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Abstract Booklet

GENERAL INFORMATION

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The Psychologie und Gehirn (PuG) 2023 conference is organised in close collaboration with the Fachgruppe Biologische Psychologie und Neuropsychologie of the German Psychological Association (DGPs) and the Deutsche Gesellschaft für Psychophysiologie und ihre Anwendung (DGPA). We thank both speakers, Prof. Hartwigsen (DGPs) and Prof. Hewig (DGPA), for their support in the scientific committee.

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Acknowledgementst

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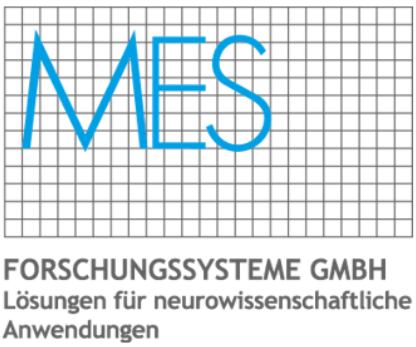

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Symposia Talks

Symposia session 1

S01.1 - The neural bases and biases of prosocial behaviors

G. Bellucci[1]

Thursday 09:00 - 10:30 | Lecture Hall N1

Department of Psychology, Royal Holloway University of London, UK

Prosocial behaviors are hypothesized to require an array of socio-cognitive and empathic abilities. In particular, mentalizing, that is, the ability to make inferences on others' intentions and behaviors, and social evaluations have been hypothesized to play a central role in different prosocial behaviors. Across different studies and with the help of different methodologies (e.g., meta-analyses, economic games, computational modeling and neuroimaging techniques), we investigated the psychological, computational and neural underpinnings of social inferences and evaluations that underlie prosocial behaviors.We first show that prosociality recruits brain regions involved in mentalizing (dorsal posterior cingulate cortex), empathy (middle cingulate cortex), social evaluations (ventromedial prefrontal cortex), and planning (dorsolateral prefrontal cortex). Further, in combination with computational modeling, we show that a psychological trait associated with a negative bias in social inferences (i.e., loneliness) is associated with reduced neural activity in the ventromedial prefrontal cortex for feedback about others' social behavior, which predicts biased learning processes that lead to more negative impressions of others.These findings provide insights into how different building blocks of prosocial behaviors are encoded, learnt, updated and represented in the brain, and how they ultimately interact with each other to bring about different social decisions in interactive settings.

S01.2 - Systematic Review and Meta-Analysis on the Effects of Acute Stress on Prosocial Behaviours

J. P. Nitschke[1], **P. Forbes**[1,2], **C. Lamm**[1]

Thursday 09:00 - 10:30 | Lecture Hall N1

[1] University of Vienna, Vienna, Austria
[2] Heinrich Heine University, Düsseldorf, Germany

Identifying factors that facilitate or decrease prosocial behaviors is crucial for our social togetherness. It's unclear how acute stress, a common occurrence in life, affects our behavior towards others. To this end, we conducted a systematic review on the effects of experimentally induced acute stress on prosocial behaviours using commonly used economic games. In a subsequent meta-analysis of 23 studies, 77 individual effects, and 2197 participants we found no overall systematic differences between stress and control groups in prosocial behaviours (SMD= 0.06), or costly punishment (SMD= 0.11). We did however, find a large heterogeneity in research findings, with some studies reporting a stress associated increase in prosociality, while others found decreases, and some no effect at all. Importantly, potential moderators—such as stress-type, gender/sex of participants, and study characteristics—could not explain these differences. This meta-analysis reveals no definitive answer on whether stress boosts or hinders prosocial behavior, indicating crucial open questions and future research directions.

S01.3 - Neural Activity During Prosocial Decision Making In Narcissistic Personality Disorder

D. S. Stolz[1,2], **A. Vater**[3], **B. H. Schott**[4,5], **S. Roepke**[3], **F. M. Paulus**[1,2], **S. Krach**[1,2]

Thursday 09:00 - 10:30 | Lecture Hall N1

[1] Social Neuroscience Lab, Klinik für Psychiatrie und Psychotherapie, Universität zu Lübeck
[2] Center of Brain, Behavior, and Metabolism (CBBM), Universität zu Lübeck
[3] Charité - Universitätsmedizin Berlin, Campus Benjamin Franklin
[4] Leibniz Institute for Neurobiology Magdeburg
[5] Klinik für Psychiatrie und Psychotherapie, Universitätsmedizin Göttingen

Narcissistic Personality Disorder (NPD) entails severe interpersonal problems with emphasized self-beneficial and exploitative behavior. To investigate the motivational and neural underpinnings of prosocial decision-making, we combined functional magnetic resonance imaging with an experimental task in which motivational conflict between self-beneficial and prosocial incentives was manipulated. A group of participants diagnosed with NPD and a group of healthy controls (CTL) were scanned while performing a prosocial decision-making task. In this task, we systematically varied the level of conflict between self-beneficial and prosocial options on each trial. We analyzed choice behavior, response times, and neural activity in regions associated with conflict monitoring to test how motivational conflict drives prosocial choice behavior. Participants in the NPD group behaved less prosocially than the CTL group overall, and showed less behavioral adaptation to changes in motivational conflict between self-beneficial and prosocial options. The NPD group responded faster than the CTL group, unless choosing prosocially, which slowed response times to a level comparable to the CTL group. Additionally, neural tracking of motivational conflict in dorsomedial prefrontal cortex was reduced in the NPD group. Collectively, low generosity in NPD appears to arise from reduced consideration of prosocial motives, which obviates motivational conflict with self-beneficial motives. Yet, our data also indicate that NPD is not marked by an absolute indifference to others' needs. This points to potentials for improving interpersonal relationships, effectively supporting the well-being of patients and their peers.

S01.4 - Investigating Adult Age Differences in Real?life Empathy, Prosociality, And Well?being Using Experience Sampling

L. Pollerhoff[1], **J. Stietz**[2], **G. J. Depow**[3], **M. Inzlicht**[3,4], **P. Kanske**[2,5], **S. Li**[1,6], **A. M.F. Reiter**[1,7,8]

Thursday 09:00 - 10:30 | Lecture Hall N1

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While the importance of social affect and cognition is indisputable throughout the adult lifespan, findings of how empathy and prosociality develop and interact across adulthood are mixed and reallife data are scarce. Research using ecological momentary assessment recently demonstrated that adults commonly experience empathy in daily life. Furthermore, experiencing empathy was linked to higher prosocial behavior and subjective well?being. However, to date, it is not clear whether there are adult age differences in daily empathy and daily prosociality and whether age moderates the relationship between empathy and prosociality across adulthood. Here we analyzed experience-sampling data collected from participants across the adult lifespan to study age effects on empathy, prosocial behavior, and well?being under real?life circumstances. Linear and quadratic age effects were found for the experience of empathy, with increased empathy across the three younger age groups (18 to 45 years) and a slight decrease in the oldest group (55 years and older). Neither prosocial behavior nor well?being showed significant age?related differences. We discuss these findings with respect to (partially discrepant) results derived from lab?based and traditional survey studies. We conclude that studies linking in?lab experiments with real?life experience?sampling may be a promising venue for future lifespan studies.

S01.5 - Monetary Incentives And Prosocial Behavior

A. Saulin[1], **M. Weiß**[1], **V. Iotzov**[1], **G. Hein**[1]

Thursday 09:00 - 10:30 | Lecture Hall N1

University Hospital Würzburg, Center of Mental Health, Department of Psychiatry, Psychosomatic and Psychotherapy, Translational Social Neuroscience Unit, Margarete-Höppel-Platz 1, 97080 Würzburg, Germany

Monetary incentives can be potent drivers of prosocial and fairness-based behavior. The studies presented here will elucidate how such incentives can foster prosocial decision behavior (study 1) as well as how they influence fairness-driven punishment and compensation behavior (study 2). Study 1 combined fMRI and drift-diffusion modelling (DDM). Participants could decide to behave either prosocially or egoistically towards another person who had previously received painful stimulation. In one condition, participants knew they would receive a monetary bonus for deciding prosocially (bonus condition) whereas in the other condition they knew they would not receive such a bonus (no-bonus condition). Results showed that when receiving a bonus, participants were more likely to choose prosocial behavior and did so more efficiently. In the bonus condition, the efficiency of the decision process (DDM v-parameter) was linked to increased neural activation in the anterior insula. These effects were particularly strong for individuals who had exhibited low levels of empathizing with the other's previously received pain. In study 2, participants were either paid to choose in accordance with or to choose in conflict with a previously activated fairness norm. In this online setting, we observed that paying participants to choose against the respective fairness norm (punishment vs. compensation) decreased their likelihood and efficiency (DDM v-parameter) to choose fairly. Taken together, the studies demonstrate that monetary incentives can promote prosocial behavior and impede fair decision-making. The extent and direction of these influences appear to be modulated by personality traits and the context in which incentives are offered.

S02.1 - Neural Correlates Of Erotic Stimulus Processing In Naturally Cycling Women

N. M. Schmidt[1], **A. Luxem**[1], **K. Henkel**[1], **L. Geißert**[1], **J. Hennig**[1], **A. J. L. Munk**[1]

Thursday 09:00 - 10:30 | Lecture Hall N2

Justus-Liebig-Universität Gießen, Germany

Background: According to the ovulatory shift hypothesis, female mate preferences and sexual desire fluctuate over the course of the natural menstrual cycle. Higher preference for masculinity and higher sexual desire are reported during the fertile phase around ovulation. However, neural mechanisms underlying this shift have scarcely been investigated so far, especially in combination with phase-specific self-reports of sexual desire. Therefore, the current study assessed self-reported sexual desire as well as neural and subjective correlates of erotic stimulus processing in association with cycle phase. Method: N = 56 naturally cycling women were studied in a counterbalanced repeated measures design during the follicular, ovulatory, and luteal phase. At each appointment, women reported their sexual desire using the sexual desire inventory. Additionally, LPP amplitudes towards erotic vs. neutral stimuli were collected as part of an emotional-picture-stroop-paradigm. Valence and arousal ratings for these stimuli were assessed at the last appointment. Results: Self-reported sexual desire differed significantly between cycle phases with the highest desire reported during ovulation. However, regarding valence and arousal ratings as well as LPP amplitudes, no phase differences were observed. While sexual desire was positively associated with valence and arousal ratings of erotic stimuli, LPP amplitudes were unrelated to self-reported sexual desire. Discussion: Observed cycle phase differences were limited to self-reported sexual desire and no significant associations were present regarding neural reactivity towards erotic stimuli. Higher ovulatory desire might thus not be attributable to higher motivational salience of erotic stimuli but might depend on other subjective processes (i.e., anticipation effects, self-perception).

S02.2 - Eye-Tracking and Erotic Stimuli Processing in Females With Different Hormonal Profiles

M. Marsiglia[1], **A. S. Kimmig**[1], **B. Derntl**[1]

Thursday 09:00 - 10:30 | Lecture Hall N2

Universität Tübingen, Germany

Oral contraceptives (OCs) are widely used in the world; however, their relationship with females' sexual motivation is multifaced. A previous study found differences in viewing patterns of erotic stimuli between naturally-cycling women and women taking OCs. However, it did not assess changes in the pill regimen. Therefore, in this exploratory study, 136 women were assessed and allocated to one of 5 groups based on their hormonal profiles. Three groups comprised women in continuous pill use, women discontinuing, and women starting OCs. Two groups were composed of naturally-cycling women. Blood samples, questionnaires, and the eye-tracking experiment were applied at two different time points. Erotic, positive, and aversive images of heterosexual couples were presented and participants had to rate the sexual attractiveness of the picture and of the male figure. The number of fixations, dwell time, and entry time were analyzed. Ratings of erotic images were higher than positive images. Women who started taking OCs decreased their number of fixations at male regions of the erotic images. However, no group differences were found for the other variables. Differences in ratings of the male figure in the erotic images positively correlated with the differences in the number of fixations at male regions in erotic stimuli and negatively correlated with differences in Ethinylestradiol levels. Shedding light on women's sexual motivation and its complex relationship with OCs is relevant to understand how physiological and psychological factors may affect each other, and, thus, to seek contraceptive methods that are more suitable for women's well-being.

S02.3 - To Start or to Discontinue Oral Contraception - Sexual Appetence And Erotic Stimuli Processing: A Longitudinal FMRI Study

A. S. Kimmig[1], **B. Derntl**[1]

Thursday 09:00 - 10:30 | Lecture Hall N2

Department of Psychiatry and Psychotherapy, University of Tübingen, Germany

Millions of women worldwide take oral contraceptives (OCs). Natural and synthetic sex hormones can affect different aspects of female sexuality such as sexual desire, motivation and possibly mating preferences. We were interested whether change in hormonal status (i.e., OC start or discontinuation) is accompanied by alterations in erotic stimuli processing and sexual appetence (i.e., sexual approach-avoidance behaviour). To this end, 81 heterosexual women participated twice in an interval of 3 to 9 months in a fMRI-based erotic approach avoidance task (eAAT). These women were measured at different hormonal states and either experienced a change in hormonal status (19 OC discontinuers and 11 OC starters) between the two measurements or were measured twice in a similar hormonal phase (26 OC users and 25 naturally cycling women) as control groups. The eAAT contains implicit and explicit measures of sexual appetence in response to images of erotic and positive non-erotic heterosexual couples. Preliminary analysis of potential changes in neural and behavioural correlates of sexual appetence across OC start or discontinuation will be presented. Behaviourally, OC discontinuers indicated to be more likely to approach erotic males after discontinuation compared to women with continued OC use. Moreover, sexual approach ratings of OC starters decreased significantly, specifically for positive, non-erotic males. This is the first longitudinal neuroimaging study providing insights into the reversibility of potential OC-related side-effects. Besides affecting sexual desire and mate preferences, OC-related alterations in actual female sexual approach avoidance behaviour could have significant implications for both, individuals and society.

S02.4 - Exploring Sexual Activity, Psychological Well-Being, and Brain Plasticity

M. Reidick[1], **A. Mascherek**[1], **S. Kühn**[1,2]

Thursday 09:00 - 10:30 | Lecture Hall N2

[1] University Medical Center Hamburg-Eppendorf, Department of Psychiatry and Psychotherapy, Hamburg, Germany
[2] Max Planck Institute for Human Development, Lise Meitner Group for Environmental Neuroscience, Berlin, Germany

While research on the implications of modifiable lifestyle factors, such as physical activity or nutrition is common, studies on the potential effects of sexual activity, especially masturbation frequency, as a lifestyle variable on health and psychological well-being as well as brain plasticity are sparse. Furthermore, masturbation is charged with centuries of superstition and ostracism and up until today masturbation is subject to social tabooing often marked with shame (Mascherek et al., 2021). We aimed at operationalizing orgasm frequency in general (= total sexual outlet) and masturbation frequency in specific as a lifestyle variable and studied whether and how frequency is related to well-being and brain plasticity. In this cross-sectional study we tested n = 112 (Mage = 29.7, SDage = 8.1; range = 18 – 54) healthy heterosexual cis-men. The participants filled in several self-reported questionnaires and underwent a cognitive measurement battery. Additionally, structural as well as functional MRI measures were administered and blood as well as semen samples were obtained. As this study is of explorative nature, we mainly performed correlational analysis to identify any potential relationship between total sexual outlet, psychological well-being, as well as brain structure and function. We will present preliminary results and give an outlook on additionally planned analyses. We thus hope to provide some ground for further interventional studies as well as contribute to the destigmatization of the topic.

S03.1 - Effects Of Calibrated Changes In Light Colour On The Human Circadian Clock And Sleep

C. Blume[1,2], **C. Cajochen**[1,2], **I. Schoellhorn**[1,2], **H. C. Slawik**[3], **M. Spitschan**[4,5]

Thursday 09:00 - 10:30 | Lecture Hall N3

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[3] Psychiatric Hospital of the University of Basel, Basel, Switzerland
[4] Translational Sensory and Circadian Neuroscience, Max Planck Institute for Biological Cybernetics, Tübingen, Germany
[5] TUM Department of Sport and Health Sciences (TUM SG), Technical University of Munich, Munich, Germany

Exposure to short-wavelength (?480 nm) light in the evening can acutely suppress melatonin, induce circadian phase delays, and affect alertness and sleep. These effects are mediated via a pathway connecting the retina and the central circadian pacemaker in the suprachiasmatic nuclei. Melanopsin-containing intrinsically photosensitive retinal ganglion cells (ipRGCs) are thought to be the primary drivers of this pathway. Much less is known about the contribution of the colour-sensitive cones. Still, especially light changing along the blue-yellow dimension of colour vision could have a relevant contribution in addition to ipRGCs. Thus, using calibrated silent-substitution changes in light colour along the blue-yellow axis, we investigated in a Registered Report whether mechanisms of colour vision affect the human circadian timing system and sleep. In a within-subjects laboratory protocol, 16 participants (8 women, 18-35 years old) were exposed to three different light scenarios for one hour starting 30 min after habitual bedtime: a control condition ("background", 93.5 lux), intermittently flickering (1 Hz, 30 seconds on/off, against background light) yellow-bright light, and intermittently flickering blue-dim light. Importantly, there was no difference in melanopsin excitation (163 lux melanopic EDI) between the conditions. Bayesian statistics did not yield conclusive evidence for differences between the three lighting conditions regarding phase delays, melatonin suppression, sleepiness, psychomotor vigilance, or sleep. Thus, this study found no evidence that evening light changing along the blue-yellow dimension under typical light levels has a major impact on human circadian melatonin secretion, alertness, and sleep. The main effect seems to be mediated via melanopsin-containing ipRGCs.

S03.2 - Lighting the Way to Productivity: Understanding the Relationship Between Light Exposure and Daytime Cognitive Performance

R. Lok[1], **R. Hut**[2], **J. Zeitzer**[1]

Thursday 09:00 - 10:30 | Lecture Hall N3

[1] Stanford University, United States of America
[2] University of Groningen, the Netherlands

Multiple brain circuits mediate the impact of light on alertness and cognitive performance, including those involving the circadian (daily) clock and other hypothalamic nuclei. While nocturnal light dose-dependently impacts alertness and cognitive performance, daytime light exposure has less robust effects. To better understand these differences, in three separate studies, we sought to investigate the (1) dose-dependent impact of light on daytime alertness; (2) spectral sensitivity of daytime light on alertness and cognitive performance; and (3) impact of circadian timing and prior wake duration on the effects of light on alertness and cognitive performance. Results indicate that: (1) exposure to higher light intensities does not alter subjective daytime alertness; (2) exposure to light enriched in shorter wavelengths (more blue) enhances several aspects of daytime cognitive function, including working memory, visual scanning, and emotion recognition; and (3) the duration of prior wake moderates the modest light effects on perceived alertness, while light effects on cognitive performance occur independent of circadian time or duration of prior wake. These studies suggest that light effects on perceived alertness are modest at best during the day, while light exposure significantly improves specific aspects of cognitive performance. Individuals should be exposed to high-intensity broad-spectrum white light indoor lighting during office hours, as this may benefit cognitive performance, even though this may not be perceived as such.

S03.3 - Behavioural Control of Light Exposure – A Target for Interventions To Support Sleep and Circadian Health?

A. M. Biller[1]

Thursday 09:00 - 10:30 | Lecture Hall N3

Technical University of Munich, Germany

Light exposure triggers neuroendocrine, behavioural, and cognitive responses, including the synchronisation of the circadian clock with the light-dark cycle. Besides beneficial effects of light on human physiology, too much light or light at the wrong time can cause adverse health effects. Insights gained from laboratory research now find applications for example in lighting design, with standards and consensus guidelines proposing optimal light levels to best support physiology and health. Implicit in this lab-based conceptualisation is a simple input-output relationship between light and its physiological effects. This conceptualisation ignores that we actively shape the lighting environment we inhabit e.g., by manipulating room light. We lack a nuanced understanding of light interactions in the real world, including how to adequately measure and quantify such behaviour. Here, I will present a novel framework that views light exposure as a behaviour which helps to systematise human-light interactions and highlights areas for behavioural change. By focusing on active behaviour we might be able to design more effective light interventions in clinical contexts and develop individualised strategies to improve sleep health and well-being in everyday life. I will present actimetry-derived light data from the OPTIMA study, a 7-week inward study on major depression (n=237), as well as other studies conducted in challenging ecological environments that include light interventions. Research in the real world comes with technical and statistical challenges, such as wearable sensor technology and handling missing data. I will end with discussing such challenges and potential solutions that focus on behaviour and behaviour change techniques.

S03.4 - What Does the Human Eye Tell the Clock? From Mechanisms to Translation, Regulation and Practice

M. Spitschan[1,2]

Thursday 09:00 - 10:30 | Lecture Hall N3

[1] Technical University of Munich, Germany
[2] Max Planck Institute for Biological Cybernetics, Germany

The human retina plays a critical role in regulating our circadian clock. This clock coordinates our daily physiological and behavioural rhythms, including sleep-wake cycles, hormone secretion, and metabolism. In recent years, there has been increasing interest in understanding how the human retina communicates with the circadian clock and how this information can be translated into practical applications to improve human health and well-being. Since the discovery of the melanopsin-containing intrinsically photosensitive retinal ganglion cells (ipRGCs) in the late 1990s, knowledge about light's non-visual (circadian and neuroendocrine) effects has received significant interest in a range of fields, including architectural lighting design and metrology. This talk introduces the mechanisms underlying the interaction between the eye and the circadian clock, how light can be measured in a physiologically-relevant way, and which strategies can be used to optimise our light exposure through structural or behavioural means to best support physiology, sleep, and wakefulness.

S04.1 - Functional Neural Plasticity Associated With Cognitive-Behavioral Therapy Of Major Depressive Disorder - A Meta-Analysis

L. Z. Maliske[1], A. Mekelburg[1], E. Schrammen[2], P. Kanske[1], K. Förster[1]

Thursday 09:00 - 10:30 | Lecture Hall N6

[1] Technische Universität Dresden, Dresden, Germany
[2] Institute for Translational Psychiarty, University of Münster, Münster, Germany

Cognitive behavioural therapy (CBT) for major depression has been associated with increased activity in prefrontal control areas and decreased activity in limbic regions. Thus, the discovery of such CBT-associated neural changes may reveal relevant mechanisms of action. Using AES-SDM, we will conduct a meta-analysis of whole-brain datasets investigating functional neural plasticity associated with CBT in patients with major depression. Longitudinal functional MRI studies will be identified by our systematic literature search using PRISMA criteria, pre-registered with OSF (will be made available via https://osf.io/rxs65/). In our meta-analysis, we will delineate functional neural plasticity associated with CBT in cognitive-emotional processing by focusing on within-group pre-post comparisons within the patient group. We will include cognitive-emotional tasks and, where possible, analyse whole-brain t-maps provided by the authors of the included studies. We hypothesise that CBT will be associated with increased activation in prefrontal regions such as the medial prefrontal cortex and reduced activation in limbic regions such as the amygdala. In terms of putative mechanisms of action during CBT, such changes may indicate an increase in top-down control over emotional states and a decrease in emotional reactivity.

S04.2 - Neural Correlates of Fear Processing and Modulating Effects of Genetic Factors

I. C. Ridderbusch[1]

Thursday 09:00 - 10:30 | Lecture Hall N6

University of Marburg, Germany

Anxiety disorders affect up to 25% of the general population worldwide and cause substantial individual and societal burden. Currently the most effective treatment of anxiety disorders is exposure?based cognitive?behavioral therapy (CBT) in which a central process of fear reduction is extinction learning. fMRI analyses in fear processing aim to understand how exposure-based CBT works on the neural level. The investigation of neural correlates of fear acquisition and fear extinction enables a better understanding of the origin of psychopathological mechanisms of fear and also to identify the mechanisms of action in the brain during exposure therapy, modeled by extinction learning paradigms. On the basis of understanding these processes and what facilitates or hinders them, therapy can then be optimized and individualized. I will present results from the large multicentric projects “Panic Net” and “Protect-AD” showing communalities and differences in the neural correlates of fear processing between patients with anxiety disorders and healthy controls. In two studies on patients with panic disorder and agoraphobia, we investigated the modulating effects of allelic variation in rs7688285 coding for GLRB and in NOS1 ex1f-VNTR as risk factors before and after exposure-based CBT.Providing evidence for differential activation towards threat and safety signals for rs7688285 during fear acquisition and for NOS1 ex1f-VNTR during fear extinction, our results shed new light on the complex interaction between genetic risk, current psychopathology and treatment-related effects. Furthermore, I will talk about the feasibility of reliable measurements of optimized extinction training as a necessary basis for future research in this field.

S04.3 - Distinct Neural Correlates of two Psychotherapeutic Approaches in Bipolar Disorder

K. Meyer[1], C. H. Attar[1], C. Vogelbacher[2], A. Jansen[3], M. Hautzinger[4], F. Bermpohl[1]

Thursday 09:00 - 10:30 | Lecture Hall N6

[1] Charité Universitätsmedizin Berlin, Germany
[2] Translational Clinical Psychology, Department of Psychology, Philipps-University Marburg
[3] Core-Facility Brainimaging, Faculty of Medicine, Philipps-University Marburg
[4] Department of Psychology, Clinical Psychology and Psychotherapy, University Tübingen

Deficits in emotion processing and social cognition are suggested to underlie mood symptoms and functioning impairments in bipolar disorder (BD). Here, we investigate whether distinct psychotherapeutic approaches targeting emotional or social processing skills differentially affect BD symptoms and brain activation. In a randomized controlled trial (RCT) conducted within the multicentric BipoLife project, two psychotherapeutic group interventions were compared in terms of their effect on mood symptoms and global functioning in euthymic BD patients. Furthermore, functional magnetic resonance imaging (fMRI) was conducted pre- and post-intervention. The first specific cognitive behavioral intervention (SEKT, n = 31) encompassed psychoeducation, self-management, impulse regulation, and theory of mind (ToM) and social skills. In the second open, emotion-focused intervention (FEST, n = 28), therapists fostered emotion processing by labeling emotions and focusing patients' attention on their affective states. While both interventions effectively stabilized patients' symptoms across follow-up, distinct effects on post-intervention brain activation emerged. Patients in SEKT versus FEST showed an increased activation of the ToM brain network in a ToM task, possibly indicating enhanced processing of social stimuli post-intervention. Patients in FEST versus SEKT demonstrated an increased amygdala activation elicited by an emotional face-matching task post-intervention, purportedly indicating reduced emotional avoidance and increased emotion processing. In FEST, the increase in amygdala activation was associated with less depressive symptoms at follow-up (r = .72). Together, the studies demonstrate how fMRI captures differences in the neural pathways by which psychotherapy exerts its positive effects on BD symptomatology. Implications for psychotherapy research are discussed.

S04.4 - Effects Of One-session Relaxation Hypnosis On Hematological And Bioenergetic Parameters: A Randomized Controlled Experiment

S. Karrasch[1], L. Matits[1,2], W. Bongartz[3], R. N. Mavio?lu[1], A. M. Gumpp[1], M. Mack[1], V. Tumani[4], A. Behnke[1], A. Karabatsiakis[5], J. M. Steinacker[2], I. Kolassa[1]

Thursday 09:00 - 10:30 | Lecture Hall N6

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Chronic stress is a central risk factor in the pathophysiology of mental and somatic diseases. Increased inflammatory processes and an altered stress response regulation have been observed. Hypnotherapy is one of the oldest relaxation methods and has a relieving effect on stress by reducing the activity of the sympathetic nervous system. However, the exact biomolecular mechanisms underlying the positive effects of hypnosis on mental and physical health are still unclear. To fill this knowledge gap, we investigated, in a randomized clinical trial, the effects of a 20-minute relaxation hypnosis on (i) hematological and (ii) bioenergetic levels in healthy subjects (N = 47) with an elevated subjective stress level. One 20-minute relaxation hypnosis was sufficient to cause an alteration in hematological parameters. Significant quantitative changes in differential blood count, namely a decrease in erythrocyte and thrombocyte counts and consequently in erythrocyte-related parameters (i.e., hemoglobin and hematocrit) in the hypnosis condition compared to the control condition, were found. While relaxation-induced vasodilatation might explain these changes, it is still not completely clear how these changes affect our stress response system. At the bioenergetic level, the results show that one session of relaxation hypnosis does not significantly alter mitochondrial respiration. However, we were able to confirm previous findings of impaired cellular energy metabolism in stress, anxiety, and depression regardless of the experimental condition. The results improve our biomolecular understanding of the effect of hypnosis and provide insights into possible psychohematological and bioenergetic mechanisms of relaxation.

S04.5 - Neurobiological Evidence For The Effectiveness Of Hypnotic Safety Suggestions

B. Schmidt[1]

Thursday 09:00 - 10:30 | Lecture Hall N6

Jena University Hospital, Germany

Safe place suggestions are a basic technique in hypnotherapy. In my research, I demonstrate their effectiveness in laboratory and clinical settings. Studies in the EEG laboratory showed lower EEG brain activity to monetary rewards and less devaluation of future monetary rewards when participants imagined being at a safe place during hypnosis. These neurobiological results indicate less impulsivity and more self-control with the hypnotic safety suggestion. To test if post-hypnotic safety suggestions work in acute stress situations, I conducted a study where participants first got a hypnosis session and then faced a social stress task (TSST). Participants who used their post-hypnotic safety trigger during acute stress felt less stressed and anxious compared to the control group. They also had fewer negative thoughts concerning their TSST performance, an effect that was stable over one week. Cortisol levels did not rise over the responder threshold of 1.5 nmol/l from baseline to after TSST in all participants, which might be a result of the relaxing hypnosis session before the TSST. To test safety suggestions in challenging clinical settings, I conducted a study where patients in the intensive care unit received safety suggestions during noninvasive ventilation. Patients indicated that they felt less anxious and aroused after the intervention and their physiological markers responded to the safety suggestions, showing lower breathing frequency and heart rate. The effect sizes of the safe place method are large. With my research, I would like to contribute to the wider application of this technique.

S05.1 - Visual and Auditory Population Coding for Quantity in Human Cortices

R. Kessler[1], **A. Kieslinger**[1], **M. A. Skeide**[1]

Thursday 09:00 - 10:30 | Lecture Hall N9

Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Extracting quantitative information from multiple sources of sensory input is essential for the survival of numerous species. Whether neural population coding for quantity is universal across different human sensory modalities is far from understood. Here we identified a common coding scheme for visual and auditory numerosities in humans using magnetic resonance imaging at 7 Tesla. Specifically, we employed a model inspired by electrophysiological data that captures the preferred numerosity and the numerosity range to which a neuronal population responds. This neurobiologically plausible model consistently explained a substantial proportion of the observed hemodynamic variance across individual datasets. Populations turned out to be organized topographically, forming 'numerotopic' maps. We isolated several visual maps scattered over extended association cortices from auditory maps in temporal cortices. The present data shed light on the sensory foundations of quantitative cognition in the human brain. Our work informs future research following the vision of narrowing the gap between cognitive neuroscience and cellular neurobiology.

S05.2 - Neural Mechanisms of Numerical Selection in the Fronto-Parietal Cortices of the Macaque

T. Machts[1], **J. Grüb**[1], **A. Nieder**[1]

Thursday 09:00 - 10:30 | Lecture Hall N9

Animal Physiology Unit, Institute of Neurobiology, University of Tübingen, 72076 Tübingen, Germany

Cognitive control is needed to regulate interactions between brain areas to generate purposeful behavior. The prefrontal cortex (PFC) and posterior parietal cortex are key brain areas for cognitive control but also for numerical representations. How numerosity-selective cells change their tuning after a presentation of a sequence of other numerosities is unclear. We trained two macaque monkeys on a version of the delayed match-to-numerosity task in which the monkeys had to match numerosities to sample numerosities (1 – 4). Non-matching numerosities that were presented between sample and matching test stimulus had to be ignored. The task consisted of up to three test phases and in each test phase the right or wrong numerosity could occur. We simultaneously recorded single-unit activity from PFC and the intraparietal sulcus (IPS). In both brain areas we found cells that encode the presented numerosities. For each of these numerosity-selective neurons we determined the tuning in the sample period. Next, we tested with tuning curve cross-correlations how this tuning changed when a match numerosity was presented in the sequence of test numerosities. Surprisingly, PFC neurons kept their initial tuning stably over the test phases, while neurons from the IPS exhibited increasingly deteriorated tuning with increasing test periods. This was confirmed by training and testing a support vector machine for the discrimination of numerosities during the match period on the spiking activity of the sample period. Our results suggest a privileged role for the PFC in coding and maintaining behaviorally relevant numerical information in light of irrelevant numerosities.

S05.4 - Neurons In The Telencephalon Of Crows Translate Perceived Numbers Into Matching Numbers Of Self-Generated Actions

M. E. Kirschhock[1], **A. Nieder**[1]

Thursday 09:00 - 10:30 | Lecture Hall N9

University of Tübingen, Germany

Humans and animals share a primordial and non-symbolic number estimation system. It allows them to not only to perceive numerosity, i.e., the number of objects in stimuli, but also produce a specific number of self-generated actions. While the brain mechanisms representing perceived number have been studied intensively, the neuronal processes of transforming number stimuli into a matching number of self-generated actions are unknown. To explore this sensorimotor transformation, we trained two carrion crows (Corvus corone) to judge numerical values in displays and to flexibly plan and perform a matching number of pecks. While the crows performed this task, we recorded single-cell activity within the telencephalic brain area nidopallium caudolaterale (NCL), a putative homologue to the mammalian PFC. Here, we report sensorimotor number neurons in the crow NCL that signaled the impending number of self-generated actions. Neuronal population activity during the sensorimotor transformation period predicted whether the crows planned the instructed number of pecks, or mistakenly planned for fewer or more pecks than instructed. During sensorimotor transformation, both a static neuronal code characterized by persistently number-selective neurons and a dynamic code originating from neurons carrying rapidly changing numerical information emerged. The findings indicate that there are distinct functions of abstract neuronal codes supporting the sensorimotor number system in the crow brain.

S05.4 - Visual Quantity Measurement and Comparison in Untrained Deep Neural Networks

S. Paik[1]

Thursday 09:00 - 10:30 | Lecture Hall N9

KAIST, Korea, Republic of (South Korea)

The ability to measure and compare quantities of visual objects is observed in naïve animals, implying that it arises in the very early stages of the development. However, how this function originates in the brain even before visual experience, remains unknown. Here, I will demonstrate our recent findings that neuronal tuning for visual quantity measurement and comparison can arise spontaneously in hierarchical neural networks in the complete absence of training. Using a biologically inspired deep neural network model, we found that units tuned to stimulus numerosity arise in untrained random feedforward circuits. These units also showed single- and multi-neuron characteristics of the types observed in biological brains, and the responses of these units enable the network to perform quantity comparison tasks, even under the condition that the information in the stimulus is incongruent with low-level visual cues. We also found that single units selective to proportions and differences between visual quantities emerge in randomly initialized wirings and that they enable the network to perform quantity comparison tasks. Notably, two distinct tunings to proportion and difference both originate from a random summation of monotonic, nonlinear neural activities, and a slight difference in the nonlinear response function determines the type of measure. Our results suggest that visual quantity measurement and comparison are primitive types of functions that can emerge spontaneously from the statistical properties of bottom-up projections in artificial neural networks and, probably, in early brains.

S06.1 - Identifying Digital Biomarkers of Mental Health Symptoms in Young Adults Using an Online Video-recorded Interview

L. Puhlmann[1,2], **K. Schultebraucks**[3,4], **R. Kalisch**[1,5]

Thursday 09:00 - 10:30 | Lecture Hall 7E02

[1] Leibniz Institute for Resilience Research, Mainz, Germany
[2] Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany
[3] Department of Psychiatry, NYU Grossman School of Medicine, New York, NY, USA
[4] Department of Population Health, NYU Grossman School of Medicine, New York, NY, USA
[5] Neuroimaging Center (NIC), Focus Program Translational Neuroscience (FTN), Johannes Gutenberg University Medical Center, Mainz, Germany

Researching individual resilience to the development of psychiatric disorders requires the accurate monitoring of symptoms in subclinical populations. Traditional mental health assessments can be insensitive to subtle and often heterogenous subclinical symptoms. In the context of an ongoing longitudinal resilience study (DynaMORE, www.dynamore-project.eu), we investigate the use of digital biomarkers (DBMs) as objective and sensitive indicators of transdiagnostic mental health symptoms in healthy but stress-exposed young adults. We developed a structured online video-recorded interview to capture psychological distress along four clusters of internalizing symptoms. From participants' recorded responses, features such as facial emotional expressivity (e.g., happiness) and vocal acoustics (e.g., voice pitch) were extracted using pre-trained machine-learning algorithms. To identify potential DBMs in a proof-of-concept analysis, we assessed whether subsets of 13 facial expressivity or 16 vocal acoustic features could predict self-reported symptoms measured via the general health questionnaire (GHQ-28). Upon data-pull, N=94 adults 18-27 years of age had completed the interview as part of extensive psycho-physiological phenotyping (half of target inclusion). Greater subjective symptoms were predicted by multiple facial emotions (full model adj-R2=.135). Lower overall facial expressivity emerged as the single most predictive feature ($t=3.80$, $p<.001$, adj-R2=.129). Vocal acoustic features did not explain significant variance in the present subsample. With this proof-of-concept analysis, we identify DBMs of mental health symptoms from a video-recorded interview to our knowledge for the first time in a subclinical population. Preliminary results indicate facial expressivity as a particularly promising feature. Future analyses with the full dataset will determine applicability in resilience research and beyond.

S06.2 - Differentiating Social Interaction Difficulties in Patients with Psychiatric Conditions using the Simulated Interaction Task

M. Norden[1], **H. Drimalla**[1]

Thursday 09:00 - 10:30 | Lecture Hall 7E02

Faculty of Technology, Bielefeld University, Germany

Many psychiatric disorders are characterized by alterations in social interaction behavior which can lead to significant impairments in daily life functioning, relationships, and overall quality of life. Analyzing non-verbal behavior in videos has shown promising results for distinguishing patients with psychiatric conditions from neurotypical individuals, which can support the diagnostic procedure and understanding of specific social interaction difficulties. However, many psychiatric conditions such as Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD) and Depression exhibit comorbidities and express overlapping social behaviors. Video analysis methods have not been applied to comparing these disorders during social interactions and evaluating patterns of non-verbal behaviors across different diagnoses. In an ongoing study, we have integrated the "Simulated Interaction Task" into the standard diagnostic procedure of a psychological practice including patients with suspected diagnoses of ADHD, ASD or Depression. We demonstrate how the non-verbal behavior captured in the videos collected during the SIT can be analyzed to characterize social interactions in different psychiatric conditions. To this end, we propose different measures for comparing facial expressivity and voice characteristics throughout the conversation and present preliminary results. Using statistical comparisons and machine learning methods, we aim to identify specific patterns of facial expressivity for each disorder compared to other social interaction diagnoses, and to gain a better understanding of the individual differences in social interaction symptomatology across individuals and patient groups. The potential benefits of more precise characterization and automated analysis of social interaction behavior extend beyond improved and expedited diagnoses to more effective targeted interventions.

S06.3 - Social Signatures of Mental Health: Objective Measurement with Digital Messaging Data

F. Martin[1], **O. Hakobyan**[1], **H. Drimalla**[1]

Thursday 09:00 - 10:30 | Lecture Hall 7E02

Center for Cognitive Interaction Technology (CITEC), Bielefeld University, Germany

Social interactions are a fundamental component of human life and are linked to both mental and physical well-being. Understanding and accurately measuring social interactions is vital for risk prediction and appropriate intervention. However, self-report questionnaires, which are commonly used to measure social interactions, produce subjective and potentially biased measurements. To overcome this challenge, we propose a solution towards more objective measurements through the use of the digital traces of online social interactions. We introduce Dona, an online platform that enables individuals to donate their chat history data in three steps. First, participants request their data from WhatsApp or Facebook and receive files containing their data. Second, the data is anonymized by retaining only aliases of the conversation participants, message timestamps and word counts. Finally, participants submit the anonymized data and receive visualizations of their messaging behavior, such as the interaction intensity, active hours and response times. In addition, participants may be asked to fill out study-specific questionnaires. Since using digital traces of online interactions is a novel approach to measure social interactions, it is crucial to verify that online data is representative of general human interactions, not just of those that occur online. For this reason, we compared the calculated interaction features from the donated chat data to interaction features reported in the literature. Preliminary results show that our data exhibits similar intensity, balance and frequency patterns. In conclusion, Dona provides a verified approach to obtain objective and retrospective social interaction data that can enrich ongoing and past studies.

S06.4 - Real-Time Analysis Of Ecological Momentary Assessments And Ecological Physiological Assessments To Trigger Interventions During Stress In Real Life

S. Bögemann[1], J. v. Leeuwen[1], A. v. Kraaij[2], J. Weermeijer[3], W. d. Raedt[4], R. Kalisch[5,6], I. Myin-Germeys[3], E. Hermans[1]

Thursday 09:00 - 10:30 | Lecture Hall 7E02

[1] Donders Institute for Brain, Cognition and Behaviour, Radboud university medical center, Nijmegen, The Netherlands
[2] OnePlanet Research Center, imec-the Netherlands, Wageningen, The Netherlands
[3] Center for Contextual Psychiatry, Department of Neuroscience, KU Leuven, Leuven, Belgium
[4] imec, Leuven, Belgium
[5] Leibniz Institute for Resilience Research (LIR), Mainz, Germany
[6] Neuroimaging Center (NIC), Johannes Gutenberg University Medical Center, Mainz, Germany

Ecological momentary interventions (EMIs) offer great potential to overcome many of the barriers associated with mental health care, including support outside sessions, waiting time, and high costs. Here, we explore how EMIs for stress-related symptoms can be optimized by real-time, personalized triggering based on psychological and physiological stress signals, because this would allow delivery of interventions at the moment when they are most effective. The DynaMORE consortium developed a real-time analysis pipeline based on the RADAR-BASE platform using both ecological momentary assessments (EMA) and ecological physiological assessments (EPA). We use two smartphone apps: 1. the RADAR aRMT app (adapted for DynaMORE) to upload EMA and 2. the DynaMORE Chill+ app to upload 10 minutes of EPA data acquired right before each EMA. EPA is collected with the Chill+ wristband. Uploaded EMA/EPA data is analyzed in real time at the Donders Institute where features are extracted to detect stress and trigger EMIs individually. The pipeline is deployed in DynaMORE's ongoing longitudinal intervention study. This study starts with a calibration week, where standardized EMA/EPA distributions are calculated to determine personalized thresholds for the identification of stressful real-life situations. During subsequent intervention weeks, EMA/EPA data are compared to each individual's baseline threshold in real time to decide on the momentary delivery of interventions on the participant's smartphone. Thresholds are adjusted on a daily basis to accommodate signal drift. We will discuss the decision algorithm based on simulations and initial real-life data from this project.

Symposia session 2

S07.1 - Comparative Anatomy and Hemisphere Determining Features in Humans and Chimpanzees

P. Friedrich[1,2]

Thursday 11:00 - 12:30 | Lecture Hall N1

[1] Institute of Neuroscience and Medicine, Brain and Behaviour (INM-7), Research Centre Ju?lich, 52428 Ju?lich, Germany
[2] Institute of Systems Neuroscience, Medical Faculty, Heinrich Heine University Du?sseldorf, 40225 Du?sseldorf, Germany

The comparison between regions or tracts in the left and right hemispheres grants insight into local asymmetries as one characteristic feature of primate brain organization. Various elements in hemispheric structural architecture show evolutionary trajectories, and thus can potentially be interpreted as adaptations which contribute to human mental abilities. While this notion motivates research about hemispheric anatomy across species, direct comparisons of brain features between primates are challenged by the lack of direct anatomical translations. Recently, we developed a new methodological framework designed to uncover relevant features for identifying a hemisphere as left or right. This approach allows us to shift our perspective of hemispheric architecture - from investigating local left-right differences towards mapping global hemisphere determining features. We utilized this framework on human and chimpanzee cortical volumetry data to reveal differences in the cortical space, lateralization strength, cand variance of leftward and rightward asymmetric hemisphere-defining areas. These results support assumptions of a shift in relevance of the two hemispheres in the common ancestor of chimpanzee and human: from a domain-specific dominance of rightward and bilateral processing in chimpanzees to increased relevance of the left hemisphere in humans.

S07.2 - Using Affective Styles To Improve Animal Welfare With The Domestic Pig As Model

C. Goursot[1]

Thursday 11:00 - 12:30 | Lecture Hall N1

Institute of Animal Welfare Science; University of Veterinary Medicine Vienna

Knowing which factors predispose individuals to resilience, anxiety or depression is crucial to ensure individualized well-being. Everyone enjoys positive emotions and reacts to aversive events in a personal way. Affective styles (i.e. consistent inter-individual differences in emotional reactivity and regulation) are a promising framework to study individual appraisal, also in non-human animals. Strikingly, individual differences in baseline cerebral lateralization are suggested to predict these affective styles. The lateralization underlying human affective styles is seen as a reliable biomarker of psychological well-being and psychopathology. Similarly, the study of behavioral lateralization is considered a promising approach to better understand emotional processing and personality in non-human animals. The domestic pig is a versatile animal model for animal welfare research and neuroscience since it is one of the most farmed species worldwide as well as a good candidate to bridge human and non-human neurosciences. In this contribution, I will first demonstrate that theory-driven research on pig laterality has opened the doors for research on affective styles in non-human animals. After this, I will specify where the knowledge gaps are between human and non-human in this research field. Finally, I will show that more interdisciplinary research on non-human affective styles is needed to understand better not only the convergent mechanisms of behavioral control (e.g. activation vs. inhibition), but also the origins of motivational tendencies and personality, hence of individual appraisal. This will help to advance animal welfare research and may inspire the fields of human psychology and neurosciences.

S07.3 - Social Cognition in the Dog´s Brain

C. A. Guran[1,2]

Thursday 11:00 - 12:30 | Lecture Hall N1

[1] Vienna Cognitive Science Hub, University of Vienna, Austria
[2] SCAN Unit, Faculty of Psychology, University of Vienna, Austria

Dogs are our beloved companions and trusted work colleagues. In addition, however, dogs are also a highly interesting model species for neuroscience research for a variety of reasons: they are interesting models for human aging, are highly trainable, they are phylogenetically distant, and they excel in their social cognitive abilities. With our cohort of trained, canine participants, we are able to conduct functional MRI in awake, unrestrained dogs, to answer questions about social cognition and convergent evolution. We showed dogs (and humans) videos of social interactions between dogs and humans, as well as non-social interactions between an agent (human or canine) and an object in the scanner, to try and find interaction, but specifically social interaction, networks in the dog brain. In addition, we also investigated how dogs process “1st dog” experience of touch in comparison to observation of touch in another dog. With our results presented in the talk, we can try to underpin neural mechanisms for social cognition across very distantly related species to understand better how the dog brain function, but also to uncover whether social cognition evolved convergently, that is through common pressures in distantly related species, or whether it is a common ability of protomammals that was lost in some lineages, and honed in others.

S07.4 - Chimpanzee Neuroepigenetics as a Window into Human Behavioral Evolution

N. Staes[1]

Thursday 11:00 - 12:30 | Lecture Hall N1

Centre for Research and Conservation, Royal Zoological Society of Antwerp, Behavioural Ecology and Ecophysiology Group, University of Antwerp, Belgium

To investigate the evolution of human behavior, fossil records are limited in what they can tell us. Therefore, extant species are often used as "the next best thing". Chimpanzees offer great models due to their close genetic relatedness and resulting similarities in genetic, neural and behavioral traits to humans. Here I present to what extent epigenetic modulation of genes coding for crucial neurohormones and neurotransmitters impacts individual variation in chimpanzee personality and joint attention behavior (i.e. the extent to which individuals are able to respond to non-verbal communicative cues). For 51 chimpanzees with matching behavioral profiles we determined epigenome-wide levels of CpG methylation in peripheral blood samples using a methylation array identical to human studies. CpG-specific methylation levels were extracted for five candidate genes coding for dopamine, oxytocin, vasopressin and serotonin receptors and/or transporters (DRD2, AVPR1A, OXTR, HTR1A, SLC6A4). Personality and joint attention data were also collected using methods highly similar to human research that were validated in chimpanzees. Results show that, similar to human studies, dopaminergic methylation strongly predicted levels of social and exploratory personality traits, whereas serotonergic methylation more closely predicted anxiety-related personality traits. Joint attention performance was primarily predicted by vasopressin and not oxytocin methylation. Combined, these studies reveal useful biomarkers for treatment of common human neurodevelopmental disorders like anxiety and autism spectrum disorders that show consistent cross-species links with behavioral impairments.

S08.1 - From Imitation to Empathy to Joint Embarrassment - fMRI Investigations in German and Chinese Participants

C. A. Sojer[1], **S. N. L. Schmidt**[1], **Z. Yan**[1], **P. Kirsch**[2], **D. Mier**[1]

Thursday 11:00 - 12:30 | Lecture Hall N2

[1] Department of Psychology, University of Konstanz, Konstanz, Germany
[2] Central Institute of Mental Health, Medical Faculty Mannheim / University of Heidelberg, Germany

Social understanding between cultures is becoming increasingly important in times of intercultural exchange. Although an intracultural advantage for social understanding has been reported, little is known about neural correlates of it regarding different social-cognitive processes. In our project, we investigated imitation, empathy, and embarrassment in two independent samples of Germans and Chinese. Participants in the main study were 32 Germans and 32 Chinese recruited in Germany, and 43 Chinese in China. We replicated the study with 36 Germans and 36 Chinese in Germany. They completed an imitation and an empathy task with happy and fearful facial expressions of both ethnic groups. In the embarrassment task, caricatures of embarrassing social situations were applied. All data was acquired with 3 T Siemens scanners and analyzed with SPM12. We found reliable activation in areas of the mirror-neuron-system and mentalizing-network in Germans and Chinese in all tasks. However, only a few group differences could be replicated. These were 1) higher activation of the somatosensory cortex during imitation for in- vs outgroup in Germans than in both groups of Chinese, and 2) higher activation of the temporoparietal junction during embarrassment in Germans than in Chinese. Notably, while this activation was highest in Germans, it was medium in Chinese in Germany, and lowest in Chinese in China. Our tasks were suitable to activate core regions associated with social cognitive processing. In addition, our results show some evidence for an intracultural advantage on different levels of social cognition, and some evidence for a cultural social learning effect.

S08.2 - From Genes To Performance: Dopaminergic Modulation Of Decision-making In A Stock Market Simulation

S. A. Hogeterp[1], **T. Plieger**[1], **M. Monzel**[1], **A. Vetterlein**[1], **M. Reuter**[1,2]

Thursday 11:00 - 12:30 | Lecture Hall N2

[1] University of Bonn, Department of Psychology, Germany
[2] University of Bonn, Center for Economics and Neuroscience, Germany

Since numerous studies have impressively demonstrated the influence of personality traits on financial decision-making, the question arises if biological markers might underlie this association. The present study investigates the relationship between financial decision-making behavior and genetic markers of the dopaminergic system, as dopamine has already proved to be a promising candidate for risk-taking and decision-making behavior. Therefore, a stock market simulation was performed over the course of three weeks with N = 133 (60 females, 73 males) participants. All of them were genotyped for the functional gene polymorphisms dopamine transporter VNTR (rs28363170), COMTVal158Met (rs4680), DRD2/ANKK1 Taq1A (rs1800497) and a dopamine D4 receptor VNTR in exon 3 (DRD4e3). Genotypes were used to calculate a polygenic score (PGS) which explained around 8% of the variance in the outcome at the end of the stock market simulation (Capital). Interestingly, this effect was only seen for male participants. This sex-dependent effect might have various causes, including different socialization processes, which should be investigated further in future studies. Furthermore, by means of the PGS, we extended a previously published model, which ultimately resulted in a variance explanation of 47% regarding Capital. Herewith we offer a comprehensive model for the success within the stock market game simulation and provide yet another evidence of the relevance of dopamine for decision-making processes, also within financial contexts.

S08.3 - The Loss of Shared Memories: Neural Correlates of Episodic Autobiographical Memory Deficits in Aphantasia

M. Monzel[1], **P. Leelaarporn**[2,3], **T. Lutz**[3], **J. Schultz**[4], **C. McCormick**[2,3], **M. Reuter**[1,4]

Thursday 11:00 - 12:30 | Lecture Hall N2

[1] Department of Psychology, University of Bonn, Bonn, Germany
[2] Department of Neurodegenerative Diseases and Geriatric Psychiatry, University of Bonn Medical Center, Bonn, Germany
[3] German Center for Neurodegenerative Diseases, Bonn, Germany
[4] Center for Economics and Neuroscience, University of Bonn, Bonn, Germany

Aphantasia is a neuropsychological variation that prohibits approximately 3.9 % of the healthy population from experiencing visual imagery. Many aphantasics report this lack of visual imagery to affect their autobiographical memory retrieval, leading to perceived social distress when losing shared memory. Our aim was to examine which neural substrates might be responsible for this autobiographical memory loss in aphantasics and which components of autobiographical memory are especially affected. We conducted an autobiographical memory interview with 14 congenital aphantasics and 16 age- and sex-matched controls as well as a fMRI autobiographical memory task. Aphantasics showed stark difficulties in episodic autobiographical memory retrieval which included emotional memory that is relevant for social bonding. Neurally, greater activation during autobiographical memory compared to a control task was found in all regions typically associated with autobiographical memory, including vmPFC, posterior neocortex, and bilateral hippocampus. Aphantasics compared to controls displayed decreased hippocampal and increased bilateral visual-perceptual cortex activation. In addition, aphantasics exhibited stronger functional connectivity between the hippocampus and visual-perceptual cortices. We propose several neural mechanisms based on our data and previous mental imagery theories that might explain the association between hippocampal hypoactivity, visual cortex hyperactivity and hyperconnectivity and the lack of visual imagery.

S08.4 - When Knowledge Hurts: Humans Are Willing To Receive Pain For Obtaining Non-instrumental Information

S. Bode[1], **X. Sun**[1], **M. Jiwa**[1], **P. S. Cooper**[2], **T. T.J. Chong**[2], **N. Egorova-Brumley**[1]

Thursday 11:00 - 12:30 | Lecture Hall N2

[1] The University of Melbourne, Australia
[2] Monash University, Australia

Humans value information that reduces uncertainty or leads to pleasurable anticipation, even if it cannot be used to gain tangible rewards or change outcomes. In exchange for such "non-instrumental" information, they are willing to incur significant costs, sacrifice rewards, or invest physical effort. In this study, we investigated whether participants were also willing to endure pain – a highly salient and aversive cost – to obtain such information. Forty participants performed a computer-based task. On each trial, they observed a coin flip, with each side associated with different monetary rewards of varying magnitude. Participants could choose to endure a painful thermal stimulus delivered to their forearm (low, moderate, or high pain) to learn the outcome of the coin flip immediately. Importantly, regardless of their choice, winnings were always earned, rendering this information truly non-instrumental. Results showed that participants were willing to endure pain in exchange for information, with a lower likelihood of doing so as pain levels increased. Both higher expected rewards and a larger variance between the two possible rewards independently increased the willingness to accept pain. Additional explorative analyses showed positive correlations between information-seeking choices and both state and trait anxiety. Deprivation Sensitivity, which measures the anxiety and frustration experienced when people cannot access desired information, correlated negatively with pain tolerance. Our results show that the intrinsic value of escaping uncertainty through non-instrumental information is sufficient to offset pain experiences, suggesting a shared mechanism through which these aversive states can be directly compared.

S08.5 - Political Orientation Predicts Brain Reactivity To In-Group And Out-Group Faces

M. Reuter[1], M. Monzel[1], A. Vetterlein[1], T. Grünhage[1], S. Hogeterp[1], A. Felten[1], T. Plieger[1]

Thursday 11:00 - 12:30 | Lecture Hall N2

University of Bonn, Germany

The human rights movement has been fighting discrimination for many decades and has helped raise awareness that racism and discrimination against minorities still exist. The reasons for xenophobia, the fear or dislike of anything which is perceived as being foreign or strange, are manifold, but evolutionary reasons are often discussed, such as that it is adaptive to protect the resources of one's own group and to react with skepticism or even hostility towards foreign people. Brain structures have already been identified that process stimuli in a differentiated manner with regard to one's own and the foreign group. On a functional level, various processes are involved in outgroup bias, such as perceptions, attributions and memory. In an fMRI study on N=86 Caucasian subjects, the influence of political orientation on brain activity was investigated when looking at faces of different origins. Results of a whole brain analysis showed a stronger brain activation on African than on Arab or Caucasian faces, especially in the left prefrontal cortex (PFC). This effect was the stronger the more conservative the political orientation of the subjects. The neural processing of out-group faces was found to vary depending on political orientation. Brain activity is an interesting and objective dependent variable in the study of xenophobia because it cannot be influenced by a bias towards social desirability.

S09.1 - Re-examining Behavioral and Neural Markers of Decision-dynamics in Value-based Choice

R. Froemer[1]

Thursday 11:00 - 12:30 | Lecture Hall N3

University of Birmingham, United Kingdom

Evidence accumulation models have been tremendously successful in explaining behavior and neural correlates of value-based decision-making. Here I re-examine two key findings that emerged from this work: a dynamic neural signature of evidence accumulation, the centro-parietal positivity (CPP), and a canonical link between attention and choice. The CPP ERP component has been proposed as a neural index of the drift to threshold process underlying decision-making. Its slope scales with the speed of evidence accumulation and it peaks at the time a response is made. Across 4 studies, 3 value-based, 1 perceptual decision-making, I show that neural signatures of evidence accumulation can spuriously arise from component overlap of stimulus- and response-related activity and that such signatures vanish when formally deconvolving the two. An extension of the drift diffusion model, the a(ttention)DDM, has been ground-breaking in establishing and mechanistically explaining a ubiquitous link between attention and choice. Here, I re-examine a critical assumption of the model, that attention is independent of the underlying choice process. By experimentally manipulating attention to meet this independence assumption, I reveal a more complex relationship between attention and choice than previously thought. I find behavioral signatures of Bayesian updating that integrate information about value-statistics in the environment and metacognitive precision estimates, i.e., what decision-makers know and don't know. Taken together these findings highlight processes beyond evidence accumulation that impact value-based decision-making and its neural correlates, and they invite us researchers to re-examine what we know and don't know about how decisions are made.

S09.2 - Using Evidence Accumulation Models to Identify Catecholaminergic Drug Effects on Incentive Motivation

F. H. Hezemans[1], **S. Muermans**[1], **D. Papadopetraki**[1], **R. v. d. Bosch**[1], **J. Määttä**[1,2], **L. Hofmans**[1,3], **B. Lambregts**[1], **N. Breedveld**[1], **A. Westbrook**[1,4], **J. Booij**[5], **R. Verkes**[1], **R. Cools**[1]

Thursday 11:00 - 12:30 | Lecture Hall N3

[1] Donders Institute for Brain, Cognition and Behaviour, Radboud University
[2] Stockholm University
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Reward motivation and target detection are central to adaptive decision-making. The monetary incentive delay (MID) task is commonly used to probe the neural mechanisms of such processes. This task involves an anticipatory phase with a reward cue, followed by a briefly presented target that requires a speeded response. The anticipatory phase has been associated with activity in the ventral striatum - a key projection area of the dopaminergic midbrain. However, the cognitive processes underlying MID task performance remain unclear, which limits our understanding of how catecholaminergic drugs change behaviour and neural activity. In particular, the emphasis on anticipatory processing poses a challenge for conventional models of speeded decision-making, which typically disregard processing prior to the target. We characterise MID task performance as a mixture of two processes affecting the decision about when to respond: A task-focused "evidence accumulation" process that is triggered by the target, and a task-disengaged "contamination" process that is triggered by the cue. In addition, we account for effects of reward learning and anticipation, by linking trial-by-trial estimates of average reward rate to the evidence accumulation process. This enabled us to identify substantive cognitive parameters that are specifically involved in reward anticipation and target detection, and investigate their unique contributions to behaviour and neural activity. We applied this approach to MID task data of 93 participants from a pharmaco-fMRI / [18F]DOPA PET study, to examine the mechanisms by which catecholaminergic challenges alter distinct cognitive parameters during incentive motivation.

S09.3 - Interindividual Differences in Dopamine Effects on Temporal Discounting

E. Smith[1], **D. Mathar**[1], **D. Tuzsus**[1], **K. Knauth**[1], **J. Peters**[1]

Thursday 11:00 - 12:30 | Lecture Hall N3

Department of Psychology, Biological Psychology, University of Cologne, Cologne, Germany

Changes in impulsive choice (e.g., temporal discounting) occur in numerous psychiatric disorders. For example, individuals suffering from substance use disorders and problem gambling show increased discounting of future rewards (Bickel et al., 2014; Peters Büchel, 2011; Ring et al., 2022). Maladaptive alterations in dopaminergic circuits are assumed as functional correlates of such effects (Diana, 2011; Volkow et al., 2004). In line with these findings, pharmacological manipulation of dopaminergic neurotransmission modulates decision making. Enhancing dopamine signalling has been reported to increase (Pine et al., 2010) and reduce impulsive choice operationalised as temporal discounting (de Wit et al., 2022; Wagner et al., 2020), while some studies reported no overall effect of modulating dopamine signalling on impulsive choice (Acheson et al., 2008; Petzold et al., 2019). The variability in the findings reported suggests that manipulating dopamine neurotransmission may have contrary effects in different individuals, possibly related to baseline differences in dopamine function (Cools D'Esposito, 2011). Therefore, we studied the effects of manipulating dopaminergic transmission by administration of L-DOPA on the discounting of future rewards in 76 healthy men and women and assessed a possible interaction with putative proxies of dopamine function, including spontaneous eye blink rate, working memory capacity, and impulsivity. Following our preregistered analyses (https://osf.io/a4k9j/), we used a model-based approach of hyperbolic discounting to describe the devaluation of future rewards and modelled the decision process with drift diffusion models via linear and non-linear linkage functions.

S09.4 - GABAergic and Glutamatergic Effects on the Dynamics of Perceptual and Reward-guided Decision Making

E. Ort[1], M. I. Froböse[1], H. Kurtenbach[1], M. Butz[2], A. Schnitzler[2,3], G. Jocham[1]

Thursday 11:00 - 12:30 | Lecture Hall N3

[1] Biological Psychology of Decision Making, Institute of Experimental Psychology, Heinrich Heine, University Düsseldorf, Germany
[2] Institute of Clinical Neuroscience and Medical Psychology, Medical Faculty, Heinrich-Heine University, Düsseldorf, Germany
[3] Department of Neurology, Center for Movement Disorders and Neuromodulation, Medical Faculty, Heinrich-Heine University, Düsseldorf, Germany

Decisions are thought to result from a temporal integration of information on choice options. Network models suggest that the dynamics of this process critically depend on the balance of slow recurrent excitation at NMDA receptors and GABAergic inhibition. Yet, experimental evidence for this mechanism is still scarce. Here, we pharmacologically manipulated synaptic transmission at NMDA and GABAA receptors in 60 healthy male participants by administering the NMDA receptor agonist d-cycloserine (250 mg), the GABAA receptor agonist lorazepam (1 mg), or a placebo in a within-subject design. During three sessions, participants performed a perceptual and a reward-guided decision-making task, in which decision difficulty was manipulated either by motion coherence in a random dot kinematogram, or by variations in reward magnitudes and probabilities of the choice options, respectively. D-cycloserine enhanced participants' sensitivity to coherent motion during perceptual decisions and increased the sensitivity of choices to reward magnitudes during reward-guided decisions. In contrast, lorazepam prolonged response times in both tasks and had no further effect on accuracy in perceptual decisions, but reduced the sensitivity to reward probabilities in reward-guided decisions. Preliminary drift diffusion modeling suggests that these behavioral patterns result from enhanced evidence accumulation under d-cycloserine and a greater leak of evidence under lorazepam. In sum, enhancing excitatory neurotransmission increased the choice sensitivity to perceptual and reward-related decision evidence, while enhancing inhibitory neurotransmission had more diffuse effects, causing less optimal integration of evidence in the perceptual and increased stochasticity in the value-based task.

S10.1 - Intensive Training In Task-Switching Alters Frontoparietal Activation And Connectivity In Children

S. A. Schwarze[1], **S. A. Bunge**[2], **U. Lindenberger**[1,3], **Y. Fandakova**[1,4]

Thursday 11:00 - 12:30 | Lecture Hall N9

[1] Max Planck Institute for Human Development, Germany
[2] Department of Psychology and Helen Wills Neuroscience Institute, University of California at Berkeley
[3] Max Planck UCL Centre for Computational Psychiatry and Ageing Research, Berlin, Germany, and London, UK
[4] Department of Developmental Cognitive Neuroscience, University of Trier, Germany

Children struggle with adapting to changing environmental demands by flexibly switching between tasks. However, these difficulties diminish with practice. In adults, training-related improvements in task switching have been associated with more efficient rule processing in frontoparietal regions and increased functional connectivity between these regions. To examine if similar neural mechanisms underly training improvements in children, 8–11-year-olds practiced single-tasking (ST; N=40/30 with/without fMRI) or task-switching (SW; N=40/26) intensively for nine weeks, or were in a passive control group (N=39, all with fMRI). All groups completed pre- and post-training cognitive testing and fMRI scans. With practice, SW children showed greater increases in drift rates during task switching than ST and control children, suggesting faster evidence accumulation for the correct response. More efficient task processing in the SW compared to the ST and control groups was further evident in larger decreases in activation in regions implicated in rule management: the inferior frontal junction, dorsolateral prefrontal cortex (PFC), and superior parietal lobule. In both SW and ST groups, engagement of default mode regions became more similar for task switching and single tasking. Task-based connectivity between frontoparietal regions was stronger during task switching relative to single tasking prior to training, and did not change with practice. These results support the hypothesis that more efficient task processing with task-switching practice is likely to be related to general improvements in meta-control processes, as evident in practice-related changes in brain regions supporting rule management and the default mode network.

S10.2 - Music Training and Functional Brain Plasticity

E. Papadaki[1], **A. Werner**[1], **U. Lindenberger**[1,2], **S. Kühn**[3,4], **E. Wenger**[1]

Thursday 11:00 - 12:30 | Lecture Hall N9

[1] Max-Planck Institute for Human Development, Berlin, Germany
[2] Max Planck UCL Centre for Computational Psychiatry and Ageing Research, London, U.K., and Berlin, Germany
[3] Lise Meitner Group for Environmental Neuroscience, Max Planck Institute for Human Development, Berlin, Germany
[4] Department of Psychiatry and Psychotherapy, University Clinic Hamburg-Eppendorf, Hamburg, Germany

Musicians have long been identified as an excellent model to study brain plasticity, in terms of changes in both structure and function. Here, we will present three instances of functional brain plasticity due to music training. A group of aspiring professional musicians, attending preparatory courses for entrance exams at universities of arts, and a group of amateur musicians, practicing in their everyday life, completed up to 5 behavioral and neuroimaging assessments in the course of one year. Firstly, aspiring professionals exhibited overall higher connectivity and global efficiency among the regions of a network facilitating interval recognition, and these metrics correlated with performance in separately assessed tests of interval identification. Secondly, aspiring professional musicians also exhibited higher global efficiency during unconstrained listening to a music piece by A. Webern in comparison to a piece by J.S. Bach, and flexibly utilized music-related processing brain regions, thereby adapting to the different demands of the two listening conditions. Thirdly, while a core region of auditory processing, the left planum polare, was found to undergo reductions in grey matter volume over time, its functional connectivity to other musically relevant regions increased. This increase in connectivity was also reflected in network metrics of local and global integration. To summarize, using connectivity measures and analytical tools from systems neuroscience, we were able to characterize functional correlates of musical training and expertise. To control for selection, future work should randomly assign participants to musical training interventions and jointly examine their effects on functional and structural aspects of plasticity.

S10.3 - Training-Induced Brain Changes During Motor Skill Learning in Humans and Mice

M. Hille[1], **T. Stark**[2], **S. Zocher**[3], **M. Czisch**[2], **S. Kühn**[1,4], **T. Bonhoeffer**[5], **U. Lindenberger**[1,6]

Thursday 11:00 - 12:30 | Lecture Hall N9

[1] Max Planck Institute for Human Development, Berlin, Germany
[2] Max Planck Institute of Psychiatry, Munich, Germany
[3] German Center for Neurodegenerative Diseases, Dresden, Germany
[4] University Clinic Hamburg-Eppendorf, Hamburg, Germany
[5] Max Planck Institute for Biological Intelligence, Martinsried, Germany
[6] Max Planck UCL Centre for Computational Psychiatry and Ageing Research, London, United Kingdom

There is accumulating evidence for experience-dependent structural and functional brain changes during skill acquisition. In humans, plasticity in response to motor training has been observed at the macroscopic level in form of grey matter volume changes in primary motor cortex, starting with tissue expansion followed by renormalization. Similar patterns have been found at the cellular level in animal models, suggesting that motor skill learning is accompanied by curvilinear neural changes such as dendritic spine growth followed by spine elimination. However, it is unclear how cellular changes found in rodents map onto gross volume changes observed in humans. In the present study, 70 human participants (18 - 35 years) trained a grasping task with chopsticks or read a book (control group) for 10 weeks in total. During the training period, all participants were invited to the institute on seven occasions to obtain structural and functional MR measurements. In parallel, mice were trained on the single-pellet reaching task for up to 25 days and underwent structural MRI on 3 - 4 occasions. Currently, morphometric brain analyses are performed to investigate training-related brain changes at the macroscopic level. Preliminary results will be presented at the conference. Further analysis will entail estimation of microstructural tissue properties in human brains by applying in vivo histology using MRI (hMRI) and two-photon microscopy processing of mouse brain data with the aim of bridging the gap between animal models and human research in order to gain a mechanistic understanding of human brain plasticity.

S10.4 - Cognitive Training of Episodic Memory and Navigation in Young and older Adults

A. C. Bråthen[1], **J. Kransberg**[1]

Thursday 11:00 - 12:30 | Lecture Hall N9

Center for Lifespan Changes in Brain and Cognition (LCBC), University of Oslo, Norwegen

While the potential for training-induced neurocognitive plasticity is to a large degree assumed, many questions remain in terms the underlying premises for gains from cognitive training and the retainment of such. As individual adjustments of cognitive training programs have been indicated to be of importance, knowledge regarding why some individuals benefit more than others from training interventions is crucial for future development of cognitive training interventions. We will present several cognitive training studies carried out at the University of Oslo. Through an episodic memory training intervention consisting of several training periods, training effects on memory function and brain characteristics were found in both young and older adults (n=237). Interestingly, retainment of changes in hippocampal volume were found several months after the intervention, and maintenance of memory benefits were observed after several years. We will further present an ongoing twin study (current n = 209) where we utilize Virtual Reality (VR) with true locomotion in an extensive 10-week training intervention. The training targets navigation abilities and memory processes in an adult twin sample. We investigate the possible neural and cognitive plastic responses with VR-training, and the extent to which early life factors, lifestyle, and genetic makeup may interact with the training results.

S10.5 - Functional Plasticity In The Language Network – Insights From Young, Aging, And Lesioned Brains

G. Hartwigsen[1]

Thursday 11:00 - 12:30 | Lecture Hall N9

Leipzig University, Germany

Functional network plasticity is a key mechanism for life-long adaptation to changes and challenges. Neural networks in our brain adapt to changing cognitive demands by flexibly recruiting different regions and connections. I will discuss how we can study functional network plasticity with neurostimulation and functional neuroimaging. My key hypothesis is that disruption of higher-level cognitive functions such as language can be compensated for by the recruitment of domain-general networks in our brain. Examples from healthy young brains illustrate how neurostimulation can be used to temporarily interfere with normal processing, probing short-term network plasticity at the systems level. I will show that dyslexia, a developmental reading disorder, can be characterized as network disorder with massively reduced activation and connectivity of both reading-related and domain-general areas. Here, facilitatory stimulation may help to re-shift the balance of network interactions. Examples from aging brains illustrate how plasticity helps to compensate for loss of function. Network approaches can disentangle patterns of compensatory reorganization from general de-differentation associated with cognitive decline. Finally, examples from lesioned brains after stroke provide insight into the brain's potential for long-term plasticity and recovery of function, further emphasizing the role of domain-general networks for language function and recovery. Collectively, these results challenge the view of a modular organization of the human brain and argue for a flexible redistribution of function via systems plasticity.

S11.1 - Neurostructural Association With Adverse Childhood Experiences And Posttraumatic Stress Disorder

S. Siehl[1], **F. Nees**[1]

Thursday 11:00 - 12:30 | Lecture Hall 7E02

University Medical Center Schleswig-Holstein, Kiel University, Kiel, Germany

Adverse childhood experiences influence mental wellbeing throughout the lifespan and can lead to the development of mental health problems, such as posttraumatic stress disorder (PTSD). The timing of adverse events is essential, and depending on when the event occurs, neurostructural alterations in both, white and gray matter, are observed between individuals with PTSD and healthy non-trauma-exposed and trauma-exposed individuals. Gray matter regions, such as the hippocampus and ventromedial prefrontal cortex, and white matter tracts, such as the corpus callosum show a reduction in individuals with adverse childhood experiences. In a series of neuroimaging studies and meta-analyses, we investigated differences in gray and white matter between patients with PTSD and healthy control groups, in children and adults with traumatic experiences during childhood/adulthood. Gray matter differences were assessed using voxel-based morphometry (cm3) and white matter difference with diffusion tensor imaging (fractional anisotrophy (FA)). Coordinate-based neuroimaging meta-analyses were performed in GingerAle. The present talk will summarize findings for gray and white matter alterations across age groups. We will embed the findings in a psychobiological model of PTSD and processes like context processing, threat detection, and emotion regulation. Finally, we will discuss future directions and clinical implications.

S11.2 - Early-life Stress and Neuro-endocrine Control of Emotional Actions During Early Adolescence

A. Tyborowska[1,2], **F. v. Ruller**[2], **R. Beijers**[1,3], **S. Kühn**[4,5], **K. Roelofs**[1,2], **C. d. Weerth**[3]

Thursday 11:00 - 12:30 | Lecture Hall 7E02

[1] Behavioural Science Institute, Radboud University, The Netherlands
[2] Donders Centre for Cognitive Neuroimaging, Donders Institute for Brain, Cognition and Behaviour, Radboud University, The Netherlands
[3] Department of Cognitive Neuroscience, Donders Institute for Brain, Cognition and Behaviour, Radboud University Medical Center, The Netherlands
[4] Lise Meitner Group for Environmental Neuroscience, Max Planck Institute for Human Development, Germany
[5] Clinic and Policlinic for Psychiatry and Psychotherapy, University Clinic Hamburg-Eppendorf, Germany

Adolescence is a critical developmental period involving intense neuro-endocrine and social-emotional changes. Previous studies have shown that during mid-adolescence, there is a maturational shift from prefrontal to subcortical emotion control, modulated by pubertal testosterone levels. Namely, high testosterone levels are associated with increased anterior prefrontal (aPFC) involvement when controlling emotional actions, reflecting adult-like functioning. Lower testosterone levels are related to greater pulvinar and amygdala activity. During early adolescence, rising testosterone levels likely facilitate neural reorganization, particularly in emotion circuits, making brain development particularly sensitive not only to ongoing stressors, but also to the emergence of incubated effects of early-life stress. Using an fMRI-based Approach Avoidance task, this study 1) identifies neural control of emotion actions, as a function of pubertal development (indexed by testosterone) in 12-year-old children (n=92); and 2) qualifies differences in aPFC, amygdala, and pulvinar engagement with respect to early-life stress. Higher testosterone levels were related to increased amygdala and pulvinar activity, but aPFC activity during emotion control was not yet modulated by testosterone. Higher levels of early-life stress were related to decreased activity in the entire emotion-control circuit. Critically, this relationship was moderated by pubertal testosterone: 12-year-old adolescents with high testosterone and early-life stress exhibited increased aPFC engagement – a pattern previously seen during mid-adolescence. These findings show that the relationship between early-life stress and engagement of emotion control regions may be highly dependent on pubertal development. In fact, early-life stress may accelerate testosterone-moderated aPFC recruitment, during a time of neural reorganization at the onset of puberty.

S11.3 - Early Life Adversities and Epigenetic Age Acceleration in Young Adults with Previous Youth Residential Care Placements

M. Meier[1,2], **S. Kantelhardt**[3], **L. Gurri**[1], **C. Stalder**[1], **M. Schmid**[1], **E. Unternaehrer**[1], **D. Bürgin**[1]

Thursday 11:00 - 12:30 | Lecture Hall 7E02

[1] Universitäre Psychiatrische Kliniken (UPK) Basel, Schweiz
[2] Universität Konstanz, Deutschland
[3] Universität Jena, Deutschland

Early life adversity (ELA) increases the risk for mental and physical disorders and premature death. Epigenetic processes, like altered epigenetic aging, may mediate these effects. In some yet not all previous studies ELA was linked to accelerated epigenetic aging. This inconsistency might be due to limitations of retrospectively assessed ELA measures. High risk samples like populations raised in residential care might remedy this, as their biography validates their exposure to ELA. This study therefore explored the link between ELA and epigenetic aging in a sample of formerly institutionalized adults. N=117 participants (32% women, age mean=26.3, SD=3.6 years) from a longitudinal study on care leavers completed the Childhood Trauma Questionnaire and the Life-Events-Checklist and provided blood samples for the analysis of DNA methylation using the Illumina Infinium MethylationEPIC BeadChip Microarray. We calculated Hovarth's and Hannum's epigenetic clocks. Age acceleration was operationalized using regression based residuals as well as the distance between chronological and epigenetic age. The statistical analysis plan was preregistered on OSF (https://osf.io/b9ev8). Preliminary analyses revealed a positive association between chronological and epigenetic age (Horvarth: r(115)=.70, Hannum: r(115)=.71). On average, Horvarth's age was greater, t(116)=-8.66, d=-0.80, and Hannum's age was smaller than participant's chronological age, t(116)=24.12, d=2.23. ELA (as indexed by CTQ total score) was negatively associated with all operationalizations of age acceleration, r(115)=-.18 to -26. Our preliminary analyses suggest decelerated epigenetic aging in a sample of care leavers with high levels of ELA. The final results of our preregistered analyses will be presented and discussed in the symposium.

S11.4 - Early Adversity and Amygdala Reactivity to Interpersonal Threat: The Role of Dissociation

K. I. Seitz[1], **M. Sicorello**[2], **M. Schmitz**[1], **N. Valencia**[1], **S. C. Herpertz**[1], **K. Bertsch**[1,3], **C. Neukel**[1]

Thursday 11:00 - 12:30 | Lecture Hall 7E02

[1] Department of General Psychiatry, Center for Psychosocial Medicine, Medical Faculty, Heidelberg University, Heidelberg, Germany
[2] Department of Psychosomatic Medicine and Psychotherapy, Central Institute of Mental Health, Medical Faculty Mannheim, Heidelberg University, Germany
[3] Department of Psychology, Ludwig-Maximilians-University Munich, Munich, Germany

Early adversity confers risk for transdiagnostic psychopathology, including diagnoses such as posttraumatic stress disorder (PTSD), major depressive disorder (MDD), and somatic symptom disorder (SSD) as well as symptoms such as dissociation. Aberrant amygdala reactivity to interpersonal threat may underlie the association between early adversity and transdiagnostic psychopathology, with recent studies pointing towards sensitive exposure periods. With this study, our objective was to investigate the association between early adversity, amygdala reactivity to interpersonal threat, and psychopathological symptoms, such as dissociation, in a transdiagnostic adult sample, specifically considering type, timing and duration of early adversity. Our sample consisted of 141 participants with varying levels of early adversity, including participants with PTSD (n = 34), MDD (n = 36), SSD (n = 35), and healthy individuals (n = 36). Participants underwent functional magnetic resonance imaging during an emotional face-matching task and completed a comprehensive retrospective interview assessing timing and duration of ten types of early adversity, the KERF-40+. In addition, participants filled out self-report questionnaires of general psychopathology as well as symptoms of PTSD, MDD, SSD, and dissociation. Results of our machine learning-based model comparison procedure will be discussed with regard to whether retrospectively reported type, timing and duration of early adversity as well as symptoms of different types of psychopathology may help to predict amygdala reactivity to interpersonal threat in a transdiagnostic adult sample.

S11.5 - Facing the Aftermath: Uncovering the Association of Early Life Adversity with Emotional Processing, Psychophysiology and Measurement Heterogeneity

A. Koppold[1], **A. Kastrinogiannis**[1], **M. Kuhn**[1,2], **J. Ruge**[1], **T. Lonsdorf**[1,3]

Thursday 11:00 - 12:30 | Lecture Hall 7E02

[1] University Hospital Hamburg-Eppendorf, Germany
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[3] University of Bielefeld, Biological Psychology and Cognitive Neuroscience, Bielefeld, Germany

Exposure to adverse experiences is a well-established major risk factor for affective psychopathology. The vulnerability of deleterious sequelae is assumed in maladaptive processes of the defensive system, particularly in emotional processing. More specifically, early adversity (EA) and recent adversity (RA) have been suggested to be associated with the recruitment of distinct defensive response profiles. Here, we present data from two different studies. Preregistered study 1 investigated the impact of exposure to EA and RA on emotional processing in 685 healthy adults with the "Affective Startle Modulation" Paradigm. We replicated higher trait anxiety and depression levels in individuals exposed to both types of adversity. Moreover, we observed generally increased skin conductance reactivity in individuals exposed to RA but not EA. Strikingly, individuals exposed to EA showed reduced, while individuals exposed to RA showed increased SCR discrimination between pictures of negative and neutral valence, compared to non-exposed individuals - suggesting distinct response profiles. Furthermore, as a first step to investigate operationalizational heterogeneity we revealed moderate dimensional and categorical agreement between two EA questionnaires. Study 2 addresses this question in more depth in the context of a content analysis among 23 EA questionnaires derived from a systematic literature review on threat and reward learning. We identified 50 distinct exposure types. Mean overlap across questionnaires was moderate (M = 0.28, range: 0.16–0.37 across questionnaires). This substantial heterogeneity in the assessment and operationalization of EA emphasizes the pressing need for methodological agreements to promote comparability, replicability and foster cumulative science on this important topic.

Symposia session 3

S12.1 - Optimized Targeting And Dosing For Transcranial Magnetic Stimulation In The Study Of Cognition

P. Kuhnke[1]

Thursday 13:30 - 15:00 | Lecture Hall N1

Leipzig University, Germany

Transcranial magnetic stimulation (TMS) can modulate neuronal processing via the induction of electrical fields (e-fields). TMS studies of higher cognition typically standardize the stimulation intensity based on the resting motor threshold (RMT). This is problematic as RMT is assessed in terms of stimulator output, whereas TMS effects depend on cortical stimulation strengths. Here, we propose a new method to optimize TMS intensity using computational e-field stimulations. We applied this approach in a condition-and-perturb TMS study on conceptual knowledge retrieval. Neuroimaging studies suggest that conceptual processing relies on the interaction of modality-specific and multimodal brain regions. However, it remains unknown whether the interaction between modality-specific and multimodal cortices is causally relevant for conceptually-guided behavior. To tackle this issue, we applied offline TMS over modality-specific cortex (somatomotor, auditory, or sham), before 24 healthy participants received online TMS over multimodal cortex (IPL, or sham) during action and sound judgment tasks on written words. To optimize targeting, we determined the coil position that maximizes the e-field in each target. To optimize dosing, we identified the stimulator intensity that elicits the same e-field in each target as in the primary motor cortex (M1) at RMT. Simulation results show that e-field based dosing better matches the effective cortical stimulation than previous dosing approaches, both within and across participants. These results indicate that e-field based dosing may increase the stimulation efficacy and reduce both the within- and between-subject variability of TMS effects. Therefore, a priori e-field simulations promise to substantially improve TMS studies of higher cognition.

S12.2 - Transcranial Electrical Stimulation In The Pediatric Brain

V. Moliadze[1]

Thursday 13:30 - 15:00 | Lecture Hall N1

University Medical Center Schleswig-Holstein, Kiel University. Kiel, Germany

The use of transcranial electrical stimulation (tES), specifically tDCS, in pediatric populations has been rapidly increasing. However, this population remains underrepresented when compared to adults, and there is a crucial need to examine the mechanisms, behavioral effects, and safety of tES in the developing brain. Given the differences in physiology, pharmacology, and anatomy between adults and children/adolescents, it cannot be assumed that identical stimulation protocols will yield the same effects in different age groups. Therefore, existing knowledge from adult populations cannot simply be transferred to children, as the child's brain is still developing. Our findings suggest that the stimulation intensity of tDCS in children and adolescents needs to be adjusted and that tDCS doses need to be administered based on specific model results. In addition, aspects of safety and tolerability are also addressed. During the context of our study, investigating the effects of anodal tDCS over the left dorsolateral prefrontal cortex (lDLPFC) in healthy children and adolescents, a subject developed an epileptic seizure. Although a causal relationship between the stimulation and seizure cannot be demonstrated, we would like to draw attention to the importance of implementing more comprehensive screening that considers the subject's potential personal or familial history of epilepsy (or seizure incidents) to improve inclusion and exclusion criteria.

S12.3 - Prefrontal Functioning in the Stress-rumination Link: Functional Measurements and Effects of Neuromodulation on Stress-induced Rumination in Healthy Subjects

I. Int-Veen[1,2], **U. Eßer**[1,2,3], **S. Ladegast**[1,2,3], **L. Liermann**[1,2], **R. Täglich**[1,2], **B. Schopp**[1,2], **R. Stark**[1,2], **V. Nieratschker**[1,2], **M. Vanderhasselt**[4], **J. Rubel**[5], **C. Plewnia**[1,2], **H. Nuerk**[3], **A. J. Fallgatter**[1,2,6,7], **A. Ehlis**[1,2,7], **B. Barth**[1,2], **D. Rosenbaum**[1,2]

Thursday 13:30 - 15:00 | Lecture Hall N1

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[2] Tübingen Center for Mental Health, Tuebingen, Germany
[3] Department of Psychology, University of Tuebingen, Germany
[4] Faculty of Psychology and Educational Sciences, Ghent University, Belgium
[5] Department for Psychotherapy and Psychotherapy Research, University of Gießen
[6] Center of Integrative Neuroscience (CIN), Cluster of Excellence, University of Tuebingen, Germany
[7] LEAD Graduate School and Research Network, University of Tuebingen, Tuebingen, Germany

Studies have shown that rumination – a trans-diagnostic process of repetitive negative thoughts – plays a crucial role in the stress-depression link. Social stress has been shown to induce state rumination in patients with depressed and healthy subjects. Regarding the neural underpinnings, previous studies have shown – in clinical and clinical analogue studies – that the increase in state rumination after social stress is mediated by reduced activity in the prefrontal cortex during the stress induction. However, only few studies directly investigated the role of the prefrontal cortex in the stress-rumination link. Using theta-burst stimulation (TBS) as a noninvasive approach to manipulate brain activity, we aimed to investigate the effects of different protocols on state rumination in a clinical analogous sample to confirm a pivotal role of prefrontal areas in (the cognitive control of) stress-induced rumination. One study already applied intermittent TBS (iTBS) to the left DLPFC following the Trier Social Stress Test (TSST) on the stress response and stress-reactive rumination (De Witte et al., 2020) in N=40 subjects. Their results showed a buffering effect on increases in state rumination in high trait ruminators as a consequence of the iTBS. However, the latter effect was only marginally significant. In the current study, we recruited N=88 healthy subjects (low and high trait ruminators) who received either a continuous TBS (cTBS), iTBS or sham TBS prior to performing the TSST. We assessed stress, state rumination, physiological data and neural correlates using functional near-infrared spectroscopy and will present first results at the symposium.

S12.4 - Clinical Studies On The Efficacy Of Activating rTMS Of The Left (Pre)frontal Cortex For Exposure-based Therapy For Anxiety

M. J. Herrmann[1], **L. Cybinski**[1], **B. Bohmeier**[1], **F. Gundelach**[1], **P. Pauli**[2]

Thursday 13:30 - 15:00 | Lecture Hall N1

[1] Universitätsklinikum Würzburg, Germany
[2] Universität Würzburg, Germany

Evidence-based treatments for anxiety disorders, such as cognitive behavioral therapy and pharmacological therapy, achieve very good therapeutic outcomes, but still, not all patients benefit sufficiently, so further research is needed to optimize treatment options. Non-invasive brain stimulation techniques provide a way to improve specific processes, such as extinction learning (Raij et al., 2018; Deng et al., 2021). Assuming that extinction learning is an underlying mechanism of exposure therapy, we tested whether repetitive transcranial magnetic stimulation (rTMS) of the left (pre)frontal cortex can improve exposure therapy in two double-blind, randomized, placebo-controlled clinical trials (N= 76 patients and N = 45 patients with acrophobia). In both studies, patients with a phobia of heights were stimulated with intermittent theta burst stimulation (iTBS, activating) before two exposure sessions in virtual reality (VR) over two different stimulation localizations of the left (pre)frontal cortex. Clinical symptoms were assessed by questionnaires and two behavioral tests before, after, and at 6-month follow-up. In addition, process variables were examined during the exposure sessions. The results of the two studies indicate that VR exposure is very effective, but no additional effects of rTMS on treatment outcomes were shown. Possible predictors and influencing factors are discussed.

S13.1 - Temporal Dynamics Of Emotion Regulation: Regulatory And Post-Regulatory Effects Of Emotional Up- And Down-Regulation

A. Gärtner[1], **K. Diers**[1], **D. Dörfel**[1], **H. Walter**[2], **B. Brocke**[1], **A. Strobel**[1]

Thursday 13:30 - 15:00 | Lecture Hall N2

[1] TU Dresden, Germany
[2] Charité Universitätsmedizin, Berlin, Germany

It is an open question how emotion regulation (ER) unfolds over time, and whether neural activation patterns during down-regulation also generalize to up-regulation. As a replication and extension of our preceding study, we investigated the neural basis of up- and down-regulation during the immediate stimulation phase as well as after short- and long-term delays. In detail, we conducted an fMRI study in N=47 young healthy adults and employed three experimental conditions – down-regulation (distance), maintenance (permit), and up-regulation (intensify) – for negative and neutral stimuli. Neural responses were observed during the stimulation and post-stimulation phase as well as during re-exposure after 10 min and after 1 week. We observed the following main results: first, greater activation in emotion-generating regions such as the amygdala in the permit vs. distance and the intensify vs. distance contrast (but not intensify vs. permit). Second, greater activation in emotion-regulating regions such as the right inferior parietal and right superior / middle frontal cortex activation in the distance vs. permit, intensify vs. permit, and the distance vs. intensify contrasts. Third, the activation difference between distance and intensify within the amygdala reversed after the regulation period. Fourth, previous ER did not influence the activation in response to the pictures, neither after 10 minutes nor after 1 week. Taken together, the results provide a partial replication of our preceding study and demonstrate that a broader perspective on ER can be achieved by simultaneously considering different goals, directions, and strategies of ER in a single experiment.

S13.2 - The CAD Paradigm For Estimating Individual Subjective Values Of Emotion Regulation Strategies

C. Scheffel[1], **J. Zerna**[1], **A. Gärtner**[1], **D. Dörfel**[2], **A. Strobel**[1]

Thursday 13:30 - 15:00 | Lecture Hall N2

[1] Chair of Differential and Personality Psychology, Faculty of Psychology, Technische Universität Dresden, Germany
[2] Center for Information Services and High Performance Computing, Technische Universität Dresden

Individuals have a repertoire of emotion regulation (ER) strategies at their disposal, which they can use more or less flexibly. ER strategies that facilitate goal achievement are considered adaptive and therefore are subjectively valuable. Individuals are motivated to reduce their emotional arousal effectively and to avoid cognitive effort. Perceived costs of ER strategies in the form of effort, however, are highly subjective. Subjective values (SVs) therefore represent a trade-off between effectiveness and subjectively required cognitive effort. We present a new paradigm for quantify individual SVs of ER strategies by offering monetary values for ER strategies in an iterative process. N = 120 participants first conducted an ER paradigm with the strategies distraction, distancing, and suppression. Afterwards, individual SVs were determined using the new CAD paradigm. SVs significantly predicted later choice for an ER strategy ($?^2(4, n = 119) = 115.40$, $p < .001$, BF10 = 1.62*1021). Further, SVs were associated with Corrugator activity ($t(5, 618.96) = 2.09$, $p = .037$, $f^2 < 0.001$), subjective effort ($t(5, 618.96) = -13.98$, $p < .001$, $f^2 = 0.035$), and self-reported utility ($t(5, 618.96) = 29.49$, $p < .001$, $f^2 = 0.155$). SVs were further associated with self-control ($t(97.97) = 2.04$, $p = .044$, $f^2 = 0.002$), but not with flexible ER. With our paradigm, we were able to determine subjective values. The trait character of the values will be discussed.

S13.4 - Rapid Stress Effects on Cognitive Emotion Regulation

K. Langer[1], **V. L. Jentsch**[1], **O. T. Wolf**[1]

Thursday 13:30 - 15:00 | Lecture Hall N2

Department of Cognitive Psychology, Institute of Cognitive Neuroscience, Faculty of Psychology, Ruhr University Bochum; Germany

In stressful situations, cognitive emotion regulation (ER) competencies are particularly needed protecting an individual from chronic stress states. Previous research showed acute stress to either enhance or impair ER performances in dependence of sex, strategy use and emotional intensity. Another potential moderating factor appears to be timing between stress exposure and ER assessment suggesting the predominant stress system to determine the direction of stress effects to occur. Whereas somewhat delayed increases in the stress hormone cortisol (end-product of the hypothalamus-pituitary-adrenal (HPA) axis) have been shown to improve ER performances, rapid increases in sympathetic nervous system (SNS) activity might oppose such effects via regulatory impairments. We thus investigated rapid effects of acute stress on two ER strategies: reappraisal and distraction. Eighty healthy participants (40 men 40 women) were exposed to the Socially Evaluated Cold-Pressor Test or a control condition immediately prior to an ER task which instructed them to downregulate negative emotions evoked by high intensity pictures. Unexpectedly, stress reduced subjective emotional arousal in men when they actively distracted themselves from negative pictures hinting at ER improvements. However, this effect was fully mediated by already rising cortisol levels suggesting beneficial stress effects on distraction to be predominantly driven by glucocorticoids. In contrast, cardiovascular responses (index of the SNS) were linked to reduced regulatory performances of reappraisal and distraction in women. Taken together, our findings provide initial evidence for rapid, opposing effects of the two stress systems on the ability to deal with negative emotions that are moderated by sex.

S13.4 - Transdiagnostic Relevance of Emotion Regulation: Electrocortical Effects of Cognitive Reappraisal

R. I. Zehtner[1,2], **M. K. Neudert**[1,2], **A. Schäfer**[2,3], **S. Fricke**[1,2], **R. J. Seinsche**[1,2], **A. Noll**[1,2], **R. Stark**[1,2,3], **A. Hermann**[1,2,3]

Thursday 13:30 - 15:00 | Lecture Hall N2

[1] Department of Psychotherapy and Systems Neuroscience, Justus Liebig University Giessen
[2] Bender Institute of Neuroimaging, Justus Liebig University Giessen
[3] Center for Mind, Brain and Behaviour (CMBB), University Marburg and Justus Liebig University Giessen

Numerous studies have shown that individuals suffering from emotional disorders (e.g., anxiety disorders, depression) demonstrate abnormalities in emotional reactivity to aversive stimuli and difficulties in emotion regulation such as reappraisal. Different disorders have mostly been investigated separately although a phenomenological overlap and comorbidity is frequently reported. On the electrocortical level, amplitudes in the late positive potential (LPP) during viewing aversive (compared to neutral) pictures were increased in anxiety disorders and decreased in depression (both compared to healthy controls). Electrocortical effects of reappraisal in these disorders are less well studied and show inconsistent results. The aim of this study was to investigate electrocortical effects of emotional reactivity and cognitive reappraisal in a transdiagnostic sample. For this purpose, participants (n = 100 patients, n = 58 healthy controls) were instructed to look at neutral and aversive pictures or to reduce negative feelings via reappraisal (distancing and reinterpretation) while measuring EEG. Following picture presentation, individuals rated their experience of negative feelings. First results show that reappraisal reduced negative feelings. For the LPP, an increased amplitude was found for looking at aversive (compared to neutral) pictures and a decrease due to reinterpretation which was not given for distancing (both compared to looking at aversive pictures). These results were not related to diagnostic status. But, a lower overall psychological distress level was associated with a stronger reduction of the LPP for both reappraisal tactics. These results contribute to a better understanding of emotion dysregulation across disorders and highlight the transdiagnostic relevance of emotion regulation.

S14.1 - Triggering memory loss during sleep using closed-loop Targeted Memory Reactivation

J. Carbone[1]

Thursday 13:30 - 15:00 | Lecture Hall N3

Tübingen University, Germany

Sleep is characterized by unique EEG oscillations, including slow oscillations (SOs) and sleep spindles, that support memory consolidation. This process relies on spontaneous reactivations of recent memories that mostly occur during non-rapid eye movement (NREM) sleep. Previous research has shown that presenting learning-associated reminder cues during NREM sleep, known as Targeted Memory Reactivation (TMR), benefits sleep-dependent memory consolidation particularly when TMR cues are applied during SO UP-states. Recent evidence in animals showed that stimulation during sleep can also lead to memory loss. Inspired by these findings, we performed experiments in humans using an object location task in which participants had to memorize the location of 90 items on a circular area. Items were either semantically similar and grouped together in sets of two or six items (e.g. six different cat images) or single items that were semantically unique. Auditory cues for subsequent TMR were the same for all items within semantic groups and were either time locked to SO UP-states or to extended UP-states without a preceding prominent downstate. TMR during extended UP-states led to impaired memory performance compared to a non-cued control condition, but only for TMR cues associated with six semantically connected items and not for groups of one or two items. Our results indicate that TMR during extended UP-states can be used to facilitate forgetting. However, this process appears to be limited to cues that are related to memories that generalize across semantic features.

S14.2 - Respiration Shapes Sleep-Oscillations And Memory Reactivation In Humans

T. Schreiner[1]

Thursday 13:30 - 15:00 | Lecture Hall N3

LMU Munich, Germany

The beneficial effect of sleep on memory consolidation relies on the precise interplay of slow oscillations (SOs) and spindles. However, whether these rhythms are orchestrated by an underlying pacemaker has remained elusive. Here, we tested whether respiration, which has been shown to impact brain rhythms and cognition during wake, shapes memory reactivation by modulating sleep-related oscillations and their interplay in humans. We recorded scalp EEG and respiration throughout an experiment in which participants acquired associative memories before taking a nap. Our results reveal that respiration strongly modulates the emergence of sleep oscillations. Specifically, SOs, spindles as well as their interplay (i.e., coupled SO_spindle complexes) systematically increase towards inhalation peaks. Moreover, the strength of respiration-SO_spindle coupling is linked to the extent of memory reactivation during SO_spindles. Our results identify respiration as a potential pacemaker for memory consolidation in humans and highlight the critical role of brain-body interactions during sleep.

S14.3 - Co-evolution of Sleep Oscillations and Cognition from Childhood up to Young Adulthood

K. Hoedlmoser[1], **K. Bothe**[1], **M. Hahn**[2]

Thursday 13:30 - 15:00 | Lecture Hall N3

[1] University of Salzburg, Austria
[2] University of Tübingen, Germany

The period from childhood to young adulthood is marked by significant changes in sleep. Especially sleep spindles and slow oscillations are known to undergo drastic maturational changes during this time of life. We here present a longitudinal approach investigating the role of sleep for developmental changes in cognitive performance over the lifespan. We assessed memory performance (word-pair association task) and intelligence (Wechsler IQ) in one sample of subjects (N=28, 19 female, 9 male) during (1) childhood (9.5yrs), (2) adolescence (16yrs) and (3) young adulthood (22.5yrs). Ambulatory sleep polysomnography was recorded during 6 nights, with two nights (baseline, experimental night) at each of the three measurements. Preliminary results show that memory performance in the word-pair association task increased over time from childhood up to young adulthood. Regarding sleep physiology, we found that higher slow (11–13 Hz) than fast (13–15 Hz) spindle density at frontal, central, and parietal sites during childhood was followed by a shift to higher fast than slow spindle density at central and parietal sites during both adolescence and young adulthood. This suggests that maturation of spindle topography develops throughout adolescence and further proceeds until young adulthood. Importantly, we found that changes in sleep spindles and their precise interplay with slow oscillations may serve as a model for sleep-dependent declarative memory network development. In sum we provide evidence that the development of sleep oscillations and memory networks are intimately linked, hallmarking an important milestone in human cognitive development.

S14.3 - Rapid stress effects on cognitive emotion regulation

K. Langer[1], **V. L. Jentsch**[1], **O. T. Wolf**[1]

Thursday 13:30 - 15:00 | Lecture Hall N3

Department of Cognitive Psychology, Institute of Cognitive Neuroscience, Faculty of Psychology, Ruhr University Bochum, DE

In stressful situations, cognitive emotion regulation (ER) competencies are particularly needed protecting an individual from chronic stress states. Previous research showed acute stress to either enhance or impair ER performances in dependence of sex, strategy use and emotional intensity. Another potential moderating factor appears to be timing between stress exposure and ER assessment suggesting the predominant stress system to determine the direction of stress effects to occur. Whereas somewhat delayed increases in the stress hormone cortisol (end-product of the hypothalamus-pituitary-adrenal (HPA) axis) have been shown to improve ER performances, rapid increases in sympathetic nervous system (SNS) activity might oppose such effects via regulatory impairments. We thus investigated rapid effects of acute stress on two ER strategies: reappraisal and distraction. Eighty healthy participants (40 men 40 women) were exposed to the Socially Evaluated Cold-Pressor Test or a control condition immediately prior to an ER task which instructed them to downregulate negative emotions evoked by high intensity pictures. Unexpectedly, stress reduced subjective emotional arousal in men when they actively distracted themselves from negative pictures hinting at ER improvements. However, this effect was fully mediated by already rising cortisol levels suggesting beneficial stress effects on distraction to be predominantly driven by glucocorticoids. In contrast, cardiovascular responses (index of the SNS) were linked to reduced regulatory performances of reappraisal and distraction in women. Taken together, our findings provide initial evidence for rapid, opposing effects of the two stress systems on the ability to deal with negative emotions that are moderated by sex.

S14.4 - Information Processing in the Wake-Sleep Transition with Concurrent fMRI-EEG

F. Klepel[1], **C. Nguyen**[1], **S. Klinkowski**[1], **S. Bikker**[1], **L. Staab**[1], **T. Eisenhut**[1], **M. Erb**[2], **K. Scheffler**[2], **S. Gais**[1], **S. Brodt**[1]

Thursday 13:30 - 15:00 | Lecture Hall N3

[1] University of Tübingen, Germany
[2] Max Planck Institute for Biological Cybernetics

While falling asleep, we lose consciousness and thereby our ability to process, store and respond to environmental stimuli. The traditional concept of sleep onset as a discrete and global event has recently been challenged by evidence for local sleep. Anecdotally, also cognition in the wake-sleep transition undergoes dynamic changes, for example when reading a book while falling asleep and not being able to remember the content of the last pages. With a new paradigm investigating wake-sleep transitions in an EEG-fMRI setting in which participants listen to an audio book and react to tones, I will show how different information processing components become uncoupled while falling asleep. The different cognitive states entail specific oscillatory signatures and functional activity changes in process-relevant regions showing that higher cognitive areas decrease their activity before lower-level processing areas. Based on these results, I will discuss that the view of sleep onset as an all-or-nothing phenomenon should be revised.

S14.5 - Aperiodic Activity, Neural Excitability and Information Coding During Human Sleep

R. Helfrich[1]

Thursday 13:30 - 15:00 | Lecture Hall N3

University Medical Center Tübingen, Germany

The proposed mechanisms of sleep-dependent memory consolidation involve the homeostatic regulation of neural plasticity at both synaptic and whole-network levels. But how? Currently, there is a lack of in-vivo data in humans elucidating if, and how, sleep and its varied stages balance neural homeostasis, and if such recalibration benefits memory. We combined electrophysiology with in-vivo two-photon calcium imaging in rodents with intracranial and scalp electroencephalography (EEG) in humans to reveal a key role for non-oscillatory brain activity during rapid eye movement (REM) sleep in adjusting neural excitability. The extent of this REM-sleep homeostatic recalibration predicted the success of overnight memory consolidation, expressly the modulation of hippocampal—neocortical excitability, favoring remembering rather than forgetting. The findings describe a fundamental non-oscillatory mechanism how human REM sleep re-establishes neural homeostasis to enhance long-term memory.

S15.1 - Social cognition and interaction: effects of context and traits on adaptation

A. Flechsenhar[1], **S. Krach**[2], **K. Bertsch**[1]

Thursday 13:30 - 15:00 | Lecture Hall N6

[1] Department of Clinical Psychology Psychotherapy, Ludwig-Maximilians-Universität München, Germany; NeuroImaging Core Unit Munich (NICUM), University Hospital LMU, Munich, Germany
[2] Department of Psychiatry and Psychotherapy, University of Lübeck, Germany

Social interactions are dynamic, context-dependent, and reciprocal events that influence prospective strategies and require constant practice and adaptation. Therefore, socio-cognitive abilities do not refer to stable traits, but are rather subject to personal experiences, situational factors, and learning abilities. Investigating this cognitive in-/flexibility may inform about mental health deficits and dysfunctional social behavior, as well as therapeutic approaches. There are a number of factors that influence the ability to adapt or ameliorate certain social abilities. Contextual factors (e.g., expected threat), may alter the flexibility of belief adaptation due to attentional restriction. Additionally, person or trait variables (e.g., a mental disorder), may be associated with cognitive rigidity or deficits that hamper learning processes. Even though the list of influencing variables is far from complete, we addressed these two aspects in a first step through a number of studies. Firstly, our research indicates a context-congruent effect on perception: fear-related contexts increase the perception of fear, such that non-negative emotions are misinterpreted as fearful. Secondly, with regard to the flexibility of social abilities, pilot data suggests that altering beliefs about one's own ability to recognize emotions of others on a meta-cognitive level could be established through self-referential feedback. Individuals learned to believe that they were proficient in recognizing one facial emotional expression, while failing to adequately recognize another. Ongoing data collection may reveal tendencies to more readily adapt to negative than to positive feedback and correlate with assessments of self-esteem, or specific traits.

S15.2 - Learning Of Social Motives

J. Bischofberger[1], **A. Saulin**[1], **Y. Zhou**[1,2], **G. Hein**[1]

Thursday 13:30 - 15:00 | Lecture Hall N6

[1] University Hospital Würzburg, Germany
[2] Chinese Academy of Sciences, Beijing, China

Learning is crucial to adapt social behavior in changing environments. Here, we present three exemplary studies that investigate whether and how learning changes important drivers of social behavior such as empathy and ingroup favoritism. A first study focused on learning-related changes in empathy, i.e., the ability to share others' emotional states, and empathy-related social closeness. Applying reinforcement learning modeling to an acquisition-extinction paradigm, we found that the formation of empathy-related social closeness was based on observing another's pain, and was maintained based on observing only rare painful stimulation of the other. A second study investigated learning-related changes in intergroup impressions. The results showed an initial ingroup bias in impression ratings that can be reduced by experiences with their own and the other social group. Analyses from computational learning models suggested that the reduction of ingroup bias in impression was predicted by the weight given to ingroup prediction errors. In the newest approach in this line of research, we developed a social approach and avoidance task to investigate how an initial ingroup approach bias can be unlearned by cooccurring non-social outcomes (financial incentives). Based on a piloting study, we ran a preregistered online experiment, accounting for possible confounding factors. Results of the study replicate previous evidence for an ingroup approach bias and show that this bias can be unlearned by financial incentives reinforcing the opposite behavior. Taken together, the presented research highlights the plasticity of social motivation and shows that this plasticity can be captured by computational modeling approaches.

S15.3 - Re-Learning of Self-Related Beliefs

A. Schröder[1], **N. Czekalla**[1], **F. M. Paulus**[1], **L. Müller-Pinzler**[1], **S. Krach**[1]

Thursday 13:30 - 15:00 | Lecture Hall N6

University of Lübeck, Social Neuroscience Lab, Department of Psychiatry and Psychotherapy, Center of Brain, Behavior and Metabolism (CBBM), Lübeck, Germany

People constantly receive feedback about their behavior and performance, and this feedback shapes their perception of their abilities. Previous research shows that feedback processing does not happen in an objective way, but is highly biased by affective and motivational aspects as well as by the context. In addition, people have strong prior assumptions about their abilities that also impact how feedback is processed. To investigate the role of prior domain-specific self-efficacy beliefs and their influence on how new information is processed in these domains, we developed a trial-by-trial learning task in which initial belief formation and changes in previously established beliefs can be investigated. Participants attended the lab for two consecutive days. The first day was used to form new beliefs in previously rather neutral ability domains. On the second day, participants were exposed to the same ability domains but received opposite feedback compared to the first day. A computational modeling approach showed significantly higher learning rates for self-related belief updating on day 1 (establishment of ability beliefs) compared to day 2 (re-learning of ability beliefs). Our results show that once self-related beliefs are established, it is more difficult to unlearn these. Our findings shed light on how prior beliefs contribute to the way information processing is biased during self-related learning and may have important implications for clinical conditions, such as depression, in which individuals have been described to fail in their capacity to update negatively imbued self-related beliefs.

S15.4 - Learning About Others' Personality Traits In Women With Borderline Personality Disorder

L. Doppelhofer[1], **K. Frolichs**[1], **G. Rosenblau**[2], **S. Herpertz**[1], **C. Korn**[1]

Thursday 13:30 - 15:00 | Lecture Hall N6

[1] Heidelberg University Hospital, Germany
[2] George Washington University, USA

Successful human interactions depend on the ability to learn accurately and flexibly about others' personality traits. Previous studies have shown that patients with borderline personality disorder (BPD) evaluate others and themselves more negatively and inconsistently in comparison to healthy controls (Korn et al., 2016).To investigate how these negative views relate to learning about others' personality traits, we tested how women with BPD and women from a control group rate themselves and others as well as learn about the personality traits of BPD patients and controls. To identify different learning strategies we combined standard Rescorla-Wagner models with two social knowledge structures: (i) Generalizations (knowledge about the relationship between personality traits that can be used at different levels of granularity) and (ii) reference points (knowledge about average people within a specific social group that can be used to make inferences) (Frolichs et al., 2022). In line with previous studies, we found that patients with BPD rated themselves and others more negatively than controls. Model comparisons showed that participants with BPD and controls seem to generalize across personality traits. In addition, both groups showed less learning (smaller decrease in absolute prediction errors over time) for BPD profiles compared to healthy profiles. Our results suggest that BPD patient's negative view on themselves and others does not impair their learning strategies. However, learning about patients with BPD seems to be more difficult than learning about healthy people.

S15.5 - Oxytocin Effects on Social Processes in Autism Spectrum Disorder

N. Ngombe[1], K. Precke[1], A. V. Mayer[2], T. Singer[3], F. Paulus[2], S. Krach[2], F. Piecha[1], K. Ihle[1], P. Kanske[4]

Thursday 13:30 - 15:00 | Lecture Hall N6

[1] Institute of Clinical Psychology and Psychotherapy, Department of Psychology, Technische Universität Dresden, Dresden, Germany
[2] Universitätsklinikum Schleswig-Holstein, Campus Lübeck, Klinik für Psychiatrie und Psychotherapie, Ratzeburger Allee 160, 23562 Lübeck, Germany
[3] Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany
[4] Institute of Clinical Psychology and Psychotherapy, Department of Psychology, Technische Universität Dresden, Dresden, Germany; Max Planck Institute for Human Cognitive and Brain Sciences, Stephanstraße 1A, 04107 Leipzig, Germany

Empathy and Theory of Mind (ToM) represent socio-affective and –cognitive routes to understanding the mental states of others (Kanske et al., 2015), thus facilitating interactions with others. Pharmacological interventions, such as the use of oxytocin, might provide a cost-effective alternative to therapeutic interventions focused on improving social interaction abilities in Autism spectrum disorder (ASD; Arlington Association, 2013; Schiltz et al., 2021). Thus, the present study aimed to investigate whether oxytocin improves empathy and ToM in men with ASD and whether these changes can be discerned from neural activation patterns. Individuals with ASD (age range: 19-40) were age-matched with neurotypical controls within a randomized, double-blind, multi-site, placebo-controlled, cross-over study. Participants underwent functional magnetic resonance imaging whilst they completed the video-based EmpaToM task (Kanske et al., 2015) to assess empathy and ToM. Mixed results were observed following oxytocin administration. Oxytocin effects, evident as decreases in negative emotions, were only marginally significant at the behavioral level ($F[1,5481.8] = 3.73$, $p=.05$) and not observable at the neural level. Similarly, ToM performance differed only behaviorally, with controls exhibiting greater accuracy in their ToM responses ($F[1,66] = 9.38$, $p = 0.003$). Taken together, the findings suggest subtle benefits of oxytocin on socio-cognitive and socio-affective processing in ASD at a behavioral level. The findings raise important questions regarding the suitability of pharmacological interventions for particular subgroups with ASD and the required duration of oxytocin exposure for meaningful effects to be observed.

S16.1 - Decision Biases Across Development And Their Relevance For Developmental Computational Psychiatry

V. Scholz[1,2], **M. Waltmann**[1,3], **N. Herzog**[3,4], **A. Horstmann**[3,4,5], **L. Deserno**[1,3,4,6]

Thursday 13:30 - 15:00 | Lecture Hall N9

[1] Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, Centre of Mental Health, University of Würzburg, Margarete-Höppel-Platz1, 97080 Würzburg, Germany
[2] Donders Institute for Brain, Cognition and Behaviour, Radboud University, Nijmegen, The Netherlands
[3] Max-Planck-Institute for Cognition- and Neuroscience, Leipzig, Germany
[4] IFB Adiposity Diseases, Leipzig University Medical Center, Leipzig, Germany
[5] Department of Psychology and Logopedics, Faculty of Medicine, University of Helsinki, Helsinki, Finland
[6] Department of Psychiatry and Psychotherapy, Technical University Dresden, Dresden, Germany

Decision making and learning change fundamentally during the sensitive period of adolescence into adulthood. Likewise, Pavlovian decision biases, often considered biologically hardwired in our system, with rewards more likely to elicite approach behaviour while the outlook of punishment tends to trigger behavioral inhibition, may also undergo temporary changes during adolescence. The temporary decrease of the impact of Pavlovian biases on behaviour is speculated to allow for extended exploration of otherwise potentially underexplored choice options. However, the exact mechanisms yet remain to be fully understood, and other adaptations in instrumental learning biases or decision noise might also play a key role in developmental changes in decision making. In my talk, I will summarize findings from a new study in a developmental sample of n = 93 healthy individuals assessing how motivational biases, both Pavlovian and instrumental, are impacted by age-dependent development and what other factors might be crucial in guiding decision-making during the sensitive period of adolescence. I will also highlight the importance of employing computational modelling to disentangle the exact role of these intricate mechanisms underlying decision-making during development and how this is relevant in the context of developmental computational psychiatry. Here, I will be using the working example of ADHD as a neurodevelopmental disorder developing early in life and primarily characterized by inattention, hyperactivity and impulsive behaviour, to explain how reinforcement learning models can help us bridge the gap between neurobiological mechanisms and observed symptom-level behavior.

S16.2 - Attenuated Flexible Learning Behaviour Through the Lens of Reinforcement Learning Across Diagnoses

L. Zhang[1,2,3]

Thursday 13:30 - 15:00 | Lecture Hall N9

[1] Centre for Human Brain Health, School of Psychology, University of Birmingham, Birmingham B15 2TT, UK
[2] Institute for Mental Health, School of Psychology, University of Birmingham, Birmingham B15 2TT, UK
[3] Social, Cognitive and Affective Neuroscience Unit, Department of Cognition, Emotion, and Methods in Psychology, Faculty of Psychology, University of Vienna, Vienna, Austria

One of the biggest challenges in psychiatry is the many-to-many mapping problem, which refers to the complex and often overlapping relationships between diagnoses and the underlying neurobiological mechanisms. For example, multiple diagnoses may share common cognitive neural pathways, meanwhile, a single diagnosis can manifest in a range of biological causes. To address this challenge, Computational Psychiatry (CP) can embrace a transdiagnostic approach by using the Research Domain Criteria (RDoC) framework, which focuses on dimensional constructs (e.g., reward, learning, inference) underlying psychiatric symptoms, rather than the more traditional categorical diagnoses. This approach allows for a more comprehensive mechanistic understanding of malfunctions across different psychiatric disorders with cognitive computational mechanisms at its core. In this presentation, I will synthesize my past and ongoing work on autism spectrum disorder (ASD), schizophrenia, and eating disorder, with a central focus on attenuated flexible learning behaviour, in other words, cognitive inflexibility, through the lens of reinforcement learning models. Across all disorders, cognitive inflexibility in probabilistic learning or inference tasks can be attributed to suboptimal parameters (e.g., learning rate) compared to healthy controls. Depending on the experimental protocol, model-derived trial-by-trial decision variables (e.g., prediction error) are further examined against other measurement modalities, such as symptomatology, pupil dilation, and fMRI. In summary, this line of work will provide better insights into the (neuro)computational mechanisms underlying attenuated flexible learning behaviour across diagnoses. Looking forward, it may help to identify potential targets for more precise intervention in disorders characterized by disruptions in reinforcement learning.

S16.3 - Learning and Decision-Making in Disorders of the Compulsive Spectrum

M. H. Sebold[1]

Thursday 13:30 - 15:00 | Lecture Hall N9

TH Aschaffenburg, Germany

Disorders within the compulsive spectrum, such as substance dependence, pathological gambling, obsessive-compulsive disorder, and binge eating disorder, are characterized by the persistent repetition of behaviors despite negative consequences. This presentation will review recent studies that use theory-informed computational models to uncover the latent mechanisms underlying learning and decision-making in both healthy and aberrant choices. The studies aim to identify whether compulsive disorders are characterized by habitual, so-called "model-free" learning and decision strategies. Additionally, the studies investigate intra- (e.g., stress) and interindividual (e.g., genetics) factors that might contribute to the development of putatively compulsive disorders. The presentation will also highlight recent findings suggesting that these mechanisms may have predictive value for treatment responses. Finally, the talk will end with a presentation of an ongoing project focused on investigating the computational mechanisms of craving as a hallmark feature that cuts across diagnostic boundaries.

S16.4 - Using Smartphone-Based Cognitive Control Tasks to Predict Real-Life Alcohol Consumption

H. Zech[1], **L. Deserno**[2]

Thursday 13:30 - 15:00 | Lecture Hall N9

[1] TU Dresden, Germany
[2] University of Würzburg, Germany

Alcohol use is one of the leading risk factors for death and disability. Loss of control over alcohol consumption has been linked to decreased cognitive control—a construct that includes, for example, the ability to inhibit unhealthy impulses, the ability to avoid excessive risk, and the ability to focus on one's goals when distracted. Existing research has mostly focused on interindividual differences in cognitive control and alcohol consumption. Here, we use four gamified smartphone-based tasks to study how within-participant changes in cognitive control and decision-making relate to changes in real-life drinking behavior. We report data from 288 participants with mild to moderate alcohol use disorder who, for a period of one year, completed monthly smartphone-based tasks and daily measures of alcohol consumption. We show, as pre-registered, that changes in task measures can, indeed, predict subsequent alcohol consumption: Specifically, participants' alcohol consumption decreased in months in which they made more careful decisions in an information sampling task and in months in which they made less risky decisions during a risk-taking task (specifically for participants with low working memory). Together our findings show how smartphone-based tasks can help elucidate how dynamic changes in cognitive control and decision-making relate to important health behaviors such as the (over)consumption of alcohol.

S17.1 - Effects Of Dietary Prebiotics On Food Decision-Making

V. Witte[1,2]

Thursday 13:30 - 15:00 | Lecture Hall 7E02

[1] Universitätsklinikum Leipzig, Germany
[2] Max Planck Institut für Kognitions- und Neurowissenschaften

Animal studies suggest that prebiotic, plant-derived fibers could improve homeostatic and hedonic brain functions through improvements in the microbiome-gut-brain communication. However, little is known if these results are applicable to humans. Therefore, we tested the effects of high-dosed prebiotic fiber on eating behavior and decision-making in a randomized, within-subject crossover study and examined relevant blood and stool-based biomarkers. Overall, 59 overweight young adults (19 females, 18-42 years, body mass index 25-30 kg/m2) underwent functional task MRI at up to four time points. Measurements took place before and after 14 days of ingestion of 30 g/d of inulin (prebiotics) and equicaloric placebo, respectively, following a standardized breakfast. Gastrointestinal hormones, glucose/lipid and inflammatory markers were assayed in fasting blood samples. The gut microbiome and metabolites were determined using stool samples. Compared to placebo, participants showed reduced brain activity towards high-caloric food stimuli in clusters in the ventral tegmental area and right orbitofrontal cortex after fiber intake (measured by fMRI BOLD response, p-FWE < 0.05). While fasting blood values remained largely unchanged, 16S-rRNA sequencing showed significant shifts in the microbiome towards increased occurrence of, among others, Bifidobacteriacea, and changes in more than 90 predicted functional signaling pathways after prebiotic intake. This proof-of-concept study suggests that a microbiome-altering diet intervention with prebiotic fibers reduces the neural response in the reward network to high-caloric food stimuli. This could help to better understand the potential of interventions targeting the gut-brain axis in the development of new strategies for healthy eating behavior.

S17.2 - Feeding the Mind: Exploring Metabolic Influences on Learning and Decision-Making Processes

A. Kühnel[1], **M. Grahlow**[2], **K. Kaduk**[2], **B. Derntl**[2], **N. B. Kroemer**[1,2]

Thursday 13:30 - 15:00 | Lecture Hall 7E02

[1] Department of Psychiatry and Psychotherapy, University Bonn, Germany
[2] Department of Psychiatry and Psychotherapy, University Tübingen, Germany

To support adaptation, the metabolic state of the body tunes reward-related behavior from eating to decision-making and learning. Recently, altered metabolic and interoceptive signaling has emerged as a potential mechanism for psychopathological symptoms across disorders. While there is ample evidence from preclinical research demonstrating the role of the metabolic state on learning, experimental evidence in humans for non-food rewards is still lacking to date. Here, we will present data from studies combining observational and experimental data to evaluate metabolic scaling of reinforcement learning. First, we will present longitudinal observational data from our App Influenca that assesses learning and value-based decision-making for food or monetary rewards with ecological momentary assessment (EMA) of metabolic and mood states over 4 weeks (up to 60 runs). In addition, metabolic state was measured with continuous glucose monitoring every 5 minutes. Second, we will present experimental data showing that a caloric load (milkshake) vs. water reduces task performance and address generalization to monetary rewards. Third, we will unravel changes in reward-related regions during learning and decision-making and evaluate their link to behavioral adaptations. To conclude, we will show that eating may affect how we learn and decide. An improved understanding of metabolic scaling of reward-related behavior could offer crucial insights into adaptive and maladaptive behavior. Ultimately, inter-individual difference in the integration of metabolic state could conceivably relate to differences in body composition and sex, including changes in circulating hormones, and our insights might help improve metabolic and mental health.

S17.3 - The Effect of Glucose Administration on Autonomic Responses to a Soft-Shoulder Massage

M. Meier[1,2], E. Unternaehrer[2], S. J. Dimitroff[1,3], B. F. Denk[1,3], J. C. Pruessner[1,3]

Thursday 13:30 - 15:00 | Lecture Hall 7E02

[1] University of Konstanz, Konstanz, Germany
[2] Psychiatric University Hospitals Basel, University of Basel, Basel, Switzerland
[3] Centre for the Advanced Study of Collective Behavior, Konstanz, Germany

The initiation of regenerative processes at times of rest is as important for survival as the initiation of a stress response at times of threat. The sympathetic and parasympathetic branches of the autonomic nervous system (ANS) play an integral role in adjusting to such changing environmental demands. While metabolic conditions at basal states have been investigated intensively, its effect on cardiac reactivity in response to stress and relaxation has not been examined in detail. In the current project, we test whether glucose administration moderates autonomic changes to a relaxing massage and explore potential cognitive consequences of this modulation. In this ongoing project, N=100 adults are randomly assigned to ingest a drink containing 75g glucose, or plainwater. Later, they either receive a 10-minute soft-shoulder massage or are allowed to rest. Then, participants complete the d2 sustained attention test. Electro- and impedance cardiography (ECG/ICG) are recorded continuously, and blood pressure and blood glucose concentrations are measured three times. Upon finishing the processing of the ECG/ICG data, we will perform the preregistered statistical analyses (https://osf.io/jw4yv) to examine group differences in autonomic reactivity to the massage and potential cognitive effects on sustained attention. The obtained results will be presented at the conference. The findings will help to understand how our metabolic state shapes our flexibility to adapt to our environment. Since adaptation to external stimuli is an integral part of health, and comprised in various mental health conditions, the results will deepen our understanding of the links between metabolic and mental health.

S17.4 - Sex Differences in Motivation: Hormonal Modulation of Cost-Benefit Decision-Making

M. Grahlow[1,2], **A. Kühnel**[3], **S. Mathis**[1], **K. Kaduk**[3], **N. Kroemer**[1,3], **B. Derntl**[1]

Thursday 13:30 - 15:00 | Lecture Hall 7E02

[1] Department of Psychiatry and Psychotherapy, Tübingen Center for Mental Health (TüCMH), University of Tübingen, Tübingen, Germany
[2] Graduate Training Centre of Neuroscience, University of Tübingen, Tübingen, Germany
[3] Department of Psychiatry and Psychotherapy, University of Bonn, Bonn, Germany

Women and men behave differently when making value-based decisions, especially when (physical) effort must be exerted to obtain a reward. However, it is not clear whether this sex-specific behavioural variability depends on reward type, magnitude or task difficulty or whether hormonal differences play a modulational role. We investigated whether metabolic state, sex hormone levels and fluctuations across the female menstrual cycle influence reward processing in participants who performed an effort allocation task after 12 hours of fasting (T0) and once a week for four weeks (T1-T4). We analysed the motivational phases of invigoration and effort maintenance, with varying reward type (food vs. money), reward magnitude (low vs. high) and difficulty (easy vs. hard). Blood insulin and glucose levels were determined in the fasted state and sex hormone levels were measured weekly. In a preliminary sample of 24 women (Mage = 23.37, MBMI = 23.70) and 24 men (Mage = 24.33, MBMI = 24.51), we analysed cross-sectional data at T0 and longitudinal data for T1-T4. Effort maintenance was higher for high and lower for low reward magnitude, in both women and men, with women working harder for small rewards. Both female and male participants allocated more effort for monetary rewards than for food rewards. Further analyses indicate that the menstrual cycle phase influences cost-benefit decision-making at T0 but also longitudinally. This implicates that sex differences and fluctuations across the menstrual cycle need to be considered when investigating cost-benefit decision-making. Hormone data and implications for metabolic health are further discussed.

Symposia session 4

S18.1 - The Cortical Hierarches Represent the Temporal Correlation and Spatial Disparity of Audiovisual Signals to Inform Causal Inferences in Spatial Perception

T. Rohe[1,2]

Friday 09:00 - 10:30 | Lecture Hall N1

[1] Institute of Psychology, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
[2] Department of Psychiatry and Psychotherapy, Eberhard Karls Universität Tübingen, Germany

Humans integrate signals across the sensory modalities to obtain multisensory representations of their environment, for example in audiovisual spatial perception. However, before relating multisensory signals, the brain needs to infer the causal structure of the signals to integrate signals from a common cause, but to segregate signals from independent causes. Human observers infer the causal structure from intersensory cues such as the signals' spatiotemporal disparity and temporal correlation. The brain represents causal-inference processes on distinct levels of the cortical hierarchies. Yet, it is unknown at which level of the cortical hierarchy and at which time point the brain infers the causal structure from multiple intersensory cues. In a combined EEG-fMRI study, we presented participants (N = 16) with sequences of audiovisual spatial signals and manipulated their intersensory spatial disparity as well as temporal correlation. Participants localized the audiovisual signals and judged their causal structure. Behavioral data showed that participants inferred a common cause if the signals' spatial disparity was low and their temporal correlation was high, leading to strong biases of participants' auditory spatial perception towards the visual signals. MVPA of fMRI and EEG data showed that the brain represented the signals' spatial disparity on lower levels in visual sensory regions at early time points. By contrast, the brain encoded the temporal correlation in higher intraparietal regions at late time points. Thus, our data demonstrate that the brain represents the spatial disparity and temporal correlation of audiovisual signals distinctively across the cortical hierarchies to inform multisensory causal inferences.

S18.2 - Visual enhancement of speech processing in auditory sensory areas

S. Puschmann[1], **R. Brückner**[1], **C. M. Thiel**[1]

Friday 09:00 - 10:30 | Lecture Hall N1

Carl von Ossietzky University of Oldenburg, 26129 Oldenburg, DE; Cluster of Excellence Hearing4all, 26129 Oldenburg, DE

Audiovisual binding is an integral aspect of natural speech processing in face-to-face situations. Visual speech provides important cues on the timing and rhythmic properties of an ongoing acoustic signal as well as on its content, and facilitates the perception of speech, especially in noisy listening settings. The neural correlates underlying this enhancement have been widely investigated, showing that visual input shapes neural activity at different levels of language processing. How audiovisual interactions modulate early speech representations in auditory sensory cortex, is however not clear at present. To explore this question, we conducted an fMRI experiment using realistic and continuous (audiovisual) speech in background noise. In this talk, I will describe how neural responses to continuous (audiovisual) stimulation can be assessed using between-brain analysis methods. Based on this approach, I will demonstrate that visual input modulates neural activity at different stages of the auditory cortex processing hierarchy. Moreover, our data suggest that visual input strengthens auditory stimulus representations that are masked by background noise, starting as early as in primary auditory cortex.

S18.3 - Changes in functional Ccnnectivity and audiovisual abilities in age-related hearing loss

S. Rosemann[1], **C. Thiel**[1]

Friday 09:00 - 10:30 | Lecture Hall N1

Biological Psychology, Department of Psychology, European Medical School, Carl-von-Ossietzky Universität Oldenburg, Oldenburg, DE; Cluster of Excellence "Hearing4all", Carl von Ossietzky Universität Oldenburg, Oldenburg, DE

Previous research provides compelling evidence for a cross-modal plastic reorganization following sensory deprivation, leading to an increased neural response to visual input in the auditory cortex in congenital deafness. Recent animal and human data indicate that these changes can already be observed after a moderate hearing impairment. However, the influence of the reduced auditory input on audiovisual interactions is largely unknown. In this talk, I will present data from different studies in elderly hard of hearing and normal-hearing individuals using the McGurk illusion and functional magnetic resonance imaging (fMRI). Our data show an increased audiovisual integration in hard of hearing individuals on the behavioral level. Further, we found that functional connectivity of the auditory cortex is increased during McGurk compared to congruent audiovisual stimuli, however it is decreased during resting state. In a randomized controlled pilot trial, we investigated how the McGurk illusion and resting state functional connectivity are altered by a six-month hearing aid use. Our results showed a statistical trend for an increase in McGurk illusion after hearing aid fitting. In addition, six months of hearing aid use was associated with a decrease in resting state functional connectivity between auditory cortex and fusiform gyrus which was also linked to an increased McGurk illusion perception. We hereby show that mild to severe age-related hearing loss is associated with changes in audiovisual integration and functional connectivity of the auditory cortex. Moreover, we demonstrate that these changes can be altered even by short-term hearing aid use.

S18.4 - Auditory and audiovisual speech processing in the first months of CI use

A. Weglage[1], **N. Layer**[1], **V. Müller**[1], **H. Meister**[2], **M. Walger**[1], **R. Lang-Roth**[1], **P. Sandmann**[3]

Friday 09:00 - 10:30 | Lecture Hall N1

[1] University of Cologne, Faculty of Medicine and University Hospital Cologne, Department of Otorhinolaryngology, Head and Neck Surgery, Audiology and Pediatric Audiology, Cochlear Implant Center, DE
[2] Jean-Uhrmacher-Institute for Clinical ENT Research, University of Cologne, DE
[3] Department of Otolaryngology, Head and Neck Surgery, University of Oldenburg, Oldenburg, DE

Individuals with severe to profound hearing loss can be provided with a cochlear implant (CI) to partially restore their auditory function. CIs are the first sensory prosthesis used in the clinical context and they provide limited auditory information compared to normal acoustical hearing. Therefore, CI patients may compensate for this limitation by enhanced visual abilities and a stronger interaction between the visual and auditory system. To get a better understanding of the audiovisual speech perception in this kind of individuals, our study used electroencephalography (EEG) and a word identification task in a visual, auditory and audiovisual condition. Postlingually deafened CI users were tested five weeks and six months after the first fitting of their CI. Additionally, an age and gender matched group of normal hearing (NH) listeners was tested with the same paradigm. Besides the behavioural data of all three conditions, the event-related potentials (ERPs) are compared between the conditions and time points. Our aim is to explain the multisensory processing in the course of the CI usage, as well as the cortical responses for a simultaneous processing of auditory and visual stimuli. The results may be of clinical relevance, as they indicate the importance of assessing the CI outcome in audiovisual speech conditions instead of purely auditory.

S19.1 - What Is Precision And Why Is It Useful?

M. Reutter[1]

Friday 09:00 - 10:30 | Lecture Hall N2

Julius-Maximilians-Universität Würzburg, Germany

In this introductory presentation, we are going to focus on different methods of good scientific practice and how they are linked to the concept of precision. We will unravel why power calculations focus primarily on sample size and in which cases the spotlight should rather be put on other desgin parameters like the number of trials per condition. For result evaluation, we will take a look at the benefits of reporting reliability of variables as well as confidence intervals around means and effect sizes. All these practices during design and analysis of studies are tied together by the overarching concept of precision that easily explains even tough statistical problems like the reliability paradox (Hedge et al., 2018). Taken together, considering precision will provide a new and comprehensive perspective on different current scientific challenges related to the replication crisis for researchers of all career stages.

S19.2 - Delivering EEGManyLabs – Challenges Opportunities

Y. Pavlov[1]

Friday 09:00 - 10:30 | Lecture Hall N2

University of Tübingen, Germany

EEGManyLabs project – a large-scale international collaborative replication effort – is working on examining some of the foundational findings using EEG with unprecedented statistical power. In a multi-step procedure involving database search and expert input, the project has identified 27 of the most influential and continually cited studies in the field with a plan to directly test the replicability of key findings from 20 of these studies in teams of at least three independent laboratories. To ensure a high scientific standard, each replication will pass quality control through being reviewed by members of the advisory board and original authors, will use standardized experimental and analysis protocols across labs, and involve registered reports that will be published irrespective of the outcomes. To date, we have assembled 145 teams that have committed to collect data from >6000 participants across the selected experiments. We are entering the data acquisition phase of the project, having recently secured in-principle acceptance for one replication and a further 3 registered reports under review. We will describe the challenges and opportunities faced thus far in the implementation of this programme – which on completion will constitute the largest collection of open access EEG datasets in history. Our ambitions for the project are to better understand the factors that contribute to variation in EEG findings, update our confidence in widely cited phenomena and create a suite of open-source resources that facilitate a cultural shift away from small-scale single laboratory experiments towards high-powered, community driven collaborations.

S19.3 - Effects of Analytical Pipelines on the Psychometric Properties of P3 Latencies: A Multiverse Study on EEG Data

K. Sadus[1], **A. Schubert**[2], **C. Löffler**[2], **D. Hagemann**[1]

Friday 09:00 - 10:30 | Lecture Hall N2

[1] Heidelberg University, Germany
[2] University of Mainz, Germany

Investigating ERP latencies and their differences across conditions and individuals requires numerous methodological decisions, resulting in pipelines of great variation ultimately limiting the comparability of results from different studies. The aim of the present work is to investigate the effects of different analytical pipelines on the psychometric properties of P3 latencies in real data. Therefore, we conducted a multiverse study and varied the low-pass filter (4 Hz, 8 Hz, 16 Hz, 32 Hz), the latency type (area vs. peak), the level of ERP analysis (single participant vs. jackknifing) and the extraction method (manual vs. automated). 30 young (18 – 21 years) and 30 old (50 – 60 years) participants completed three tasks (Nback task, Switching task, Flanker task) while an EEG was recorded. The results show that different analysis strategies can have a tremendous impact on the psychometric properties of P3 latencies. We found that the reliabilities fluctuated between rtt = .13 and 1.00, while the homogeneities ranged from rh = -.18 to .86. More specifically, reliabilities were subject to greater variation when data was noisy. Peak latencies in particular showed great variability in reliability estimates across different pipelines, while area measures resulted in more consistent and higher reliabilities. We derive practical recommendations aimed at facilitating a priori decisions that ensure adequate reliability and validity. In addition, we encourage researchers to report reliability estimates by default to improve the interpretability of the effects of interest studied.

S19.4 - How to Increase Precision in Eye-tracking Research? The Importance of Evaluating Application Scenarios in Addition to Experimental Setups

A. Vehlen[1,2], **D. Tönsing**[3], **I. Spenthof**[4], **B. Schiller**[3], **M. Heinrichs**[3], **G. Domes**[1,2]

Friday 09:00 - 10:30 | Lecture Hall N2

[1] Department of Biological and Clinical Psychology, University of Trier
[2] Institute for Cognitive and Affective Neuroscience, University of Trier
[3] Department of Psychology, Laboratory for Biological and Personality Psychology, Albert-Ludwigs-University of Freiburg
[4] Institute of Psychology, Experimental Psychology II and Biological Psychology, University of Osnabrück

Questions about data quality and its impact on validity of results have a relatively long tradition in eye-tracking research. Nevertheless, reporting standards are far from perfect, and most researchers still reference the manufacturer's data quality specifications to justify their analyses rather than relying on empirical estimates of precision and accuracy. In a sample of 42 female participants, we developed and evaluated a setup for measuring gaze behavior in dyadic interactions. To this end, gaze data quality was assessed before, during, and after a question-and-answer based interaction task. Additionally, data quality during the interaction was correlated with an index for the movement of the interaction partner. We found data of sufficient quality to discriminate between distinct features on the interaction partner's face at all time points. Moreover, estimates of data quality during the interaction revealed no association with the movements of the interaction partner. However, it should be noted that the total amount of movement in the study was limited. In summary, the proposed setup provides good data quality for the study of gaze behavior in dyadic interactions. At the same time, this evaluation focused on a specific interaction task and participant sample. Consequently, researchers should ensure that evaluations are tailored to the specific application scenario and ideally conducted as part of the actual study. Relying solely on manufacturer specifications of data quality or past evaluation studies is insufficient to strengthen the precision of eye-tracking research.

S20.1 - Methodological Advancements in Functional Connectivity Real-Time fMRI Neurofeedback

M. F. Gerchen[1]

Friday 09:00 - 10:30 | Lecture Hall N6

Zentralinstitut für Seelische Gesundheit, Mannheim, Germany

Real-time fMRI neurofeedback (rtfMRI NF) can be applied to train voluntarily control of otherwise covert brain processes. Hitherto, a majority of rtfMRI NF studies has focussed on regional brain activation, but novel approaches targeting brain network properties derived from functional connectivity (FC) estimates are emerging. However, FC rtfMRI NF presents with methodological issues, like respiratory artefacts and movement artefacts that might distort the data if they are not controlled for. These issues are well known for general fMRI analyses, but are even more relevant in rtfMRI NF were they affect the real-time training signal and cannot be corrected retrospectively. Here, our work on establishing a novel large-scale network rtfMRI NF approach based on FC, the identification of physiological, especially respiratory, artefacts in the data, and the development of procedures for the real-time control of these artefacts in FC rtfMRI NF will be presented. Overall, our results demonstrate the capability of FC rtfMRI NF to train large-scale frontostriatal brain networks while applying strict control for physiological artefacts and thus provide a promising basis for the development of novel intervention approaches for mental disorders addressing prefrontal cortical functions.

S20.2 - An Inhibitory Control Training Assisted by Transcranial Direct Current Stimulation in Patients with Binge Eating Disorder – Data of the ACCELECT Trial

K. Schag[1], **P. Martus**[2], **S. Max**[1,3], **C. Plewnia**[3], **K. Giel**[1]

Friday 09:00 - 10:30 | Lecture Hall N6

[1] Universitätsklinikum Tübingen, Psychosomatische Medizin und Psychotherapie, Tübingen, Deutschland
[2] Universitätsklinikum Tübingen, Institut für angewandte Biometrie klinische Epidemiologie, Tübingen, Deutschland
[3] Universitätsklinikum Tübingen, Psychiatrie und Psychotherapie,Neurophysiologie Interventionelle Neuropsychiatrie, Tübingen, Deutschland

Inhibitory control particularly concerning eating behavior, presents a risk factor for binge eating disorder (BED). Thus, we developed a training program that is supported by transcranial direct current stimulation (tDCS) to decrease binge eating. We examined feasibility and efficacy of this training program in the randomized controlled ACCELECT pilot trial. Therefore, 41 patients with BED were trained in 6 sessions of a computer-based antisaccade training to look away from individually preferred high-caloric food stimuli. In a double-blind design, half of patients received an active anodal stimulation of the right dorsolateral prefrontal cortex (2 mA), whereas the other half received a sham stimulation. Primary endpoint was the frequency of binge eating episodes before (T0) vs. 4 weeks after training (T8) and in three months follow-up (T9). Secondary outcomes were the error rate in the antisaccade training while (T1-T6) and directly after training (T7), eating disorder pathology (T7, T8), BMI (T8, T9) and quality of life (T7, T8). Only two patients cancelled the training prematurely. Binge eating frequency was clinically significant reduced in both groups at T8 and T9, and this effect was even stronger in the active stimulation at T9 compared to the shame stimulation. Secondary outcomes were ameliorated in both groups as well. To conclude, the training program is feasible and highly accepted. Results imply that the training influences binge eating as the core pathology of BED and that tDCS has an additional effect in the mid-term. The training fosters neurocognitive as well as behavioral improvements independent from stimulation.

S20.3 - The Right Prefrontal Cortex as a Target for Neuromodulation in Attention-Deficit/ Hyperactivity Disorder

K. Krauel[1]

Friday 09:00 - 10:30 | Lecture Hall N6

Universität Magdeburg, Germany

Neurodevelopmental disorders such as attention-deficit/ hyperactivity disorder (ADHD) or specific learning disorders are among the most frequent reasons for seeking health services in childhood and adolescence. Their treatment is generally time- and cost-intensive and particularly pharmacological treatment effects are often short-lived. Studies using different methods of transcranial electrical stimulation in neurodevelopmental disorders have yielded promising results. The current talk will focus on the right prefrontal cortex (PFC) as a target for transcranial direct current stimulation (tDCS) in ADHD. The right PFC, and specifically the right inferior frontal gyrus, shows functional changes during interference control and working memory tasks, is connected to relevant functional networks and is most sensitive to treatment effects. While some studies have shown positive effects of rIFG stimulation on attentional parameters and interference control, other studies did not find an improvement of cognitive measures. It will be discussed how key parameters such as anatomical fit of the stimulation site, montage, stimulation frequency and intensity as well as concurrent tasks could influence stimulation success, particularly in pediatric samples.

S20.4 - Advances In Closed-loop Transcranial Alternating Current Stimulation And Prospective Clinical Applications

D. Haslacher[1]

Friday 09:00 - 10:30 | Lecture Hall N6

Charité – Universitätsmedizin Berlin, Germany

Non-invasive brain stimulation techniques such as transcranial alternating current stimulation (tACS) have become a promising tool to treat neurological and psychiatric disorders, but their effects suffer from high variability, known to result (in part) from their depency on the millisecond-by-millisecond state of the brain. Closed-loop approaches that adapt stimulation parameters to ongoing brain activity in real-time can solve this problem, but have been technically challenging to implement due to stimulation artifacts that obscure simultaneous recordings of brain activity, e.g. using electroencephalography. Here, I present recent advances in artifact rejection approaches that enable single-trial assessment of brain oscillations targeted by tACS. I show that by tuning the phase of tACS to brain oscillations in real-time, selective enhancement and suppression of brain activity can be achieved. Finally, I show that closed-loop tACS can be used to enhance and suppress short- and long-term memory in healthy participants, and discuss prospective clinical applications of this technique.

S21.1 - Neural Underpinnings Of Individual Differences In Emotion Regulation

U. Basten[1], **C. Morawetz**[2]

Friday 09:00 - 10:30 | Lecture Hall N9

[1] RPTU Kaiserslautern-Landau, Germany
[2] University of Innsbruck, Austria

Findings on individual differences in neural processes underlying emotion regulation have not yet been integrated across studies. In a meta-analysis, we integrated findings from studies relating brain activation during emotion regulation to (1) behavioural, (2) questionnaire, (3) demographic, and (4) physiological measures. 261 fMRI studies on emotion regulation were screened for analyses of individual differences. We summarized 53 studies (participants = 1,847, foci = 287) reporting an effect for a covariate of interest: (1) online behavioural measures assessed during the fMRI experiment (n = 32; reappraisal success, anxiety reduction, etc.), (2) offline questionnaire measures assessed separately from the fMRI experiment (n = 15; habitual emotion regulation, personality, well-being, etc.), (3) demographic measures (n = 9; age, gender, etc.), and (4) physiological measures (n = 6; cortisol, heart rate, skin conductance, etc.). Both online behavioural and offline questionnaire measures correlated with activity in the amygdala and prefrontal regions. However, behavioural measures correlated with amygdala activity only in region of interest analyses, while questionnaire measures did so on a whole-brain level. A lack of spatial clustering for the effects of demographic and physiological measures suggested that these variables did not exert a systematic effect on brain activity during emotion regulation. Our meta-analysis points to reliable individual differences in prefrontal and amygdala activation during emotion regulation that are associated with behavioural and questionnaire measures associated with regulation success. The systematic investigation of these differences can contribute to a better understanding of emotion regulation as a transdiagnostic dimension of psychopathology.

S21.2 - Resting-state Effective Connectivity is systematically linked to Reappraisal Success of High- and Low-Intensity Negative Emotions

C. Morawetz[1], **S. Berboth**[2], **S. Bode**[3]

Friday 09:00 - 10:30 | Lecture Hall N9

[1] University of Innsbruck, Austria
[2] Charité Berlin, Germany
[3] School of Psychological Sciences Melbourne, Australia

Introduction Emotional intensity has been shown to impact emotion regulation. Here, we tested whether the neural network dynamics underlying reappraisal in the absence of task stimuli is directly related to regulating high- and low-intensity negative emotions. We hypothesized that intrinsic effective connectivity of reappraisal-related brain regions at rest would be (i) associated with prospective reappraisal success and (ii) modulated by stimulus intensity. Methods We used spectral DCM to model resting-state fMRI (rs-fMRI) data of 26 participants collected during 3 scanning sessions separated by 1 week (22f, mean age = 22.8) (SIEMENS Magnetom 7.0 Tesla MR scanner). We extracted rs-fMRI time series from 11 regions of interest, defined by parametrically modulated neural activity during reappraisal of high- and low-intensity negative emotions. Results Overall, reappraisal success was related to a high degree of interconnectivity between temporal and parietal regions independent of stimulus intensity. Right middle temporal gyrus and superior parietal lobe provided the most afferent and efferent connections for low- and high-intensity stimuli, respectively. These hubs might be critical for regulating the flow and integration of information within networks. A leave-one-out cross-validation revealed that effect sizes were sufficiently large to predict reappraisal success with an out-of-sample estimate for 15 connections for low-intensity and 10 connections for high-intensity stimuli, respectively. Conclusions This is the first study to unravel how effective connectivity within a reappraisal-related network at rest is linked to reappraisal success of high- and low-intensity negative emotions.

S21.3 - Neural Emotion Regulation During Pregnancy

F. Weinmar[1], E. Rehbein[2], L. Kogler[1], C. Morawetz[3], I. S. Poromaa[4], A. Skalkidou[4], B. Derntl[1,5]

Friday 09:00 - 10:30 | Lecture Hall N9

[1] Department of Psychiatry and Psychotherapy, Innovative Neuroimaging, Tübingen Center for Mental Health (TüCMH), University of Tübingen, Tübingen, Germany
[2] Department of Clinical Psychology and Psychotherapy, Georg-Elias-Mueller-Institute of Psychology, University of Göttingen, Göttingen, Germany
[3] Institute of Psychology, University of Innsbruck, Austria
[4] Department of Women's and Children's Health, Uppsala University, Uppsala, Sweden
[5] LEAD Graduate School, University of Tübingen, Tübingen, Germany

Pregnancy is a physiological and psychological transition phase in which estradiol (E2) levels rise substantially and modulate emotional processes, brain structures and networks; thus presenting a window of vulnerability for mental health. E2 fluctuations along the female menstrual cycle and pregnancy influence behavioral and neural emotion regulation, which is a transdiagnostic factors for psychopathology. For the first time, behavioral and neural emotion regulation were investigated in healthy primiparous pregnant women with extremely high E2 levels (N = 15) using a fMRI paradigm. Results were compared with naturally-cycling women with high E2 levels (N = 16) and low E2 levels during the early follicular phase (N = 16). Although pregnant women reported the lowest trait use of cognitive reappraisal, all women successfully downregulated their negative emotional state on the behavioral level. On the neural level, all women had increased activity in the left middle frontal gyrus during regulation although this was pronounced in bilateral frontal regions for pregnant women. A psychophysiological interaction analysis in pregnant women demonstrated less functional connectivity between the left inferior frontal gyrus and right temporal parietal junction during downregulation, which was negatively associated with regulation success. Also in pregnant women, testosterone levels negatively correlated with left amygdala activity during downregulation, which itself predicted reduced emotional state after downregulation. Future research needs to examine if these altered neural patterns apply to women with postpartum depression and could indicate protective and vulnerability markers during pregnancy, eventually allowing enhanced identification, prevention, and treatment for mental health disorders.

S21.4 - Now or Later? A Comparison of the Effectivity of Continuous and Intermittent Feedback for Amygdala Neurofeedback Training

M. Jindrova[1], **L. Wölfl**[1], **F. Kirn**[1], **K. Böttcher**[1], **M. Paro**[1], **N. Lubianiker**[2,3], **C. Schmahl**[1], **C. Paret**[1,2]

Friday 09:00 - 10:30 | Lecture Hall N9

[1] Department of Psychosomatic Medicine and Psychotherapy, Central Institute of Mental Health, Mannheim, Germany
[2] Sagol Brain Institute, Wohl Institute for Advanced Imaging, Tel-Aviv Sourasky Medical Center and School of Psychological Sciences, Tel-Aviv University, Israel
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Background: Amygdala neurofeedback training (amy-NF) is a promising tool to augment emotion regulation therapy. During the training, participants downregulate the amygdala response to negative stimuli while receiving real-time feedback. Presenting feedback continuously alongside affective stimuli allows for pairing the mental actions of emotion regulation with the amygdala feedback directly. However, this continuous feedback presentation imposes additional cognitive processing demands as compared to the process of emotion regulation alone. Presenting aggregated feedback right after the regulation block, which is called intermittent feedback, reduces the complexity of the interface and may favor more efficient training of regulation strategies. The main goal of this study is to investigate the difference in the effectiveness of amy-NF training between the two feedback timings. Methods: Healthy participants are randomized to two groups, receiving either continuous or intermittent amygdala-related Electrical Fingerprint feedback. The difference in the ability to downregulate will be compared between the two groups using mixed-level ANOVA with within-factor session and between-factor group. Results: Interim analysis with N=59 showed learning success in both, continuous and intermittent groups. Comparing the two feedback timings resulted in different time courses of regulation success. Learning transfer did not differ between the intermittent vs. continuous group. Discussion: The different learning patterns between the two trainings will be discussed. The results of this study may help to improve amy-NF training protocols for emotion regulation.

S22.1 - Combining Transcranial Brain Stimulation with Neuroimaging for State-Dependent Stimulation and Causal Network Interrogation

T. O. Bergmann[1]

Friday 09:00 - 10:30 | Lecture Hall 7E02

Johannes Gutenberg University Medical Center Mainz, Germany; Leibniz Institute for Resilience Research (LIR) Mainz, Germany

Functional neuroimaging and electrophysiological techniques, such as fMRI or EEG/MEG, serve well to study spontaneous or task-related neuronal activity as correlates of specific cognitive functions in the human brain. However, to infer causality of brain activation for cognition, the former must be manipulated experimentally. In healthy humans, this is possible with the help of non-invasive brain stimulation (NIBS) techniques, such as transcranial magnetic, electric, or ultrasonic stimulation (TMS, tES, TUS). Online approaches, assessing the immediate neural response to stimulation, can be used to quantify cortical excitability or connectivity, to interfere with ongoing spontaneous or task-related neural activity, or to modulate its level or timing, whereas offline approaches can be used to inhibit or facilitate subsequent local neuronal excitability via mechanisms of synaptic plasticity. Importantly, NIBS techniques can also be combined with neuroimaging (e.g., TMS-fMRI, TMS-EEG) as well as with each other (e.g., TUS-TMS) to map network responses and gain proof-of neural target engagement. In this talk, I will present data from concurrent TMS-fMRI and TUS-TMS studies and discuss the benefits and challenges of these multimodal approaches, in particular for inferring causality from NIBS studies in cognitive neuroscience.

S22.2 - Investigating Repetitive Transcranial Magnetic Stimulation on Cannabis Use and Cognition in People with Schizophrenia

M. Sorkhou[1], **K. K. Bidzinski**[2], **T. P. George**[1]

Friday 09:00 - 10:30 | Lecture Hall 7E02

[1] Centre for Complex Interventions at the Centre for Addiction and Mental Health, Canada; University of Toronto, Canada
[2] University of Toronto, Canada

The prevalence of cannabis use disorder (CUD) in patients with schizophrenia is estimated between 20 % to 35 %, exceeding almost four times that of the general population. Moreover, comorbid CUD may exacerbate symptoms, trigger relapse, and negatively impact treatment adherence. Current treatments for this comorbidity demonstrate limited efficacy, warranting the need for novel therapeutic options. The goal of this study was to compare the effects of active versus sham high-frequency (20 Hz) repetitive transcranial magnetic stimulation (rTMS) on cannabis use in outpatients with schizophrenia and CUD. Secondary outcomes included cannabis craving/withdrawal, psychiatric symptoms, cognition and tobacco use. Nineteen participants were randomized to receive active (n = 9) or sham (n = 10) rTMS (20 Hz) applied bilaterally to the dorsolateral prefrontal cortex (DLPFC) 5x/week for 4 weeks. Cannabis use was monitored twice weekly. A cognitive battery was administered pre- and post-treatment. rTMS was safe and well-tolerated with high treatment retention (90 %). At the endpoint, no significant differences in reductions in cannabis use between active and sham rTMS treatments were found. However, linear contrast estimates indicated greater reductions in cannabis use in the active versus sham groups (p = 0.02). Significant improvements in positive symptoms (p = 0.02) were found in the active versus sham group. Active rTMS also improved attention scores on the Continuous Performance Test (p = 0.04). Our preliminary findings suggest that 20 Hz rTMS is a safe and potentially effective treatment for comorbid CUD and schizophrenia.

S22.3 - More than Ambiguity: Effects of Low-Intensity Transcranial Focused Ultrasound Neuromodulation of Midfrontal Theta and related Approach versus Withdrawal Behavior in Unambiguous Approach-Avoidance and Exclusive Avoidance Situations of a Virtual T-Maze

P. Ziebell[1], **J. Rodrigues**[1], **A. Forster**[1], **J. L. Sanguinetti**[2], **J. J.B. Allen**[2], **J. Hewig**[1]

Friday 09:00 - 10:30 | Lecture Hall 7E02

[1] University of Würzburg, Germany
[2] University of Arizona, USA

Recently, we demonstrated that low-intensity transcranial focused ultrasound (LITFUS) to the right prefrontal cortex (RPFC) can modulate electroencephalographic (EEG) midfrontal theta (MFT) and related behavior, complementing studies on mood enhancement and anxiety/worry reduction. Here, we expand previously presented findings from a preregistered double-blind within-subjects study with a large dataset (N = 152) and a virtual T-maze task. Originally, we showed RPFC LITFUS inhibition of conflict-related MFT, significantly predicting heightened approach versus lowered withdrawal in ambiguous T-maze events. Now, we focus on T-maze events without ambiguity that still provided potential for conflict between approach and withdrawal, namely approach-avoidance and exclusive avoidance situations. RPFC LITFUS inhibition of MFT significantly predicted heightened approach and reduced withdrawal in unambiguous approach-avoidance and exclusive avoidance T-maze events. Both event types showed distinct EEG-behavior prediction patterns in scalp topography. Notably, RPFC LITFUS MFT inhibition not only predicted increased approach via joystick pushing but also heightened approach towards safety via 180-degree turn and joystick pushing versus lowered withdrawal via joystick pulling. The EEG-behavior prediction patterns for unambiguity differed to some extent from those for ambiguity, potentially reflecting differing underlying mechanisms. As LITFUS can also be effective in less ambiguous, more rigid situations, this ultimately opens room for various applications such as supporting psychotherapy.

S22.4 - Evaluating Temporal Interference Stimulation Efficacy in Human Subjects

C. Thiele[1], **T. Zähle**[1], **S. Repplinger**[1], **K. Rufener**[1], **A. Haghikia**[1], **P. Ruhnau**[2]

Friday 09:00 - 10:30 | Lecture Hall 7E02

[1] University of Magdeburg, Germany
[2] University of Magdeburg, Germany; University of Central Lancashire, UK

Temporal interference stimulation (TI) is a promising method of non-invasive electric brain stimulation that involves the use of multiple interfering electric fields with specific frequencies to target and modulate cortical and subcortical brain regions. This technique holds potential therapeutic applications for various neurological disorders, such as Parkinson's disease or epilepsy. However, despite the potential benefits of TI, there is a lack of in-vivo research investigating its efficacy. Therefore, we conducted two experiments to provide empirical evidence for the stimulation effects of TI in humans. Our first experiment was an electroencephalography (EEG) study researching TI's efficacy in entraining parieto-occipital alpha oscillations to improve performance in a Shepard's mental rotation task. Another group receiving sham stimulation served as the control. While we did not observe behavioral performance increases after stimulation, most likely due to ceiling effects, analysis of EEG data resulted in a significant increase of event-related desynchronization (ERD) in the TI group. The second conducted experiment employed a TI montage to modulate beta oscillations in the motor cortex, again compared to sham stimulation. Using transcranial magnetic stimulation, motor-thresholds were determined to analyze changes in cortical excitability, as well as EEG measurements to detect changes in motoric beta activity. Our results indicate that TI causes an entrainment of beta activity, but no effect on motor thresholds was found.

Symposia session 5

S23.1 - Virtual Reality As An Ecologically Valid Tool to Study Emotions

M. Andreatta[1,2], **M. Winkler**[1], **P. Collins**[1], **D. Gromer**[1], **D. Gall**[1], **P. Pauli**[1], **M. Gamer**[1]

Friday 11:00 - 12:30 | Lecture Hall N1

[1] University of Würzburg, Germany
[2] Erasmus University Rotterdam, Netherlands

Emotions are considered dispositions to act. This means that emotions are accompanied by cognitive-verbal and physiological-humoral reactions, which in turn facilitate motor-behavioral responses. In patients with psychiatric disorders, these mechanisms are often altered. A more comprehensive investigation on the dynamic between the different levels of response can be crucial to gain a better understanding of the pathological mechanisms. To date, human research lacks an experimental protocol for a comprehensive and ecologically valid characterization of such emotional states. Virtual reality (VR) allows researchers to study mental processes linked to behavioral responses in highly controlled but reality-like settings. In this talk, we elucidate the role of presence and immersion as requirements for eliciting emotional states in a virtual environment and discuss different VR methods for emotion induction. We then consider the organization of emotional states on a valence continuum (i.e., from negative to positive), and on this basis discuss the use of VR to study threat processing and avoidance as well as reward processing and approach behavior. Although the potential of VR has not been fully realized in laboratory and clinical settings yet, this technological tool can open up new avenues to better understand the neurobiological mechanisms of emotional responding in healthy and pathological conditions.

S23.2 - Influence of Social Cues on Social Pain Modulation in Virtual Reality

I. Neumann[1], **P. Pauli**[1,2], **I. Käthner**[1,3]

Friday 11:00 - 12:30 | Lecture Hall N1

[1] Department of Biological Psychology, Clinical Psychology, and Psychotherapy, Institute of Psychology, University of Würzburg, Germany
[2] Center of Mental Health, Medical Faculty, University of Würzburg, Germany
[3] Department of Physiological Psychology, Institute of Psychology, University of Bamberg, Germany

Social support can reduce pain. In virtual reality (VR), social interactions can be investigated in a standardized way, yet, few studies explore the possibilities of social VR for pain modulation. A specific research question is what features of virtual characters impact social influences on users. In this study, we investigated the role of social cues and agency of virtual characters in social pain modulation. Healthy participants underwent four within-conditions in VR. In two conditions, virtual characters differing in number of social cues (low: static figure, high: virtual human) provided verbal support during pain stimulation. No support was provided in two other conditions, but neutral words were read aloud in one. Agency of the virtual characters served as between-subjects factor. In the avatar group, participants were led to believe that another participant controlled the virtual characters. In the agent group, participants were told that they interacted with a computer. However, in both groups, the virtual characters were computer-controlled. Conditions with support compared to no support reduced pain intensity and unpleasantness, albeit with smaller effects than with real humans. More social cues led to less pain unpleasantness and higher feelings of presence. Agency had no impact. We could not find a modulation of skin conductance through virtual support. This means that independent of the perceived agency, virtual characters providing support can reduce pain. Social cues affected both pain and presence, indicating beneficial effects of more human visual appearance. Implications for digital health interventions and limitations of virtual social interactions are discussed.

S23.3 - Social Stress in Virtual Reality – Effects of Ostracism and underlying Psychopathology

M. Rubo[1]

Friday 11:00 - 12:30 | Lecture Hall N1

University of Bern, Switzerland

Social stress can emerge from situational as well as dispositional factors. Here we tested in direct juxtaposition how ostracism in a Cyberball game and underlying psychopathology levels both influence subjective and objective stress markers in an interaction with artificial agents in virtual reality (VR). Ostracism led to moderately enhanced subjective stress and negative mood but not to alterations on objective markers of stress. By contrast, underlying psychopathology levels were associated with substantially stronger alterations on subjective stress markers and were additionally associated with reduced eye gaze at virtual agents' heads, larger pupil size, higher heart rate and reduced high-frequency heart-rate variability. Effects for social anxiety, general anxiety and depression levels were overall similar with largest effects on objective stress markers linked to general anxiety. This study demonstrates the utility of gaze and physiological data in predicting psychopathology levels, but also highlights the need for data security solutions when using social VR applications where rich data streams are exposed.

S23.4 - Naturalistic Human Escape Decisions In Virtual Reality

J. K. Sporrer[1], **J. Brookes**[1], **S. Hall**[1], **S. Zabbah**[1], **U. D. S. Hernandez**[1], **D. R. Bach**[1,2]

Friday 11:00 - 12:30 | Lecture Hall N1

[1] Max Planck UCL Centre for Computational Psychiatry and Ageing Research and Wellcome Centre for Human Neuroimaging,University College London, United Kingdom
[2] Hertz Chair for Artificial Intelligence and Neuroscience, University of Bonn

Coping with immediate threat is critical for humans and requires taking rapid decisions between action options without much leeway for cognitive and motor errors. Despite advances in some non-human species, little is known about human escape behavior as it is a substantial challenge to study for ethical reasons. We addressed this issue by using fully immersive virtual reality experiments in which participants had to escape from various natural threats. All threats had pre-historic relevance and were animated for biological and physical realism. We show that escape decisions are dynamically updated during escape according to changes in the environment. The decision whether, when, and how to escape depends on a detailed assessment of external factors such as threat identity and predicted behavior, as well as internal factors like stable personal characteristics. Its implementation integrates secondary goals such as behavioral affordances. Our results suggest that instead of being instinctive, stereotypical, or hardwired stimulus-response patterns, human escape decisions integrate multiple variables even under strong time constraints in a flexible architecture.

S23.5 - Navigating The Approach-Avoidance Matrix: Exploring Individual Differences In A Novel Virtual Reality Foraging Task

A. Kastrinogiannis[1], **Barbara Lonsdorf Tina**[1,2]

Friday 11:00 - 12:30 | Lecture Hall N1

[1] University Medical Center Hamburg-Eppendorf, Germany
[2] University of Bielefeld, Biological Psychology and Cognitive Neuroscience, Bielefeld, Germany

A key characteristic of adaptive fear is avoiding genuinely threatening situations or stimuli. However, excessive avoidance of hazardous stimuli or circumstances can have negative long-term consequences on preventing the acquisition of safety information, leading to the maintenance of anxiety. Recent research has concentrated on investigating approach-avoidance (AA) conflicts in foraging tasks under predation threat, with a focus on decision-making strategies. However, the influence of inter-individual variations on AA tactics within a threatening context remains unclear. We present an approach-avoidance paradigm in a virtual foraging task that is based on a matrix-designed environment that facilitates the tracking and visualisation of AA behaviour as a function of spatial movement. Participants have to gather an adequate number of food tokens in three simulated environments (forest, water, desert) over 24 trials to attain virtual survival. An AA conflict is induced by proportionally linking the potential reward to the probability of encountering an aversive (electrical) stimulus. To achieve this goal, each individual is required to perform a specific AA behaviour in terms of time spent in each context and spatial movement along the field. We present data demonstrating the validity of our task and highlighting the utility of using reward and punishment in a gamified design within virtual reality to elicit AA behavior as a novel method for investigating this phenomenon in a continuous manner. Additionally, we demonstrate findings towards our goal of identifying subgroups based on behavioral task performance and physiological activity (skin conductance level).

S24.1 - Making It Worse? Aversive Contexts Enhance Defensive Responses To Conditioned Threat

Y. Stegmann[1], **M. Gamer**[1], **M. J. Wieser**[2]

Friday 11:00 - 12:30 | Lecture Hall N2

[1] University of Würzburg, Germany
[2] Erasmus University Rotterdam, The Netherlands

Adaptive responses to aversive events typically involve a cascade of physiological, sensory, and behavioral processes. Previous research demonstrated distinct defensive strategies in response to potentially threatening situations compared to imminent threat. How these strategies interact, however, remains elusive. To address this gap, the present studies examined the impact of contextual threat on defensive responses to acute threat cues. In total, n = 42 and n = 52 participants completed a differential fear conditioning paradigm followed by a cue-in-context test phase in which the fear-conditioned cues were presented orthogonally in front of inherently aversive vs neutral contexts. To capture defensive responding, we recorded subjective and physiological (electrodermal and cardiovascular) responses to the conditioned stimuli as a function of contextual threat. In the second study, we also collected electrocortical measures (steady-state visual evoked potentials, ssVEPs) to index attentional processing on the brain level. Results demonstrated successful fear conditioning in all measures. In addition, threat and US- expectancy ratings, cardiac deceleration, skin conductance, and ssVEP responses were enhanced to conditioned cues presented in aversive compared to neutral contexts. These results suggest that potentially threatening situations prompt a slow but sustained mobilization of defensive resources to ensure a minimum of defense system activation. Then, the detection of an acute threat activates an additional, rapid but short-lived fear response. In sum, our findings are in line with the notion that defensive strategies in response to potential and acute threat are not mutually exclusive but interact to optimize adaptive behavior in life-threatening situations.

S24.2 - Unpredictable Threat increases Early Event-Related Potential Amplitudes, Cardiac Acceleration, and Brain-Heart Coupling during an Oddball Paradigm

K. Gerpheide[1,2], C. Panitz[1,3,4], S. L. Unterschemmann[1], P. Bierwirth[1], J. Gross[2], E. M. Müller[1]

Friday 11:00 - 12:30 | Lecture Hall N2

[1] Philipps-Universität Marburg, Germany
[2] Stanford University, CA, USA
[3] Universität Leipzig, Germany
[4] University of Florida, FL, USA

In the face of threat, the rapid processing of events as well as behavioral mobilization through early psychophysiological responses are crucial for survival. Investigating how brain and heart activity are modulated in the context of unpredictable threat is particularly important to understand mechanisms of anxiety and anxiety disorders. In the current study, N = 76 participants performed an auditory oddball paradigm during a threat-of-shock manipulation. Participants received unpredictable shocks in THREAT but not in SAFE contexts while frequent (STANDARD) and infrequent (ODDBALL) tones were presented. We assessed event-related potentials (ERP), evoked heart period (HP), and time-lagged within-subject correlations of single-trial EEG and HP (cardioelectroencephalographic covariance tracing, CECT). N1 and P2 amplitudes in the ERP as well as cardiac acceleration were generally enhanced in the THREAT vs. SAFE context. Meanwhile, P3 for ODDBALL was attenuated under THREAT. CECTs revealed that cardiac acceleration was predicted by central midline EEG from 140 to 240ms (P150H) and from 300 to 400ms (N300H) after tone presentation. Of relevance, early cortico-cardiac coupling as reflected by the P150H was enhanced during THREAT, while later coupling (N300H) was reduced. The results suggest that contextual, unpredictable threat enhances early cortical processing of auditory events. This enhancement is functionally linked to a subsequent cardiac acceleration presumably to enable behavioral mobilization. Conversely, at later processing stages, benign, infrequent events receive reduced resource allocation during unpredictable threat.

S24.3 - Long-Term Stability Of Brain-Heart Coupling Assessed Via The N300H

P. Bierwirth[1], **C. Panitz**[1], **S. Unterschemmann**[1], **E. Mueller**[1]

Friday 11:00 - 12:30 | Lecture Hall N2

Philipps-Universität Marburg, Deutschland

Communication between the brain and the heart can be readily assessed via simultaneous recordings of an electroencephalogram (EEG) and an electrocardiogram (ECG). Using both methods it was shown that motivationally salient stimuli evoke neural activity (around 300ms after stimulus-onset) that negatively correlates (on a single trial basis) with a subsequent decrease of heart period (i.e., heart rate acceleration). This phenomenon was termed N300H and presumably reflects brain-heart communication. Interestingly, the N300H was shown to be elevated in healthy participants with high trait anxiety as well as in panic disorder patients. Thus, the N300H might serve as a biomarker for trait and pathological anxiety. However, while trait and pathological anxiety can be measured via psychometrically well-validated instruments, the (neuro-)psychometric properties of the N300H are currently unknown. This might constitute a problem since low reliability decreases statistical power and increases the likelihood of spurious results. Thus, we aimed at elucidating the neuro-psychometric properties of the N300H, specifically its internal consistency and retest-reliability. We examined 55 participants at two separate time-points (6 months apart). The well-established Sato gambling task was used to evoke a robust N300H response. Preliminary analyses revealed that the internal consistency of the N300H ranges from rtt'=0.5 to rtt'=0.7, depending on the quantification method. The observed retest-reliability was slightly lower ranging from rt1-t2= 0.45 to rt1-t2= 0.6. Given that the N300H reflects within-subject correlations of two different physiological measures, these reliability coefficients are substantial and indicate a considerable long-term stability of individual differences in brain-heart communication as assessed with N300H.

S24.4 - Promoting The Reduction Of Defensive Responding To Threat Of Spiders By Non-invasive Transcutaneous Auricular Vagus Nerve Stimulation

C. Szeska[1], **K. Klepzig**[2], **A. Hamm**[3], **M. Weymar**[1]

Friday 11:00 - 12:30 | Lecture Hall N2

[1] Department of Biological Psychology and Affective Science, University of Potsdam, Potsdam, Germany
[2] Functional Imaging Unit, Department of Diagnostic Radiology and Neuroradiology, University Medicine, Greifswald, Germany
[3] Department of Physiological and Clinical Psychology/Psychotherapy, University of Greifswald, Greifswald, Germany

Excessive defensive responding defines maladaptive, pathological fear and is possibly mediated by increased amygdala firing. However, repeated exposure towards a fear cue may trigger fear extinction, i.e., learning that a threat signal no longer predicts danger, which conversely results in an inhibition of the amygdala (by prefrontal regions) and reduced defensive responding. Recent research revealed that fear extinction's underlying circuitry may be targeted by vagus nerve stimulation, opening up a new avenue to facilitate reduction of maladaptive, excessive fear. Hence, we tested whether vagal stimulation may promote the reduction of excessive defensive responses during exposure to real-life threat cues (spiders). In this two-day sham-controlled and double-blinded study, 32 spider-phobic women either received transcutaneous auricular vagus nerve stimulation (taVNS) or a placebo sham stimulation during exposure in vitro(viewing spider pictures). Afterwards, participants underwent exposure in vivo towards a real tarantula, which was repeated twenty-four hours later to test for potential long-term effects of taVNS. During exposure sessions, fear was measured on multiple levels of expression (verbal report, heart rate, corrugator muscle activity, behavioral avoidance). During exposure in vitro, participants receiving taVNS showed reduced heart rate acceleration and corrugator muscle activity. Such fear reducing effects by taVNS were transferred to exposure to a living spider: Participants, who had received taVNS, showed stronger reduction of avoidance behavior towards a real tarantula compared to sham-stimulated participants. Our study suggests that vagal stimulation may be useful to enhance the efficacy of exposure treatment by promoting the reduction of excessive physiological and behavioral defensive responding.

S24.5 - Unraveling The (Oculo)motor And Autonomic Dynamics In Response To Avoidable Threat In Humans

A. Merscher[1], **M. Gamer**[1]

Friday 11:00 - 12:30 | Lecture Hall N2

Universität Würzburg, Germany

Defensive behaviors in response to threats are key in maintaining mental and physical health, but their phenomenology remains poorly understood. Prior work reported an inhibition of oculomotor activity in response to avoidable threat in humans that reminded of freezing behaviors in rodents. This notion of a homology between defensive responding in rodents and humans was seconded by concomitant heart rate decrease and skin conductance increase. However, several aspects of this presumed defense state remained ambiguous. For example, it was unclear whether the observed oculomotor inhibition would 1) robustly occur during preparation for threat-avoidance irrespective of task demands, 2) reflect a threat-specific defensive state, and 3) be related with inhibitions of somatomotor activity as both motion metrics have been discussed as indicators for freezing behaviors in humans. We thus embarked on a series of experiments to unravel the robustness and threat-specificity of previously observed (oculo)motor and autonomic dynamics upon avoidable (vs. inevitable or no) threat in humans. We provided robust evidence for reduced gaze dispersion, significantly predicting the speed of subsequent motor reactions across a wide range of stimulus contexts. Along this gaze pattern, we found reductions in body movement and showed that the temporal profiles of both movement metrics were positively related within individuals. A simultaneous activation of the parasympathetic (i.e., heart rate deceleration) and sympathetic (i.e., increased skin conductance and dilated pupil) autonomic systems was present in defensive and appetitive contexts, suggesting that these autonomic dynamics are not only sensitive to threat but reflecting a more general action-preparatory mechanism.

S25.1 - Physical Exercise Improves Long-Term Spatial Memory in an Immersive Virtual Reality Task

D. R. Butavand[1,2], **M. F. Rodriguez**[3], **M. V. Cifuentes**[3], **M. Lazo**[4], **C. G. Bauza**[4], **P. Bekinschtein**[2], **F. Ballarini**[5,6]

Friday 11:00 - 12:30 | Lecture Hall N9

[1] Institute of Sports and Sports Science, Heidelberg University Central Institute of Mental Health in Mannheim, Germany
[2] Instituto de Neurociencias Cognitivas y Traslacionales, Universidad Favaloro-INECO-CONICET, Argentina
[3] CIC, PLADEMA, Universidad Nacional del Centro, Tandil, Argentina
[4] CONICET, PLADEMA, Universidad Nacional del Centro, Tandil, Argentina
[5] Departamento de Ciencias de la Vida, ITBA
[6] Instituto de Biología Celular y Neurociencias, Facultad de Medicina, UBA-CONICET, Argentina

Spatial memory is an essential cognitive process that enables us to remember information about our environment, including the location of objects in it. This ability declines with aging and degenerative diseases, so it is essential to study simple ways to improve it. Physical activity has been shown to benefit both fitness and cognition, but its effect on long-term spatial memory remains unclear. In this study, we evaluated the effect of acute and chronic physical activity on long-term spatial memory using a novel virtual reality task. Participants were immersed in the virtual environment and navigated a wide arena featuring target objects and we assessed spatial memory in two conditions (encoded targets separated by short or long distances). We found that 25 minutes of cycling after encoding - but not before retrieval - was sufficient to improve the long-term retention for the short, but not the long-distance condition. Therefore, our results suggest the existence of a specific time window in which this physical activity intervention is able to enhance long-term episodic memories. Furthermore, we observed that the distribution of the performances of chronic participants differed significantly from a random distribution, indicating an improvement in memory also for participants who perform physical activity regularly. These results suggest that physical activity may be a straightforward yet effective method for improving spatial memory.

S25.2 - Exercise Affects Sleep Architecture and Associated Procedural Memory Formation

N. Frisch[1], **L. Heischel**[1], **P. Wanner**[1], **S. Kern**[2], **M. Roig**[3], **G. Feld**[2], **S. Steib**[1]

Friday 11:00 - 12:30 | Lecture Hall N9

[1] Institute of Sports and Sports Sciences, University of Heidelberg, Germany
[2] Central Institute of Mental Health in Mannheim, Germany
[3] McGill University Montreal, Canada

Acute exercise has been shown to affect long-term memory and sleep architecture. To date, it is unclear whether exercise and sleep act synergistically to improve memory. Recently, it has been shown that exercise followed by a day nap enhanced declarative memory formation. Whether these effects can be transferred to other memory systems and to nocturnal sleep, has not yet been studied. Thus, our aim was to investigate the influence of exercise on sleep-dependent memory consolidation. 19 healthy subjects (23.7, ±4.0) were tested in a within-subject design. In two evening sessions, participants either (i) exercised (high-intensity interval training; HIIT) or (ii) rested after encoding of two memory tasks. These were a finger tapping task (FTT) and a paired-associate learning task (PAL). Subsequent nocturnal sleep was recorded by polysomnography. Retention tests were performed the following morning. Differences between the conditions and associations between memory and sleep were analysed using paired t-tests and Pearson correlations. HIIT had a small non-significant positive effect on procedural memory consolidation ($p=.101$, $d=0.304$) and a significant small positive effect on declarative consolidation ($p=.047$, $d=0.405$). HIIT also increased N2 ($p=.042$, $d=0.480$) and decreased REM sleep ($p=.006$, $d=0.747$) proportion. Notably, the exercise-induced change in N2 duration was positively correlated with procedural memory consolidation ($r=0.475$, $p=.037$). Our results confirm previous findings of altered sleep architecture with acute intensive evening exercise. The expected increase in memory consolidation was partially confirmed. Associations between exercise-induced changes in N2 and FTT consolidation suggests that HIIT may favour procedural memory formation by modifying relevant sleep stages.

S25.4 - Workout to Improve Memory! Effects of Physical Exercise on Emotional Memory Consolidation

V. L. Jentsch[1], **L. N. Wolsink**[1], **O. T. Wolf**[1], **C. J. Merz**[1]

Friday 11:00 - 12:30 | Lecture Hall N9

Ruhr University Bochum, Germany

Physical exercise promotes learning and memory, especially when performed in close proximity to memory encoding. This benefit may occur due to circulating stress hormones released in response to acute exercise. In a set of studies, we explored the timing-dependent effects of a single bout of physical exercise on emotional memory consolidation. In total, N=174 participants were exposed to a treadmill running task, psychosocial stressor or resting control condition either after (study 12) or before (study 3) memory encoding. Memory retrieval was assessed 24h later. Acute exercise/stress significantly increased heart rate, salivary alpha amylase, and cortisol concentrations. Furthermore, exercise selectively enhanced retrieval for emotional material in a spatial memory task (study 1). This memory benefit was positively related to increases in heart rate and cortisol, suggesting the favorable effects of exercise on emotional memory to be mediated via synergistic noradrenergic-glucocorticoid actions. Exercising after extinction training also enhanced emotional memory consolidation in a fear conditioning paradigm (study 2). However, instead of boosting extinction memory retrieval, it rather strengthened fear memory retrieval. A failure to completely extinguish conditioned fear responses might account for this unexpected, exercise-induced fear memory enhancement. Preliminary findings from study 3 suggest that pre-extinction exercise and stress both may enhance extinction retrieval and reduce fear renewal. Taken together, these findings emphasize the critical role of physical exercise in modulating emotional memories, which may open new avenues for augmenting extinction-based interventions for the treatment of anxiety disorders but also illustrate potential risks when extinction is not successful in the first place.

S25.4 - Stress Hormone Effects on Memory Formation

C. J. Merz[1], **O. T. Wolf**[1]

Friday 11:00 - 12:30 | Lecture Hall N9

Ruhr University Bochum, Germany

Exposure to stress (and also physical exercise) leads to an activation of the hypothalamus-pituitary-adrenocortical axis and the sympathetic nervous system initiating the release of stress hormones such as cortisol and (nor)epinephrine. Stress hormones enter the brain and affect different brain regions, for example, the amygdala or the hippocampus. Thus, they can also crucially change (emotional) learning and memory processes. Particularly, stress can enhance memory formation, depending on the exact timing of the stressor. The present talk will give an overview on how stress hormones change episodic as well as fear memory formation. Furthermore, the impact of sex, sex hormones and hormonal contraceptives on these stress effects will be discussed showing that beneficial effects on memory formation do not universally occur. Altogether, an enhanced understanding of basic mechanisms of memory formation in the face of stress is clearly needed, since they also convey important insights into the etiology of anxiety disorders or posttraumatic stress disorder.

S25.5 - Effects Of Mental Contrasting On Sleep And Associations With Stress: A Randomized Controlled Trial

L. Schmidt[1], **B. Ditzen**[2], **A. Neubauer**[3], **J. Schirmaier**[1], **C. Farrenkopf**[1], **M. Stoffel**[2], **M. Sieverding**[1]

Friday 11:00 - 12:30 | Lecture Hall N9

[1] Psychologisches Institut, Universität Heidelberg
[2] Universitätsklinikum, Universität Heidelberg
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Background: Mental contrasting with implementation intentions (MCII) has been successfully applied to improve health-related behaviors (e.g. exercise). We explored its effectiveness to improve sleep outcomes beyond effects of sleep hygiene (SH) information, and investigated associations with stress. Methods: Eighty university employees (mean age: 29.6, SD = 4.5) were randomized to either a MCII + SH or a SH-only condition. During a baseline-week and a post-intervention week, sleep duration (Fitbit Alta and self-report), sleep quality, and stress were assessed daily and saliva was collected to assess the cortisol awakening response (CAR). Results: In total, self-reported sleep quality and duration increased, but there was no meaningful condition*week interaction for sleep parameters or CAR. Higher average stress was associated with shorter sleep duration and lower sleep quality. Within-persons, days with higher stress were followed by nights with lower sleep quality. Discussion: Despite overall improvements, effects of MCII were not confirmed. MCII might be less effective to improve behaviors which are less controllable.

S26.1 - How Task Shapes the Learning and Retrieval of Cross-Modally Associated Valence in Faces

A. C. Ziereis[1], **A. Schacht**[1]

Friday 11:00 - 12:30 | Lecture Hall 7E02

Cognition, Emotion and Behavior, Georg-Elias-Müller Institute for Psychology, Georg-August-University of Göttingen, Germany

Being highly salient social cues, faces can inform about the emotional and intentional state of others. Yet, face perception occurs rarely out of context and is shaped by both situational factors and previous experiences. Event-related potentials (ERP) studies provide empirical evidence that faces can gain additional relevance by their association with affective context. However, the time course of the effects ranges from short (P1 or N170), and mid- (EPN), to long latencies (LPC) across studies, and findings are mixed to which extent learning and retrieval require directed attention to the emotional quality of the contextual stimulus. In two studies, we tested cross-modal associations of vocal affect bursts (positive, negative, neutral) to faces displaying neutral expressions. When only gender information was task-relevant during learning (Study 1, N = 32), associated effects triggered by faces were restricted to the task-relevant gender information, although the emotional valence of the voices modulated auditory processing and response times. In contrast, implementing a learning task without instructions to focus on specific stimulus features (Study 2, N = 40), effects of associated negative valence at retrieval were present for the EPN in both a valence-implicit and a valence-explicit task, suggesting early attentional prioritization for negative information. Moreover, later processing (LPC) was more strongly affected by the task. The present findings highlight the interplay between experience-driven attention and task and corroborate research on early selection and sustained attention during the processing of associated faces similar to the processing of facial expressions of emotion.

S26.2 - Threat And Safety Reversal Learning Involves vlPFC Activation In Low- But Not High-Anxious Participants: A MEG Study

F. Bublatzky[1], **A. Espino**[2], **S. Schindler**[3], **J. Reichelt**[2], **T. Schwegmann**[2], **M. Junghöfer**[2]

Friday 11:00 - 12:30 | Lecture Hall 7E02

[1] Central Institute of Mental Health Mannheim, Medical Faculty Mannheim / Heidelberg University, Germany
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Facial expression recognition is essential for social communication and depends on the situational context. For instance, in a dangerous situation, we tend to recognize threats better than safety information. Such recognition biases in favor of threat recognition can prevent harm and injury but, if exaggerated, also contribute to developing and maintaining anxiety psychopathology. Here we examined the impact of trait anxiety on threat perception and their malleability through threat-safety reversal learning using magnetoencephalography. To this end, 40 low-anxious and 40 high-anxious participants completed an emotion recognition task with subtle expressions of fearful and happy faces in a context of threat-of-shock or safety. Results showed that contextual threat led to enhanced threat and arousal ratings as well as biased recognition of fearful and smiling faces. MEG data revealed spatio-temporal clusters of neural network activity associated with contextual threat/safety, emotion recognition, and anxiety-group in prefrontal cortex regions. For the first block (threat/safety instantiation), the integration of affectively incongruent face-context compounds (e.g., happy faces in the context of threat) was associated with enhanced vlPFC activity (253-333ms). This effect was maintained in a later time window (307-400ms) only in low- but not high-anxious participants. Similar regions were involved in threat-safety reversal learning (first vs. second block) and showed differential threat-safety processing in a vlPFC cluster (147-243ms) for low- but not high-anxious participants. Thus, the PFC integrated incongruent face-context information and threat-safety reversal learning. For both processes, highly anxious participants showed less differential processing, possibly reflecting impeded memory updating and inhibition of (old) threat associations.

S26.3 - Right But Not Left Medial Temporal Lobe Resections Attenuate Early Markers Of Emotional Face Perception: Evidence From Event-related Potentials And Stimulus-induced Gamma-band Activity

E. M. Weidner[1], **M. Mielke**[1], **L. M. Reisch**[1], **S. Schindler**[2], **C. G. Bien**[3], **J. Kissler**[1]

Friday 11:00 - 12:30 | Lecture Hall 7E02

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[2] Institute of Medical Psychology and Systems Neuroscience, Münster University, Germany
[3] Department of Epileptology (Krankenhaus Mara), Bielefeld University, Medical School OWL, Germany

Although it is widely believed that medial temporal lobe (mTL) structures, predominantly the amygdala, drive processing biases for emotional faces in scalp EEG signals, systematic research on the temporal dynamics of causal effects of mTL structures on emotional face processing are still sparse. By comparing a sample of 36 epilepsy patients with left- or right-hemispheric temporal lobe resections (lTLR/rTLR) to a matched healthy control group (HC), this study aimed to uncover possible influences of such resections on event-related potentials and gamma-band activity (GBA) that typically differentiate emotional from neutral faces in healthy participants. While all groups similarly evaluated the faces' valence and arousal, EEG data demonstrated reduced early attentional selection of fearful over neutral faces in rTLR patients compared to HC, as indicated by reduced P1 difference amplitudes (fearful – neutral). Visually, N1 and EPN emotion differentiation was shifted to the contra-resectional side in rTLR patients compared to HC. Likewise, emotion differentiation in occipital GBA was ipsi-resectionally reduced in rTLR compared to HC from about 30-360 ms and 550-700 ms. By contrast, lTLR patients presented with stronger ipisi-resectional emotion differentiation than HC in the N1 and EPN. These results suggest an involvement of the right mTL, perhaps particularly the amygdala, in rapid attentional selection of emotionally relevant faces and specify some underlying mechanisms. Absence of the right mTL might be increasingly compensated as stimulus processing progresses. Also, present data imply a potential role of the left mTL in attentional disengagement from emotion that diminished in lTLR patients.

S26.4 - I can see it in your face! A Battle of Emotion Recognition between facial EMG and Computer Vision Algorithms

S. Scholz[1], **J. Kissler**[1]

Friday 11:00 - 12:30 | Lecture Hall 7E02

Bielefeld University, Germany

Nowadays, computer vision algorithms are available on the market that claim to accurately predict expressed emotions from video clips showing facial expressions. However, the validity and accuracy of these algorithms is still debated. We investigated whether computer vision algorithms or laboratory-based psychophysiological measurements are more accurate in the recognition of happy, neutral, and disgust expressions in response to visual emotional stimuli. Participants (N = 30) viewed emotional pictures from the IAPS and other databases, gave valance and arousal ratings, and had to select the basic emotion that best fitted their reaction towards the presented stimulus. We recorded psychophysiological data, most notably facial EMG, and videotaped participants facial expressions towards the stimuli. For analyzing the video recordings, we applied the open access algorithm OpenFace, which extracts facial action units from video files. Supervised machine learning algorithms were then used for predicting valance and arousal ratings and self-selected universal emotions. We compared recognition performance between the algorithms and the facial EMG data. In line with limited prior research, we found that OpenFace was able to accurately recognize happy reactions but could not distinguish between disgusted or neutral reactions. In contrast, facial EMG showed a higher accuracy across all emotional reactions and were more reliable in separating the three stimuli categories. Advantages and disadvantages of facial EMG and recognition algorithms in different fields of application will be discussed.

S26.5 - Deep Fake Smiles Matter Less – Believing a Face to be Fake Affects Face Perception and Emotional Processing

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Friday 11:00 - 12:30 | Lecture Hall 7E02

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High-quality computer-generated portraits are becoming increasingly prevalent. Oftentimes, distinguishing them from images of actually existing people requires additional context information. Here we investigate how the processing of facial expressions as core social signals is influenced by the mere belief that a depicted person is real or "fake", i.e., computer-generated. We used EEG to track participants' (N=30) brain responses to real faces showing positive, neutral, and negative expressions, after being informed that they are either real or fake. When marked as fake, smiling faces appeared less positive, as reflected in ratings and early brain activity related to visual perception (P1 and N170 component), were emotionally less arousing (indicated by a reduced EPN effect), and were evaluated more slowly and effortfully (LPP component). None of these modulations were observed for negative expressions. These findings demonstrate that presumed deep fake smiles, but not angry expressions, dampen perceptual, emotional and evaluative face processing.

Symposia session 6

S27.2 - Pupil-indexed Neuromodulation Shapes Cortical Low-frequency Synchronization During Task and Rest

M. J. Dahl[1,2], **M. Kaisheva**[1], **M. Mather**[2], **M. Werkle-Bergner**[1]

Friday 15:00 - 16:30 | Lecture Hall N1

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During wakefulness, cortical activity fluctuates between synchronized and desynchronized states which determine an organism's sensitivity for external stimuli. The timed release of neuromodulators from subcortical structures can switch brain activity from a low external attention highly synchronized state to a desynchronized state with more scope for processing salient information. However, methodological challenges have long impeded in-vivo human research relating changes in neuromodulation to cortical synchronization. Here we simultaneously recorded electroencephalography (EEG) and pupil dilation, a proxy of noradrenergic neuromodulation, during periods of task and rest (n = 39 younger adults). In particular, participants completed an auditory fear conditioning and oddball task, two experimental manipulations designed to provoke changes in noradrenergic neuromodulation. As hypothesized, both tasks elicited pronounced pupil dilation in absence of visual input. Task-related changes in pupil-indexed neuromodulation were associated with trial-by-trial changes in cortical synchronization, especially in the alpha-frequency band. Moreover, pupil–synchronization relations were similar across tasks, suggesting a general association between noradrenergic neuromodulation and cortical synchronization. Corroborating this interpretation, also during periods of rest, interspersed between the two tasks, we found spontaneous fluctuations in pupil dilation to be linked to moment-to-moment changes in cortical synchronization. Finally, underlining their behavioral relevance, trial-by-trial changes in pupil dilation and cortical synchronization were associated with quicker reaction times collected during the oddball task. Taken together, the present data are consistent with the framework that noradrenergic activity desynchronizes alpha activity and so increases cortical excitability to regulate our sensitivity to external information during moments requiring attention.

S27.3 - The Human Thalamus Orchestrates Neocortical Oscillations During NREM Sleep

T. Schreiner[1]

Friday 15:00 - 16:30 | Lecture Hall N1

LMU Munich, Germany

A hallmark of non-rapid eye movement sleep is the coordinated interplay of slow oscillations (SOs) and sleep spindles. Traditionally, a cortico-thalamo- cortical loop is suggested to coordinate these rhythms: neocortically- generated SOs trigger spindles in the thalamus that are projected back to neocortex. Here, we used intrathalamic recordings from human epilepsy patients to test this canonical interplay. We show that SOs in the anterior thalamus precede neocortical SOs (peak ?50 ms), whereas concurrently- recorded SOs in the mediodorsal thalamus are led by neocortical SOs (peak +50 ms). Sleep spindles, detected in both thalamic nuclei, preceded their neocortical counterparts (peak ?100 ms) and were initiated during early phases of thalamic SOs. Our findings indicate an active role of the anterior thalamus in organizing sleep rhythms in the neocortex and highlight the functional diversity of thalamic nuclei in humans. The thalamic coordination of sleep oscillations could have broad implications for the mechanisms under- lying memory consolidation.

S27.4 - Coordination Of Alpha Oscillations And Sleep Spindles Shapes Information Coding

F. J. v. Schalkwijk[1], **J. Weber**[1,2], **R. F. Helfrich**[1]

Friday 15:00 - 16:30 | Lecture Hall N1

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Alpha oscillations (8-14 Hz) and sleep spindles (11-16 Hz) constitute the defining electrophysiological signatures of wakefulness and NREM sleep. Both oscillations are shaped by corticothalamic interactions, thus, relying on the same network architecture. Despite their overlap, these oscillations are traditionally studied in isolation. Previously, it has been demonstrated that task engagement modulates both alpha and spindle activity in a spatially-specific manner. The paralleled modulation directly impacts cognitive performance and has been associated with memory formation. However, to date it remains unknown if and how alpha and spindle activity coordinate spatial and spectral characteristics that shape information coding. The key question is how neuronal alpha-band dynamics underlying cognitive functioning orchestrate the spatiotemporal spindle expression during sleep. In this study, we establish that alpha and spindle oscillations share highly comparable spatiotemporal patterns related to information encoding, suggesting that both phenomena rely on the very same neurophysiological mechanism. We utilized intracranial and scalp EEG in pharmacoresistant patients with epilepsy to quantify spectral and spatial similarities between alpha oscillations and sleep spindles in relation to executive functioning in humans. We first quantified spatial, temporal, and spectral similarities of spindles in relation to alpha oscillations during an eyes-open resting state. Task-related modulation of alpha activity topographically modulated spindle occurrence. We thus demonstrate that alpha activity during wakefulness coordinates spindle occurrence during sleep across space and time. In sum, our results reveal that alpha oscillations during wakefulness and spindle activity during sleep are inherently related phenomena that jointly coordinate the spatiotemporal dynamics underlying sleep-dependent memory consolidation.

S28.1 - Chemical Cousins With Contrasting Behavioral Profiles: Uncovering the Differential Performances of MDMA vs. Methamphetamine Users in Social Cognitive Functions

A. Zacher[1], **J. Zimmermann**[1,2], **D. Cole**[1], **M. Shanahan**[3,4], **A. Opitz**[5], **A. Stock**[5], **C. Beste**[5], **B. B. Quednow**[1,2]

Friday 15:00 - 16:30 | Lecture Hall N2

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[2] Neuroscience Center Zurich, University of Zurich, Swiss Federal Institute of Technology Zurich
[3] Jacobs Center for Productive Youth Development, University of Zurich
[4] Department of Sociology, University of Zurich
[5] Cognitive Neurophysiology, Department of Child and Adolescent Psychiatry, TU Dresden

Background. Methamphetamine (METH) and 3,4-methylenedioxymethamphetamine (MDMA) share structural similarities but have distinct psychotropic effects most likely related to their specific neurochemical actions. Previous research has suggested that their impact on social cognitive functions may differ significantly, however, direct comparisons of long-term effects of METH and MDMA on aspects of social cognition and behavior have been lacking so far. Methods. Performances in cognitive and emotional empathy (Multifaceted Empathy Test) and emotion sensitivity (Face Morphing Task), as well as behavioral interpersonal aggression (Competitive Reaction Time Task) were assessed in a sample of n=40 chronic METH users, n=39 chronic MDMA users, and n=87 healthy controls. Hair samples and self-reports were used to obtain objective and subjective estimates of substance use. Results. METH users showed elevated punitive behavior and poorer performances in cognitive and emotional empathy, specifically when presented with positive stimuli, compared to healthy controls and MDMA users. Conversely, MDMA users showed no significant alterations in any task in comparison to controls. Sensitivity analyses on dose-dependent effects revealed that both increased hair MDMA and METH concentrations were associated with lower cognitive empathy in MDMA and METH users, respectively, while higher lifetime MDMA use was linked to greater punitive behavior in MDMA users. Conclusions. The results support the notion that long-term METH and MDMA use have differential effects on social cognition, with significant impairments found in chronic METH users. Tailored treatment interventions may be required depending on the substance used, with social cognitive training being potentially beneficial for METH users.

S28.2 - Conflict Monitoring and Emotional Processing in 3,4-methylenedioxymethamphetamine (MDMA) and Methamphetamine Users

A. Opitz[1], J. Zimmermann[2], D. Cole[2], R. Coray[2], A. Zachäi[1], M. Baumgartner[2], M. Pilhatsch[3], B. Quednow[2], C. Beste[1], A. Stock[1]

Friday 15:00 - 16:30 | Lecture Hall N2

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In stimulant use and addiction, conflict control processes are crucial for regulating substance use and sustaining abstinence, which can be particularly challenging in social-affective situations. Users of methamphetamine (METH, "Ice") and 3,4-methylenedioxymethamphetamine (MDMA, "Ecstasy") both experience impulse control deficits, but display different social-affective and addictive profiles. We thus aimed to compare the effects of chronic use of the substituted amphetamines METH and MDMA on conflict control processes in different social-affective contexts (i.e., anger and happiness) and investigate their underlying neurophysiological mechanisms. For this purpose, chronic but recently abstinent users of METH (n = 38) and MDMA (n = 42), as well as amphetamine-naïve healthy controls performed an emotional face-word Stroop paradigm, while event-related potentials (ERPs) were recorded. Instead of substance-specific differences, both MDMA and METH users showed smaller behavioral effects of cognitive-emotional conflict processing (independently of emotional valence) and selective deficits in emotional processing of anger content. The neurophysiological data further suggests that users of substituted amphetamines employ altered stimulus-response mapping and decision-making. Given that these processes are modulated by noradrenaline and that both MDMA and METH use may be associated with noradrenergic dysfunctions, the noradrenaline system may underlie the observed substance-related similarities. Better understanding the functional relevance of this currently still under-researched neurotransmitter and its functional changes in chronic users of substituted amphetamines is thus discussed as an important avenue for future research.

S28.3 - Effects of Methylphenidate on the Motivation of Distinct Working Memory Processes

M. I. Froböse[1], **J. C. Swart**[2], **J. L. Cook**[3], **D. E. M. Geurts**[4], **S. J. Fallon**[5], **H. E. M. d. Ouden**[2], **R. Cools**[2,4]

Friday 15:00 - 16:30 | Lecture Hall N2

[1] Heinrich Heine University Düsseldorf, Germany
[2] Radboud University, Nijmegen, The Netherlands
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[4] Radboud Medical Centre, Nijmegen, The Netherlands
[5] University of Bristol, Bristol, United Kingdom

Our constantly changing environment requires an adaptive balance between focus and flexibility: We should suppress irrelevant new input, but respond flexibly when new input is relevant. Accumulating evidence indicates a role of catecholamine transmission in this cognitive flexibility/stability tradeoff. Moreover, recent studies suggest that shifts in the tradeoff might reflect drug-induced changes in the motivation of cognitive control. We assessed the role of catecholamine transmission in the degree to which distinct flexible versus stable component processes of working memory are altered by incentive motivation. To this end, we administered 20mg of methylphenidate or placebo in a within-subject design to 100 healthy, young adults. They performed an adapted delayed match-to-sample task to probe distractor inhibition (i.e. focus) and flexible updating in separate blocks that promised gains, absence of losses or no monetary outcomes for good performance. We expected to replicate that methylphenidate improves distractor inhibition and hypothesized that methylphenidate would alter the effect of motivation on task performance. Mixed effects regressions and sequential sampling modeling revealed that both methylphenidate and incentive motivation improved overall task performance, evidenced by increased accuracy and an increased rate of evidence accumulation (i.e. drift rate). In addition, post-hoc tests of a significant drug-by-motivation interaction on the drift rate point towards a reduced motivational benefit for working memory processes under methylphenidate. Together, these findings suggest that both methylphenidate and incentive motivation can improve overall working memory performance instead of selectively shifting the flexibility/stability tradeoff.

S28.4 - How do Gaba and Glx+ Baseline Levels Moderate Methylphenidate Effects on Cognitive Control?

A. H. Koyun[1]

Friday 15:00 - 16:30 | Lecture Hall N2

TU Dresden, Germany

Methylphenidate (MPH) increases synaptic catecholamine concentrations in prefrontal and striatal structures and further modulates the sensitivity of GABAergic and glutamatergic transmitter systems in fronto-striatal circuits, which are well-known to be crucial for cognitive control and response selection. The overarching goal of the presented study was to provide insights into whether and how inter-individual differences in baseline levels of these amino- acid neurotransmitters help to explain the magnitude and direction of MPH/catecholamine effects on cognitive control processes. Using proton Magnetic Resonance Spectroscopy (1H- MRS) we assessed GABA+ and Glx+ levels in the striatum, ACC and SMA of young healthy adults. Based on previous evidence, intermediate levels of catecholaminergic stimulation (i.e., 0.50 mg/kg) were expected to induce optimal performance, whereas either too high (0.75 mg/kg) or too low (0.25 mg/kg) levels of stimulation were hypothesized to impede performance. Response selection and inhibition performance and their neurophysiological correlates were investigated. Our findings on whether and how differences in baseline levels of amino-acid neurotransmitters in control-relevant brain regions explain the effects of Methylphenidate on response selection and inhibition processes will be presented and discussed.

S28.5 - Acetylcholine Enhances Foraging Optimality In Humans

N. Sidorenko[1], H. Chung[1], M. Grüschow[1], B. B. Quednow[2,3], H. Hayward-Könnecke[4], A. Jetter[5], P. N. Tobler[1,3]

Friday 15:00 - 16:30 | Lecture Hall N2

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[3] Neuroscience Center Zurich, ETH Zurich and University of Zurich, Zurich, Switzerland
[4] Neuroimmunology and MS Research, Department of Neurology, University Hospital Zurich, Zurich, Switzerland
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Foraging theory prescribes how to decide when to leave the current option for potentially more rewarding alternatives. However, foragers often violate this rule and exploit options longer than necessary. We investigated whether upregulation of cholinergic, noradrenergic, and dopaminergic systems increases foraging optimality. In our double-blind, between-subject design, participants (N=160) received placebo, nicotine, reboxetine or methylphenidate, and played a farmer who collected milk from patches with different yield. Across all groups, participants on average overharvested. Importantly, while methylphenidate had no effects on this bias, nicotine, and to some extent also reboxetine, significantly reduced deviation from foraging optimality, which resulted in more optimal performance compared to placebo. Concurring with amplified goal-directedness and reward sensitivity and excluding impulsivity-related explanations, nicotine independently also improved trial initiation and time perception. Our findings elucidate the neurochemical basis of behavioural flexibility and decision optimality and open novel perspectives on psychiatric disorders affecting these functions.

S29.1 - Specialized Memory Subsystems for Detailed and Conceptual Information Assessed with Multimodal MRI

S. Klinkowski[1], A. Seewald[1], B. Fath[1], P. Iliopoulos[1], S. Schmidt[1], F. Voss[1], M. Erb[2], K. Scheffler[2], S. Gais[1], S. Brodt[1]

Friday 15:00 - 16:30 | Lecture Hall N6

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While traditional models of systems memory consolidation postulate the reliance of freshly encoded memories on the hippocampus, recent evidence in humans and animals has shown that there are conditions under which the neocortex can rapidly acquire genuine memory engrams. Presenting data from a novel experimental paradigm, I will elaborate on the idea of concurrent memory encoding in the entire network, and specialized subsystems coding for different aspects of the memory. Participants (N=80) encoded the same abstract visual stimuli but focused either on differentiating individual stimuli or on identifying categories while undergoing functional and diffusion MRI. A naïve control group (N=40) was included to assess microstructural changes and representational similarity of the stimuli unrelated to learning. Integrating the results from multimodal MRI analyses, higher-order association areas in the posterior parietal cortex, in particular the superior parietal lobule and the precuneus, seem to have a general, integrative memory function for conceptual as well as detailed information, independent of encoding strategy. On the other hand, more down-stream areas, like the cuneus or intracalcarine cortex, as well as the hippocampus seem to have more distinct roles in processing and representation of the specifically encoded detailed or conceptual information. Taken together, I will discuss how different aspects of the same event might be embedded in a distributed memory network.

S29.2 - Pre-Existing Knowledge Facilitates Episodic Retrieval

H. Schultz[1], **R. Benoit**[1,2]

Friday 15:00 - 16:30 | Lecture Hall N6

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[2] University of Colorado Boulder

Humans retain rich episodic memories of unique events. The retrieval of episodic memories has been suggested to be facilitated by pre-existing general knowledge via interactions of the prefrontal cortex (PFC) and medial temporal lobe (MTL). Here, we test how such knowledge is represented in these structures during knowledge-guided retrieval. We scanned 40 human participants (20 male) using functional magnetic resonance imaging (fMRI) at 7T. On each trial, an abstract cue prompted participants to retrieve scene images from memory. Importantly, in the knowledge condition, the cue predicted the scene category (i.e., houses or landscapes). In the control condition, the cue was not predictive with regard to the scene category (i.e., it was randomly paired with houses or landscapes). Behaviorally, pre-existing category knowledge improved episodic memory retrieval. It also increased same-category false alarms. The ventrolateral PFC was more active during retrieval if knowledge was available, whereas the MTL was more active during retrieval when no knowledge was available. Multivariate analyses revealed reinstatement of episodic information (i.e. specific scenes) during successful retrieval in the parahippocampal cortex. Importantly, reinstatement of knowledge information (i.e. categories) was modulated by pre-existing knowledge in the MTL and PFC. We suggest that the MTL and PFC play complementary roles in knowledge-guided retrieval.

S29.3 - The Structure Of Experience: Examining The Emergence Of Schematic Representations in the Medial Prefrontal Cortex

P. C. Paulus[1,2], **A. N. Williams**[2,3], **S. S. Wiese**[2], **R. G. Benoit**[2,4]

Friday 15:00 - 16:30 | Lecture Hall N6

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The hippocampus supports the retention of unique experiences as episodic memories. In contrast neocortical regions including the medial prefrontal cortex (mPFC) have been argued to support the retention of more generalized memory representations, i.e., memory schemas. These representations are thought to be extracted across multiple related experiences. Recently we have demonstrated that the mPFC encodes such schemas of our real-life environment as well as of the people that live in it. Here we examine how such schemas emerge de novo by immersing people in a complex and novel environment: The character-rich tv show The Wire. Across two weeks participants watched the entire first season and thereby learned the complex structure of its characters' relationships. We quantified participants' subjective schema from repeated fine grained behavioral assessments and defined the objective relationships between the characters by their co-occurrences. Preliminary analyses indicate that objective models based on co-occurrences of the characters predict the structure of participants' subjective schema. These models are also reflected in the structure of neural memory representations in the mPFC. These findings elucidate how life-like experiences shape the structure of memory schemas and their neural representation.

S29.4 - Integrating Knowledge about Structure and Reward Contingencies for Generalization and Inference

F. F. Deilmann[1], **S. Theves**[1], **M. M. Garvert**[1], **C. F. Doeller**[1,2,3]

Friday 15:00 - 16:30 | Lecture Hall N6

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The hippocampal-entorhinal system is remarkably efficient in organizing relations between sensory stimuli, such as state transition probabilities, in a cognitive map. Such knowledge representation is assumed to enable fast learning of novel relations and the generalization of reward, likely facilitating goal-directed behavior. However, in addition to experienced transition probabilities, objects may simultaneously share other types of relational information, such as reward contingencies. This fMRI study investigates how the neural representation of relational knowledge is influenced by a subsequently learned latent reward structure, whether the structural relations between objects still are represented veridically. Participants first acquire knowledge about object relations based on object transitions that follow a hidden graph structure. In a subsequent decision-making task, each object gets associated with fluctuating reward values. Critically, two parts of the graph structure share the same reward contingencies (orthogonal to the initial graph representation). Behavioral data suggest that participants successfully acquire structural knowledge and can utilize it to find shortcuts when transitioning around the graph. Model-based analysis reveals that participants can extract the additional underlying latent reward structure and generalize over states sharing the same reward contingencies. Furthermore, they can apply their acquired structural knowledge to correctly infer current reward values of objects whose values they never directly experienced. Preliminary RSA results reveal hippocampal and vmPFC activation patterns reflecting structure and reward contingency representations. Suggesting participants represent both experienced transitions and shared reward contingencies between objects; moreover, they can combine both types of information for generalization and inference.

S29.5 - Representations of Context and Context-dependent Values in vmPFC Compete for Guiding Behavior

N. Moneta[1,2,3], **M. M. Garvert**[1,2,4], **H. R. Heekeren**[5,3,6], **N. W. Schuck**[1,2,5]

Friday 15:00 - 16:30 | Lecture Hall N6

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The ventromedial prefrontal-cortex (vmPFC) is known to contain expected value signals that inform our choices. But even for the same stimulus, expected values can differ by task or context. Even a simple choice between two apples will depend on whether the task is to find a snack, or to buy ingredients for a cake. Previous work has shown that vmPFC is also involved in representing such context-signals, which suggests that its role goes beyond representing attention-filtered values. In this study, we asked how the brain flexibly switches between value representations in a task-dependent manner. Thirty-five participants alternated between tasks in which either stimulus color or motion-direction predicted rewards. As expected, choices and neural activity in vmPFC were largely driven by task-relevant values. Yet, behavioral analyses indicated that participants also retrieved the values of irrelevant features, and computed which option would have been best in the alternative context. fMRI analyses showed that multivariate vmPFC signals contain a rich representation that includes the current task state or context (motion/color), the associated expected value of the choice, and crucially, the irrelevant expected value of the alternative context. Further investigation revealed that these irrelevant value representations in vmPFC compete with relevant value signals, interact with the task-state representations and relate to behavioral signs of value competition. Our results shed light on vmPFC's role in decision making, bridging between its role in mapping observations onto the task states of a mental map, and computing expected values for multiple states.

S30.1 - Preprocessing Choices for P3 Analyses with Mobile EEG: Mind the Gap

N. S. J. Jacobsen[1], **S. Debener**[1]

Friday 15:00 - 16:30 | Lecture Hall N9

University of Oldenburg, Germany

Preprocessing of electroencephalography (EEG) data is required to obtain interpretable results. While a variety of preprocessing choices are justifiable, they can greatly influence the results obtained. The impact of preprocessing decisions has been studied in stationary EEG but remains unexplored in mobile EEG. Here more complex processing is required to deal with motion artifacts. We investigated the effect of preprocessing decisions on an event-related potential (ERP, P3) that decreases in amplitude during walking compared to standing. Our long-term goal is to determine how strongly different processing choices influence results. A systematic literature review yielded N = 258 publications, of which 29 investigating the P3 during standing and walking using mobile EEG were included. Two independent reviewers coded the described preprocessing pipelines. Preliminary results indicate that some preprocessing steps are more common than others. For example, offline filters were used in all but one study, while line noise correction was used in only three of 29 studies. Although all studies included a data segmentation step in their data processing, only 79% also mentioned baseline correction. Of the 29 studies analyzed, 50% used at least one manual processing step. In addition, 79% of the studies (including some from our own laboratory) did not report relevant details such as the type of temporal filter used. Our results are consistent with those obtained for stationary EEG preprocessing. Existing reporting standards should be used and adapted to mobile EEG to ensure that preprocessing is described in sufficient detail to be reproducible.

S30.2 - EEGManyPipelines: A Large-scale Multi-analyst Project on the Variability of EEG Analysis Approaches

E. Cesnaite[1]

Friday 15:00 - 16:30 | Lecture Hall N9

Münster University, Germany

Analysis of electroencephalographic (EEG) data is marked by a large variability in the analytic approaches researchers might pursue to test the same research question. Although a few recent studies addressed the question of the impact of potential EEG analytic decisions, it remains unclear how variable real-life practices are and how they affect the result. To answer this question, we launched the EEGManyPipelines project: the large-scale, community-driven project that aims to investigate the robustness of EEG findings across different analysis approaches performed by different analyst teams. To achieve this goal, we sent a single EEG dataset together with a set of 8 hypotheses to more than 300 expert teams that signed up for the project. Importantly, we asked these teams to use analysis approaches they would deem appropriate given the hypothesis and their usual research practices. 168 teams successfully completed the task and shared data including a self-report form on the analytic decisions taken, scripts, and pre-processed EEG data. In this symposium, I will present the initial findings of the project detailing how variable the analytic choices and the results in our sample were. We will discuss whether the prototypical EEG analysis pipeline exists and whether there is a need to standardize analytic practices.

S30.3 - The Garden of Forked Paths in Graph Theory fMRI Studies

D. Kristanto[1], **C. Gießing**[1], **C. Thiel**[1], **A. Hildebrandt**[1]

Friday 15:00 - 16:30 | Lecture Hall N9

University of Oldenburg, Germany

Graph theory fMRI, which views brain areas as highly interconnected networks, has been widely used to understand the relationship between neural organisation and cognition. However, graph theory-based fMRI analysis implies a large number of researcher degrees of freedom, creating a garden of forked paths in data pre-processing and analysis. Given that different paths can lead to different results, elaborate knowledge of the choices made by previous studies is important for a cumulative scientific approach. We therefore conducted a systematic review of studies that applied graph theory to fMRI data (N 300) to extract the garden of forked paths in data pre-processing and analysis. We found, firstly that the garden of forked paths can be divided into three taxonomic levels: (1) categorisation depending on the inclusion/exclusion of certain analysis steps, (2) categorisation depending on the order of the steps, and (3) categorisation according to the parameter tuning within a step. Secondly, we found large inconsistencies in the reporting of data pre-processing and analysis steps across studies, supporting the notion that reporting standards are needed. We propose a standardised reporting template and present an R Shiny application to summarise and visualise the garden of forked paths in graph theory-based fMRI data analyses. Users can interactively visualise analytical choices made in the literature and plot the frequency distribution of particular choices to understand how popular a particular decision was. These resources should help researchers to navigate the extensive garden of forked paths in graph theory fMRI studies.

S30.4 - Noisy Business: The Convergent Validity Of Signal Variability Measures For Electroencephalography Data

J. C. G. Alanis[1], **M. D. Nunez**[2], **C. Löffler**[1], **A. Schubert**[1]

Friday 15:00 - 16:30 | Lecture Hall N9

[1] Johannes Gutenberg-Universität Mainz, Germany
[2] University of Amsterdam, Netherlands

Measures of brain signal variability can offer complementary information to common analysis techniques (e.g., average evoked amplitude responses) for electroencephalography (EEG) data. In this line of research, measures such as aperiodic signal components (e.g., 1/f exponent) and estimates of signal regularity measures (e.g., entropy) are becoming increasingly important. Here, we present the results of a multi-level approach for estimating different brain signal variability measures, showing their theoretical and empirical commonalities. Our results indicate that brain signal variability measures share large proportions of variance, indicating a potential functional overlap between their neural generators. However, or results also indicate that the choice of analysis units (e.g., single-trials, ERPs), time windows, frequency ranges, and sensors can influence the reliability of the results. We discuss these caveats and the potential incremental validity of these measures for predicting behavioural performance.

S31.1 - Internal Attributions Shape Positive Affect, Neural Dynamics Of Outcome Valuation, And Motivated Behavior

D. S. Stolz[1], **L. Müller-Pinzler**[1], **S. Krach**[1], **F. M. Paulus**[1]

Friday 15:00 - 16:30 | Lecture Hall 7E02

Social Neuroscience Lab, Klinik für Psychiatrie und Psychotherapie, Universität zu Lübeck, Germany

Experiencing events as controllable is essential for human well-being, affective experience, and motivation. However, behavioral neuroscience on the value of control has often focused on control as mere choice, where agents cannot attribute choice outcomes to internal causes. Guided by classic psychological theory, we here focus on the value of internal control. Precisely, we ask how the belief of having internal control over outcomes impacts the affective valuation of task outcomes, neural dynamics, and ensuing behavioral preferences. In three consecutive studies we show that positive affect increases, and displays a qualitative shift towards self-evaluative pride, when agents believe they caused a given outcome. We demonstrate that these outcomes engage brain networks along the cortical midline that are associated with self-referential processing. Here, activity in the ventromedial prefrontal cortex tracks the value of outcomes in terms of both success and internal control, and covaries with positive affect in response to outcomes. The affective dynamics linked to internal control beliefs also relate to increased functional coupling between the ventral striatum and cortical midline structures. Finally, we show that pride predicts preferences for control, even at monetary costs. Our investigations extend recent models of positive affect and well-being, and emphasize that control beliefs drive intrinsic motivation.

S31.2 - Interactions Between Causal Attributions And Beliefs: Evidence From A Novel Computer Game Task

E. Zamfir[1], **P. Dayan**[2]

Friday 15:00 - 16:30 | Lecture Hall 7E02

[1] University of Oxford, United Kingdom
[2] Max Planck Institute for Biological Cybernetics

Knowledge, beliefs and expectations about ourselves are important both from an objective/cognitive perspective, as they inform decisions, and from an subjective/emotional perspective, as they shape our view of ourselves and our capabilities. Here, we use a multi-round task to investigate relationships between self-evaluation and causal inferences at a trial-by-trial level, and the resulting trajectories of beliefs across time. We administered a novel, challenging game of skill to a substantial population of healthy online participants, and collected time series of both their self-evaluations, defined here as beliefs about skill, and their attributions about the causes of the success or failure of the outcomes that they actually experienced. We found reciprocal relationships at the trial-by-trial level, which illustrate the dynamic nature of attributions and their importance in modulating feedback processing and self evaluation. The loopy nature of this relationship can produce complex dynamics, with significant impact on the evolution of beliefs, as we demonstrate in simulation analyses highlighting various functional regimes of an interconnected self-evaluation-attribution making system. This work provides empirical confirmation of the attribution-self representation cycle theory, proposes a framework for developing and testing computational accounts of attribution-belief interactions and provides additional evidence for a need to investigate richer aspects of self-evaluation, beyond local confidence measures.

S31.3 - Neurocomputational Mechanisms Of Affected Beliefs

L. Müller-Pinzler[1], **N. Czekalla**[1], **A. V. Mayer**[1], **A. Schröder**[1], **D. S. Stolz**[1], **F. M. Paulus**[1], **S. Krach**[1]

Friday 15:00 - 16:30 | Lecture Hall 7E02

University of Lübeck, Germany

During everyday interactions people constantly receive feedback on their behavior, which shapes the beliefs they form about themselves. However, this is not a passive process during which information is picked up in an objective manner, rather the idea prevails that belief formation is essentially biased and shaped by affective and motivational. To assess the impact of self-related affective states during the formation of self-related ability beliefs we modeled updates of performance expectations in response to feedback during a cognitive estimation task. We show that updating of self-related ability beliefs was biased towards negative information and this bias was associated with the experience of self-conscious emotions, i.e. embarrassment and pride during the task. Further, the results suggest that individuals who update more negatively and experience stronger embarrassment and less pride process negative information more intensely than positive information as indicated by increased pupil dilation and neural activation within the anterior insula, amygdala, VTA and mPFC. Our results shed light onto a potential mechanism of how affective states could shape the attention towards and the processing of specific information therefore biasing the beliefs people form about themselves.

S31.4 - Confidence Hierarchy: a Neurocomputational Approach to Self-beliefs

M. Rouault[1,2]

Friday 15:00 - 16:30 | Lecture Hall 7E02

[1] Paris Brain Institute, France
[2] Centre National de la Recherche Scientifique (CNRS), France

Metacognition, the ability to reflect on our own cognition and mental states, is a critical component of human subjective experience, and operates across many hierarchical levels of abstraction—encompassing "local" confidence in isolated decisions to "global" self-beliefs about our abilities and skills, and even more global constructs such as self-esteem. Alterations in metacognition are often considered foundational to neurological and psychiatric disorders, but it has historically been difficult to isolate and quantify metacognition independently of other cognitive performance features. I will present large-scale studies employing a dimensional computational approach for identifying links between symptom dimensions and metacognitive abilities. However, a major determinant of human behaviour is not only "local" confidence in isolated decisions, but also an overall sense of confidence about our abilities and skills which I refer to as "global" self-beliefs. In a series of behavioural and neuroimaging studies, I show that humans can incorporate local decision confidence to form global self-beliefs over time, while also pervasively underestimating their performance in the absence of feedback. I will further show that subjects with low self-esteem report lower global self-beliefs despite a similar objective performance, suggesting that global self-beliefs may be more closely related to core subjective and functional symptoms experienced by psychiatric patients.

Symposia session 7

S32.1 - Tools For Investigating Fetal Brain Activity

H. Preissl[1]

Saturday 09:00 - 10:30 | Lecture Hall N1

University of Tübingen, Germany

Fetal magnetoencephalography (fMEG) is the only non-invasive method of directly measuring electromagnetic fetal brain activity in utero. This technique records magnetic fields generated by the fetal brain. Both spontaneous neural activity and event-related fields triggered by auditory and visual stimuli can be recorded with fMEG. Finding obtained from fMEG may also be complemented by fetal neuroimaging data obtained with magnetic resonance imaging (MRI), a separate technique that can examine fetal brain structure and hemodynamic activity. This talk will give an overview of developmental insights gained from both techniques, with an eye toward new applications for inferring the emergence of cognition and consciousness in the perinatal period. In the first part of my talk, I will describe studies that show the developmental trajectories of auditory and visual perception during the last trimester of human gestation. Additionally, I will present data that demonstrate the generation of mismatch responses and habituation to repetitive stimuli by the fetal brain. I will also discuss how fetal behavioral states can affect these processes. Next, in the second part of my talk, I will discuss the results of fetal neuroimaging with MRI, which demonstrates the development of functional connectivity brain networks in utero. In this context, I will explore the effects of adverse factors during gestation on fetal brain development. In conclusion, fetal brain imaging is an emerging field which, in the near, may illuminate the perinatal emergence of perception, cognition, and perhaps consciousness.

S32.2 - P3b-like Responses In Newborns And Fetuses As Possible Evidence Of Consciousness

K. Sippel[1]

Saturday 09:00 - 10:30 | Lecture Hall N1

Universitätsklinium Tübingen, Germany

The developmental stage at which consciousness emerges is uncertain. Given that fetuses and infants cannot answer questions or self-report their conscious state, neural markers of consciousness are perhaps crucial to investigating the possibility of subjective experience in the perinatal period. In particular, the P3b or late slow wave (LSW) component is a cortical evoked signal associated with a reorienting of attention and possibly conscious processing, which can be recorded noninvasively with magnetoencephalography (MEG). Thus, to investigate the possibility of perinatal consciousness, our research group recorded cortical MEG responses to auditory irregularities in fetuses and newborns. Specifically, we utilized the auditory local-global paradigm introduced by Bekinschtein et al. (2009 PNAS) to test for evidence of Bayesian prediction errors in fetuses and newborns. This paradigm involves auditory irregularities (i.e., low probability "oddball" stimuli) both within-trials ("local violations") and between-trials ("global violations"). While it is arguable that the brain might process local rule violations unconsciously, cortical responses to global rule violations are stronger evidence of consciousness. We found that fetuses and newborns showed a clear LSW (analogous to the adult P3b response), indicating hierarchical rule learning. Notably, this response was limited to active behavioral states, consistent with an explanation that the fetuses and newborns do not recognize global rule violations when they are in quiet sleep. Although these findings are highly suggestive of perinatal consciousness, the sensitivity and specificity of the P3b response has been questioned; thus, future work should also look at alternative markers such as MEG signal entropy or perturbational complexity.

S32.3 - Perturbational Complexity and Consciousness: Methodology and Validation Roadmap

P. A.M. Mediano[1]

Saturday 09:00 - 10:30 | Lecture Hall N1

Imperial College London, United Kingdom

Over the last few years, there has been a surge of studies linking consciousness with metrics quantifying various aspects of the complexity of brain activity. Of these, perhaps the most empirically successful metric is the so-called Perturbational Complexity Index (PCI), that quantifies the complexity of the brain's response to a Transcranial Magnetic Stimulation (TMS) pulse. PCI can very accurately predict the presence of consciousness across a wide variety of conditions in adults, which prompts the question: can we use PCI, or a measure like it, to infer consciousness in infants and fetuses? In this talk I will cover the basic methodology and theoretical foundation behind PCI, and explore alternatives to TMS that are more suitable for infants and fetuses. I will then introduce our proposed measure, sensory PCI (sPCI), as introduced in a recent publication (Frohlich et al. 2023 Neuroimage), that leverages salient sensory perturbations as a substitute for magnetic perturbations. In particular, we propose that the framework of Bayesian predictive processing can provide tools to design and test stimuli that are suitable replacements of TMS. I will conclude by highlighting some practical considerations involved in the practical implementation of sPCI and with a roadmap for future studies based on progressive empirical validation.

S32.4 - Understanding the Complexities of MEG Signal Entropy: Implications for Assessing Consciousness in Fetuses and Infants

J. Frohlich[1]

Saturday 09:00 - 10:30 | Lecture Hall N1

University of Tuebingen, Germany

In this presentation, I explore the hypothesis that the complexity of auditory evoked brain signals should increase with maturation during the perinatal period, based on the rich body of literature linking signal complexity to consciousness (Sarasso et al. 2021) and the possibility that consciousness might emerge in the perinatal period. My colleagues and I tested this hypothesis using magnetoencephalography (MEG) data from 43 human fetuses (81 recordings) and 20 newborns (one recording each). Surprisingly, we found that neural complexity—a general marker of consciousness in adults—decreases with gestational age in fetal development and continues to decline after birth. The largest entropy change with age is seen with 4-10 Hz permutation entropy for both groups, corresponding to the perinatal alpha band. For this and most other entropy measures, we found that the age-related decline in fetal entropy was significantly stronger in male fetuses. Additionally, in newborns, the 4 - 10 Hz permutation entropy interacted with heart rate variability (HRV, a proxy for arousal) such that age-related changes in entropy were significantly stronger when HRV was low. In both fetuses and newborns, decreases in permutation entropy with age were driven by changes in signal amplitude, as revealed by an entropy decomposition, whereas changes in signal phase with age drove increases in entropy, plausibly related to the emergence of consciousness. Our results demonstrate that MEG signal entropy is influenced by many factors during the perinatal period, which must be taken into consideration before entropy-based techniques for inferring consciousness are deployed in fetuses or infants.

S32.5 - Theories Of Consciousness And The Emergence Of Consciousness In Early-life

A. Kirkeby-Hinrup[1,2]

Saturday 09:00 - 10:30 | Lecture Hall N1

[1] Dept. of Philosophy, Lund University, Sweden
[2] Center for functionally integrative neuroscience, Århus University, Denmark

Few believe that consciousness emerges immediately after the cerebral cortex begins its development. Rather, the majority (but in no way universal) consensus in the field appears to be that certain features (e.g. processes, areas, or functions) of the brain are necessary for consciousness. Furthermore, because these necessities may not be met until later stages of prenatal development, or possibly early years of childhood, there is significant theoretical wiggle room with respect to hypotheses about when consciousness emerges in early-life development. Nevertheless, this is a severely underexplored domain. Only a few of the extant theories of consciousness include hypotheses about how or when consciousness appears in early life. The most prominent of these is the global neuronal workspace theory. Yet even in these cases many questions remain. Nevertheless, even for theories that have not explicitly addressed this, often it is possible to extrapolate from the theoretical framework and empirical commitments of the theory (roughly) what its position on the emergence of consciousness in early-life is likely to be. This talk does three things: 1) highlights the extant hypotheses about consciousness in early-life. 2) illustrates how claims by a given theory of consciousness constrain what positions are available regarding the emergence of consciousness in early-life, and 3) discusses investigations of consciousness in early-life in light of the overarching project of understanding consciousness.

S33.1 - Active Placebos Increase Treatment Expectations And Placebo Analgesia

L. A. Schenk[1], **T. Fadai**[1], **C. Büchel**[1]

Saturday 09:00 - 10:30 | Lecture Hall N2

Department of Systems Neuroscience, University Medical Center Hamburg-Eppendorf, Germany

Treatment expectation effects can be augmented by vividly perceiving the treatment. Here we ask the question whether negative side effects during a sham treatment (i.e. active placebos) can improve treatment expectation effects. A 2x2 design with the factor expectancy and side effect (nasal spray with capsaicin/without capsaicin) was employed. During the experiment, participants received nasal sprays with the belief that 50% contain pain relief medication before receiving thermal pain stimuli that were rated on a VAS scale. During the initial reinforcement phase when all participants expected the possibility of a real pain relief treatment, we observed a significant main effect of capsaicin, indicating that participants report less pain when the nasal sprays had a noticeable side effect. During the subsequent test phase, when only half of the participants expected a real pain relief treatment, we observed a significant interaction. Only the pain relief expectancy group showed less pain when a side effect was experienced as compared to the no-expectancy group. Using fMRI, we observed that this interaction was associated with a modulation of the rACC as well as increased rACC – PAG connectivity in the pain relief expectancy group. Together, this shows that even negative side effects (e.g. burning feeling) can increase treatment expectation and therefore treatment effects, potentially via a stronger activation of the descending pain modulatory system. This is highly relevant for randomized clinical trials as well as clinical practice.

S33.2 - Placebo Effects in Dermatological Diseases: The Role of Patients' Treatment Expectations

S. Hölsken[1]

Saturday 09:00 - 10:30 | Lecture Hall N2

Institute of Medical Psychology and Behavioral Immunobiology, Essen University Hospital, Germany

Patients' expectations towards the benefit of a treatment shape placebo effects. Thus, they can not only affect the course of medical conditions but also the efficacy and tolerability of treatments. The underlying mechanisms have been best described for placebo analgesia of experimental and clinical pain. However, there are findings from a variety of medical conditions and also in the field of dermatology experimental and clinical studies demonstrate that symptoms such as itch and skin pain can be modulated by expectations. This talk will provide an overview of the current empirical evidence regarding the impact of treatment expectations in dermatological diseases. Two crucial mechanisms that have also been described in the field of pain appear to influence treatment expectations: Prior learning experiences as well as verbal information provided by healthcare professionals. Studies targeting these mechanisms provide evidence that positive treatment expectations can reduce skin disease symptoms and enhance treatment efficacy. For example, a study employing classical conditioning was successful at reducing psoriasis symptoms and sham-conditioning could reduce symptoms in allergic patients. Knowledge of these mechanisms is vital in order to utilize patients' expectations in the clinical practice, by fostering positive expectations and reducing the formation of negative expectations. By employing a variety of disease models, the generalizability of findings from placebo analgesia can be tested, allowing us to gain a broader understanding of the role of patients' expectations.

S33.3 - Placebo Effects In The Endocrine System

A. Skvortsova[1], **J. Veldhuijzen**[1], **A. Evers**[1]

Saturday 09:00 - 10:30 | Lecture Hall N2

Leiden University, Netherlands, The

Evidence demonstrates that placebo effect affects not only subjective health outcomes such as pain, but also physiological markers. In our research, we investigate whether is possible to elicit a placebo effect in various endocrine parameters using a pharmacological conditioning paradigm. In this paradigm, a hormonal-stimulating or inhibiting medication (unconditioned stimulus) gets associated with the conditioned stimulus (CS), and later the mere presentation of the CS alone leads to changes in hormone levels or triggers effects associated with this hormone. We investigated whether it is possible to condition endogenous oxytocin release using a nasal oxytocin spray as a US and a smell of rosewood oil as a CS in healthy volunteers. After 3 learning trials, there was a significant increase of exogenous oxytocin in response to the CS. Further, we explored whether such endocrine placebo responses can be elicited in clinical population. We studied the effects of conditioning with intranasal insulin in patients with type-2 diabetes and age-matched healthy controls. The results indicated that conditioning stabilized dropping glucose levels but only in male and not female patients. Moreover, conditioning with insulin decreased hunger in healthy volunteers. Our proof-of-concept studies demonstrate that it is possible to elicit placebo effect in endocrine system both in healthy volunteers and patients with metabolic disorders. However, these effects seem to depend on the sex of participants and might be short-lasting. Future research should aim to create protocols that elicit stable and beneficial placebo effects that can be used as an add-on to standard treatments.

S33.4 - Non-Deceptive Placebos Appetite: Open-Label Placebo Effects on Food Cue Reactivity

J. Potthoff[1]

Saturday 09:00 - 10:30 | Lecture Hall N2

University of Graz, Austria

People's attentional biases towards (depictions of) food are associated with increased craving, overeating, weight gain, and subsequent overweight and obesity. These attention biases are especially problematic in obesogenic environments where food is almost always available, and high-calorie food cues are omnipresent. Decreasing visual attention biases—especially towards high-calorie "junk foods"—is a promising approach to promoting healthy eating habits. Placebos have been shown to reduce the time people spend gazing at high-calorie food cues and the appetite for the depicted foods. However, if placebo recipients discover the deception, they may feel deceived or distrustful. This may impair the relationship between patients and healthcare providers. The deception is circumvented by open-label placebos, which are placebos without deception. Contrary to deceptive placebos, the receivers know that they receive a treatment (e.g., a pill) without an active substance. Over the past few years, open-label placebos have been investigated as a potential alternative to deceptive placebos in multiple domains: Open-label placebos have been shown to decrease pain, cancer-related fatigue or emotional distress and increase health-promoting behaviours. However, research on open-label placebo effects on appetite and visual food processing is still scarce. In our department, we investigated open-label placebo effects on appetite and the visual processing of food cues and compared these effects to deceptive placebos.

S34.1 - Sex Differences In Cortisol Secretion In Depression: A Systematic Review And Meta-Analysis

R. Wang[1], **L. Kogler**[1], **B. Derntl**[1,2]

Saturday 09:00 - 10:30 | Lecture Hall N3

[1] Department of Psychiatry and Psychotherapy, Tübingen Center for Mental Health (TüCMH), Medical Faculty, University of Tübingen, Germany
[2] LEAD Graduate School and Research Network, University of Tübingen, Germany

Higher prevalence rates of depression in females than in males might be associated with sex-specific activation of the hypothalamic-pituitary-adrenal (HPA) axis, as well as the sex-specific cortisol secretion, which is the primary glucocorticoid end product of the HPA axis in humans. Evidence exists that cortisol differs between healthy females and males, however so far, a sex-specific cortisol secretion in depression has not been systematically assessed. Thus, the current systematic review and meta-analysis were conducted to quantify the existing literature on different cortisol parameters (1) basal cortisol; (2) hair cortisol; (3) cortisol awakening response (CAR); (4) cortisol stress reactivity comparing depressed females and males as well as sex-specific comparisons with healthy controls. Following an extensive literature research, a total of 50 original articles were included. Females with depression had significantly higher hair cortisol, higher CAR, and lower cortisol stress reactivity compared to males with depression. In comparison with healthy females, female patients had significantly higher evening basal cortisol, higher CAR and lower cortisol stress reactivity. Male patients showed significantly higher overall, morning and evening basal cortisol than male controls. Thus, sex as a fundamental driver of dysfunctional cortisol secretion in depression needs to be considered. More rigorous research into the interaction of sex and other factors, as well as the neural mechanisms underlying sex-specific cortisol secretion in depression is warranted.

S34.2 - Psychophysiological, Subjective And Hormonal Stress Reactivity In Women With And Without Hormonal Contraception

Z. Bürger[1], C. Müllerschön[1], J. Kübbeler[1], E. Comasco[2], M. Henes[3], L. Kogler[1], B. Derntl[1,4]

Saturday 09:00 - 10:30 | Lecture Hall N3

[1] Department of Psychiatry and Psychotherapy, Tübingen Centre for Mental Health (TüCMH), Medical Faculty, University of Tübingen, Germany
[2] Department of Women's and Children's Health, Neuropsychopharmacology, Uppsala University, Sweden
[3] cDepartment of Women's Health, Medical Faculty, University of Tübingen, Germany
[4] LEAD Graduate School and Research Network, University of Tübingen, Germany

Hormonal intrauterine-devices (LNG-IUDs) are, along with oral contraceptives (OCs), the most used hormonal contraceptives (HCs) worldwide. Although these methods are heavily used, little is known about their psychological and neural effects. Studies on stress reactivity have shown that OCs can alter psychophysiological and hormonal responses to acute stress. Regarding LNG-IUDs, so far only one study investigated the association between them and stress reactivity, reporting a potentiated cortisol reactivity in LNG-IUD users and a blunted cortisol reactivity in OC users compared to naturally cycling (NC) women. To investigate the effects of HC on stress reactivity, we applied the Maastricht Acute Stress Test, including a stressful and a non-stressful condition, to LNG-IUD (n=26) or OC (n=27) users and NC women (n=25), resulting in a mixed within-between-subject design. To cover the multiple facets of stress, we measured hormonal (salivary cortisol), psychophysiological (electrodermal activity (EDA), heart rate (HR)) and subjective stress reactivity. A cortisol increase following stress induction is seen in LNG-IUD and NC groups, while no significant changes in cortisol due to the stress or placebo condition occurred in OC users. Similarly, subjective ratings showed group differences, with higher negative affect in LNG-IUD users compared to OC and NC users, while no group differences were seen in psychophysiological responses. This project has enormous societal relevance, as it helps to better understand the underlying mechanisms of action, and women worldwide can make more informed choices on hormonal intake and their contraceptive method.

S34.3 - Effects of Acute Oral Contraceptive Intake on Social Cognition

B. v. Dawans[1], **G. Domes**[1]

Saturday 09:00 - 10:30 | Lecture Hall N3

University of Trier, Germany

As sex hormones have been shown to modulate various aspects of human emotion, cognition and behavior, the psychological and behavioral effects of hormonal contraceptives came into view in recent years. Studies have already shown that women using hormonal contraception differ in social cognitive variables compared to naturally cycling women. In a recent study we wanted to test for immediate effects of the acute intake of hormonal contraception (the pill). Twenty healthy women, using the pill as hormonal contraceptive method for a minimum of six month participated in our study twice during their active intake phase. In a counterbalanced order they participated in social cognitive paradigms once one hour after intake of the pill and once before the pill was taken. We took saliva samples to measure the levels of endogenous sex hormones estradiol and progesterone. There was no effect of the pill intake on the level of salivary progesterone and estradiol. On the behavioral level we found a significantly lower level of cognitive empathy after the acute intake of the oral contraceptive compared to no intake. There were no differences between the conditions in emotional empathy or the social value orientation. Our results give first evidence for acute effects of hormonal contraception on social cognition and call for replication in bigger samples. Moreover, this research needs to be expanded to other psychobiological variables und include measures of synthetic hormones in order to disentangle the underlying psychobiological mechanisms.

S34.4 - Hormonal Contraception and Face Processing

B. Pletzer[1]

Saturday 09:00 - 10:30 | Lecture Hall N3

Paris-Lodron-University Salzburg, Austria

Previous cross-sectional studies observed differences between users and non-users of combined oral contraceptives (COCs) in both the structure and function of the fusiform face area (FFA) related to face processing. For the present study 120 female participants performed high-resolution structural, as well as functional scans at rest, during face encoding and face recognition. Participants were either never-users of COCs (26), current first-time users of androgenic (29) or anti-androgenic COCs (23) or previous users of androgenic (21) or anti-androgenic COCs (21). Results suggests that associations between COC-use and face processing are modulated by androgenicity, but do not persist beyond the duration of COC use. Alterations in the own-gender bias in accuracy and FFA-activation during face encoding were observed in anti-androgenic COC-users compared to never-users. Furthermore, during the identification of novel faces, longer duration of androgenic COC-use was related to reduced accuracy, right FFA activation, as well as connectivity of the left FFA to the bilateral SMG, which is a key region in cognitive empathy. Accordingly, the FFA and SMG emerge as promising ROIs for future randomized controlled trials on the effects of COC-use on face processing.

S35.1 - Effects of the Glucocorticoid Receptor Gene (NR3C1) and Subjective Birth Experience on the Risk of Postpartum Depression and Maternal Bonding

T. Plieger[1], **J. Lepper**[1], **A. Klein**[2], **M. Reuter**[1]

Saturday 09:00 - 10:30 | Lecture Hall N6

[1] Uni Bonn, Germany
[2] University Hospital Bonn, Department of Gynecologic Psychosomatics, Germany

Postpartum depression (PPD) is a serious health care issue that affects a substantial share of women giving birth. PPD is considered a severe stress response that is likely associated with impaired HPA-axis activity. However, genetic findings regarding HPA-axis effects on PPD are scarce and inconsistent. Inconsistencies may be due to the neglect of environmental (stressful) events such as perinatal trauma or averse subjective birth experiences associated with PPD. Therefore, the present study aims to investigate whether the NR3C1 gene and subjective birth experience interact on PPD and postpartum bonding to the child. N = 277 mothers provided gene samples and self-report data on PPD and postpartum bonding. We genotyped 11 polymorphisms on the NR3C1 gene (including the prominent BCL1) and conducted haplotype analyses. A negative subjective birth experience was associated with both PPD and maternal postpartum bonding. Our results further show a significant main effect of NR3C1 haplotype and a haplotype x birth experience interaction on PPD. We did not find any NR3C1 haplotype effects on bonding. Our results support the assumption that the glucocorticoid receptor coding NR3C1 gene is involved in the development of PPD. These gene effects become particularly important in presence of a negative environmental event such as the subjective birth experience. This finding allows more targeted preventions in terms of being particularly sensitive to potentially harming environmental influences that may present even stronger risk factors for genetically vulnerable women.

S35.2 - Maternal Perinatal Depression and Postpartum Bonding

E. Fransson[1,2], F. Sörensen[3,4], T. K. Kallak[1], M. Ramklint[5], P. Eckerdal[1], M. Heimgärtner[3], I. Krägeloh-Mann[3], A. Skalkidou[1]

Saturday 09:00 - 10:30 | Lecture Hall N6

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[3] Pediatric Neurology Developmental Medicine, University Children's Hospital Tübingen, Germany
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The presented study aimed to examine the impact of maternal depression on child behavioral difficulties at 18 months, taking into account the timing of maternal depression, child gender, and maternal bonding. The study utilized data from a Swedish population-based longitudinal mother-infant study that included 1,093 participants. Linear regression models were used to assess the associations between antenatal depression, postpartum depression, persistent depression, and child behavioral problems. The results of the study revealed that maternal antenatal and persistent depression were significantly associated with higher Child Behavior Checklist scores. Moreover, the effects of depression were more pronounced in girls than in boys. Maternal bonding mediated most of the negative effects of postpartum and persistent depression on child behavior, but not the effects of antenatal depression. It is important to note that the study's limitations included the fact that only maternal reports of child behavioral problems were used, and information regarding paternal depressive symptoms was not available. The study findings suggest that different onset and timing of maternal depression have varying impacts on child behavioral problems. Antenatal depression, for example, was not mediated by maternal bonding, indicating underlying mechanisms that may be related to fetal programming. Early screening and identification of depressive symptoms, including during pregnancy, could be crucial in providing routine care to mothers and preventing the onset of depression or seeking early treatment when it does occur.

S35.3 - Impact of perinatal Maternal Mental Health and pregnancy-specific Anxiety on Infant's Self-Regulation: A prospective longitudinal Study

C. E. Schwarze[1], **S. v. d. Heiden**[1], **S. Wallwiener**[2], **S. Pauen**[1]

Saturday 09:00 - 10:30 | Lecture Hall N6

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Maternal symptoms of anxiety and depression are highly prevalent during the pre- and postnatal period and impact fetal development and newborn behaviour. However, not much is known about the differential effects and time-sensitivity of the exposure. Self-regulation is a fundamental precondition for individuals' health and overal life success whereas dysfunctional self-regulation leads to behavioural problems, poor academic achievement, social rejection, and physical/mental disorders. Exploring the early factors that impact self-regulation development is crucial to prevent adverse outcome for mother and offspring. This study aims to explore the impact of maternal mental health symptoms on infant self-regulation. This prospective longitudinal study investigates the effects of maternal symptoms of depression, anxiety, and pregnancy-specific anxiety on infants' self-regulation in N=225 mother-infant dyads. Maternal psychopathological symptoms were examinded at five prenatal and three postnatal time-points. Infant's self-regulation -crying, feeding, sleeping- was assessed twice (3-6 months). Maternal pregnancy-specific anxiety turned out to be the most significant predictor for infant self-regulatory problems. It predicted crying/sleeping: $p<.001$ and feeding problems: $p<.05$ and explained 13,3% of the variance. Even when controlling for maternal postpartum psychopathological symptoms, pregnancy-specific anxiety remained a significant predictor for infant self-regulatory problems. Our results suggest that fetal exposure to maternal affective symptoms plays a substantial role in the development of infant self-regulation –potentially mediated by epigenetic modifications. Importantly, even though maternal psychopathology only reached subclinical levels, it was predictive for infant behavioral problems. Our findings underline the importance of early prevention and clearly tailored interventions during pregnancy and postpartum.

S35.4 - Neurofeedback training in mothers with postpartum bonding disorder

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Saturday 09:00 - 10:30 | Lecture Hall N6

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[2] Institute of Medical Psychology, Center for Psychosocial Medicine, Heidelberg University Hospital, Heidelberg, DE; Technical University Dresden, Department of Psychology, Dresden, DE

Mothers with postpartum bonding disorder report experiencing their own baby as less rewarding and delighting than healthy mothers. Risk factors and underlying neural mechanisms remain unclear so far, but may be related to hypoactivation in reward-associated brain areas. In the present study, N=36 mothers with postpartum bonding disorder underwent a neurofeedback training 3-4 months after birth. During three training sessions mothers learned to consciously increase activation in reward-associated brain areas (or a control region – clinical control group) during the presentation of images of their own infant.Preliminary results point to an improvement of bonding after the neurofeedback intervention. Additionally, questionnaire data reveal potential risk factors for the development of bonding disorder.Results will be discussed regarding their implications for innovative therapeutic interventions as well as for prevention of postpartum bonding disorder. Regarding long-term consequences for child development, better understanding of the underlying mechanisms of bonding disorder and improvement of intervention strategies are of high clinical relevance.

S36.1 - Affectionate Touch of Loved Ones and Endogenous Oxytocin Affect Individuals' Well-being in Times of Prolonged Stress

E. Schneider[1,2], **D. Hopf**[1,2], **M. Eckstein**[1,2], **D. Scheele**[3], **C. Aguilar-Raab**[1,2], **B. Ditzen**[1,2]

Saturday 09:00 - 10:30 | Lecture Hall N9

[1] Heidelberg University Hospital, Germany
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[3] Ruhr-University Bochum, Germany

Background: Affectionate touch is vital for mental and physical health but was restricted during the Covid-19 pandemic. This study investigated the association between momentary affectionate touch and subjective well-being as well as salivary oxytocin and cortisol in everyday life during the pandemic. Methods: In a cross-sectional (N=254) and a longitudinal (N=196) assessment during lockdowns in Germany, participants completed a 2-day ecological momentary assessment (EMA) protocol (collecting six saliva samples on two consecutive days each and simultaneously reporting on affectionate touch, stress, and burden levels) in 2020, as well as one year later, in 2021. Results: Hierarchical linear modeling revealed that affectionate touch was associated with higher salivary oxytocin concentrations, and lower cortisol and stress levels in their everyday life during the pandemic. Preliminary results of longitudinal data showed that affectionate touch and oxytocin levels measured in 2020 significantly predicted subjectively reported lower stress levels in 2021. Discussion: These results suggest that affectionate touch is linked to higher endogenous oxytocin in times of pandemic and might buffer stress on a subjective and hormonal level. These findings might have implications for preventing mental burden during social contact restrictions.

S36.2 - Ageing of Topographic Tactile Maps and Their Behavioural Implications

P. Liu[1,2,3]

Saturday 09:00 - 10:30 | Lecture Hall N9

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Topographic maps are a fundamental feature of cortex architecture in the mammalian brain. Their malfunctions can give rise to a multitude of sensory, motor, and cognitive functions and associated deficits. One common theory is that brain ageing leads to the 'de-differentiation' of topographic maps, which can be conceptualised as greater map activation, larger map area, more noisy units and/or less cortical inhibition between neighbouring units. Moreover the de-differentiation process was assumed to give rise to maladaptive behaviour. With the combination of ultra-high resolution 7T functional magnetic resonance imaging (7T-fMRI) of human primary somatosensory cortex (S1) topographic maps, computational modelling and psychophysical assessments of everyday sensory and motor tasks, we disproved this theory. We found that older adults do not show greater map activation or larger map areas, but show larger population receptive field sizes (i.e., the cumulative response of a population of neurons within a fMRI voxel), more overlapping neighbouring sensory representations but less similar distant representations, and reduced cortical distance (i.e., the distance between finger representations) between index finger and middle finger representations in S1. Given the latter was related to worse finger individuation but better motor performance, the present work uncovers the drawbacks of a simple de-differentiation model of topographic map function, and motivates the introduction of feature-based models of cortical reorganisation. This does not only allow us to investigate human sensory ageing more comprehensively, but also help us better understand age-related changes in topographic map architectures and their behavioural correlates.

S36.3 - Perception Of Touch And Space In Patients With Complex Regional Pain Syndrome

X. Fuchs[1,2], **W. Witte**[3], **T. Heed**[1,2]

Saturday 09:00 - 10:30 | Lecture Hall N9

[1] Cognitive Psychology, Department of Psychology, University of Salzburg, Salzburg, Austria
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Some studies have suggested that 'neglect-like' disturbances related to the perception of the own body and the surrounding space play an important role in complex regional pain syndrome (CRPS). For example, tactile processing speed and skin temperature in unilateral upper-limb CRPS patients was reported to be lower for the affected than for the contralateral hand. However, this relationship reversed when the hands were crossed, presumably because the affected hand was moved away, and the non-affected hand was moved into the pain-associated portion of space. We attempted to replicate and extend these findings using recordings of tactile processing speed, tactile distance perception, and skin temperature. We also separated effects related to space from effects of hand crossing. In sum, we do not find clear evidence for a role of disturbance of space in any of the tested paradigms. This evidence adds to several other recent studies that have reported failure to replicate the originally reported, strong, neglect-like effects in CRPS and, thus, calls into question a significant relationship between CRPS, body perception, and space. Instead, underlying mechanisms of CRPS might be more heterogenous and neglect-like symptoms might only play a role in a subset of patients.

S36.4 - Don't Touch? - The Neural Signature of Social Touch in Borderline Personality Disorder

J. Voelter[1]

Saturday 09:00 - 10:30 | Lecture Hall 7E02

University of Oldenburg, Germany

Social connections have a strong impact on physical and mental health. Health benefits of social connections can result from interpersonal touch, a phylogenetically ancient mechanism to provide comfort to conspecifics. Although interpersonal problems are a core symptom of Borderline Personality Disorder (BPD), little is known how social touch is processed in BPD. Preliminary evidence indicates that BPD patients perceive touch as less pleasant and intense than healthy controls (HC), but the underlying neural mechanisms remain unclear. Therefore, the current study aims to shed light on possible pathological distortions of touch perception and related neural substrates in BPD and how these might improve after one month of inpatient Dialectical Behavior Therapy (DBT). BPD patients and HC underwent functional magnetic resonance imaging (fMRI) to investigate neural correlates of social and non-social touch and completed questionnaires to further assess constructs related to an altered touch perception. Furthermore, comfort zones of social touch were assessed with a computerized task. To probe treatment-related changes, the behavioral and neural measurements were repeated after one month of inpatient DBT and compared to changes in a control group. This study will offer novel insights into a neglected core component of interpersonal functioning in BPD.

S37.1 - Uncovering Cognitive Load in Natural Work Environments: The Potential of Eye-Activity Related Mobile Neurophysiological Methods

J. E. Reiser[1], **E. Alyan**[1], **S. Arnau**[1], **E. Wascher**[1]

Saturday 09:00 - 10:30 | Lecture Hall 7E02

Leibniz-Institut für Arbeitsforschung an der TU Dortmund, Germany

Modern work environments are strongly characterized by cognitive work demands. However, in these activities cognitive load is often challenging to measure using behavior-based methods. Even questionnaire-based survey methods may encounter limitations when subjective perception and objective stress response diverge. Here, mobile neurophysiological methods - such as the mobile EEG - help to capture the objectifiable demands of such situations. Mobile amplification technology also allows event-related potentials to be analyzed in natural environments without presenting additional stimuli. Using new analysis methods, such as linking eye blink activity and EEG, has opened up possibilities for studying mental processing in a wide range of natural environments. To investigate the validity of blink-evoked potentials, EEG was recorded in naturalistic settings such as an operator workstation and a naturalistic driving simulation. Participants were allowed to move freely and interact with the interfaces in a natural manner. A range of blink-evoked EEG measures was employed, revealing consistent variations across experimental workload conditions. These differences could be used to draw meaningful conclusions about the cognitive load underlying the observed responses. Variations in blink-related potentials indicated that higher visual demands and increased expenditure of attentional resources occurred in higher load conditions. Also, time-frequency analyses (alpha, theta) indicated that more demanding conditions required increased levels of executive control functions and action control. This resulted in increased connectivity of functionally relevant brain areas. These findings highlight the potential of mobile neurophysiological methods to capture the complexities of cognitive work practices and provide valuable insights into improving workplace productivity and well-being.

S37.2 - Advancing The Study Of Mental States With (Mobile) ECG: Challenges, Advantages, And Practical Approaches

M. Gaebler[1]

Saturday 09:00 - 10:30 | Lecture Hall 7E02

Max Planck Institute for Human Cognitive and Brain Sciences, Germany

Research on the biology of mental (e.g., cognitive or affective) states has often concentrated on activity in the central nervous system (CNS). However, the autonomic nervous system (ANS) plays a crucial role for cognitive-affective processes and concomitant CNS activity. Electrocardiography (ECG) offers a non-invasive approach to measure ANS activity – also in naturalistic (i.e., dynamic and interactive) settings. For example, heart rate variability can index parasympathetic cardioregulation. I will present our work on acquiring ECG data in classical lab setups, in "traveling experiments", in real-world scenarios (using ambulatory assessment), and in immersive virtual reality (VR) environments – also in combination with other measures of activity in the brain (e.g., electroencephalography, EEG) and the rest of the body (e.g., respiration). I will focus on methodological advantages (e.g., the ability to collect continuous data), challenges (e.g., artifacts and data analysis complexity), and limitations of (mobile) ECG technology. I will also share practical tips and considerations for researchers who want to use (mobile) ECG. Advancing the practical use of (mobile) ECG in psychophysiological research can enhance our understanding of the complex interplay between the mind, the brain, and the rest of the body.

S37.3 - Investigating Learning Processes with Functional Near-infrared Spectroscopy and Virtual Reality

K. Lingelbach[1,2], **M. Vukeli?**[1]

Saturday 09:00 - 10:30 | Lecture Hall 7E02

[1] Fraunhofer Institute for Industrial Engineering IAO, Germany
[2] Department of Psychology, Carl von Ossietzky University, Germany

Companies striving to maintain competitiveness must re-skill employees using appropriate training environments. Virtual Reality (VR) provides immersive learning experiences that offer secure and cost-effective exploration of actions, as well as customization to individual users. To identify the user's needs, a Brain-Computer Interface (BCI) is a suitable technology to measure and interpret brain activity associated with current mental states such as working memory load. Recent advancements in mobile functional near-infrared spectroscopy (fNIRS) allow measuring brain activity in real-world BCI applications. In this longitudinal fNIRS study, we investigate different levels of working memory load and dynamics indicating learning progress in an industrial VR learning scenario. During three learning sessions, nine participants (four female, mean age of 28 ± 3.28 years) completed learning units of two difficulty levels (low vs. high working memory load). We analysed the underlying neuronal correlates using linear mixed-effects models and machine learning-based decoding. Our results revealed a non-linear relationship between working memory load and brain responses in the prefrontal cortex. In the first session, a clear distinction was observed, with higher right prefrontal cortex activation during high load. However, in the subsequent session, when the overall difficulty level was increased, the prefrontal cortex pattern disappeared, possibly due to excessive load or overload. In the last session, the increased right prefrontal cortex activity was re-established, indicating learning progress. Our study demonstrates the potential of fNIRS-based BCIs in applied VR learning scenarios and provides insights into the neuronal correlates of working memory load and associated learning progress.

S37.4 - Using Mobile EEG To Study Sound Processing In The Operating Room

M. Rosenkranz[1], **T. Haupt**[1], **M. Jaeger**[1], **T. Cetin**[2], **V. N. Uslar**[2], **M. G. Bleichner**[1,3]

Saturday 09:00 - 10:30 | Lecture Hall 7E02

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[3] Research Center for Neurosensory Science, University of Oldenburg, Oldenburg, Germany

In demanding work situations, such as during a surgery, the soundscape can be a burden for medical staff. While background noise in the operating room (OR) has long been identified as a stressor for medical staff, the exact effects are difficult to measure. Surgeons rate the soundscape as disturbing, however, OR noise does not immediately lead to poorer surgical performance. Therefore, surgical performance is not a good measure to quantify the individually experienced noise induced burden. Instead, we use mobile electroencephalography (EEG) to capture sound processing continuously and without interference with the ongoing surgical procedure to understand when sound becomes a burden. We gradually developed our empirical approach to ultimately study medical staff in the OR. First, we constructed an audio-visual-motor task, i.e., participants played Tetris while they listened to a complex soundscape that included OR sounds. Second, participants performed a small laparoscopic task on a surgical simulator with a similarly complex soundscape under low and high memory conditions. In both studies we analyzed the event related and continuous neural response to the complex soundscape using event related potentials and temporal response functions, respectively. Our results demonstrate the feasibility of our approach and represent important steps towards using mobile EEG as a promising tool to study individual sound perception in the OR.

Poster session 1

Computational Methods and Neuroimaging

P.199 - Investigating Robust Associations Between Functional Connectivity Based On Graph Theory And General Intelligence

D. Metzen[1], C. Stammen[2], C. Fraenz[2], C. Schlüter[1], O. Güntürkün[1], E. Genç[2]

Poster Session 1

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Studies analyzing the relation between general intelligence and graph theoretical properties of the brain's intrinsic functional network yielded contrary results. We used a multi-center approach based on different imaging sessions of four independent samples (N > 2000) to check whether robust associations across samples exist between g factor scores and global as well as node-specific graph metrics. On the global level, g was significantly positively associated with global efficiency in one sample and with global clustering coefficient in almost all data sets, while no significant associations with small-world propensity existed. On the node-specific level, elastic-net regressions for nodal efficiency or local clustering yielded no areas with consistently positive or negative significant effect sizes across data sets. Comparisons between or within imaging sessions of the same sample also did not result in an overlap of more than 36.8%, despite moderate to good test-retest reliability of efficiency metrics. Thus, using conventional graph theoretical approaches based on resting-state imaging did not result in replicable associations between functional connectivity and general intelligence.

P.207 - Exploration Mechanisms in Recurrent Neural Networks Models During Reinforcement Learning in Volatile Environments

D. Tuzsus[1], **I. Pappas**[2], **J. Peters**[1]

Poster Session 1

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A key feature of animal and human decision making is to balance exploring unknown options for information gain (directed exploration) versus exploiting known options for immediate reward, which is typically examined using restless bandit problems. Recurrent neural network models (RNNs) have recently gained traction in both human and systems neuroscience work on reinforcement learning. Here we comprehensively compared the performance of a range of RNN architectures on restless four-armed bandit problems. The best-performing architecture (LSTM network with computation noise) was able to solve the tasks on par with human-level performance. Cognitive modeling showed that human and RNNs data is best described by a learning model with terms accounting for perseveration and directed exploration. However, whereas human learners exhibited a positive effect of uncertainty on choice probability (directed exploration), RNNs showed the reverse effect (uncertainty avoidance) in conjunction with increased perseveration. RNN hidden unit dynamics revealed a form of win-stay-lose-shift behaviour, such that exploratory choices were associated with a disruption of choice predictive signals during states of low state value, resembling previous findings in monkey single unit recordings recorded from the prefrontal cortex. Our results highlight both similarities and differences between exploration behavior as it emerges in RNNs, and computational mechanisms identified in cognitive and systems neuroscience work.

P.214 - A Laminar Signature of Pain in the Human Insular Cortex

O. Goltermann[1,2,3], **B. Horing**[1], **J. Finsterbusch**[1], **C. Büchel**[1]

Poster Session 1

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[3] Max Planck School of Cognition

The computational principles underlying the processing of pain in the human brain on a microscopic to mesoscopic level are poorly understood. Previous neuroimaging studies have suggested that the insular cortex, a part of the brain located deep within the lateral sulcus, plays a key role in the integration of pain experiences and is therefore considered a central hub for the processing of pain. In line with a predictive coding account of pain, studies investigating the neural activity related to thermal heat pain revealed a functional axis within the insula where activity changes in the anterior part are associated with the anticipation of pain, while changes in the posterior part reflect the intensity of a painful stimulus. This functional dissociation is consistent with anatomical work in animal models showing that the cytoarchitectonic organization of the insular cortex varies along an anterior-posterior axis and divides the insula into different subdivisions with unique functional connectivity properties. To investigate whether this functional dissociation is also reflected in cortical layers and columns, we used high-field magnetic resonance imaging in humans to map cortical information processing at a mesoscopic spatial scale. Our preliminary results demonstrate different laminar signatures of pain and pain onset prediction at different locations within the human insular cortex. These observations help to bridge the gap between microscopic findings from animal research and macroscopic findings from human neuroimaging by pushing the spatial limits of current in-vivo human neuroimaging techniques in pain research.

P.217 - Exercise-Induced Hypoalgesia (EIH) After Aerobic Exercise And The Endegenous Opioid System – a Pharmacological FMRI Study

J. Nold[1], **C. Büchel**[1]

Poster Session 1

University Clinic Hamburg Eppendorf (UKE), Germany

Exercise-induced hypoalgesia (EIH) refers to an attenuated pain perception following different types of exercise in healthy humans (Koltyn, 2000; Naugle et al., 2012). Although numerous studies have investigated EIH over the past century, results remain controversial (Naugle et al., 2012; Vaegter et al., 2020; Wewege Jones, 2020). We aimed to induce EIH after 10-minute long bouts of aerobic exercise for pressure and heat pain. Furthermore, we want to test whether EIH is regulated by the endogenous opioid system by administering naloxone.To this date, 12 healthy participants (6 female, age: 18 – 45 years, BMI: 18 - 30) completed 2 sessions (within-subject) cycling on a stationary bike for 4 blocks of 10 minutes of moderate-high and low intensity. Each block was followed immediately by an fMRI scan where participants received 15-second-long painful heat (through a thermode attached to the left lower arm) and pressure (through a cuff around the left upper arm) stimuli in an alternating fashion. We employed a double-blind, RCT design, where participants were blind to the pharmacological intervention with naloxone (opioid-antagonist) and saline.Due to the risk of bias and currently low sample size, results concerning the effect of naloxone and exercise cannot be analysed as of now. However, preliminary analyses comparing heat and pressure pain convey distinct as well as overlapping temporal and spatial activation patterns. Results of the complete dataset will be presented at the conference.This study aims to provide a comprehensive investigation of EIH on a cortical and pharmacological level.

P.222 - I Knew I Would See You Here! Combining Computational Modelling with Multivariate fMRI to Investigate the Influence of Scene Context on Face Representations

A. Garlichs[1], **H. Blank**[1]

Poster Session 1

University Medical Center Hamburg-Eppendorf, Deutschland

Why are we better at recognizing a familiar face at an expected location, e.g., it is easier to recognize a colleague in the office than at the beach during a holiday? Context effects on face perception have been previously investigated with functional magnetic resonance imaging (fMRI) revealing an expectation suppression effect, i.e., reduced brain activation for expected compared to unexpected faces. This reduced activation could arise from different mechanisms: (a) A smaller prediction error (PE) or (b) a sharpened face representation. We combined computational modelling based on a deep neural network (VGG-Face) with multivariate representational similarity analyses to investigate which of these two processes takes place at different stages of the face-processing hierarchy. Participants learned to associate scene images with four distinct faces and had to identify the presented face. The faces were either unambiguous or ambiguous face morphs. We observed a facilitation effect, i.e., faster reaction times for expected compared to unexpected faces and an assimilation effect, i.e., face morphs were more often identified as the expected face identity. Univariate fMRI replicated an expectation suppression effect in the fusiform face area (FFA) and in the middle temporal gyrus (MTG). Multivariate analyses revealed evidence for PE processing along the whole ventral face-processing hierarchy (occipital face area (OFA), FFA, MTG, anterior temporal lobe (aTL)). In addition, there were indications for sharpened face representations in bilateral OFA. In conclusion, our results support the idea that the human brain represents faces depending on how they were expected in a certain context.

P.259 - Flooding Brain Waves: Mobile EEG Acquisition During Freestyle Swimming

M. Klapprott[1], **S. Debener**[1,2,3]

Poster Session 1

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Mobile electroencephalography (EEG) enables the study of brain-electrical activity during natural human behavior such as walking or cycling. Previous work showed that mobile EEG can capture how demanding natural actions are, using a dual tasking approach and the assessment of cognitive-motor interference (CMI). Here we explored whether it is feasible to measure EEG during freestyle swimming, a rather hostile activity and recording condition for EEG acquisition. 11 experienced swimmers were given an active auditory oddball task while sitting and swimming. The task was implemented on a smartphone placed in a swim buoy and 30-channel EEG data were recorded with a head-mounted wireless amplifier and a custom cap, both of which were made waterproof with a silicone cap and medical tape. The auditory evoked potential N100 was analysed as an index of EEG recording setup functionality and stimulus detection, the P300 event-related potential served as an indicator of the processing demands allocated to the auditory task. 8 valid datasets were obtained and a single-subject oriented analysis approach was used. Whereas 7 participants showed an N100 component in all three conditions (seated pre swimming, during swimming, seated post swimming), a clear P300 reduction during swimming compared to seated conditions was found only in 1 participant. We conclude that it is feasible to obtain EEG signals of reasonable quality during conditions as hostile as during swimming. However, further improvements are needed to capture the cognitive demands of complex whole body physical activities with mobile EEG reliably.

P.295 - Dissociating The Link Between Inhibition-Related Brain Response, The Degree Of Substance Use And Substance-Related Problems

M. Hildebrandt[1], **K. Schwarz**[1], **R. Dietrich**[1], **T. Endraß**[1]

Poster Session 1

TU Dresden, Germany

Background: Blunted inhibition-related brain response is a promising phenotype for substance use disorder (SUD). Inconsistencies between studies could result from distinctive processes related to the degree of substance use and the severity of substance-related problems – two correlated but distinct facets of SUD. This preregistered study tests whether inhibition-related frontal hypoactivation is specifically linked to substance-related problems in SUD, beyond the degree of substance use.Methods: A stop signal task during fMRI, trait self-control, substance use and substance-related problems in the last 12 months were assessed in 121 (poly-)substance users. 107 participants completed a one-year follow-up. We examined the association between multimodal indicators of inhibition (neural activation in regions-of-interest, inhibitory performance, trait self-control) and substance-related problems, while controlling for the degree of substance use.Results: Hypoactivation in the right inferior frontal gyrus explained variance in substance-related problems beyond the degree of substance use, while hyperactivation in the same region explained variance in substance use beyond problems, both cross-sectionally (problems: $p=.048$, use: $p<.01$) and prospectively (problems at trend level: $p=.096$, use: $p=.01$). Trait and behavioral inhibition were unrelated to problems beyond substance use ($ps>.05$).Conclusion: We demonstrate that inhibition-related frontal hypoactivation specifically relates to substance-related problems. Interestingly, an increased activity may even represent a resilience factor in substance use without SUD. Future studies should distinguish between processes linked to the degree of use and substance-related problems, to disentangle why some substance users develop SUD.

P.296 - Neural Correlates of Auditory Consciousness: a No-Report fMRI Study

T. Dellert[1,2], **H. Balster**[1], **R. Moeck**[1], **I. Schlossmacher**[1,2], **M. Bruchmann**[1,2], **T. Straube**[1,2]

Poster Session 1

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How does our brain generate consciousness, that is, the subjective experience of what it is like to see, hear, think or feel? In the search for neural correlates of consciousness (NCC), predominant theories disagree about the role of early, sensory versus late, fronto-parietal activity. Previous studies have focused on visual perception, and awareness was often confounded with task-related processes (e.g., decision-making and report). In the present study, we aimed at isolating NCC in auditory perception using functional magnetic resonance imaging (fMRI) and a no-report inattentional deafness paradigm. Sixty-three participants were asked to perform an auditory distractor task while task-irrelevant speech stimuli were presented in the background. Whereas one group was informed about these critical stimuli and later reported awareness of them, another group remained uninformed and experienced inattentional deafness. After the awareness assessment, both groups were able to detect the sounds. Comparing brain responses to the task-irrelevant speech stimuli between aware and unaware participants revealed strongly increased activity in the bilateral superior and middle temporal gyrus. Activation of fronto-parietal regions, on the other hand, was considerably weaker. These findings support a dominant role of sensory rather than widespread fronto-parietal information processing in conscious auditory perception.

P.353 - 50 First Dates: An fMRI Study on Social Risk Perception in Individuals with Alcohol Use Disorder

A. Wolber[1], **S. N.L. Schmidt**[1], **L. Lipinski**[1], **S. Stumpp**[1], **N. Büchele**[1], **M. Odenwald**[1], **B. Rockstroh**[1], **D. Mier**[1]

Poster Session 1

Universität Konstanz, Deutschland

Introduction: Functional imaging studies report the involvement of the salience network in evaluating perceived risk. Viewing individuals that are rated as "not trustworthy" is associated with activation in medial prefrontal cortex (mPFC), bilateral insula, and ventral striatum, but not viewing of individuals previously categorized as likely having a sexually transmitted infection (STI).Methods: In an ongoing preregistered study, 21 patients with alcohol use disorder (AUD) and 14 healthy controls (HC) viewed 50 images of unknown individuals (25 had been previously categorized as high-risk being infected with STI, 25 as low-risk) during an fMRI measurement. Participants were instructed to rate the trustworthiness of the presented individuals in an imagined dating situation. Data was acquired with a 3 T Siemens Syngo MRI, and analyzed with SPM12.Results: Preliminary analysis of trustworthiness ratings revealed a tendency for activation in left anterior insula in the contrast “not trustworthy vs trustworthy” only in AUD. Analysis by pre-categorization revealed significant activation in the right dorsolateral prefrontal cortex in “low risk vs high risk” contrast in AUD and a tendency in the mPFC in “high risk vs low risk” contrast in HC.Discussion: These initial results support the role of the salience network in interpreting (social) health risk in AUD. Analyses with a larger sample will show whether we can also replicate the findings of salience network involvement in HC, and reveal potential group differences.

P.354 - Hunting SNARC Across the Cortex: A Fronto-parietal tDCS-fNIRS Study

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Poster Session 1

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Cognitive-behavioral representations such as the spatial-numerical association of response codes (SNARC) effect may emerge in fronto-parietal circuits across cortical regions. A previous neuroimaging study with functional near-infrared spectroscopy (fNIRS) showed signatures of the SNARC effect in bilateral parietal regions. At the same time, brain stimulation of the left prefrontal cortex with cathodal transcranial direct current stimulation (tDCS) reduced the SNARC effect. By combining 1 mA cathodal tDCS with fNIRS during magnitude comparison task, we investigate the neural effect of prefrontal stimulation on brain activity in the parietal cortex.Following the assumption that the SNARC effect is causally generated by a fronto-parietal network, we would expect that prefrontal cathodal tDCS should reduce both parietal activation in the intraparietal sulcus (IPS) and the behavioral SNARC effect. However, if parietal activation as a signature of number representation was only remotely implied in the activation of spatial-numerical associations, only the behavioral SNARC effect would be reduced.The design of our study is a within-subjects cross-over design with the factors stimulation (cathodal tDCS vs. sham tDCS), congruency (SNARC incongruent vs. SNARC congruent), and hemisphere (left vs. right parietal activation). According to power analysis, a sample size of 36 healthy participants is required, with an additional 25% for possible dropouts. Measured variables are concentration changes in oxygenated hemoglobin (HbO) in the posterior parietal cortex (ROIs: channels over the left and right IPS), and reaction time (RT) as a behavioral outcome. Our hypothesis and analysis plan are preregistered (osf.io/svn5e) and we will also present the first results.

P.452 - An Adaptive Web-based Framework for Manipulating Behavior in fMRI Experiments

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Poster Session 1

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One way to improve event-related fMRI studies is to improve the efficiency of the behavioral experiments under investigation. Here we present a novel behavioral model and web-based framework to generate adaptive experiments. After inferring underlying latent behavior models from an internet-based task session outside the scanner (usually at home), adaptive experimental trials are generated to elicit predictable behavior during a second session (e.g. in the fMRI). This approach further allows to compare and validate different behavioral models based on out-of-sample prediction error estimates. We will demonstrate the effectiveness of the proposed framework through data obtained from web-based experiments in three different decision-making tasks: a delay discounting task, a probability discounting task, and a combined delay and probability discounting task. We will describe the technical background of the open-source internet platform and present the development of an efficient fMRI task design through iterative online studies. The presented framework can be easily applied to other cognitive and affective research domains and may help to highly resolve cognitive constructs in neuroimaging studies.

P.163 - Are Catechol-O-methyltransferase Gene Polymorphisms Genetic Markers For Pain Sensitivity After All?

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Poster Session 1

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Although pain sensitivity likely underlies polygenic influences, the catechol-O-methyltransferase (COMT) gene has arguably been the designated pain sensitivity gene for nearly two decades. Single nucleotide polymorphisms (SNP) as well as haplotypes have been implicated in various pain phenotypes as well as chronic pain conditions. However, the literature provides inconsistent evidence. Therefore, we aimed at sorting the literature and enhancing statistical power to answer the question whether ultimately COMT polymorphisms are genetic markers of pain sensitivity.Electronic data bases were searched for relevant records published or in press before July 2022. We performed several meta-analyses including a total of k = 31 samples and n = 4631 participants. The effects of rs4680, rs6269, rs4633, rs4818 as well as the respective haplotypes on pain thresholds were assessed, thereby accounting for different pain modalities and pain status. Besides, subanalyses were run to investigate the influence of measuring pain threshold at affected vs. unaffected body sites.We found small effects of rs4680 on pain sensitivity in fibromyalgia, chronic pain as well as in pain patients when affected body sites were assessed. No effect was found for any of the other SNPs. Importantly, we could corroborate earlier findings associating COMT haplotypes and pain sensitivity.Our results support the idea that COMT might only impact behavioural measures of pain when descending pain modulatory pathways are sufficiently challenged. After all, COMT gene polymorphisms are genetic markers of pain sensitivity, albeit with some limitations which are discussed with respect to their implications for research and potential clinical significance.

P.191 - When Easy Is Not Preferred: A Discounting Paradigm To Assess Load-Independent Task Preference

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Poster Session 1

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When individuals set goals, they consider the subjective value (SV) of the anticipated reward and the required effort, a trade-off that is of great interest to psychological research. One approach to quantify the SVs of levels of a cognitive task is the Cognitive Effort Discounting Paradigm by Westbrook and colleagues (2013). However, it assumes a unidirectional, inverse relationship between task load and SVs. Therefore, it cannot map differences in effort perception that arise from traits like Need for Cognition, since individuals who enjoy effortful cognitive activities likely do not prefer the easiest level. We replicated the analysis of Westbrook and colleagues with an adapted version, the Cognitive and Affective Discounting (CAD) Paradigm. It quantifies SVs without assuming that the easiest level is preferred, thereby enabling the quantification of SVs for tasks without objective order of task load. Results show that many participants preferred a more or the most difficult level. Variance in SVs was best explained by a declining logistic contrast of the n-back levels and by response accuracy, while reaction time as a predictor was highly volatile across all 63 preprocessing pipelines. Differences between subjective effort, aversion, and SVs between participants with higher versus lower Need for Cognition scores emerged only in the more difficult n-back levels. The CAD Paradigm appears to be well suited for assessing and analysing task preferences independent of the supposed objective task difficulty, which opens up new perspectives to investigate the interplay of subjective and objective effort and their physiological correlates.

P.216 - Social High Performers Under Stress Behave More Prosocially And Detect Happy Emotions Better

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Psychosocial stress is increasing in society, impacting our lives in all social domains. However, the conditions under which stress facilitates ("tend-and-befriend") or hinders ("fight-or-flight") social approach remain elusive. We tested whether heterogeneous findings might be resolved by accounting for individual differences in social performance under stress. For that purpose, we introduce the novel Trier Social Stress Test (TSST) social performance index that was aggregated across ratings from two independent observers. Moreover, we apply an innovative setup enabling electroencephalographic (EEG) data to be measured inside an electrically-shielded cabin during stress, namely the TSST-EEG. Relying on a sample of 59 healthy male participants, we collected behavioral (i.e., sharing resources with others) and cognitive (i.e., detecting facial emotional expressions) approach patterns while participants experienced either acute psychosocial stress (n = 31) or no stress (control condition; n = 28) and while EEG was being recorded. During stress exposure, high-performing participants be-haved more prosocially, and differentiated better between happy and neutral emotions on both behavioral and neurophysiological levels (revealed by intensity differences in a N170-like response). Overall, our findings demonstrate the added value of both the novel TSST social performance index and the novel TSST-EEG setup. By showing that high social performance during the TSST is associated with behavioral, cognitive, and neurophysiological approach patterns, our study illuminates psychobiological mechanisms in coping with psychosocial stress. Future stress research should address the role of social performance differences during stress in social interaction to better understand the behavioral consequences of psychosocial stress in humans.

P.246 - Acute Stress Alters Self-Controlled Decision-Making

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Poster Session 1

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Self-control refers to the ability to resist immediate temptations or to endure short-term aversions in order to reach personally valued long-term goals (Inzlicht et al., 2014; Krönke, Wolff, Mohr, et al., 2020). Here, we investigated the relationship between acute and chronic stress measures and behavioral and neural underpinnings of self-control using an fMRI self-control task involving decision-making scenarios with potential real-life relevance. In a sample of N = 190 participants, we show that resisting temptations seemed to be more difficult than enduring aversions as indicated by elevated self-control failures. Further, an interaction of acute stress, anticipated action consequences, and type of self-control conflict (resisting temptations vs. enduring aversions) predicted choice behavior: Stressed participants, as opposed to participants in the control group, were more strongly influenced by anticipated short-term action consequences in their decisions. This was specifically the case for the negative short-term consequences characteristic of endure aversion conflicts. Finally, we point out neural correlates of decision-making in self-control conflicts and its alterations by acute stress, focusing on the ventromedial prefrontal cortex. This study is among the first to investigate the neural basis of stress-induced changes in self-controlled decision-making using real-life decision scenarios. Our results emphasize the role of anticipated action consequences in decision-making under stress.

P.271 - The Interplay Of Telomere Length And The Expression Of DNA Damage Repair Genes In The Biological Embedding Of Traumatic Experiences

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Poster Session 1

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Traumatic life events can threaten mental and physical health. A body of evidence points towards a mediating role of both the immune system and oxidative stress in the biological embedding of traumatic stress. Accordingly, increased DNA damage is associated with traumatic stress. We investigated the interplay between telomere length as a marker of cellular stress and the expression of DNA repair genes PARP1 and XRCC1 in circulating immune cells in a cohort of postpartum women (N = 100) as well as in a cohort of individuals exposed to war, torture, and civil traumatic events (N = 24). In postpartum women with moderate experiences of childhood maltreatment (CM) a significant negative association between telomere length and PARP1 gene expression could be found (pHolm = .003, $?p^2$= 0.1). There was no significant association in women without experiences of CM (pHolm = .635, $?p^2$= 0.003). In a cohort of war- and torture-exposed individuals telomere length was negatively associated with both PARP1 (p = .02, $?p^2$= 0.23) and XRCC1 (p = .011, $?p^2$= 0.27) gene expression. Our results suggest that traumatic experiences necessitate immunocellular DNA damage repair which is inversely linked to telomere length pointing towards permanent cellular stress. This does not only apply to severe traumatic experiences manifested as post-traumatic stress disorder but also to CM to a certain extent. Our findings support the assumption of an allostatic load triggered by traumatic experiences, likely mediated by oxidative stress, on account of which the body needs to enhance energy-depleting compensatory mechanisms.

P.290 - Comparison Of Two Classical And One Novel Behavioral Approach-avoidance Tasks In Relation To Interindividual Differences And Their Reliability

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Poster Session 1

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Approach-avoidance behaviors are essential ways to respond to the environment and strongly differ between humans. These differences in approach-avoidance tendencies are assumed to relate to a number of interindividual differences (e.g., avoidance to trait anxiety; approach to trait aggression). To investigate approach and avoidance behaviorally, two prominent tasks are the joystick and the manikin task in which two classes of stimuli are presented, e.g., happy and angry faces, which participants are instructed to approach or avoid . However, it has been recently questioned how reliably measures of classical task-based approach-avoidance behavior predict interindividual differences.In this preregistered study, we used a correlational design in which 168 participants completed three behavioral approach-avoidance tasks (joystick, manikin and a novel translational approach-avoidance conflict task; AACT) and answered several personality questionnaires (e.g., state and trait anxiety, trait aggression, trait approach-inhibition). Approach-avoidance outcomes of the manikin and joystick tasks (bias measures) were not significantly correlated, suggesting that they assess different constructs. Moreover, only measures of the AACT correlated as hypothesized with questionnaire scores (trait behavioral inhibition and physical aggression). Finally, internal consistency of approach-avoidance measures of the classical tasks was subpar, but good for the AACT . Our findings suggest that the AAT and the manikin task measure different constructs. Moreover, depending on the specific experiment details (stimuli, instructions, etc.), reliability can be rather low and should be reported routinely when using these tasks. Novel tasks can have improved reliability and validity, but further research on the best implementation of these tasks is needed.

P.310 - Stress in Daily Life – A Gene-Environment Interaction Study

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Poster Session 1

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Psychological stress can be caused by many factors, including interpersonal conflicts, work-related stress, and loneliness. People have different ways of coping with stress, and it's important to understand why some people are more affected by daily stressors than others. In order to examine how daily hassles affect emotions, the effects of positive social interactions on reducing negative effects of stress, and explore gene-environment interactions on emotional responses to stress; an online questionnaire about oneself, daily tasks, feelings, and thoughts is presented to 600 participants using an ecological momentary assessment design. The participants answered the questions using their smartphone while they went on with their regular routine in daily life in a six-month period, 5 times a day, 4 days straight, for 3 times. Genetic samples are collected to investigate whether genetic disposition for stress related disorder moderates the association between stress exposure and emotional states. Polygenic risk scores for different mental health problems are used as moderators to to test for potential gene-environment interaction. This can provide important insights into the complex interplay between genetics and the environment in the development of mental health problems. Results will be presented at the conference.

P.318 - Methylation Analysis in Psychology – Methodological Considerations

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Poster Session 1

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Epigenetic research, especially methylation studies, gain popularity in psychology. However, sample characteristics, precision and reliability are often accompanied by a lack of appropriate information. Our aim is to provide an exemplary procedure for methylation analysis of the MT2 region in the oxytocin receptor gene.Bisulfite Conversion: Methylation of target regions becomes visible after bisulfite treatment of DNA resulting in the conversion of unmethylated cytosine (C) into uracil (later thymine, T). DNA quality ration is pivotal and must be documented.Primer Design: Primer selection for bisulfite converted DNA is the most crucial step since primer binding is restricted to only 3 bases. It is suggested to add 300 to 500 bases up- and down-stream of the target sequence to increase the probability to find appropriate sequences. M13-tails are recommended for sanger sequencing.PCR Amplification Cycle Sequencing: The PCR should follow certain rules: (1) annealing temperature 2-5 degrees above primer melting temperature and (2) increase in annealing temperature approximately 3 degrees after the first 5 cycles to facilitate binding. The number of cycles must be identified individually.Purification Sanger Sequencing: Poor removal of dye terminators and salts can lead to excessive peaks at the beginning of the sequence. Precise selection of appropriate run modules and analysis protocols is central.Data Analysis: SNP analysis can be used to detect base exchange from C to T. A precise investigation of the raw data is recommended to analyze ambiguous bases. A positive control is advised to check the reliability of the complete procedure.

P.327 - Predicting Personality Scores from Structural-Functional Brain Network Coupling

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Poster Session 1

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Personality neuroscience examines individual differences in personality traits, which are stable patterns of thought and behavior. Neuroimaging studies have revealed neurobiological correlates of personality in structural and functional brain networks. However, it is unknown whether their agreement, the structural-functional brain network coupling (SC-FC coupling), is associated with individual differences in personality traits. Specifically, our preregistered hypotheses include the presence of significant associations during resting state and during tasks as well as the possibility to predict individual personality scores based on these associations.We used open data from 764 adults of the Human Connectome Project, derived structural connectivity from diffusion weighted imaging, functional connectivity from fMRI assessed during resting state and seven tasks, and obtained scores for five established personality traits (neuroticism, extraversion, agreeableness, openness, conscientiousness) from the NEO-FFI. One similarity measure and three communication measures were used to model functional interactions arising from structural brain networks. SC-FC coupling was estimated as degree to which these measures align with functional connectivity, providing insight into different neural communication strategies.On a whole-brain level, significant associations between measure-specific SC-FC coupling and personality traits were observed during resting state and during task. Further, features created from region-specific SC-FC coupling allowed to significantly predict individual personality scores ($p < .05$ by permutation test). All analyses will be replicated in a lockbox data sample.Our results provide new insights into neurobiological bases of individual differences in personality traits by highlighting the importance of global and region-specific neural communication strategies implemented during resting state and during tasks.

P.349 - Differences In Dynamic Reconfiguration Of Whole-brain Connectivity Are Related To Individual Differences In Working Memory Task Performance

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Poster Session 1

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The ability to store information in working memory critically depends upon whole-brain network states and their dynamic adaption to specific cognitive demands. Here we use data from the Human Connectome Project (N=978; 520 females) to study how whole-brain connectivity dynamics differ (i) between task and non-task (rest), (ii) between low (0-back) and high (2-back) task demands, and (iii) how task-related connectivity differences relate to between-person differences in working memory performance. Dynamic whole-brain connectivity was quantified as cofluctuation time series, i.e., the instantaneous co-activation strength between brain regions. Time-averaged cofluctuation during task is lower than during rest and two-back cofluctuation is lower than zero-back cofluctuation (both $p<.001$). We suggest that this reflects suppression of predominant but task-unrelated networks with increasing cognitive task demands. Focusing on connectivity dynamics, we observed that towards the end of each task block the strength of whole-brain cofluctuation jumps to a higher level and switching between blocks resets the cofluctuation to a level of weak connectivity. Lastly, we find that task performance is positively correlated to zero-back cofluctuation strength and variance ($r=.16$ and $r=.17$, both $p<.001$) but negatively correlated to the difference in cofluctuation strength between two-back and zero-back ($r=-.26$, $p<.001$). This may indicate that better performing subjects deviate less from resting-state under easy task conditions, but can adapt their whole-brain connectivity patterns more strongly under increased task demands. Overall, we show that differences in reconfiguration of whole-brain connectivity states are related to cognitive task performance.

P.125 - Sleep Spindle Maturity Promotes Slow Oscillation-Spindle Coupling

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Poster Session 1

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The temporal grouping of canonical fast spindles (12.5–16 Hz) precisely during slow oscillation up states is considered a fundamental property of adult non-rapid eye movement sleep. However, little is known about how this well-known coupling pattern develops. Using an individualized approach, we first identified age-specific patterns of slow and fast spindles, slow oscillations, and their coupling in children and adolescents aged 5–6, 8–11, and 14–18 years. Based on this, we then examined how spindle and slow oscillation maturity relate to age differences in their coupling profiles. Although the predominant type of fast spindles was identified in a frequency range below the canonical fast spindle range for the majority of children (development-specific), time-frequency analyses showed that the well-known slow oscillation-spindle coupling pattern was evident in the canonical fast spindle range in all three age groups—but notably less precise in children. Peri-event time histograms further implied that precise slow oscillation-spindle coupling might be driven by spindles in the canonical fast spindle range. To corroborate these findings, we linked personalized measures of fast spindle maturity, which reflects the similarity between the prevailing development-specific and canonical fast spindles, and slow oscillation maturity, which reflects the extent of their frontal dominance, with individual slow oscillation-spindle coupling patterns. Importantly, we found that fast spindle maturity was uniquely associated with enhanced slow oscillation-spindle coupling strength and precision. Taken together, our results suggest that the increasing ability to generate canonical fast spindles promotes precise slow oscillation-spindle coupling patterns across child and adolescent development.

P.165 - Previous and Current Action Targets Held in Working Memory Determine Repulsive and Attractive Serial Dependence

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Poster Session 1

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Serial dependence refers to a phenomenon where a current representation is biased by a previous representation. Current representations can be biased either in an attractive or a repulsive manner, i.e., they are inaccurately reported to be more similar or dissimilar to the previous representation, respectively. Here we tested whether the status of a representation as a previous or a potential future target for an action determines the occurrence of attractive or repulsive serial dependence. Participants had to memorize orientations of two gratings. One of them was cued for later report, i.e., it was further maintained as a potential target in working memory. The uncued stimulus could either be removed from working memory immediately or serve as a target for a secondary task before its removal. Subsequently, participants had to memorize the orientation of a third grating. When subjects were asked to report the third orientation, it was repulsed only by the previously encoded orientation that was still maintained as a potential target in working memory. At the same time, the third orientation was attracted towards the just removed orientation, but only if it had served as a target for the secondary task. These results support previous claims that repulsion serves as a mechanism to separate representations that are concurrently maintained in working memory, whereas attraction supports the integration of past and current representations. Our results additionally reveal that separation and integration operate only between representations that serve or have served as targets for an action.

P.183 - Neural Signatures Of Contingency Awareness

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Poster Session 1

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The recognition of the conditioned-unconditioned stimulus (CS-US) association in human fear conditioning is referred to as contingency awareness. A common view is that such simple forms of associative learning are independent of awareness. We challenge this view in an experiment where only some participants learned the association between CS and US. In this preregistered study (https://osf.io/vywq7), the participants heard words paired with tactile stimulation followed by either a neutral sound (CS-) or unpleasant loud noise (CS+). The condition depended on the word+vibration side compound. The participants were only instructed to listen carefully. Based on structured interviews, the participants were divided into aware (N=50) and unaware (N=31) groups. Questionnaires were administered to explore potential predictors of contingency awareness. Only the aware group showed signs of learning as expressed in a larger CS+/CS- difference in stimulus preceding negativity developing shortly before the US. In terms of oscillatory brain activity, the aware group showed stronger alpha-beta suppression before and in response to the vibration. Moreover, the aware group scored higher on the intolerance to uncertainty scale and had a narrower distribution of trait anxiety. These findings support the notion that associative learning cannot occur without contingency awareness. We conclude that contingency awareness is indexed by generally amplified neural patterns reflecting expectation of an aversive event and informative cues, as well as violation and confirmation of the expectation.

P.186 - Enhanced Memory for Central Visual and Auditory Elements Experienced During a Stressful Episode

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Poster Session 1

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Previous studies were able to demonstrate that acute stress benefits encoding of central visual learning material associated with the main stress source. Our study aimed to investigate whether this improvement of memory for visual stimuli is accompanied by improvements in memory for central auditory elements of a stress inducing situation. To test this, we made use of a modified version of the Trier Social Stress Test (TSST). Objects were placed on the table in front of the committee members as well as on their bodies. Auditory learning material consisted of information associated with the committee members, such as their name, age and position, as well as the exact wording of phrases verbalized by them. In a counterbalanced 2 x 2 design, 77 men and women participated in either a stressful or non-stressful version of the TSST. Participants´ recognition memory of the visual and auditory stimuli was tested 24 hours after encoding. Salivary cortisol levels and negative affect increased in stressed participants only. While stress improved memory for personal information about the committee members, there was no difference in memory regarding the wording of phrases. Central visual stimuli were better remembered by stressed participants, whereas no effect of stress on memory for objects located on the committee members´ bodies or their faces could be shown. Our findings support the theory of enhanced memory binding under stress and extend previous studies demonstrating improved memory for central visual elements encoded under stress to auditory learning material associated with the main stress source.

P.190 - Observational Fear Learning of Interoceptive Threat

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Poster Session 1

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Observational learning has been identified as one of the pathways through which clinically significant fears can be acquired. Here we investigated whether fear in response to interoceptive threats or threats coming from inside the body can be acquired by observing the aversive experiences of others in an experimental setting.Our study included forty, healthy participants who underwent an observational fear conditioning paradigm consisting of two phases. During the first, observational learning phase, participants watched a video of a demonstrator experiencing aversive respiratory symptoms (US), such as difficulty breathing, paired with one of the conditioned stimuli (CS+, e.g., blue square), but not with the other conditioned stimuli (CS–, e.g., yellow circle). In the second, direct expression phase, participants were presented with the same visual stimuli as the demonstrator they had previously observed, however, in the absence of direct experience with the aversive event (no US).As expected, participants successfully discriminated between conditioned stimuli, showing greater skin conductance responses towards CS+ as compared to the CS– at the beginning of the direct expression phase, as well as larger startle potentiation to the CS+ as compared to the ITI. Participants also demonstrated greater subjective fear responses towards CS+ compared to CS– in both experimental phases.Our results provide experimental evidence that fear of interoceptive threats can be learned by observing others, thereby implicating the role of observational learning in the etiology of fear of bodily symptoms associated with panic and somatic symptom disorders.

P.197 - Can Physical Exercise Induce Changes in Brain Activation and Improve Performance in a Working Memory Task?

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Poster Session 1

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Correlational studies indicate a positive influence of physical activity and exercise on cognitive abilities. In contrast, the results of interventional studies are inconsistent. These studies however often examined a single bout of exercise and mainly focused on older adults and children. To the best of our knowledge, changes in functional neural activation induced by longer lasting exercise have rarely been assessed.In this randomized controlled trial, 60 physically inactive university students are either assigned to an 8-week high-intensy low-volume jump training or a non-training control group. An extensive test battery, including physical and neural measures, is conducted pre- and post-intervention. These include fMRI scans to assess changes in working memory associated neural activation. Participants perform a 2-back task as the experimental condition and 0-back task as a baseline, with a total duration of 6 minutes.The study is currently ongoing. Preliminary results of a subsample (N = 32) of the first scanning session show strong task-related neural activation in a fronto-parietal network in the 2-back > 0-back contrast. The interaction effect of group and time, as a measure of training effects, will be presented with a larger sample at the conference.Activation in the fronto-parietal network during performance of a working memory task is in line with pertinent literature. We expect activation changes within these regions in the training group compared to the control group. The findings of this project will help to improve the understanding of exercise-induced changes in cognitive abilities and underlying neural processes.

P.201 - Auditory Objects In Working Memory Include Task-relevant And -Irrelevant Features

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Poster Session 1

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Visual working memory is thought to operate on objects rather than individual features, which can include an automatic encoding of task-irrelevant features. While the efficient processing of auditory stimuli also requires the formation of auditory objects, little is known about their role in auditory working memory (AWM). We conducted four experiments (N = 20 each) to assess the processing of task-irrelevant features in AWM. Stimuli were abstract sounds characterized by their central frequency and perceived location. Only one feature dimension was task-relevant in each experiment. Two sample sounds were presented in each trial, one of which was retro-cued as the target for recall. The first two experiments required a match-nonmatch decision about a probe sound whose irrelevant feature value could either be identical to or differ from the target stimulus. We found clear effects of the irrelevant feature. For trials with matches on the relevant dimension, accuracy was higher when there was also a match of the irrelevant feature, whereas for nonmatches on the relevant dimension, accuracy was higher for nonmatches of the irrelevant feature. To test the robustness of these findings, Experiments 3 and 4 used a continuous report task. In Experiment 3 with frequency as the target feature, responses were faster when the location of the probe sound matched the target stimulus than when it differed. Results from Experiment 4 with location as the target dimension will be presented at the meeting. In summary, our results support the automatic integration of relevant and irrelevant object features in AWM.

P.244 - Confident Remembering While Being Clueless: A Neural Basis For Constructive Episodic Memory Retrieval

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Poster Session 1

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When retrieving a past episode, several factors influence what is being remembered. The scenario construction model hypothesizes that during episodic memory recall, only the gist of an experienced moment is retrieved, while missing details are complemented by semantic information (Cheng, Werning Suddendorf, 2016). We developed a promising paradigm to investigate semantic construction during episodic memory retrieval (Zöllner et al., 2021). Specifically, participants interacted with common household objects in unexpected places in a virtual environment. During a retrieval task, participants were asked to recall the location of the objects. We found a behavioral bias towards pre-existing semantic information: when incorrectly recalling the location of an incongruently encountered object, participants tended to remember the object in a semantically fitting location instead. In the current study, we combined the paradigm with fMRI data acquisition to further investigate underlying neural features of scenario construction. The neural representational structure pre-encoding is expected to be shaped by semantic relations between objects (e.g. Cohen et al., 2017), while post-encoding, it is expected to reflect the experienced episode (Deuker et al., 2016). The representational change is thus predicted to be less strong for behaviorally semantically constructed objects. Indeed, preliminary analyses show semantic clustering pre-encoding in higher visual areas. Post-encoding, objects which were remembered in the same room show higher pattern similarity change in the hippocampus. We will additionally present results from our ongoing further analyses. This work contributes to the understanding of the scenario construction process during episodic memory retrieval and elucidates its neural basis.

P.267 - Dream Incorporation of Complex Narratives and Offline Memory Reprocessing

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Poster Session 1

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How dreams are generated and what function they serve is a question dating back centuries, yet a scientific approach to dream investigation is relatively new. In the past years a continuity between day-time experiences and dream content has been observed. This suggested a potential link between offline memory reprocessing and dream mentation. Reactivation of daily-life experiences during sleep has been shown to be crucial for the formation of long-term memories. If dreaming reflects nighttime memory reactivation, it should be associated with enhanced memory performance. The relationship between nocturnal mentation and memory processes, however, is still unclear. In this study, we manipulated the pre-sleep experience of participants to investigate subsequent mental reactivation and its impact on memory for complex naturalistic information. Participants were presented with different audiobooks before falling asleep. We then collected dream reports in a serial awakening paradigm. Memory performance for the studied audiobook was assessed. Based solely on the dream reports, blind raters were able to determine which audiobook a participant had listened to before falling asleep. This indicates that previous learning content is incorporated into dreams. Additionally, the more information from the narrative surfaced in dreams, the better participants were able to retain the contents. These results suggest that dreaming in part reflects ongoing nighttime memory processing. Dreams may therefore provide a valuable window to investigate the processes contributing to memory consolidation in sleep, and to shed light on what information is preferentially reprocessed.

P.278 - Graded Clustered Reactivation during Declarative Memory Retrieval: Evidence from MEG Recordings

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Poster Session 1

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Declarative memory storage and retrieval has been extensively researched. In animal models it has been established that retrieval involves reinstatement of previously encoded neuronal activity, however, how these findings translate to humans is not yet clear. How does the brain retrieve multi-item memories from storage? Two separate mechanisms have been proposed by previous study results: Individual items can be replayed in step-wise, temporally spaced-out succession (sequential replay) along a search path or alternatively, can be reactivated simultaneously (clustered reactivation). In our study, we investigated the presence of these mechanisms during cued retrieval with the help of magnetoencephalographic recordings (MEG). In the experiment, participants first learned associations between ten images embedded in a directed graph network until they achieved 80% accuracy, followed by a 10-minute consolidation period. Using brain decoding, we examined evidence for clustered reactivation of learned material during a subsequent cued retrieval.During this testing session, we find evidence for graded clustered reactivation after cue onset, with reactivation strength of items decreasing with increasing graph distance. This ordering of reactivation was present only during successful retrieval and not during retrieval failure. Our results provide evidence that retrieval is supported by clustered reactivation, suggesting a mechanism for search within abstract cognitive maps.

P.312 - Memory and Prediction Errors in Visual Narrative Perception: Evidence from MEG

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Poster Session 1

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The ability to predict future events is crucial for adaptive behavior. Yet, not all predictions are based on the same sources of information. A crucial distinction concerns the difference between predictions based on abstract contextual models (schemas) and retrieval of previously experienced events (episodic memory). In this study, we investigated the neural mechanisms underlying the interaction between memory and prediction errors during visual narrative perception using magnetoencephalography (MEG). Twenty participants were presented with a series of comic strips while their brain activity was recorded using MEG. Part of the stories included endings that were incongruent with the schematic structure of the events. To assess the effect of episodic memory on narrative processing, some of the comics were repeated 3 times. We combined evoked-response analysis and MVPA to investigate the impact of memory on schemas processing and prediction error. Our results showed that (i) incongruent endings elicited an N400 signal, indicating prediction errors; (ii) abstract schema representations can be decoded from neural activity as soon as the schema manifests in the story; (iii) stimulus repetition affects both the amplitude of the error signals and the decodability of schema representations; (iv) a decoder can discriminate between the first and third presentations of the same comic, indicating the presence of different neural states for schema-based and episodic processes. These findings demonstrate the ability of the human brain to extract detailed information about event schemas, congruence levels, and memory, providing important insights into the cognitive mechanisms underlying the interaction between memory and prediction.

P.317 - The Impact Of Semantic Information On Memory For Temporal Sequences

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Poster Session 1

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Episodic memory retrieval can be conceptualized as a constructive process that combines episodic and semantic information (Cheng et al., 2016). This may introduce a semantic bias in the reconstructed memory if there is a conflict between the two sources of information. Previous studies have shown this effect in spatial episodic memory (Tompary Thompson-Schill, 2021; Zöllner et al., 2022). This project aimed to investigate semantic bias in temporal episodic memory. Participants were shown sequences of object images and subsequently asked to make temporal proximity judgments during memory retrieval. The image sequences were constructed in a way that introduced statistical regularities based on semantic categories, with images from the same category clustering in time. This allowed the contrast of retrieval performance on congruent trials where the cue and correct choice image were from the same or neighboring categories, with incongruent trials where the cue and correct choice images were from different categories. The results showed a higher error rate on incongruent trials, indicating that participants tended to incorrectly recall semantically similar images as temporally close to each other. This was in support of the main hypothesis regarding the impact of semantic information on temporal episodic memory. Overall, the study demonstrated that semantic information biases episodic memory for temporal sequences, as previously reported for spatial associations. Future studies could explore the impact of further variables and the neural basis of this process.

P.329 - The Influence of Time-Of-Day on Recognition Memory for Faces

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Poster Session 1

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Previous studies showed that time-of-day can have an impact on memory performance in general. Its influence on memory recognition performance for faces, which might be important for daily encounters with new persons or testimonies, has not been investigated yet. Importantly, the stress hormone cortisol also exerts a critical impact on recognition memory. High cortisol concentrations impair memory recognition, in particular for emotional material. However, some studies also reported high cortisol levels to enhance memory recognition. Since cortisol levels in the morning are usually higher than in the evening, it can be assumed that time-of-day might also influence recognition performance. In this pre-registered study, we investigated the impact of time-of-day on memory recognition for faces. In a two-day design, 52 healthy men encoded pictures of male and female faces with distinct emotional expressions on day one around noon. Memory for the faces was retrieved two days later either in the morning (when endogenous cortisol levels were high) or in the evening (under low endogenous cortisol levels). Additionally, alertness as well as salivary cortisol levels at the different timepoints were assessed. Preliminary analyses showed that recognition performance for face stimuli with happy facial expressions was better when participants were tested in the morning than in the evening. Thus, recognition memory performance seems to depend on the time-of-day and the valence of the expressed emotion. Ongoing analyses will focus on the association between cortisol and/or alertness on these time-of-day effects to better understand possible underlying mediating factors.

P.335 - Reactivation of Sequential Head Direction Memory Traces in Humans

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Poster Session 1

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Spatio-temporal sequences are a hallmark of episodic memory. In animals, the reactivation of previously encoded sequential memories has been shown to accompany their retrieval. In humans, testing the reactivation of sequential spatial memories on a neural level has mostly been done in virtual-reality neuroimaging experiments, lacking information from self-motion cues. The present study set out to incorporate real-world movements in a sequence memory paradigm. 36 participants learned 24 unique sequences of four images from four categories that were sequentially presented on monitors positioned at different angles around them. Participants associated each image with a specific head direction (HD) by turning their head to the presented image. Each sequence was followed by an immediate memory test: (i) covertly retrieving the full sequence (HD and image order), (ii) performing the correct HD sequence, and (iii) recognizing and sorting the images according to their temporal and spatial position in the sequence. To assess episodic memory, the three retrieval steps were performed for all previously learned sequences after a distractor task. By applying linear discriminant analyses to the EEG data, we were able to decode image categories while participants performed sequential head movements during both memory tests. Transfer classification will be used to identify the reactivation of sequences, targeting image categories as well as HD information. This allows to investigate how distinct features of sequential memory traces are reactivated during retrieval, contributing to the understanding of how real-world navigation and memory processes work together on a neuronal level.

P.337 - The Associations Between Scale-free Neural Dynamics, Working Memory And Divergent Thinking

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Poster Session 1

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Background and Aims: The role of alpha oscillations in various cognitive performances has long been studied. However, in addition to periodic oscillations, brain activity also exhibits an aperiodic 1/f-like spectral pattern, also known as scale-free neural activity. Notably, the periodic oscillatory and aperiodic scale-free neural activity are mixed in the brain signals. The aim of the present study is to disentangle them and investigate their differential relationships with working memory and divergent thinking.Methods: We investigated the relationship between resting-state EEG activity and the performance on a battery of cognitive tasks in a sample of N = 101 individuals. The Fitting Oscillations and One Over F (FOOOF) algorithm was used to disentangle alpha oscillations from the scale-free neural activity. Structural equation modelling (SEM) was used to explore associations between brain signal components and working memory, as well as two facets of divergent thinking (i.e., fluency and originality).Results: The results showed that alpha power at rest with eyes open was significantly associated with fluency and working memory, whereas the scale-free neural activity at rest with eyes closed was associated with originality and working memory.Conclusions: This is the first evidence for a link between scale-free neural dynamics (i.e., an indicator of the complexity of brain signals) and the originality score. The finding highlights the value of aperiodic resting-state neural dynamics as a biomarker of individual differences in creativity.

P.340 - Does a Single Night of Short Sleep Matter? Meta-analytic Evidence for Cognitive Impacts

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Considerable research has addressed effects of acute and chronic sleep restriction on sleepiness and cognition with mixed results. The present meta-analysis addresses effects on subjective sleepiness and objective alertness, assessed through simple reaction time tasks, after only one night of restricted sleep.A systematic literature search was conducted via Scopus, Web of Science, and Pubmed, in February 2023. Thirty-three studies of healthy adult participants are included in the meta-analysis. Sleep restriction durations lasted between 3 and 6 hours. All reported results are for common effects models. Participants were revealed to feel significantly sleepier after sleep restriction compared to control ($k = 19$ studies, standardized mean difference (SMD) = 0.824, 95%-CI = [0.685, 0.964], $z = 11.61$, $p < .001$). Participants responded significantly slower ($k = 25$, SMD = 0.371, 95%-CI = [0.236, 0.506], $z = 5.38$, $p < .001$), and the number of lapses, i.e., reaction times slower than 500 ms, was significantly higher after sleep restriction ($k = 14$, SMD = 0.462, 95%-CI = [0.318, 0.605], $z = 6.29$, $p < .001$).Our meta-analysis shows significant small to medium sized effects on subjective and objective measures after one night of sleep restriction. As reduced sleep for a single night seems to occur often in modern societies, this finding raises awareness of the consequential cognitive effects that may translate into increased risks in everyday situations (e.g., driving).

P.341 - Intrinsic Motivation Affects Electrophysiological Underpinnings of Working Memory

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Poster Session 1

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In this study, we explored the impact of intrinsic motivation on oscillatory brain activity during the encoding, retention, and retrieval processes of working memory (WM). Our hypothesis was that intrinsic motivation would affect the correlates of WM processes, including the enhancement of frontal midline theta power during retention and the suppression of alpha power during encoding and retrieval. We recorded EEG from 48 participants during the performance of the Sternberg task, with set sizes varying between 3 and 15 letters. We transformed the objective difficulty levels into three subjective difficulty levels: "easy", "difficult", and "very difficult". To investigate the impact of intrinsic motivation, we used three personality trait factors as indicators: the Resilience factor (associated with mental toughness, self-efficacy, and achievement motivation), Need for Cognition, and Subjective Motivation to perform a task.Our results showed that motivational personality traits influenced EEG correlates of WM, particularly under conditions of high subjective difficulty. However, contrary to our expectations, the Resilience factor reduced alpha depression during encoding and retrieval at the "very difficult" task level. In addition, Subjective Motivation was associated with relatively stronger retention-related theta activation at the “easy” condition.Based on our findings, we can conclude that the Resilience personality trait impacts the mechanism of effort allocation during encoding and retrieval of WM. It is possible that individuals with high Resilience are better able to conserve cognitive resources when faced with excessively demanding tasks. In addition, Subjective Motivation was associated with relatively stronger retention-related theta activation at the “easy” condition.

P.345 - Effects of Phase-Synchronization and Frequency-specificity in Classical Fear Conditioning

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Poster Session 1

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Oscillatory synchronization via repetitive sensory stimulation in the theta-frequency band was found to play a causal role in binding information of different modalities in declarative memory. In a first laboratory fear-conditioning study, we provided evidence that theta-synchronized (vs. asynchronized) multimodal input resulted in better discrimination of a threat-associated conditioned stimulus (CS+) compared to perceptually similar stimuli (CS-) never associated with the aversive loud noise (unconditioned stimulus, US). However, we did not address if this phase-synchronization effect is specific for the theta frequency. Hence, we conducted a second, pre-registered web-based study: We compared synchronized (vs. asynchronized) input in the theta- vs. delta-frequency range. As in the lab-study, visual gratings of different orientations (25°, 35°, 45°, 55°, 65°) served as CS with only one (CS+) paired with the auditory US. The CS were luminance-modulated, and the US was amplitude-modulated in a theta (4 Hz) or delta (1.7 Hz) frequency. In both frequencies, CS-US pairings were presented either in-phase (0° lag) or out-of-phase (90°, 180°, 270° lag), resulting in four independent groups (each n = 40, total N = 160). In accordance with our findings in the lab, phase synchronization augmented the discrimination of CSs in contingency knowledge, but without affecting valence and arousal ratings. Interestingly, the augmentation occurred independent of frequency. Combining the laboratory and web-based study, we suggest that phase-synchronization of CS-US input in a slow theta or delta rhythm causally affects knowledge of CS-US contingencies. Moreover, our data provide evidence for successfully conducting a generalization fear-conditioning paradigm in an online setting.

P.351 - Effects of Stress on Memory Consolidation of Aversive and Appetitive Counterconditioning

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Poster Session 1

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Extinction training can diminish conditioned responding, but acute stress has been shown to interfere with retrieval of the new extinction memory trace, leading to a return of the response. Another approach to reduce previously learned behavior comes in the form of instrumental counterconditioning (CC), which pairs a response to a stimulus with a reinforcer of the opposite valence. Our previous results, however, uncovered differences between instrumental extinction and CC with regards to their retrieval after stress, suggesting that the comparability between associative learning approaches is not as straightforward as assumed. In the current, pre-registered study we aim to further explore the influence of acute stress on the consolidation of contingencies learned via instrumental CC, also considering insights from decision making. To this end, 78 healthy male participants will learn that a specific behavior (press of a "risk"-key) in response to four geometric shapes will lead to either an aversive (loss of money) or appetitive (gain of money) consequence. On the next day, contingencies will be reversed for two of the stimuli (CC) and participants will either be exposed to acute stress by means of the socially-evaluated cold pressor test before or after CC, or will take part in a non-stressful control procedure. The following day, the instrumental task will be conducted again, but without feedback about monetary consequences, enabling us to investigate which contingencies will be retrieved in an ambiguous situation. Preliminary results of data acquired so far will be presented and discussed.

P.359 - Role of Low-Level Visual Features of Symbolic Stimuli in Associative Learning

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Poster Session 1

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Relevance association affects neural responses to abstract and symbolic stimuli. Previous studies demonstrated modulations of event-related brain potential (ERP) components, mainly reflecting influences on late stimulus evaluation (e.g., LPC). Relevance associations have been shown to impact also earlier ERP responses such as the P1 component, indicating a role of low-level visual features of symbolic stimuli during associative learning.However, evidence regarding the presence of these early effects is still inconclusive and little is known about the dimension at which the association may occur.In the present study, we investigated the role of low-level visual features of symbolic stimuli in associative learning and the effect of manipulating different dimensions of visual features by conducting two parallel experiments (N=24 each, between-subject design).Strings composed of consonants and presented in different fonts, were associated with positive, neutral, or negative monetary outcome. The experiments differed in the dimension of low-level visual features relevant for the association: characters of the string (experiment 1) vs. its font (experiment 2). ERPs were recorded in both experiments.We predicted faster learning and enhanced LPC amplitudes to gain/loss associated stimuli, which was confirmed in both experiments.The hypothesized enhanced P1 amplitude to gain/loss associated stimuli was observed only in experiment 1 and only for loss associated stimuli. This indicates a selective involvement of specific low-level visual features in associative learning. Interestingly, exploratory analysis revealed a modulation of the EPN component, which was previously considered to be limited to symbolic stimuli with a semantic content as words compared to pseudowords.

P.369 - Spindle-dependent Memory Consolidation In Healthy Adults: A Meta-analysis

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Poster Session 1

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Recent studies have provided compelling evidence for the critical role of sleep spindles in the consolidation of new memories. However, no metaanalysis of the association between sleep spindles and memory performance has been conducted so far. In this study, we conducted a meta-analysis of 53 studies, comprising 1427 effect sizes, to examine the relationship between sleep spindles and memory consolidation. We explored how various factors, including memory type, spindle type, spindle characteristics, and EEG topography, affect this association. Our results reveal a small to moderate effect size for the average association between sleep spindles and memory consolidation. Interestingly, we observed that the association between spindles and memory consolidation was stronger for procedural memory than declarative memory. Neither spindle types nor EEG scalp topography had an impact on the strength of the spindle-memory relation, but we observed a distinct functional role of global and fast sleep spindles, especially for procedural memory. We also found a moderation effect of spindle characteristics, with power showing the largest effect sizes. Collectively, our findings suggest that sleep spindles are involved in learning, thereby representing a general physiological mechanism for memory consolidation.

P.372 - Gamma-range Visual Stimulation During Sleep

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High-frequency periodic visual stimulation ("flicker") is gaining traction as a non-invasive method to entrain EEG activity in the gamma range. Specifically, stimulation at 40 Hz seems promising as a potential treatment intervention in early Alzheimer's Disease, with neuronal, cognitive, and circadian benefits (Traikapi Konstantinou, 2021). Stimulating during sleep could increase the feasibility of flicker-based interventions, but so far, such a procedure has only been applied to healthy subjects at lower frequencies (Sharon Nir, 2018). As a first proof-of-concept study, we performed 40-Hz square-wave activity entrainment in healthy volunteers by flickering light in wakefulness through closed eyes. A Steady-State Visually Evoked Potential (SSVEP) analysis supported by Power Spectral Density (PSD) and Signal-to-Noise Ratio (SNR) measures at occipital locations showed that healthy subjects entrain to the stimulation at four different illuminance values compared to a control condition, also when moving their eyes. Moreover, we developed a prospective protocol for an EEG study, in which we will a) investigate the feasibility of 40 Hz visual stimulation during sleep in a young cohort (18 – 35 years) and b) assess potential effects on gamma-band EEG activity in the various sleep stages and on sleep architecture. Participants will be invited to the sleep laboratory for one control and one experimental night; in the latter, long-wavelength-light flicker will be applied with a custom LED-based sleep mask guided by polysomnography. The results will allow us to develop a flicker protocol for individuals at risk for Alzheimer's Disease.

P.374 - Beeinträchtigungen Im Arbeitsgedächtnis Und Stärkeres Fatigue-Erleben: Ein Vergleich Zwischen SARS-CoV-2 Betroffenen Und Nicht Betroffenen Personen

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Poster Session 1

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Hintergrund: Die COVID-19 Pandemie stellte mit ihren starken Restriktionen in verschiedenen Lebensbereichen einen anhaltenden multidimensionalen Stressor für die Gesamtbevölkerung dar. Personen, die sich mit dem neurotropen SARS-CoV-2 Virus ansteckten, erlebten einen zusätzlichen Stressor und können daher vulnerabler für die Entwicklung langfristiger Folgen, besonders neuropsychiatrischer Art, sein. Ziel dieser Studie war es daher, anhaltende kognitive und affektive Symptome bei betroffenen Personen mindestens 3 Monate nach ihrer SARS-CoV-2 Infektion zu untersuchen.Methoden: In dieser Querschnittsstudie verglichen wir Personen mit (N = 40) und ohne (N = 42) nachgewiesene SARS-CoV-2 Infektion hinsichtlich ihres Haarcortisolwertes, kognitiver Funktionen (BTACT), Fatigue (FAQ) und Long-COVID Symptomen (C19-YRS) sowie der gesundheitsbezogenen Lebensqualität (SF-36).Ergebnisse: Im Bereich kognitiver Funktionen schnitten SARS-CoV-2 betroffene Personen schlechter hinsichtlich auditiv-verbalem Lernen, Arbeitsgedächtnisprozessen, kognitiver Flexibilität und Verarbeitungsgeschwindigkeit ab. Außerdem berichtete diese Gruppe stärkere körperlich- und kognitivbezogene Fatigue. Angst war das am häufigsten berichtete anhaltende Symptom in beiden Gruppen. SARS-CoV-2 betroffene Teilnehmende gaben eine niedrigere körperlichbezogene, jedoch vergleichbare mentale Lebensqualität an. Die Haarcortisolwerte unterschieden sich nicht zwischen beiden Gruppen.Diskussion: Zusammenfassend deuten unsere Ergebnisse auf eine Beeinträchtigung des Arbeitsgedächtnisses und ein stärkeres (körperliches) Erleben von Fatigue bei von SARS-CoV-2 betroffenen Personen hin, die durch neuroinflammatorische Kaskaden verursacht werden könnten. Bemerkenswerterweise gab es keine Unterschiede in Bezug auf das psychische Wohlbefinden, was die Tatsache unterstreicht, dass alle Personen während der Pandemie mit Herausforderungen konfrontiert waren.

P.381 - Identifying Sequential Memory Reactivation During Sleep In Humans

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Poster Session 1

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Sleep is assumed to benefit memory consolidation by reactivating previous experiences. Animal models demonstrated that sequences of prior learned spatial trajectories are replayed during sleep. However, research into human memory reactivation during sleep usually lacks the combination of sequential and spatial features. This study aims to close this gap by implementing a sequential spatial-learning paradigm during wake and using targeted memory reactivation (TMR) to trigger the sequential reactivation during non-rapid eye movement sleep (NREM) in humans. Participants (N = 24) were instructed to learn 24 distinct sequences, each comprising four images that were linked to specific real-world head directions (HD) by presenting them on one of four monitors positioned at different angles around the participant. The sequences were preceded by a unique sound serving as a reminder cue during retrieval and TMR. Memory performance was tested before and after a night of sleep, as well as 24 hours after the morning retrieval. During NREM sleep, half of the previously learned sounds were presented to trigger reactivation of associated sequences. EEG was recorded during the whole experiment. Multivariate EEG analyses revealed that the image-category of the first element in a sequence can be reliably decoded after the onset of TMR cues. Building on this, we will use advanced multivariate decoding approaches to identify the reactivation of complete sequences. By enriching sequences of learned material with real-world spatial contexts, this study seeks to provide novel insights into characterizing sequential reactivation during sleep in humans.

P.382 - Species-Specific Differences In Neural Population Information Coding During Sleep: Enhanced Efficiency In Humans Compared To Rodents

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Poster Session 1

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Sleep is essential for processing newly acquired information and consolidating recent memories. Despite the evident cognitive differences between humans and rodents, their oscillatory signatures of information processing during sleep are remarkably similar. This raises the question of whether differences in information processing between the two species can be explained by an oscillation-independent coding mechanism. To test this notion, we first estimated population coding efficiency based on contrast entropy, an information theoretical metric that is bounded by its theoretical maximum. We subsequently validated this approach using neural population modeling and demonstrate enhanced coding efficiency of non-oscillatory signals. Our results reveal that the frontal cortex in both species codes information more efficiently than the hippocampus. Furthermore, coding efficiency increases during task engagement and decreases during medically-induced unconsciousness. Importantly, our results imply that the frontal cortex provides the necessary scaffold to enable efficient long-term storage during NREM sleep by displaying a higher degree of redundancy. In contrast, the hippocampus exhibits increased efficiency during NREM sleep, which might reflect information reactivation. Critically, in both nodes of the memory network, human neural population coding efficiency surpasses that of rodents, which likely constitutes a key signature of enhanced information processing capabilities in the human brain. Collectively, our results provide robust evidence for species-, region-, and stage-specific information coding in the memory network.

P.510 - Neural Correlates Of Working Memory Precision

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Poster Session 1

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A hallmark of working memory (WM) is its capacity limitation: the precision of items decreases as more items are simultaneously stored in memory. The neuronal origins of this limitation remain unclear. Precision limitation is typically assessed by asking participants to report a single item out of several concurrently stored ones. In contrast, we applied a whole-report paradigm where participants reported all items. Specifically, participants remembered either one, two, or four Gabor gratings presented at different locations and reported the memory confidence and remembered orientations of all items subsequently. This enabled us to estimate the memory precision of each item separately. Participants performed 1620 trials in total while their brain activity was recorded with magnetoencephalography (MEG). Using MEG signals, we reconstructed the spatial location of each grating and found that the strength of this reconstruction during the delay period was correlated with the memory precision of the corresponding gratings. On the behavioral level, we observed a steep drop in precision from the first to the later reported gratings, indicating that they were reported from two qualitatively different states in WM. In further analyses, we plan to investigate the neural signals involved in the readout of items from WM, which should be responsible for this qualitative difference.

P.521 - Re-Examining the Impact of Sleep on False Memories

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Poster Session 1

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Sleep plays an important role for memory consolidation, and it has been argued that it also facilitates gist abstraction, i.e., the extraction of regularities from episodes. Thereby, sleep might contribute to the formation of false memories. Others have argued that sleep decreases false memories because it strengthens source memory, making it easier to distinguish between veridical and false memories. Empirical studies have reported mixed results. False memories in studies are frequently elicited using the Deese–Roediger–McDermott (DRM) paradigm, where participants learn a list of semantically related words, and when tested for their memory, they remember words that are related to the lists but were never presented. The strong variance in the effect sizes (including their direction) found using this paradigm might be due to methodological differences between the different studies but can also be explained by low power due to small sample sizes. In a conceptual replication of Diekelmann et al. (2010), we preregistered that participants would generate more false memories after a retention interval that contains sleep vs. exclusively wake in the DRM task in a large online study (n sleep = 104; n wake = 101). Furthermore, we preregistered that participants in the sleep condition would generate more false memories when their overall memory performance was low, compared to high performers. We additionally employed two control groups (AM control, n = 101; PM control, n = 102) to test for an influence of circadian effects on false memory generation. Results will be presented at the conference.

P.534 - Natural Language Processing Reveals the Impact of Medial PFC Lesions on Schema Usage

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Poster Session 1

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The medial prefrontal cortex (mPFC) is thought to mediate the reinstatement of memory schemas. Schemas provide general knowledge about what to expect in a given scenario (e.g., the sequence of events when preparing a meal). Such general knowledge has been hypothesized to provide a scaffold for the retrieval of past episodes and the simulation of future episodes. However, there is mixed evidence on whether the mPFC is critically involved in these two capacities. One methodological challenge is the difficulty in assessing the schematic content of remembered and simulated episodes. Here, we first used natural language processing on an online sample to infer the schematic content of several everyday scenarios (e.g., preparing a new meal; in a bakery; on a picnic). Specifically, we determined the key reoccurring content across a large number of reported memories and simulations. We then examined whether people with mPFC lesions use schematic content less than matched controls. Preliminary analyses indicate that this is the case. Notably, as expected, the deficiency in using schematic content was particularly pronounced for future simulations. This is consistent with a stronger scaffolding demand for the simulation of novel episodes. Together, the data provide evidence for the critical contribution of the mPFC in reinstating memory schemas.

P.544 - Working Memory and Reinforcement Learning Dynamics: Correlation or Causation?

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Poster Session 1

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Working memory (WM) plays an important role in instrumental learning when reinforcement histories of multiple options must be integrated. In addition to maintenance, the ability to update and shield items against interference are key to good WM; functions conceivably also essential to instrumental learning in an ever-changing environment. We have previously shown that dynamic changes in people's learning rates in a reversal learning paradigm were more pronounced with higher WM capacity. This was accompanied by better performance and a stronger representation of learning rates and reward prediction errors in cortical activity. Whether or not WM modulated learning in this task, is an open question that we aim to address in an online study (n=300; preregistration: https://osf.io/ujrt8). WM load was manipulated in the reversal learning task by varying the number of stimuli for which changes in reward probability had to be followed (1 to 4 stimuli, n=75 per condition). As expected, task performance scaled with WM load, whereby higher load negatively contributed to performance. Response switching following misleading feedback increased with WM load, but so did spontaneous response switching. Response times were unaffected. An interaction between WM load and capacity (OSPAN score) was only observed for response times, not for performance or response switching. To understand the effect of WM load on trial-to-trial learning dynamics we will construct a nested model set built from reinforcement learning models. The results show a complex relationship between WM and reinforcement dynamics in a volatile context and are discussed within current theories of instrumental learning.

Cognition

P.156 - Seeing What You Believe: Cognitive Mechanisms of Flexible Integration of Priors in Visual Decisions

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Poster Session 1

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Beliefs and expectations, or priors, shape our perception and they must be flexibly integrated into decision-making in a constantly changing world. This study aimed to dissociate the phenomena into four mechanisms: the rate of evidence accumulation, the starting point of evidence accumulation, the amount of evidence needed to be accumulated, and the time of non-evidence accumulation processes.We developed a behavioral paradigm combining a reversal learning with a motion discrimination task at perceptual threshold to separate the learning of prior beliefs from the visual decision process. We used Hierarchical Gaussian Filtering and Drift Diffusion Models to analyze behavior on single trials.Our findings replicated previous observations that endogenous priors bias the starting point and rate of evidence accumulation. Critically, we observed that endogenous priors led to a decrease in non-decision time and an increase in the amount of evidence accumulated. In trials where invalid beliefs were held, the amount of sensory evidence sampled before a decision can increase to correct for biases. This increase in threshold is mathematically equivalent to a decrease in the baseline of the starting point. Decreases in non-decision time can be caused by various factors such as pre-stimulus presentation, early sensory, or motor execution processes.Despite the progress in understanding how priors are integrated into visual decisions at the computational and algorithmic level, the neural implementation of these processes remains unclear. In the future, we will combine computational models with neurophysiological recordings to determine the neural correlates of flexible integration of priors in visual decisions.

P.164 - (How) Can Predictive Modelling Improve Our Understanding Of Human Cognition?

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Poster Session 1

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Predictive modelling has evoked increasing interest in the study of human behavior and cognition. A growing body of research demonstrates that individual levels of cognitive ability can be predicted from differences in brain characteristics such as functional brain connectivity. Most of this research is, however, conceptualized to reach the highest possible prediction performance, while insights into neurobiological processes underlying the predicted concepts are limited or even lacking. Here, we suggest predictive modelling studies to be designed on the basis of a specific conceptual question, whose answer actually contributes to our understanding about human behavior and cognition. Following this idea, we investigated in a preregistered study the relative importance of functional brain networks for predicting general, fluid, and crystalized intelligence of 806 (main sample) and 322 (replication sample) adults with artificial brain lesioning. Intelligence types were predicted from functional connections within single brain networks and from connections of specific network combinations, both during rest and during different tasks. General and crystalized intelligence were more accurately predicted than fluid intelligence and multiple brain networks contributed to these predictions. Importantly, artificial lesioning of widespread functional systems did not substantially affect the prediction performance suggesting that lesioned predictive connections can well be compensated by those of other systems. We found that different methods assessing the importance of neural prediction features (brain networks) yielded heterogeneous results and conclude that future research on human behavior and thought should select their prediction strategy based on interpretability and on targeted conceptual insights rather than exclusively on prediction performance.

P.166 - Still Not Rational, But Different... A Registered Replication Study Of "Why Humans Deviate From Rational Choice"

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Poster Session 1

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One of the first studies investigating electrocortical correlates of humans' deviation from rational behavior in decision making paradigms was given by Hewig et al. (2011). They examined feedback related EEG activity while participants played the ultimatum game (UG) and the dictator game (DG) from the receiver perspective, using the feedback related negativity (FRN) as marker for fairness evaluation. In their work with 13 participants, the FRN was considered linearly related to the game offers. However, as there were only few participants, the results from DG and UG were pooled. In our registered replication report attempt with 105 participants, we tried to replicate their findings and further differentiate the DG and UG feedback responses using multi-level based single trial modeling. In addition to preregistration, all our analysis, scripts and processed data are available on OSF.The results partly supported the previous findings, however questioning the linearity assumption concerning the FRN response to the offers. In addition, theta-analyses revealed much higher midfrontal theta responses (MFT) in the UG compared to the DG. This stressed the difference in cognitive effort and cognitive control for these two tasks based on execution of meaningful behavior, i.e., the rejection and acceptance in the UG vs. a mere button press in the DG. Hence these findings support the importance of distinguishing between MFT as a marker of cognitive control and cognitive effort linked to behavioral decisions, compared to the FRN response as an evaluation process of the fairness of the offer in economic games.

P.171 - Slacklining with Mobile EEG for the Study of Cognitive Motor Interference

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Poster Session 1

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Neural correlates of cognitive motor interference (CMI) are frequently investigated in increasingly complex environments during different types of movement such as walking or cycling. Here, we used wireless, smartphone electroencephalography (EEG) outdoors while participants were either standing on a slackline or on firm ground. We expected to find similar CMI effects on the P3 event-related potential (ERP) component as previously reported for walking and cycling. Twenty young, experienced slackliners performed an auditory oddball task, silently counting rare target tones in a series of frequently occurring standard tones. Results revealed similar P3 topographies and morphologies during both movement conditions. We observed significantly reduced P3 amplitudes and marginally increased latencies during slacklining, confirming our predictions. We further explored whether participants' slacklining skill level correlated with individual P3 effects. We discovered a significant correlation for P3 latency, but not amplitude. The study confirms that ERPs can be measured reliably during slacklining outdoors. It is likely that CMI explains the effect of movement type on the P3 since slacklining is a demanding balancing task, limiting the resources otherwise available for auditory attention processing. We found an interference effect for less skilled individuals, whereas individuals with a high skill level may have shown a facilitation effect. Further analyses of motion-sensor signals will help to characterize the potential of mobile EEG for the study of real-world behaviour.

P.172 - Suppression And Omission Effects In Auditory Predictive Processing – Two Of The Same?

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Poster Session 1

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Recent theories describe perception as an inferential process based on internal predictive models adjusted by prediction violations (prediction error). Two different modulations of the auditory N1 event-related brain potential component are often discussed as expression of auditory predictive processing. The sound-related N1 component is attenuated for sounds generated by the listener compared to the N1 elicited by externally produced sounds (N1 suppression). An omission-related component in the N1 time-range is elicited when sounds generated by participants are rarely omitted (omission N1). Both phenomena were explained by action-related forward modeling that takes place when the sensory input is predictable: Prediction error signals are reduced if predicted sensory input is presented (N1 suppression) and elicited if predicted sensory input is omitted (omission N1). This common theoretical account is appealing, but has not yet been directly tested. We manipulated the predictability of a sound in a self-generation paradigm where in two conditions either 20% or 50% of the button presses did not generate a sound, inducing a strong or a weak expectation for the occurrence of the sound. In agreement with the forward modelling account, an omission N1 was observed in the 20% but not in the 50% condition. However, N1 suppression was highly similar in both conditions. Thus, our results demonstrate a clear effect of predictability for the omission N1, but not for the N1 suppression. This implies that the two phenomena rely on (at least partly) different mechanisms and puts prediction related accounts for the N1 suppression in question.

P.212 - Upper Alpha Band Modulations During Divergent and Convergent Problem- Solving: The Influence of Verbal Vs. Figural-spatial Knowledge Domain

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Poster Session 1

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Divergent and convergent thinking tasks provide insight on how humans operate in open and closed problem spaces, respectively. Both cognitive operations have been connected to specific modulations in the EEG upper alpha band (10-12 Hz). However, classic divergent and convergent thinking tasks assess problem solving in different knowledge domains (e.g., verbal or spatial-figural), potentially modulating the EEG signature of these tasks. Additionally, prior research showed that both divergent and convergent thinking require active maintenance and manipulation of relevant information in working memory. Therefore, directly comparing both processes might result in an overestimation of their shared variance due to the impact of working memory. We present data from two consecutive studies that investigated modulations in the upper alpha band for the verbal and the spatial-figural knowledge domain, respectively. For each study, we used three tasks for divergent and convergent thinking as well as a working memory task employing highly comparable stimulus material. As a first step, we identified theta band oscillatory activity as an indicator of working memory related activity. In a second step, we removed this oscillatory activity from the data collected during divergent and convergent thinking tasks to avoid a potential misattribution of this common task requirement to divergent and convergent thinking per se. Our research demonstrates specific modulations in the upper alpha band related to convergent and divergent thinking for both knowledge domains beyond working memory related oscillatory activity, illustrating the commonalities between these cognitive operations even when controlled for common task demands.

P.248 - Tracking Rapid Decision Making Under Conflict: Does Age Or Context Similarity Play A Role?

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Poster Session 1

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In everyday life it is often necessary to respond rapidly to situations that involve conflicting information. Being able to focus on relevant and ignore irrelevant information as well as retain and update rules in memory, are some of the factors that can determine the efficiency of our responses.In this project, we study the development of these skills by measuring the performance adjustments following conflict (conflict adaptation effects) in a changing environment. To this end we employ conflict tasks and mouse-tracking, a sensitive response method that allows us to access the unfolding of this rapid decision-making process in real time. More specifically, we assess the presence and size of the Congruency Sequence Effect (CSE) across two experiments. In each experiment, two conflict tasks were combined that varied in their context similarity (i.e shared relevant or irrelevant dimensions). We measured the total movement time, initiation time and maximum absolute deviation values (MAD) in these tasks across three age groups (1st graders, 4th graders, adults).Across-task CSE size in MAD values increased with age, suggesting that the flexibility of conflict processing in a changing environment improves with age. Furthermore, context similarity, as defined in this study, does not appear to play a determining role in the transfer of conflict adaptation effects in children or adults.

P.251 - Neural Correlates of Cognitive Inhibition and Task Switching

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Poster Session 1

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Executive functions allow humans to flexibly adapt to changing environments, by building the basis of attention control, goal-oriented reasoning and behavior, as well as emotion regulation. Therefore, profound understanding of the processes and their neural correlates is central.The current preliminary analysis includes a subsample of 32 healthy university students, who completed a go-nogo and a task switching task during fMRI. A larger sample of >50 participants will be presented at the conference. Data was acquired with a 3 T Siemens Syngo MRI and was analyzed with SPM12. We conducted whole brain analyses with $p < 0.05$ FWE-correction for activation and $p < 0.001$ uncorrected for functional connectivity, as well as small volume analyses.During nogo > go, there is activation in anterior cingulate cortex (ACC) and insula. Furthermore, functional connectivity is enhanced between ACC and insula, and also from ACC to medial frontal gyrus. During switching > repetition there is activation in inferior parietal lobe, inferior frontal gyrus (IFG), middle cingulate cortex, ACC and bilateral insula. In addition, there is functional connectivity for switching > repeat between ACC and IFG reaching into insula, as well as thalamus.Both tasks present clear activation and connectivity patterns in key regions associated with cognitive control, inhibition and cognitive flexibility. Specifically, go-nogo and switching present overlapping as well as distinct neural activation and connectivity patterns involving ACC and insula as common network .

P.275 - Midfrontal Signaling of Need for Control Continuously Adapts to Incoming Information during Outcome Anticipation

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Poster Session 1

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Performance monitoring is essential for successful action execution and previous studies have suggested that frontomedial theta (FMT) activity in scalp-recorded EEG reflects need for control signaling in response to negative outcomes. However, these studies have overlooked the fact that the most likely outcome can be anticipated during outcome anticipation. To optimize action execution, it is necessary for the time-critical performance monitoring system to utilize continuously updated information to adjust actions in time. This study used a combination of mobile EEG and virtual reality to investigate how the performance monitoring system adapts to continuously updated information during brief phases of outcome evaluation that follow action execution. In two virtual shooting tasks, participants were either able to observe the projectile and hence anticipate the outcome or not. We found that FMT power increased in response to missing shots in both tasks, but this effect was suppressed when participants were able to anticipate the outcome. Specifically, the suppression was linearly related to the duration of the anticipatory phase. Our results suggest that the performance monitoring system dynamically integrates incoming information to evaluate the most likely outcome of an action as quickly as possible. This dynamic mode of performance monitoring provides significant advantages over idly waiting for an action outcome before getting engaged. Early and adaptive performance monitoring not only helps prevent negative outcomes but also improves overall performance. Our findings highlight the crucial role of dynamic integration of incoming information in the performance monitoring system, providing insights for real-time decision-making and action control.

P.291 - Motor Inhibition vs Interference Suppression: Response Processing and Error Monitoring in a Complex Choice Task

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Poster Session 1

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Motor inhibition and interference suppression represent two core function of inhibition. Motor inhibition is essential to overcome prepotent but inadequate action impulses. Interference suppression is vital to ignore salient but irrelevant distractions from the environment. Lapses in these mechanisms are common during daily routines. Yet, it is crucial to process them properly to avoid more momentous consequences in the future. A plethora of studies from psychology and cognitive neuroscience suggest that motor inhibition errors and interference suppression errors share similarities, but also display differences in the ways they are processed. To further explore this, for the current study (N = 30) we developed a speeded complex choice task that allows us to directly contrast these two errors types. With that, we compared the antecedences and consequences of the two inhibition errors in the event-related potential. For motor inhibition, we observed error-related variations along the entire processing stream, beginning with variations in the P2 amplitude (associated with sensory gating) and the P3 amplitude (associated with resource-intense conflict evaluation). For interference suppression, these processes appear resource-intense independent of response accuracy, potentially due to a more complex response selection process. After the response, the two error types did not differ significantly in the Ne amplitude (linked to early error monitoring processes). However, motor inhibition errors displayed a higher Pe amplitude (linked to error evidence accumulation), suggesting that an early inhibitory failure is more evident than deficiencies in a complex response selection process.

P.344 - Assessing Properties of Hedonic Reward Stimuli: A Comparative Study

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Poster Session 1

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Money is often used as reward in psychological experiments. Though evidently motivating, monetary reward does not fully capture the hedonic effects of reward consumption, as it predominately acts as a secondary reinforcer. To better investigate hedonic reward processing, researchers seek to apply images more closely resembling primary reinforcers, presenting a need for validated, up-to-date image datasets of this kind. In this study, we assessed the valence and arousing effects of images of two categories previously shown to have hedonic rewarding properties (puppies and erotic images), curated from internet searches and pre-existing datasets. We collected skin conductance responses (SCRs; arousal) and pleasantness (valence) ratings of from 34 healthy participants while they passively viewed 60 images per category. Results showed that while both males and females rated puppies as more pleasant, erotic images elicited greater SCRs in both sexes. Valence and arousal responses to both categories were comparable across sexes, but arousal correlated with valence ratings only for erotic images in male participants. Our data indicates that in direct comparison, puppies present a suitable option for both sexes when aiming for highly pleasing hedonic effects irrespective of autonomic activation. In turn, when requiring stimuli both highly arousing and increasing in valence as a function of arousal, supporting evidence was only found for erotic images in males. Overall, our study provides insights into rewarding components of hedonic primary reinforcers and emphasizes the importance of specifying desired effects of reinforcers used when choosing from different reward options.

P.373 - The Role of Acetylcholine in Reward-Guided Decision Making Under Different Degrees of Uncertainty

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Poster Session 1

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Decisions we make on a daily basis involve varying degrees of uncertainty. For some decisions all the relevant information is available, whereas for others option attributes need to be learnt by trial and error. Acetylcholine has been suggested to both govern the learning rate and to modulate neural dynamics supporting reward-guided choice behaviour irrespective of learning. To dissociate how acetylcholine controls the influence of decision variables on choice behaviour under different levels of uncertainty, we administered the muscarinic M1 antagonist biperiden (4 mg) to healthy male participants (n = 43) in a within-subjects, placebo-controlled design. Participants performed two tasks associated with different degrees of uncertainty: In one task the option attributes, reward probability and reward magnitude, were explicitly presented to participants (reward-guided choice, less uncertainty), whereas in the other task the reward probability had to be learnt from experience (reward-guided learning, greater uncertainty). In the latter, reward contingencies additionally changed over the course of the experiment, involving stable and volatile phases. We show that biperiden reduced the sensitivity to reward probabilities, but only in the reward-guided learning task, while leaving decisions in the reward-guided choice task unaffected. Strikingly, drug effects in the learning task were even more pronounced during the volatile phase, where uncertainty is highest. Overall, this suggests that acetylcholine plays a key role in how individuals use decision-relevant information in uncertain contexts, such as during learning.

P.377 - Multi-Heuristic Policies in a Sequential Decision-making Task

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Poster Session 1

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In complex environments, people have to trade off different decision policies that are more or less optimal and demanding. Optimal policies (derived from computational formulations of the task at hand) map choice options to an abstract value representation and take the option with the highest value. Heuristic policies (also called behavioral classifiers) simplify decisions by focusing on specific variables of the choice options. Here, we combine behavioral data with computational models (which use approaches from reinforcement learning and supervised learning) to test if people use mixtures of heuristic policies that approximate optimal solutions but reduce cognitive demands. We developed a sequential decision-making task in the form of a hunter-gatherer game, in which participants (current n=24) had to find food and avoid predators in order to stay alive over a given number of time-steps within mini-blocks of the task. To make good decisions, participants had to trade off multiple variables (such as the probabilities of getting food or encountering predators, the current energy level, the remaining time steps, etc.). Our experimental set-up allowed the comparison of different decision models, including a number of heuristic policies and the optimal policy (computed from a fully observable Markov decision process). Model comparisons showed that a mixture of multiple heuristic policies best explained participants' decisions. As a proof of concept for the hierarchical application of multiple heuristics, we used a machine learning approach to derive a decision-tree model from participants' choice data. Overall, people seem to employ multi-heuristic policies rather than complex action-values.

P.379 - Bidirectional Modulation of Reward-Guided Decision Making by Dopamine

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Poster Session 1

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The neuromodulator dopamine has been shown to play a key role in working memory and decision making, albeit the latter is usually studied in contexts that include reinforcement learning. Here, we asked whether dopamine plays a causal role in reward-guided choice when information about choice attributes is explicitly presented but needs to be maintained over a delay period. To probe working memory, the two choice options were presented sequentially, separated by a short delay. Each option was associated with a reward magnitude and a probability to obtain this reward. The task was performed by 31 healthy participants under the influence of the dopamine D2/3 receptor antagonist amisulpride (400 mg), the dopamine precursor L-DOPA (100 mg L-DOPA + 25 mg carbidopa), or placebo in a double-blind cross-over design. The drugs had opposite effects on choice behavior. Whereas the degree to which choices were guided by both value parameters (reward magnitude and probability) was decreased under amisulpride, this influence on behavior was increased under L-DOPA. Notably, these drug effects are not specific to the option presented first, which suggests that the effect is independent of working memory representations of option values. Furthermore, there was no significant drug effect on the integration of choice attributes (i.e., expected value) and thus no difference in participants' overall financial bonus. Together, our data provide evidence for a role of dopamine in controlling the influence of value parameters on choice irrespective of working memory demands and beyond reinforcement learning.

P.384 - Reversing Mistakes in Sequential Tasks: Effects of Automatic Error Correction on Own and Observed Error Processing in Pianists

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Poster Session 1

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Although effects of conscious error correction on error processing have been investigated thoroughly, findings on effects of automatic corrections are sparse. Sequential tasks, in which errors are often corrected automatically and performance even decreases if error correction is not allowed, seem particularly suitable to investigate effects of such corrections. In a piano-playing task, automatically corrected errors elicited an altered error-related negativity (ERN) response compared to uncorrected errors, which can be explained with response conflict accounts. Interestingly, effects of later error correction were also seen when participants listened to others playing (Paas et al., 2021). This surprising finding could point to the detection of differences in volume between later corrected and uncorrected errors, indicating a different mechanism as for own errors. Alternatively, the findings could mean that later corrected errors are processed as specifically significant errors for both actors and listeners, indicating similar processing. To investigate the mechanisms of error correction on own and observed error processing further, we analysed data from a previously published piano-playing task in which participants either played themselves or watched videos of others playing, both with the piano muted to dissociate error processing from other factors associated with (observed) errors such as volume perception. In mixed linear model analyses, we found larger ERN amplitudes ($p = 0.12$, $b = 0.91$) for own corrected compared to uncorrected errors, while for the observer ERN component ($p = .705$, $b = 0.09$) no significant effect was found. This result pattern hints to response conflict accounts of error correction processing.

P.506 - Linking The Association Between Obesity And Cognition To Neurite Morphology Of White Matter Tracts Of Older Adults By Mediation

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Poster Session 1

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Obesity has been associated with lower fractional anisotropy (FA), a measure capturing global microstructural differences of WM integrity. Since FA, however, is not directly attributable to biological mechanisms (e.g., myelination), complex diffusion models may help to disentangle the underlying biological mechanisms of obesity-related WM differences. This is especially important in older adults whose high inter-individual variability in cognitive decline may be linked to specific neurite characteristics. The current study, hence, applied Neurite Orientation Dispersion and Density Imaging (NODDI) to 558 participants of the population-based 1000BRAINS study (45% females, 56-86 years).We analyzed associations between body mass index (BMI), waist-to-hip ratio (WHR), Body Shape Index (ABSI) and FA and NODDI parameters, i.e. neurite dispersion and neurite density, based on T1- and diffusion-weighted MRI (covariates: age, education, hypertension, physical activity). We stratified analyses for sex and explored whether WM differences mediate the relationship between obesity and cognition.In women, no differences in WM microstructure were detected. In men a higher WHR correlated with (i) lower neurite dispersion in circumscribed fiber tracts, e.g. corona radiata and internal capsule, as well as (ii) lower neurite density in almost all deep white matter tracts. Lower neurite density and dispersion partly overlapped, indicating that excess visceral fat might be a highly relevant factor in the linkage between obesity and brain structure. Here, NODDI enabled biological insights beyond global statements about FA as measure of WM integrity, since no differences in FA were found. An association between WHR, neurite morphology and cognitive performance could not be established.

P.514 - Neural Efficiency During Tactical Decision-Making in Volleyball

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Poster Session 1

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The neural efficiency (NE) hypothesis states that more intelligent individuals exhibit more efficient brain activation during cognitive tasks compared to less intelligent individuals. Furthermore, research shows that when individuals with higher capabilities in a certain domain (i.e., higher aptitude, experience or training) are tested on tasks that are specific to that domain, similar findings in regard to brain activation occur. This is also true in the context of sport, where numerous investigations in different disciplines revealed similar results. A sport which is not well researched yet in terms of NE is volleyball. Therefore, with this project, we aim to comprehensively investigate this matter. In a first preregistered study the tactical decision-making ability of volleyball experts, amateurs and novices will be tested by means of tactical game scenes presented by video, while simultaneously the brain activity is being measured using electroencephalography. In an exploratory approach we also use eye-tracking to record the gaze behavior during the tactical decision-making task. We expect to find better behavioral performance of volleyball experts compared to amateurs and novices and indicators of neural efficiency (i.e., more efficient brain activity) in relation to expertise level. Investigating sport-related phenomena on the neural and behavioral level can make useful contributions to a better understanding of their underlying complexity.

P.542 - Managing Perception-Action Representations Through The Interplay Of Alpha And Theta Band Activity

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Poster Session 1

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Goal-directed behavior requires integrated mental representations of perceptions and actions. The neurophysiological underpinnings of these processes, however, are not yet understood. It is particularly undetermined, which oscillatory activities in which brain regions are involved in the management of perception-action representations. We examine this question with a focus on response inhibition processes and show that the dynamics of perception-action representations reflected in theta band activity (TBA) are particularly evident in the supplementary motor area and the occipito-temporal cortex. Mental representations coded in alpha band activity (ABA) during perception-action integration are associated with the occipito-temporal cortex. Crucially, perception-action representations are exchanged between theta and alpha frequency bands. The results imply that ABA functions as dynamic top-down control over binding, retrieval and reconfiguration processes during response inhibition, which in turn are reflected by TBA. Our study thus highlights how the interplay of oscillatory activity enables the management of perception-action representations for goal-directed behavior.

P.644 - Outcome of Reward-based Multi-session Attentional Bias Modification is Contingent on Task but Not on Condition

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Poster Session 1

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Attentional bias modification is a procedure aiming to treat anxiety disorders based on the deliberate manipulation of attentional biases towards threat, i.e. the preferential processing of threatening stimuli (MacLeod et al., 1986, 2002). In its conception, it employed reaction time differences to measure and probability contingencies to manipulate attentional biases, however these methods have more recently come under criticism for being ineffective and unreliable. We aimed to improve upon both the efficacy of the attentional training as well as the reliability of outcome measures by using reward contingencies (Sigurjónsdóttir et al., 2015) during an app-based multi-session training period, combined with the N2pc component of the EEG, indicative of selective visual attention, to quantify attentional biases (Reutter et al., 2017).Healthy subjects (N=100, split 50/50 into training and control conditions) completed at least 10 ABM training sessions on their own devices at home, prior to and afterwards of which they underwent EEG measurement at our laboratory. The N2pc (i.e. the selective attention) for threatening faces was measured during a Dot Probe as well as a Visual Search task. In both groups, we found a nominal but nonsignificant decrease of attentional bias towards threat in the Dot Probe task, but a significant increase in the Visual Search task. These results not only further question the efficacy of ABM procedures, but highlight the impact that study design choices may have on results, given that the two tasks yielded highly different outcomes. Future planning and evaluation of research should take this fact into account.

P.101 - The Role of Conscious Awareness in Olfactory Conditioning

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Poster Session 1

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Comparing the physiological mechanisms of appetitive and aversive conditioning often proves difficult, because multiple modalities are involved (e.g. pain stimulus versus monetary reward). The olfactory system is unique in that isointense odors can elicit comparable pleasant and unpleasant responses, providing a valuable opportunity to examine both types of conditioning in humans. To do this, we used odors as unconditioned stimuli (US) in a within-subjects design and measured physiological responses such as skin conductance, heart rate, fear-potentiated startle, event-related brain potentials, and auditory steady state responses (ASSR) as derived from EEG. In a series of three experiments with overall sample of 69 participants, we presented three neutral sounds paired with either a pleasant odor, unpleasant odor, or clean air. In the first experiment, participants were not instructed and the conditioned stimuli (CS) were amplitude modulated for the ASSR analysis. This modulation and the startle probe were omitted in the second experiment, and in the third experiment, participants were instructed on the CS-US contingencies before the experiment. The results suggest that effects are stronger in participants who are consciously aware of the CS-US contingencies, but even in these aware participants, the effects were only minimal. We only identified differences between CS+ and CS- in heart rate (in experiment 1) and fear-potentiated startle (in experiment 3). Our finding of minimal or no learning effects on multiple peripheral and neural physiological measures is possibly attributed to the extra-thalamic nature of olfactory pathways and the resulting difficulty in forming associations with auditory stimuli.

P.195 - Rock Around The Clock: The Size Of Prediction Error Determines The Amplitude Of The Mismatch Negativity (MMN)

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Poster Session 1

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Mismatch negativity (MMN) is an automatic brain response occurring to an irregularity in the auditory environment. It is usually tested in an oddball sequence comprising identical, standard, tones interrupted unpredictably by a different, deviant, tone. The MMN is greater negativity in event-related potentials (ERPs) approximately 100–250 ms after the onset of a deviant tone compared to ERPs from standard tones. It is considered to be a prediction-error signal in predictive coding theory.We aimed to test whether MMN could occur when the standards changed on every trial in a predictable way and whether the size of the MMN is dependent on the magnitude of difference between the predicted tone and the deviant.We presented discrete Shepard scales comprising 12 semitones that either ascended or descended forever, sequentially visiting each hour of a scale clock. We randomly violated the scale with deviants that were one third or two thirds of semitone less or more than the predicted tone. We found larger MMNs to deviants more different from the predicted tone, showing that the size of prediction error is important in generating the MMN.

P.215 - Neural Entrainment And Phase-Amplitude-Coupling During Rhythmic Grasping Under Visuomotor Conflict

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Poster Session 1

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We tested for neural entrainment in MEG data recorded from eighteen participants performing a virtual reality based, rhythmic hand-target phase matching task: Participants matched the phasic size change of a target dot (0.5 Hz) with their real hand (RH) movements, or with the movements of a virtual hand (VH) that was controlled via a data glove and moved either congruently (C: no delay) or incongruently (IC: 0.5s delay). The averaged power spectrum across all sensors showed prominent 0.5 Hz and 1 Hz power, indicating neural entrainment to the full-grasping cycle (open-and-close; 0.5 Hz), as well as to open vs close movements (1 Hz). An ANOVA revealed a significant interaction effect at 1 Hz power; mainly driven by increased power in the VHIC condition; i.e., the only condition requiring visuomotor adaptation. This interaction effect was strongest over the contralateral motor cortex, and furthermore significant over central-frontal and parietal sensors. To further test for attentional interactions with the above entrainment, we computed phase-amplitude-coupling (PAC) between the 1Hz phase and low-frequency (i.e., alpha and beta) amplitude. We found significant interaction effects in the PAC of sensors over the left motor cortex in the alpha range (10-14 Hz); with the strongest PAC in the VHIC condition. Overall, our results suggest that the entrainment of rhythmic neuronal activity in contralateral motor areas to a slow rhythmic grasping task, and potential cross-frequency interaction, may be sensitive to task conditions such as those requiring visuomotor adaptation and related attentional control.

P.263 - The Aperiodic Temporal Structure of Human Attention

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Poster Session 1

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Attention is a fundamental cognitive process that enables the brain to effectively process sensory information while filtering out irrelevant stimuli. A growing literature suggests that attention moves rhythmically between stimuli at around 4 – 8 Hz. However, recent studies have proposed that attentional switching can also be accounted for by aperiodic temporal structure. Neural activity has been shown to exhibit distinct temporal receptive windows, which are crucial for information integration and segregation. Sensory areas (i.e. unimodal regions) display shorter timescales that might enable rapid processing of environmental changes, whereas association areas (i.e. transmodal regions) have longer timescales that might support sustained cognitive processes. To date, little is known about how intrinsic timescales modulate attention and perception. In this study, we examined the relationship between neural timescales and behavior during attention using two different spatial attention tasks and neurophysiology (scalp and intracranial electroencephalography). Our results reveal that behavior is modulated by neural timescales, with transmodal regions predicting individual reaction times during the delay period. Longer timescales predicted slower responses, while shorter timescales were associated with faster responses. This suggests during sustained attention it is advantageous to quickly sample the environment in order to segregate behaviorally relevant information. Intracranial data additionally reveals two distinct clusters of electrodes, showing shorter and longer timescales in unimodal and transmodal regions, respectively. Taken together, our findings provide evidence for the idea that multiple, non-oscillatory timescales are simultaneously present in behavior and across the cortex and that both periodic and aperiodic temporal structures contribute to attention control.

P.270 - Modulations Of Gamma-Band Oscillations Under Virtual Reality Conditions

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Poster Session 1

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Electrophysiological activities in specific frequency bands are regarded well-established indices to examine the cortical mechanisms underlying cognition. Likewise, Virtual reality (VR) is a more and more important research tool, driving the investigation of human cognition under ecological valid settings. In this context, gamma-band oscillations are highly relevant to complement findings from the low-frequency range. However, 30-100Hz activity is even more prone to electrical and extracerebral artefacts as opposed to low-frequency oscillations, impeding undisturbed signal acquisition during the use of immersive technologies. At the example of a classical repetition priming paradigm, we aim to demonstrate the feasibility of capturing oscillations in the high-frequency gamma-band range (30-100Hz) under VR conditions and address potential interferences from electrical noise and micro-saccades. Our results reveal that gamma-band responses can be accessed during the use of a VR headset, and that the observed responses are in line with previous findings. Controlling interferences which are less critical for lower frequencies, the acquisition of high-frequency oscillatory electrophysiological markers under immersive VR conditions offers a promising approach to extend findings based on conventional EEG studies and current approaches to combine VR and electrophysiological methods.

P.298 - The Impact of Multi-Step Actions on the Sense of Agency: Insights from Explicit and Implicit Measures

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Poster Session 1

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The sense of agency is the sense of controlling our actions and their outcomes. While everyday actions mostly consist of several steps before an outcome occurs, little is known about how our sense of agency operates across multi-step actions. In this study, we aimed to investigate this phenomenon with a task in which participants had to complete a one-step action or a three-step action sequence to produce a tone. Apart from these two self-generation conditions, there were two external conditions in which the sequences from the self-generation blocks were replayed. A visual countdown announcing the tone was presented on screen during the three-step external condition, ensuring high tone predictability. We measured sensory attenuation, the phenomenon that self-generated effects are perceived as less intense than externally-generated ones, by having participants compare the loudness of two subsequent tones (the self-generated tone and a computer-generated one). In the two self-generation blocks, we also obtained explicit agency judgments. The explicit sense of agency for self-generated tones was reduced in the three-step action condition compared to the one-step action, replicating previous findings. However, we observed sensory amplification rather than attenuation in all four conditions. Still, the point of subjective equality was lower, i.e., tones were perceived as less loud in the self-generation conditions than in the external conditions. These results once more show that implicit and explicit measures of the sense of agency may reflect different processes. They furthermore question the validity of sensory attenuation as a cue to the sense of agency.

P.333 - Investigating The Interaction Between Microsaccades And Electrophysiology To Understand Their Joint Impact On Visual Perception In Humans

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Poster Session 1

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Humans rely heavily on their vision to explore the environment. By making saccades, humans move their fovea to increase acuity while fixating. However, even when fixating, the eyes never remain completely still. Among such fixational eye movements, microsaccades have been indicated to play an important role in visual attention and perception. Here, we ask whether and how microsaccades modulate the neural correlates of visual perception and, consequentially, influence performance in humans. We simultaneously record scalp EEG and eye tracking while participants perform a near-threshold visual detection task, to detect the orientation of a brief, masked visual target stimulus. The time interval between target and mask is adapted to the participant's individual detection threshold following a 2-up-1-down staircase procedure. Focusing on the time interval prior to target appearance, we expect to observe phase alignment of low frequency brain activity, locked to the onset of microsaccades, similar to previous findings with large saccades. We also expect to confirm previous findings showing that pre-stimulus phase predicts detection performance, an observation called phase bifurcation. Here, however, we expect that phase bifurcation is expected to vary with the occurrence of microsaccades. More specifically, we expect that the timing of microsaccades in relation to the target appearance will impact phase bifurcation and, consequentially, detection performance. We speculate that microsaccades, like large saccades, modulate brain activity, and that the behavioural outcome in a near-threshold visual task can be predicted by the covariation of microsaccades and neural activity preceding the target.

P.364 - Transsaccadic Neural Preview Benefits for Faces, Objects, and Words: A "Mega-analysis" across Studies

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Poster Session 1

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In most electrophysiological studies, visual stimuli such as faces, objects, or words are passively presented in foveal vision. In contrast, everyday viewing conditions typically afford a (blurry) extrafoveal preview on the stimulus, which then facilitates recognition once the stimulus is foveated with a saccade. Recently, several laboratories have started to investigate the neural correlates of this trans-saccadic preview benefit by using combining EEG, eye-tracking and saccade-contingent display changes. In the current work, we analyzed the subject-level EEG waveforms from 16 recently published experiments (from 6 different labs, n=349) investigating extrafoveal-to-foveal preview effects for various stimulus categories (faces, objects, Gabors, words, Chinese characters) both with and without an intervening saccade. Evoked potentials from all studies were jointly analyzed within one linear mixed model (so-called "mega analysis" approach). Results reveal a remarkably consistent effect of extrafoveal preview validity on the subsequent brain responses to the foveated stimulus. Strongest effects were consistently observed on the later parts of the occipitotemporal N1/N170 component but results also reveal early effects of preview validity beginning after only 80-90 ms and peaking during the falling flank of the P1. We highlight several factors modulating these neural preview effects, such as stimulus category, active saccade execution, and the participant's display change awareness. We also show evidence indicating that EEG measures can distinguish preview effects acting at different levels of the visual hierarchy. We conclude that during natural vision, extrafoveal previews and trans-saccadic predictions have a considerable and consistent impact on the electrophysiological response to faces, words, and objects.

P.393 - Similar Costs Of Dimension-Weighting Shifts For Random And Predictable Changes In Target Dimension

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Poster Session 1

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The so-called dimension-weighting account states that visual search for pop-out targets in different dimensions depends on the history of target presentation: targets defined in another dimension as the preceding one (e.g., a color-target following an orientation-target) are detected more slowly than targets defined in the same dimension (e.g., a color-target following color-target, Found Müller, 1996). These costs of dimension-weight shifts are reduced when a cue word indicates the upcoming target dimension (Müller, Reimann, Krummenacher, 2003).Here, we tested whether dimension-weighting is not only subject to top-down cueing but also to predictive bottom-up mechanisms. In two conditions we presented color (C) and orientation (O) targets with the same frequency in either random (e.g., C-O-C-O-C-C-O-O-O-C...) or predictable order (e.g., C-C-O-O-C-C-O-O-C-C....). That is, in the latter condition both repetitions and changes of target dimensions were predictable. If the perceptual system makes use of the regularity contained in the predictable sequence we expected that the costs of dimension-weight shifts should also be reduced. However, we found only a general reaction times decrease in the predictable condition as compared to the random condition demonstrating that the perceptual system benefits from extracting regularities. But critically, we did not observe a reduction in costs of dimension-weight shifts between the conditions: in both the random and the predictable condition, reaction times were delayed when target dimensions changed compared to when they were repeated. Thus, we conclude that the extraction of sequence regularities does not affect the operation of the dimension-weighting system.

P.395 - Some Great Reward? Investigating Neural Correlates of Attentional Conflict Control and Reward Sensitivity in Post COVID-19 Patients

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Poster Session 1

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Background: Post COVID-19 patients commonly experience bodily and cognitive impairments, but the neural correlates of their symptoms are unclear. Aberrant reward processing has been linked to symptoms prevalent in post COVID-19, such as depression, anxiety, and fatigue but has not yet been investigated in post COVID-19 patients. Aim: This ongoing study aims at investigating behavioural and neural substrates of attentional conflict control and reward processing in post COVID-19 patients, and a possible influence of reinforcement sensitivity. Methods: 25 post COVID-19 patients and 17 healthy controls completed a rewarded flanker task during functional MRI and filled in a questionnaire on behavioural inhibition (BIS) and activation systems (BAS). FMRI Data were acquired with a 3T Siemens Skyra and analysed with SPM12. Results: Post COVID-19 patients showed prolonged reaction times compared to controls but did not differ in accuracy or interference effects. No differences in neural activity were found regarding congruency and groups. Higher reward was related to more deactivation during incongruent vs. congruent trials in left inferior frontal gyrus, left dorsolateral prefrontal cortex, and bilateral anterior insula across groups. BAS Fun-Seeking was associated with faster responses and higher reward across groups. In patients, BAS Drive was associated with more anterior cingulate activation in incongruent vs. congruent trials. Conclusion: These results indicate that post COVID-19 patients respond more slowly but may not additionally show reduced conflict control. Reward and reinforcement sensitivity modulate activation in regions crucial for cognitive control and reward processing. However, the preliminary analysis did not reveal activation differences between groups.

P.407 - Investigating Sensory Attenuation: The Effects of Self-Initiated Multisensory Stimuli

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Poster Session 1

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The auditory N1 attenuation effect indicates that sensory consequences resulting from self-initiated sounds are attenuated. There has also been evidence for the same effect in the visual domain, but here, the self-initiated picture caused either an attenuated or enlarged N1 response. The present study compares N1 sensory attenuation for auditory, visual, and auditory-visual.In two experiments, three conditions of self-initiated stimuli were studied, namely self-initiated sounds (auditory), self-initiated visual pictures (Experiment 1: checkerboard; Experiment 2: Gabor patches; visual), and simultaneously occurring self-initiated sounds and pictures (Experiment 1: checkerboard; Experiment 2: Gabor patches; auditory-visual).In separate blocks, self-initiated and externally-initiated sensory consequences were collected for each condition. Both experiments provided converging evidence for the N1 attenuation effect when comparing self-initiated to externally-initiated blocks for the auditory and auditory-visual conditions. However, this effect was not observed for the visual condition.Furthermore, the study highlights the salience of the auditory modality for auditory-visual sensory attenuation.

P.107 - Investigating the Impact of Acute Stress on Cross-Frequency Coupling and its Relationship to Endocrinological Outcomes

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Poster Session 1

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Acute stress constitutes a strong impact on the brain and on cognitive and affective processing. It is related to an increase in stress hormones and negative affect. Cross-frequency coupling (CFC) between activity in the delta (1-4 Hz) and beta (14-30 Hz) frequency bands has been implicated as a potential neural correlate of stress regulation processes: frontal delta-beta CFC could reflect communication between subcortical structures and frontal cortical structures associated with the regulation of negative affect. To investigate the influence of acute stress on delta-beta CFC and its role in stress regulation, 50 participants underwent acute stress induction as well as a control procedure on separate days. EEG data were recorded during stress induction and the control procedure. We calculated amplitude-to-amplitude (AAC) correlations and phase-to-amplitude coupling (PAC) between the delta and beta band activity at frontal (F3, F4, Fz) and parietal (P3, P4, Pz) electrodes. Non-parametric Wilcoxon signed-rank tests revealed higher AAC during stress at parietal electrodes and higher PAC during stress at frontal and parietal electrodes compared to the control condition. There were no significant correlations between mean AAC, mean PAC, and markers of the physiological stress response (salivary cortisol and alpha-amylase). Our results indicate that acute stress has a strong influence on cross-frequency coupling between the delta and beta bands. However, these changes were not associated with changes in physiological stress markers. It is possible that changes in delta-beta CFC and endocrinological and subjective stress measures reflect distinct aspects of the stress response that do not necessarily correlate.

P.213 - Expectation-Induced Modulation Of Psychological And Bodily Sickness Symptoms In A Human Model Of Acute Systemic Inflammation: A Randomized Placebo-Controlled Trial In Healthy Volunteers

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Poster Session 1

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Background: Inflammatory mediators released during inflammatory conditions can induce unspecific sickness symptoms including hyperalgesia and depression-like mood via central nervous effects. It remains unclear, whether the generation and treatment of inflammation-induced sickness symptoms can be modulated by expectations, despite their high prevalence and clinical relevance. To this aim, we employed an established model of acute systemic inflammation (i.e. experimental endotoxemia) to experimentally induce sickness symptoms in combination with a placebo-controlled anti-inflammatory drug treatment and tested expectation effects on inflammation-induced sickness symptoms as well as on the efficacy of an anti-inflammatory drug treatment.Methods: In this randomized placebo-controlled trial, all healthy volunteers were intravenously injected with a low dose of 0.8ng/kg lipopolysaccharide (LPS) to induce sickness symptoms. In double-blind manner, volunteers received an active anti-inflammatory drug or a placebo, which was randomly combined with either positive or neutral treatment-related information. Herein, we report on data from the placebo arm (N=62). Bodily and affective sickness symptoms and inflammatory markers were repeatedly assessed up to six hours after LPS-injection.Results: LPS application induced the expected transient increases in inflammatory markers and self-reported sickness symptoms in all participants (all $p<.001$, time effect). Compared to neutral treatment expectation, participants in the positive condition reported significantly less bodily symptoms ($p<.05$) and - as a trend - decreased symptoms of negative mood in response to LPS.Conclusion: Our findings indicate a beneficial effect of verbally induced positive expectation on sickness symptoms, suggesting that expectation effects may enhance treatment efficacy in the context of immune-mediated sickness symptoms.

P.223 - Kynurenin und Lymphozyten-zu-Monozyten-Verhältnis als inflammatorische Marker für den Schweregrad depressiver Symptome nach SARS-CoV-2-Infektion

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Hintergrund: Eine Infektion mit SARS-CoV-2 (Schweres- akutes -Atemwegssyndrom- Coronavirus Typ 2) kann einen Risikofaktor für die Entwicklung depressiver Symptome (u.a. Energielosigkeit, Interessenverlust und gedrückte Stimmung) darstellen. Persistierende Entzündungsprozesse werden als ein möglicher biologischer Mechanismus diskutiert, der diesen Zusammenhang beeinflusst. Zwischen depressiver Stimmung und der Konzentration diverser Entzündungsmarker (z. B. Zytokine, Kynurenin) wird ein Dosis-Wirkungs-Zusammenhang vermutet. Das Ziel dieser Studie war es, den Zusammenhang zwischen verschiedenen Entzündungsmarkern und dem Schweregrad der depressiven Symptomatik nach SARS-CoV-2-Infektion zu untersuchen. Um hierbei den Einfluss von konfundierenden Variablen (Bewegungsmangel, Übergewicht und Adipositas etc.) möglichst gering zu halten, wurden körperlich aktive Individuen zur Untersuchung eingeschlossen. Methoden: Bei N = 61 Probanden wurde im Mittel 6 Monate (SD = 4.29) nach der ersten SARS-CoV-2-Infektion die Konzentration diverser Entzündungsmarker (Interleukine, Ferritin, Lipopolysaccharid- bindendes- Protein, Neutrophilen- zu- Lymphozyten-Verhältnis, Thrombozyten- zu- Lymphozyten- Verhältnis, Lymphozyten- zu-Monozyten- Verhältnis [LMR]) und Kynurenin [KYN]) im peripheren Blut bestimmt. Die Erhebung der depressiven Stimmung erfolgte mittels der Allgemeinen Depressionsskala. Das Vorliegen weiterer SARS-CoV-2-assoziierter Symptome (u.a., Müdigkeit, Einschränkungen der körperlichen Leistungsfähigkeit) wurde in einem Anamnesegespräch erhoben. Ergebnisse: Individuen mit höherer KYN-Konzentration wiesen einen höheren Schweregrad der depressiven Symptomatik auf, während höhere LMR-Werte mit einem geringeren Schweregrad einhergingen. Zudem konnte bei Probanden mit persistierenden körperlichen Symptomen ein höherer Schweregrad der depressiven Symptome und niedrigere LMR-Werte festgestellt werden als bei Probanden ohne persistierende körperliche Symptome. Für die weiteren Inflammationsmarker zeigte sich kein Unterschied. Schlussfolgerungen: Die Ergebnisse dieser Studie deuten darauf hin, dass ggf. sowohl KYN als auch LMR als Biomarker für depressive Symptome nach SARS-CoV-2-Infektion angesehen werden können und als Zusatz in die klinische

Diagnostik implementiert werden sollten.

P.226 - Gastric Biofeedback in Virtual Reality: a Pilot Study

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Poster Session 1

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Gastric Biofeedback (with electrogastrography; EGG) is a promising new tools in the field of interoception, emotion regulation and eating disorders (Davey et al., 2023; Stern et al., 2004; van Dyck Lutz, 2022; Vujic et al., 2020). However, research in the domain is still scarce with not even a handful of experimental studies on the topic (Stern et al., 2004; Vujic et al., 2020). The current pilot study, therefore, evaluated a novel gastric biofeedback paradigm in virtual reality (VR). We conducted a randomised controlled study with three groups (1) a VR based gastric biofeedback paradigm, (2) the same paradigm in 2D and (3) a relaxation control group. The primary outcome was the extent to which healthy subjects could increase their normal (3cpm) gastric myoelectric activity. Secondary outcomes were motivational aspects and attentional focus. Results showed significant differences between the groups regarding both the increase in 3cpm activity as well as motivational and attentional aspects. This pilot study contributes important new findings in the domain of gastric biofeedback, demonstrating that an increase in normal gastric 3cpm activity through EGG biofeedback is feasible. However, more research is needed to clarify the underlying mechanisms as well as how and if training success may be associated with beneficial effects on interoception, emotional regulation and eating disorder symptoms.

P.261 - Associations Between Cortisol Stress Responses and Limbic Volume and Thickness in Young Adults

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The investigation of the relationship between neural measures of limbic structures and hypothalamic pituitary adrenal axis responses to acute stress exposure in healthy young adults has so far focused in particular on task-based and resting state functional connectivity studies. Thus, the present study examined the association between limbic volume and thickness measures and acute cortisol responses to the psychosocial stress paradigm ScanSTRESS. Using multiple linear regression analyses controlling for sex, age, and total brain volume, the associations between (sex-specific) cortisol increases and human connectome project style anatomical variables of limbic structures (i.e., volume and thickness) were investigated in 66 healthy and young (18-33 years) subjects (35 men, 31 women taking oral contraceptives). Significant positive effects were detected for cortisol increases on left amygdalar volume and parahippocampal as well as (marginally) lateral orbitofrontal cortex thickness. Regarding the left ncl. caudatus volume, a marginally significant dissociation between sex-specific cortisol responses was found describing a positive association in men but a negative one in women. Although none of the results survived false discovery rate correction, the present results suggest interesting new insights into the involvement of limbic structures in psychosocial stress processing. Indeed, the findings suggest that not only situation- and context-dependent reactions of the limbic system (i.e., blood oxygenation level dependent reactions) are related to acute cortisol stress responses, but also basal and somewhat more constant structural measures.

P.265 - Is Executive Function in Children Affected by Empathic Resonance With Their Mother's Stress?

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Stress exposure and the associated physiological activation can have detrimental consequences for physical and mental health. Children are especially vulnerable to such adverse stress effects, as their bodies and brains are constantly developing. Beyond the stress experienced first-hand, stress can be transmitted empathically between individuals – even more so when they share a strong emotional bond. Given the close relationship between children and their caregivers, we examined the effects of children's empathic stress with their mothers on their cognitive performance. To this end, 76 mother-child dyads were recruited and assigned to either an experimental group, where mothers completed a standardized laboratory stress paradigm, or a control group, where mothers completed a stress-free task. Children, aged 8-12, observed their mothers through a one-way mirror during their respective tasks and subsequently completed a category-switching and an n-back task to test cognitive flexibility and working memory. We assessed salivary cortisol, subjective stress, and heart rate of mothers and children at various time points and used changes in these stress parameters to predict children's cognitive performance. Our findings revealed no significant difference in cognitive performance between stress and control groups, and child stress markers did not affect their cognitive performance. However, maternal stress markers significantly influenced children's cognitive flexibility and working memory. These results emphasize the potential impact of parental stress experiences on their children's cognitive outcomes, underscoring the importance of mitigating stress and promoting well-being for parents and children alike.

P.299 - Solidifying Fundamental Methodological Practices of Hair Cortisol Analysis: A Study Protocol for Investigating Influences of Storage Duration, Scalp Region and Sampling Method

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Poster Session 1

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The analysis of hair cortisol concentrations (HCC) is a reliable method for measuring long-term cumulative hormone secretion. However, certain methodological gaps remain. This planned project aims to address a current lack of systematic knowledge concerning the influence of storage duration, scalp sampling region, and sampling methodology on HCC and other steroid hormones within three individual studies. Study I will utilize a within-subject design to assess the effect of storage duration on HCC levels by analyzing hair samples at five different time points: immediately after sampling and after 3, 6, 12, and 24 months of storage. Sampling will be conducted in four cycles, each three months apart, to control for laboratory batch effects and seasonal influences. Study II will investigate the influence of scalp region on HCC levels by comparing samples taken from the posterior vertex and the occipital region using a within-subject design. Participants will provide hair samples at two time points, six months apart. Study III will compare two sampling methods: the accumulation method (accumulation of smaller samples from different locations) and the single sample method, to determine which yields more accurate HCC measurements. Samples will be collected twice, again six months apart. Anthropometric measures and stress-relevant constructs will be measured in all studies to examine the impact of methodological choices on external criteria. All hair samples will be analyzed using liquid chromatography tandem mass spectrometry (LC-MS/MS). Findings from this project will help researchers to make evidence-based methodological decisions and thus increase the quality of future hair cortisol research.

P.315 - Exploring The Complex Relationship Between Stress And Associative Memory: The Impact Of The Trier Social Stress Test On The Retrieval Of Emotionally Valenced Word Pairs

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Poster Session 1

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The relationship between stress and associative memory is to date not fully understood. Prior findings have been contradictory, suggesting that the relationship may be complex and dependent on characteristics and timing of the stressor, as well as on characteristics of the stimulus material and memory task. The present study explores the effects of psychosocial stress induced by the Trier Social Stress Test (TSST), on associative recognition memory performance for emotionally valenced, arousing, versus neutral word pairs. Female participants were recruited for two experimental sessions. In each session, participants completed an intentional encoding phase comprising neutral- positive, neutral-negative and neutral-neutral pairs, each followed by a judgment of learning. The encoding phase was immediately followed by one block of an associative recognition test. While in the first session, the first test block was followed by a number of questionnaires, in the second session, participants were next subjected to either the TSST or a control task. Finally, two additional blocks of testing were administered. Results revealed that participants in the stress group demonstrated enhanced recall of positive word pairs relative to neutral word pairs in the second session as compared to the first session. Notably, no significant differences were observed between the sessions for the control group. In sum, the present results suggest that stress effects on retrieval of word pairs are particularly strong for positively valenced word pairs.

P.319 - Altered Stress Responses In Patients With Alcohol Use Disorder

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In patients with alcohol use disorder (AUD) a dysregulation of physiological stress systems has been observed; however, little is known about the interplay of changes in various stress parameters and associations with neural changes. Functional connectivity (FC) of the brain has been found to be disrupted in AUD and under stress, but acute stress effects on FC in AUD have been rarely investigated. Thus, this study aimed to examine (stress-induced) changes in different stress parameters and FC in patients with AUD.34 individuals with AUD and 34 healthy controls were recruited for a two-day study, which included acute stress induction using the Trier Social Stress Test and a control task on separate days. Cortisol samples, pulse rate, and questionnaire data on negative affect were collected before, (during), and after the tasks. Furthermore, participants underwent a functional magnetic resonance imaging scan to assess stress-induced changes in FC.Results showed that negative affect increased more strongly after stress induction in the patients group compared to healthy subjects while cortisol and pulse rate responses were less pronounced in this group. FC analyses revealed increased connectivity between the left amygdala and bilateral angular gyrus and between the right ventral insula and cerebellum after stress induction in the patients group.These results indicate altered stress responses in patients diagnosed with AUD, which are manifested in various parameters. Further, they suggest a dissociation of physiological and affective stress reactivity in individuals with AUD and a potential role of the brain's FC in mediating these responses.

P.328 - No Changes in Triple Network Engagement Following (Combined) Noradrenergic and Glucocorticoid Stimulation

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Successful recovery from stress is integral for adaptive responding to the environment. At a cellular level, this involves slow genomic actions of cortisol, which alter or reverse rapid effects of noradrenaline and cortisol associated with acute stress. At the network scale, stress recovery is less well understood but assumed to involve changes within salience-, executive control-, and default mode networks. To date, few studies have investigated this phase and directly tested these assumptions. Here we present results from a double-blind, placebo-controlled, between-groups paradigm (N=165 healthy males) administering both 10 mg oral yohimbine and/or 10 mg hydrocortisone two hours prior to resting state scanning. Salivary markers of both noradrenaline and cortisol were still significantly elevated at the time of resting state scanning, but we found no changes in within network connectivity of the three networks, both after single and combined drug administration. This conflicts with previous findings and may be attributable to systematic differences between stress paradigms. The majority of previous investigations into the stress recovery phase have implemented psychosocial stress induction, which may have led to paradigm-specific confounds. For example, stress conditions of psychosocial stress induction have often involved higher cognitive load (potentially inflating stress effects on the executive control network), or greater social evaluative threat, which may in turn have increased self-referential processing and rumination (and thereby possibly increased observed effects on the default mode network). Our null findings in a pharmacological paradigm therefore highlight the need to isolate paradigm-specific effects from those related to stress.

P.330 - Effects of Stress-related Neuromodulators on Amygdala and Hippocampus Resting State Functional Connectivity

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The human stress response is characterized by an increase in several neuromodulators, including catecholamines (mainly norepinephrine) and glucocorticoids (mainly cortisol). Both neuromodulators play important roles in the initial response to stress as well as in adaptive recovery from stress, which promotes resilience. Two brain areas that play an important role in the stress response are the hippocampus and the amygdala. The precise influence of cortisol and norepinephrine on hippocampus and amygdala functional connectivity (FC) is poorly understood. The current study examines the influence of norepinephrine and cortisol on resting-state FC of the hippocampus and amygdala. We used a pharmacological paradigm with N = 165 participants (N = 40 yohimbine + placebo; N = 41 hydrocortisone + placebo; N = 42 hydrocortisone + yohimbine; N = 42 placebo + placebo). Participants received either 10 mg yohimbine and/or 10 mg hydrocortisone in a randomized, double-blind, placebo-controlled design. Resting state scans were performed two hours after pharmacological elevation of stress neuromodulators. We will present data on whole brain FC with the amygdala and the hippocampus as regions of interest. Based on the existing literature, we expect all experimental groups to have reduced FC of the amygdala and hippocampus compared to the placebo group. We expect to see greater reductions in FC in both groups receiving hydrocortisone, with the greatest difference compared to placebo after combined hydrocortisone and yohimbine administration. Reducing FC of the amygdala and hippocampus during stress recovery may enhance cognitive processing and increase resilience to the development of stress-related mental disorders.

P.361 - The Impact of Pre-extinction Stress Vs. Exercise on Contextual Retrieval and Generalization

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Stress hormones timing-dependently modulate the strength and context-dependency of extinction memories. Exposure to stress or cortisol before extinction leads to a strong and less context-dependent extinction memory (STaR model; Meir Drexler et al., 2019). However, common stress protocols have disadvantages, such as increases in negative affect. Therefore, we need a more positively appraised stress-hormone associated intervention to promote extinction memory retrievability and to mitigate fear relapse. Physical exercise is a potential candidate: it also increases cortisol, it improves emotional memory consolidation, and it is typically associated with positive affect. Here we compare the effects of physical exercise (treadmill running) and psychosocial stress (Trier Social Stress Test (TSST)) before extinction training on contextual retrieval and generalization 24h later. Healthy participants underwent fear acquisition on day 1, the exercise, stress, or control intervention followed by extinction on day 2, and a retrieval and reinstatement test on day 3. During the interventions, HPA axis (salivary cortisol) and SNS (alpha-amylase and heart rate) activity were assessed. Skin conductance responses (SCRs) and pupil dilation served as outcome measures during the fear conditioning paradigm. We predicted that pre-extinction stress and exercise both facilitate extinction memory consolidation context-independently. Preliminary results (N = 63, planned N = 120) showed that the stress and exercise intervention both significantly increased heart rate as compared to the control group. Fear and extinction learning, as measured by SCRs, were both successful and did not differ between groups. Both interventions seemed to reduce fear renewal, but these effects did not reach significance yet.

P.366 - Open TSST-VR: Validation of an Open Access Version of the Trier Social Stress Test in Virtual Reality

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The Trier Social Stress Test (TSST) is one of the most frequently used psychosocial stressors under laboratory conditions. However, the implementation causes significant costs and is sensitive towards protocol variations, for instance the conduct of the judges. Therefore, in recent years, there has been growing interest in adapting the TSST in virtual reality (VR) to increase the standardization and economy of the procedure. This study aimed to validate a freely accessible version of the TSST-VR. Heart rate, salivary cortisol, and subjective stress ratings were measured in fifty male participants randomly assigned to the TSST-VR or a control procedure in VR. The analysis revealed a significant rise in salivary cortisol in the stress condition compared to the control group indicating a significant induction of stress. From the results of this study, we conclude that the Open TSST-VR provides a suitable tool for eliciting psychosocial stress. In addition, this open access version offers various options to customize the VR environment to individual needs and enables collaborations between research groups.

P.387 - Wirkung Verschiedener Yoga-Atemtechniken Auf Die Herzratenvariabilität

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Poster Session 1

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Methoden zur Regulation des Atems werden in vielen Techniken zur Entspannungsförderung eingesetzt. Physiologische Maße zur Erfassung der Wirksamkeit der genutzten Technik bietet das EKG, da es Effekte auf das vegetative Nervensystem zeigen kann. In der vorliegenden Studie praktizierten Anfänger verschiedene Atemtechniken, während das EKG aufgezeichnet wurde. Es wurden vier Techniken verglichen: (1) ujjay-Atmung: gleichmäßiger Atemfluss, (2) Verlängerung der Atemphasen mit Audiodateien, (3) leichte Hyperventilation mit anschließender Atempause und (4) wechselseitige Nasenatmung. Jede Atemtechnik wurde innerhalb von zwei Wochen vermittelt und geübt. Die anschließende Messung der Probanden (n=34) beinhaltete eine Baseline-Messung (5 Min.) und eine Phase, in der die jeweilige Atemtechnik praktiziert wurde (10 Min.). Anschließend wurden Fragebögen zum subjektiven Stresserleben, zur Achtsamkeit und zum körperlichen Wohlbefinden ausgefüllt. Die EKG Daten wurden auf unterschiedliche Effekte auf die Herzratenvariabilität hin untersucht, in Bezug auf Unterschiede zwischen den Atemtechniken und Zeitverlauf.Im Vergleich zur Baseline führten drei Interventionen (1, 2, 4) zu einer Erhöhung der Herzratenvariabilität. Die verschiedenen Atemtechniken führten nicht zu signifikant unterschiedlichen Veränderungen in der Herzratenvariabilität, eine Analyse der ersten Hälfte der Messung und der zweiten zeigte ebenfalls keine signifikanten Unterschiede. Dies spricht dafür, dass der Atem das vegetative System unabhängig von der genutzten Atemtechnik beeinflussen kann und es für den initialen Effekt keinen Unterschied macht, ob die Technik fünf oder zehn Minuten lang praktiziert wird.

P.424 - Reducing Stress Through Socio-emotional Training: Exploring Differential Impact Of App-Delivered Trainings On Cortisol Responses In The Trier Social Stress Test

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Psychosocial stress is a common experience in daily life and can have negative impacts on physical and mental health. Mindfulness-based interventions have been widely used to alleviate stress. In terms of psychosocial stress, recent studies suggest that socio-emotional training may be a more effective intervention for reducing cortisol levels. This randomized controlled trial aimed to compare the effectiveness of two 10-week app-based socio-emotional and mindfulness-based trainings on cortisol reduction during the Trier Social Stress Test (TSST). We recruited 140 healthy participants (55% female, mean age 44) from the CovSocial project to participate in the TSST. The intervention groups completed a 10-week app-based purely online training program, which consisted of 12-minute daily practice, and were compared to a waitlist control group. After the intervention period, participants underwent the TSST, and salivary cortisol levels were measured at multiple time points. Only the socio-emotional training group showed significant lower cortisol responses compared to the control group. These findings suggest that app-delivered socio-emotional training may be a more effective intervention than mindfulness training for reducing cortisol levels during (socially) stressful situations. Exploratory analysis for identifying intervention-related mechanisms underlying these reductions in this social stress marker will be discussed.

P.590 - Cortisol Reactivity to and Recovery from Acute Psychosocial Stress are Differentially Related to Long-Term Stress and Health Markers

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Failure to properly downregulate acute stress reactivity may cause the accumulation of allostatic load. However, the question of how altered acute stress recovery contributes to chronic stress and associated health impairments received little attention in prior research. We explored whether cortisol recovery, rather than reactivity, from acute stress is an indicator of the basal stress load. Cortisol reactivity and recovery trajectories of 106 healthy participants undergoing a psychosocial stress test were analyzed using piecewise growth curve models with landmark registration. We included long-term stress questionnaires, diurnal cortisol measures [diurnal slope, cortisol awakening response (CAR)], markers of inflammation (high-sensitive C-reactive protein; interleukin-6), and hippocampal volume (HCV) as model predictors. Increased CAR was consistently linked to decelerated acute cortisol recovery, whereas smaller HCV was associated with greater acute cortisol reactivity. With the CAR representing the physiological activation necessary to prepare for the challenges of the upcoming day, this link may point to the contribution of cognitive processes in the determination of both, CAR and recovery from acute stress. The inverse relation of HCV and acute cortisol reactivity shows that acute reactivity, not just recovery, translates to potentially health-relevant downstream consequences. No further associations between acute and long-term stress measures were found, which may be due to biases in self-reports of chronic stress and the exceptionally healthy study sample. Altogether, our findings show that cortisol stress recovery cannot replace reactivity as an indicator of long-term stress and downstream health effects. Rather, recovery and reactivity seem to have differential utility in predicting allostatic states.

P.594 - Chronischer Stress Und Bewegungsmangel Reduzieren Baro-Afferente Signalübermittlung

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Chronischer Stress und Bewegungsmangel spielen eine wesentliche Rolle bei Interozeption. Kardiale Interozeption geht wiederum auf die Verarbeitung von baro-afferenten Signalen zurück. Um den Einfluss von Sport, sowie psychosozialem Stress auf die Verarbeitung baro-afferenter Signalverarbeitung zu untersuchen, rekrutierten wir 185 gesunde Teilnehmer (M: 22.82 Jahre; Geschlecht: 57.3 % weiblich). Den Teilnehmern wurden 14 akustische Schreckreize in der frühen (R-Zacke +230 ms) und späten (R +530 ms) kardialen Phase dargeboten, jeweils vor und nach einem sozial-evaluativen Kaltwasser-Stresstest (SEKWT), oder einer Kontrollbedingung. Chronischer Stress wurde mittels Trierer Inventar für Chronischen Stress (TICS), körperliche Aktivität mittels eines Items zu absolvierten Sporteinheiten in Stunden pro Woche erfasst. Weder die SEKWT-Gruppe (n = 115) (Md = 57.93, n = 63; Md = 55.83, n = 51; z = -1.229, p = .219) noch die Kontroll-Gruppe (Md = 25.27, n = 22; Md = 25.68, n = 28; z = -.787, p = .431) zeigten unterschiedliche Schreckreaktionen in der frühen gegenüber der späten kardialen Phase („kardiale Modulation der Schreckreaktion"/KMS). Signifikante Korrelationen zeigten sich zwischen dem KMS-Effekt und den TICS-Subskalen „Erfolgsdruck" (r = .216, p = .005) und „Chronische Besorgnis" (r = .156, p = .041). Eine Regressionsanalyse zeigte eine signifikante Interaktion zwischen erhöhter körperlicher Aktivität und dem KMS-Effekt in der SEKWT-Gruppe (F(1,113) = 5.257, p = .024) mit einer Varianzaufklärung von R2 = .044. Akuter Stress hat offenbar keinen Einfluss auf baro-afferente Signalverarbeitung. Chronischer Stress und verminderte körperliche Aktivität hingegen kann baro-afferente Signalübermittlung verringern, was ein Mechanismus der Symptomentstehung bei bestimmten Stress-bezogenen Erkrankungen sein könnte.

P.606 - Acute Stress Induction and the Role of Controllability

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Behavioral studies have indicated a protective effect of cumulative adverse life events against future stressors (Seery et al., 2010, 2013), while the neural mechanisms are unknown. Sense of control over events might be a potential mechanism in this context. A total of N = 103 healthy male participants (age M = 26.7, SD = 5.6) underwent an acute stress induction task during functional magnetic resonance imaging (fMRI) to elicit psychosocial stress (i.e. ScanStress task; Sandner et al., 2020). Participants performed another uncontrollable stress task in the behavioral lab, simultaneously rating subjective controllability over the task (Meine et al., 2020), and reported previous life events (adapted from Canli et al., 2006).In line with previous findings (Sandner et al., 2020), participants showed neural activation in regions of the salience network e.g., bilateral anterior insula and dorsal anterior cingulate cortex, and deactivation in regions of the default mode network, such as precuneus, posterior cingulate cortex, and medial prefrontal cortex, during acute stress induction. Moreover, they showed a significant cortisol increase roughly 20 min past the stressor onset ($F(1,496.47) = 13.26$, $p<.001$) and an increase in negative affect ($F(2.46,250.64) = 86.71$, $p<.001$). Hence, stress induction was successful. Notably, activation in bilateral posterior insula was significantly reduced in participants, who experienced a stronger sense of controllability in the other stress task. Thus, sense of controllability likely modulated the neural stress response.

P.255 - Bad Robot? Humans Rapidly Attribute Mental States During The Perception Of Robot Faces

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Poster Session 1

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Social robots are expected to become more prevalent in private and professional settings. They represent an intriguing psychological puzzle: on one hand, people often explicitly think of robots as mindless machines, taking a "design stance". On the other hand, they can also anthropomorphize robots and intuitively engage with the characters they represent, taking an "intentional stance". In this study, we investigated the attribution of intentionality by testing whether people read emotional expressions into robot faces. Ninety participants learned positive, negative, or neutral back-stories about 36 humanoid robots and rated their facial expressions and trustworthiness. Ratings aligned with the valence of the learned knowledge. EEG recordings from 30 participants during the facial expression rating revealed that affective knowledge influenced perceptual encoding reflected in the N170 component, as well as more elaborate stimulus evaluation shown in the late positive potential (LPP). However, reflexive emotional responses to robot faces, indicated by the early posterior negativity (EPN), were not influenced in the same way as responses to human faces would be. These findings indicate that people automatically attribute mental states to humanoid robots during perception, literally seeing good or bad intentions in their faces, but they are less emotionally affected than when interacting with other humans. The results suggest that both intuitions about social robots—the intentional stance and design stance—are reflected in neural dynamics at different processing stages. These findings improve the understanding of the basic neurocognitive processes supporting human-robot interaction and the dimensions that support human partners' trust and acceptance of social robots.

P.258 - Hemispheric Asymmetries And Brain Size: A Cross-Species Meta-Regression

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Poster Session 1

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Hemispheric asymmetries differ considerably across species, but the neurophysiological base of this variation is unclear. It has been suggested that hemispheric asymmetries evolved to bypass interhemispheric conduction delay when performing time critical tasks. This implies that large brains should be more asymmetric. We performed preregistered cross-species meta-regressions with brain mass and neuron number as predictors for limb preferences, a behavioral marker of hemispheric asymmetries. Brain mass and neuron number showed positive associations with rightward limb preferences but negative associations with leftward limb preferences. No significant associations were found for ambilaterality. These results are only partly in line with the idea that conduction delay is the critical factor that drives the evolution of hemispheric asymmetries. They suggest that larger-brained species tend to shift towards more right-lateralized individuals. Therefore, the need for coordination of lateralized responses in social species needs to be considered in the context of the evolution of hemispheric asymmetries.

P.262 - The Effect of Gaze Camouflage and Social Anxiety on Attention and Autonomic Measures in Naturalistic Social Situations

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Poster Session 1

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Adaptive social approach and avoidance behavior is of substantial importance for social functioning. An imbalance in social approach and avoidance tendencies may constitute a risk factor for the etiology and maintenance of mental illness such as social anxiety (SA). The present study investigated how trait SA influences gaze behavior, place preference, and autonomic responses (heart rate and skin conductance) using a naturalistic two-phase design. The first phase was a half-hour walk on a freely chosen route; the second phase entailed a staged social interaction with an alleged test subject (confederate) starting with a brief waiting period followed by a short interaction initiated by the confederate. Additionally, we introduced a between-subject gaze-camouflage condition. Participants wore shaded or clear glasses to test the assumption that people direct their overt attention in a less socially normative way when their eye-movements cannot be observed. Participants were pre-screened and selected to show a high variance in SA. Preliminary results of the walking phase (N = 30 of pre-registered 90) indicate that SA as measured by the SIAS was negatively associated with the frequency of person-centered fixations. Preliminary results of the lab phase (N = 70 of 90) show a negative relationship between SA and fixations on the interaction partner during the waiting phase, but no significant effect during the interaction. We did not observe a significant effect of SA on autonomic responses in either the first or second phase of the experiment. Furthermore, gaze camouflage had no effect in any phase on any measure.

P.272 - Gaze Matters: The Influence of Eye Direction on the Experience of Social Exclusion - An ERP Study

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Poster Session 1

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Eye gaze is a crucial nonverbal cue that plays an important role in modulating social interaction. Despite its importance, research on the effect of gaze direction on the processing of social exclusion is restricted. The current study aimed to address this gap by investigating the effect of gaze direction using a Cyberball game that stimulates social exclusion. In addition to self-reports provided in a standardized questionnaire, the processing of exclusionary signals was monitored by recording ERPs. Participants were randomly assigned to two groups: one received direct gazes from their co-players, while the other received averted gazes toward their avatar. Our results showed that participants who received averted gazes reported stronger negative feelings of exclusion and had a smaller P300 effect in response to the transition from inclusion-to-exclusion, The P300 effect supports the idea that social exclusion is a violation of the subjective expectations of participation, and that direct eye gaze leads to an increased sensitivity to this process. The self-report, on the other hand, reflects the supportive role of eye gaze in modulating affective evaluation. These findings highlight the impact of gaze direction on the processing of social exclusion and underscore the importance of considering both cognitive and affective responses.

P.281 - To Smile or Not to Smile: The Interplay of Associated Target Valence and Inhibitory Control in Facial Expressions

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Poster Session 1

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Regulating emotional facial expressions is crucial for social interactions, as it can either facilitate or impede social connections. While expressing positive emotions, such as smiling, is relatively effortless towards likable individuals, it requires effort and may even be inhibited when interacting with disliked individuals or competitors. In two studies involving a total of 90 participants, we examined whether inhibiting affiliative facial expressions, such as smiling, is more effective when directed towards targets associated with negative valance. Participants' attitudes towards the target faces were manipulated through an attitude formation task. Our results revealed a significant interaction between associated target valence and facial expression suppression, indicating that inhibiting affiliative facial expressions was more effective when directed towards targets associated with negative behavior. In contrast, inhibiting disengaging facial expressions, such as frowning, did not significantly affect participants' performance based on associated target valence. Furthermore, the peak amplitude of the ZM muscle during suppression trials was significantly higher for targets associated with positive valence (Study 1 and 2). Overall, our results provide evidence that attitudes towards the identities of faces influence the ability to inhibit affiliative facial expressions, resulting in less smiling towards targets that display smiles but are associated with negative valence. Moreover, our findings suggest that this inhibition advantage may be mediated by differential activation of the ZM muscle, which may reflect the suppression of positive affiliative responses towards negatively valenced targets.

P.289 - Do Loved Familiar Faces Boost The Extinction Of Fear-Conditioned Responses? Evidence From An Instructional Learning Paradigm

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Poster Session 1

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Recent studies have shown that pairing a previously conditioned stimulus with pictures of a supportive individual enhances extinction learning and prevents the return of fear in a classical conditioning protocol. However, it remains unknown whether these effects are observed in social learning contexts. The present study was aimed at determining whether pictures of the romantic partner have the capability of improving the extinction of fear-conditioned responses and preventing the return of fear in an instructional learning setting. Fifteen participants underwent a threat-of-shock procedure with two separate sessions. During the first day, two neutral, unknown faces were instructed as threat cues, whereas a third face indicated safety. The task comprised 78 trials divided in four phases (habituation, acquisition, extinction, and test). During the extinction phase, one of the threat cues was presented together with the picture of the romantic partner, whereas the second threat cue was presented with the picture of a stranger. During the second day, participants were presented again with all three stimuli used in the previous session. Heart rate, skin conductance, corrugator EMG activity and startle responses were collected. Preliminary analyses showed that during extinction, threat cues presented together with the picture of the romantic partner were associated with increases in skin conductance, potentiated startle, sustained heart rate deceleration, and corrugator inhibition, compared to safety cues. A very similar pattern emerged during the second recording session. The implications of these data for the role of supportive, self-relevant stimuli as a mean to improve inhibitory learning are discussed.

P.292 - How Face Selective Is The N170...for Real? – An Electrophysiological Comparison Of Event-related Potentials In VR And The Conventional Laboratory Using Faces And Cars

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Poster Session 1

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Human faces are inherently important social cues, making face perception one of the most specialized visual processes in the brain. However, most research on face perception has been conducted in the conventional laboratory, i.e., on monitors providing a distal representation of faces as planar 2D images. The introduction of virtual reality (VR) as a complementary method in the laboratory allows for the presentation of life-sized 3D subjects at a personal distance from participants, creating a sense of social involvement and adding self-referential value to the faces.Extending previous findings on face perception in VR, the present study compares the perception of persons and cars under conventional laboratory conditions with realistic conditions in VR. Following standard designs, images of unknown persons and cars were presented along with perceptual control images in both modalities. To investigate the extent to which face perception mechanisms differ under realistic conditions from those in the conventional laboratory, typical face-specific N170 and subsequent components were analyzed, supplemented by response-related analyses in the ERP and frequency domains. Stimulus-locked analyses revealed an inconclusive picture of the discriminative power of the N170 toward faces when compared between modalities, whereas the later components showed more discriminative face-specific processing in VR. This is further supported by the response-locked analyses revealing distinct post-decisional processing of faces in realistic conditions. Taken together, the results show that face-specific neural mechanisms are applied under realistic conditions, beyond the N170 time frame.

P.293 - Smiling Doctor, Happy Patient: The Role of Facial Expressions in Patient-Doctor Communication

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Poster Session 1

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Effective communication between doctors and patients is essential for ensuring positive healthcare outcomes. However, the role of non-verbal communication, especially facial expression and its impact on patient satisfaction and conversation quality has been largely unexplored. To address this gap, we conducted a study to investigate how facial expressions of medical students during simulated doctor appointments with standardized patients influenced the quality of the conversation and patient satisfaction.A total of 52 medical students (40 females, mean age = 21.96 years) from the third semester of the medical faculty at the University of Augsburg participated in the study. Medical students engaged in a conversation (about 7 minutes) with a standardized patient playing the role of a parent seeking advice on vaccinating their 3-month-old child. The interaction was recorded on video and facial expressions were analyzed offline using the Facial Action Coding System. Conversation quality was assessed via standardized questionnaires (e.g., Berlin Global Rating) being filled out by medical students, by standardized patients, and by communication experts.Our findings revealed significant associations between the degree of smiling of the medical student and conversation quality. Medical students who displayed genuine smiles, with contractions of the orbicularis oculi and zygomaticus muscles, were rated more positively by the standardized patients as well as by the communication experts.Our study highlights the importance of facial expressions in doctor-patient interactions. The facial display of positive affect leads to more patient satisfaction and a better conversation quality.

P.305 - Less Flexible, More Accurate? Error Processing in Socially Anxious Individuals Under Speed and Accuracy Conditions

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Poster Session 1

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Background: Error processing is a crucial cognitive function allowing humans to adjust future behavior and can be measured by the error-related negativity (ERN) and error positivity (Pe). However, not all errors are consequential, or even dangerous, underlining the need for flexible adjustments. Overactive error processing transdiagnostically characterizes patients with obsessive-compulsive (OCD) and social anxiety disorders (SAD), but only OCD has been investigated regarding the flexibility of error processing under different task requirements. Therefore, this preregistered study aimed at replicating and expanding previous findings by examining the flexibility of error processing in social anxiety.Method: Thirty socially anxious and 16 unaffected individuals performed three flanker tasks with EEG recording. Performance indicators (response times, error rates) were determined during a baseline task. Participants subsequently underwent a speed (faster responses) and an accuracy condition (less errors than baseline). The order of conditions was counterbalanced and participants gained one euro per block when beating their baseline performance.Results: As expected, participants' performance differed across conditions. The ERN was smaller in both the speed and accuracy condition compared to baseline, while the accuracy condition led to a larger Pe compared to the speed and baseline condition. However, we did not find differences between socially anxious and unaffected individuals in any condition regarding performance, ERN, or Pe.Discussion: Contrasting previous findings, we could not find evidence suggesting enhanced and less flexible error processing characterizes social anxiety. This impairment might be specific for OCD patients. However, these are preliminary findings calling for replication studies.

P.309 - Salience Beyond Acoustic Features: Manipulating Top-down Attention-driven Neural Responses In Natural Environments

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Poster Session 1

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Noise pollution is a social problem that has negative consequences on people's health and well-being. The focus is usually on loud noises that can cause hearing damage. However, what constitutes noise is highly individual and depends on several factors, such as context or personality. Even quiet sounds can be perceived as unpleasant and physical dimensions like volume alone cannot fully explain how individuals perceive sounds.In an EEG study, we investigate the subjective nature of noise perception and how it is influenced by a person's momentary intention. We consider the influence of stimulus type (i.e., beep tones vs. a recorded soundscape of a busy city), activity (i.e., visual search task vs. simulated office work), and listening mode (i.e., ignoring the soundscape vs. actively paying attention to it). The experiment has three phases, with the first serving as baseline measure using audio-visual stimuli of varying naturalness. The second phase studies how the neural response to the acoustic scene changes if some part of the acoustic scene becomes behaviorally relevant, while the last phase studies the opposite effect. We analyze event-related potentials and temporal response functions to relate the neural response to the acoustic information.We hypothesize that manipulating relevance alters the perception of the soundscape and that the factors stimulus type, activity and listening mode influence sound processing. Furthermore, we predict that the washout phase is prolonged in noise-sensitive subjects. Understanding these factors will help in developing effective noise reduction strategies that account for individual differences in perception and noise sensitivity.

P.339 - Yes, I Can! – How Positive Self-Instruction Modulates Neural And Subjective Correlates Of Being Socially Evaluated

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Everyday situations in which we are socially evaluated arise. Negative social evaluation can decrease self-esteem, which is a transdiagnostic symptom amongst mental disorders. Inner self-speech has a self-regulatory function, such as controlling affective reactions, and it often incorporates situations of social evaluation. However, this inner self-speech is often negative and evaluative, thereby inducing low self-esteem, fostering anxiety and depression. Neural correlates of inner self-speech and social evaluation seem to overlap in frontal midline structures such as the anterior cingulate cortex (ACC) but so far, the effects of modifying this region via a cognitive intervention were not assessed. With the current study we modified inner self-speech via an intervention of positive self-instruction to modulate subjective and neural reactions to social feedback in 63 healthy women.Our results show a general increase in self-esteem in the intervention-group (n=33) compared to the control-group (n=30) and less subjective arousal during the social feedback paradigm. On a neural level, activation of the ACC during social feedback decreased significantly after the intervention in the intervention compared to the control group.Thus, our results suggest that positive self-instruction significantly modifies self-esteem and subjective negative reactions to social evaluation. Decreased neural activation of the ACC might reflect self-regulatory processes which were potentially strengthened via the intervention. Fear of negative evaluation and inadequate dealing with situations of social evaluation is prevalent in various mental disorders. Our intervention is a promising tool to increase self-esteem, to reduce subjective (maladaptive) reactions to social situations and even alters neural activation.

P.348 - Investigating EEG Correlates of Visually Induced Self-motion Perception (Vection)

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Poster Session 1

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The study aims at further identifying EEG correlates of visually induced vection, i.e., self-motion perception in stationary observers triggered by visual motion stimuli. Participants were seated in front of a three-monitor assembly, enabling a large field-of-view (visual angles 228x48 degrees). Visual motion stimulation was applied by presenting black-white bars moving in the horizontal plane. Participants were asked to indicate whenever they experienced self-motion onset or offset by pressing a button. During the experiment, participants EEG was recorded with 32 channels (10-20-system) and analyzed by means of time-frequency analyses. Further analyses were focused to the alpha-band because previous studies have shown correlations between vection and alpha EEG. Prelaminar data of 20 participants (age range: 20 to 40 years; 5 male) confirm the relevance of the alpha-band for vection: here, vection onset was correlated with a reduction of activity in the alpha-band compared to baseline measures, i.e., motion stimulation without self-motion experience. However, effects in the alpha-band were modulated by the speed of the motion stimulation. With ongoing data acquisition, we plan to include further participants into the analyses and to support the finding that processing of self-motion perception inducing visual stimuli is best represented in activity in the alpha-band of the human EEG. It can be further concluded that alpha-band activity depicts the most promising candidate for identifying an objective marker for vection.

P.389 - Learning About Others' Intentions in Ambiguous Environments

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Poster Session 1

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People interact with others in a world full of uncertainty. To adequately navigate social interactions, it is important to know about others' intentions. However, intentions are often difficult to infer in ambiguous environments with incomplete information. The cognitive process of learning about others' intention under ambiguity remains poorly understood. Here, we developed a novel learning and decision-making task in which participants (currently n=22) interact with cooperative or competitive agents by moving around environments of spatial grids in order to get rewards. In grids with high ambiguity, rewarding outcomes often occur even when interacting with the competitive agents such that rewarding outcomes are not unequivocally indicative for the agents' intentions. Standard analyses showed an asymmetrical learning for cooperative and competitive intentions. During the learning phase, participants unduly rated competitive agents as less competitive than they rated cooperative agents as cooperative in grids with high ambiguity. The frequency of joint rewards decreased in the post- vs. the pre-learning phase for interactions with competitive agents, indicating a type of revenge. We developed a series of Rescorla-Wagner models, which showed that participants integrated information by weighting outcomes and intentions during learning. The weight of outcomes decreased, and the weight of intentions increased across time. Participants also had higher learning rates when interacting with competitive agents vs. cooperative agents, which may be due to their initial positive expectations. Taken together, our results demonstrate an asymmetrical difficulty of learning different intentions in ambiguous environments and highlight the importance of information integration during social learning processes.

P.574 - Assoziation von Schizotypie und Resting-State Aktivität in einem Sozialen Interaktionsnetzwerk

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In Gesunden ist erhöhte Schizotypie – ein Set schizophrenie-ähnlicher Persönlichkeitsmerkmale – mit sozialen Defiziten assoziiert, selbst bei intakter Kognition und Empathie. Sozialen Funktionen liegen Entscheidungen über Annäherung vs. Vermeidung und Belohnungs- vs. Bestrafungskakulation zugrunde, Prozesse die durch das reward/affective network moduliert werden. Während in klinischen Stichproben veränderte Funktionsmuster in Teilen dieses Netzwerk gezeigt wurden, fehlen Nachweise in Gesunden. Wir testen die Annahme, dass derartige Veränderungen auch bei Gesunden in Abhängigkeit von Schizotypie auftreten.In 216 (136 weiblich, mittleres Alter = 26.93 Jahre) haben wir ROI-to-ROI Resting-State Functional Connectivity (RSFC) innerhalb des reward/affective network (Nucleus Accumbens, Insula, Amygdala, Anteriores Cingulum, Orbitofrontaler Cortex) und Seed-to-Voxel RSFC, ausgehend vom ventralen und dorsalen Striatum, analysiert und deren Zusammenhang zu hoher vs. niedriger positiver und negativer Schizotypie (O-LIFE) getestet.Wir finden keine signifikanten Unterschiede in ROI-to-ROI RSFC. Dagegen zeigt sich in den Seed-to-Voxel-Analysen negative Schizotypie negativ assoziiert mit RSFC Clustern im Frontalen Pol (p=1.2e-5; p=8.5e-3) sowie positiv assoziiert mit RSFC in einem Cluster im posterien Cingulum und Precuneus (p=2.3e-3, alle FWE-korrigiert). Positive Schizotypie ist positiv assoziiert mit RSFC in einem superior-frontalen Cluster (p=0.031, FWE-korrigiert).Wir können zeigen, dass negative und positive Schizotypiedimensionen in Gesunden differentiell mit veränderter RSFC zwischen dorsalem und ventralen Striatum und frontalen und cingulär-parietalen Regionen assoziiert sind. Diese Cluster mit signifikanten Konnektivitätsveränderungen beinhalten Regionen, die in belohnungsbasierter Entscheidungsfindung, Vermeidungslernen, Handlungsauswahl und -ausführung involviert sind. Dies zeigt, dass selbst subtile, non-klinische Ausprägungen von Psychose-Spektrum-Charakteristiken durch Veränderungen in funktionellen Konnektivitätsmustern in belohnungs- und lernrelevanten Hirnnetzwerken und reflektiert werden und begleitende soziale Funktionseinschränkungen indizieren könnten.

P.593 - Investigating the Behavioral and Neural Underpinnings of Informational Social Influence

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Poster Session 1

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Individuals often seek information from others, with the belief that it will help them make more accurate decisions. Although the circumstances in which individuals are receptive to information from others have been studied, the underlying neural processes are still unclear. The present pre-registered study (N = 90) investigates the behavioral and neural underpinnings of informational social influence using the judge-advisor-system, where the participant (judge) makes an initial estimation and has the possibility of revising the estimate after receiving advice from another person (the advisor). The study manipulated advice type (verbal: good/bad and numerical) and advice proximity (high and low proximity to the judge's initial estimate) to investigate the influence on judges' decisions. In line with previous studies, our behavioral results indicate that advice was weighted more as advice proximity decreased from the judges' initial estimates. The likelihood of revising their initial estimates were also greater in the low proximity advice, however the effect was much higher in the verbal compared to the numerical advice. The confidence in the estimations also dropped significantly in the verbal advice type of low proximity ('bad'). These results suggest that in addition to advice proximity, the advice type significantly influenced the judges' decisions, where the verbal advice (good/bad) possibly contributed to an additional affective dimension compared to the numerical feedback. The neural underpinnings using event related potentials (ERPs) - FRN, P300 and LPC are currently being analyzed and will shed insights into the neural processes of cognitive and affective mechanisms contributing to informational social influence.

P.232 - Predictability Differences Among Measures Targeting Cognitive Performance In Older Age

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Multimodal neuroimaging data offer predictive potential for cognitive status in patient samples, but only partially in healthy older adults. One possible reason for these different results could be the measurement instrument, which was investigated in the current study. We systematically examined the predictive performance of multimodal imaging data for i) a clinical dementia screening test, ii) a subjective cognitive impairment report and iii) a standard cognitive test of processing speed in 354 older adults between 55 to 85 years (from 1000BRAINS) using machine learning (ML). Thereby, multimodal brain measures (gray matter volume, resting-state functional connectivity- and structural connectivity-derived graph metrics) served as features and cognitive status scores (i.e. dementia screening test [DemTect], subjective report [SCI] and Trail Making Test A [TMT-A]) as targets in five regression algorithms. ML performance for each modality and all multimodal combinations, with and without confound (age, education and sex) regression, was assessed using cross-validation. Predictability differences emerged in absence of confounder control. TMT-A tended to be best predicted followed by DemTect and SCI. For TMT-A and DemTect, a trend for better ML performance was found for multimodal data. After confounder control, effects could no longer be observed. ML models revealed overall restricted predictability. In absence of confounder control, ML models tended to better predict cognitive status measured by a standard cognitive test of processing speed than by clinical measures. Our findings uncovered that clinical measures used successfully in prediction settings including patients may not necessarily lead to equally promising ML performance in healthy older cohorts.

P.158 - Increased Functional Connectivity in Reward-Related Brain Regions in Children with Low Peripheral Insulin Sensitivity

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Introduction. In children with obesity, viewing of food images elicits heightened brain responses in regions involved in reward processing. This activation seems to facilitate weight gain and the development of diabetes. The current study investigates changes in brain functional connectivity (FC) during a food cue reactivity task before and after a glucose ingestion in children with low and high insulin sensitivity. Methods. Data from 53 children (36 females) with normal-weight, overweight and obesity between 7-11 years old were analysed. An oral glucose tolerance test was performed to estimate the children's insulin sensitivity (ISI-Matsuda: 0.94-26.57). Neural processing to food vs. non-food pictures was measured with fMRI before and 30 min after a glucose ingestion in a separate session. Statistical analysis was performed using a factorial design with 'before/after glucose ingestion' as a within-subject factor and two between subject factors (high/low ISI (median split)) and male/female), and two covariates (age and BMIz). Results. We found increased FC between reward-related regions in children with lower ISI independent of prandial state (pFWE < 0.05). Moreover, we observed an interaction between ISI and prandial state (pFWE < 0.05). Only children with high ISI increased FC between cognitive and reward-related regions from the fasted to the postprandial state. Conclusions. Our results highlight the role of peripheral insulin sensitivity in children

independent of BMI in neural processing of food cues, with a heightened reward network connectivity and lower cognitive network connectivity in the postprandial state. These differences might influence eating behavior and future risk of developing diabetes.

P.355 - Effects of Auditory Stimulation on Rapid Visual Categorization in the Infant Brain: An FPVS Study

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Poster Session 1

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At 4 months of age, children are able to categorize human faces at a glance. However, the neural mechanisms behind building distinct categories remain disputed. It has been suggested that the combined information of multisensory input early in life is advantageous to forming categories in context and benefits perceptual development.The current study focuses on the auditory domain by providing participants with infant- or adult-directed speech during visual stimulation. Beyond the finding that children prefer infant-directed speech (IDS), neurobehavioral studies suggest that specific neural mechanisms may mediate the benefits of IDS. Additionally, IDS can serve as an ostensive cue eliciting referential expectations.Fast periodic visual stimulation (FPVS) is employed to investigate the influence of concurrently presented IDS versus adult-directed speech (ADS) on visual categorization. Stimuli are flickered periodically at a fixed rate of F = 6 Hz, with a picture of the target category displayed at every 6th position. To compare the categorization of social and non-social categories, faces and cars serve as targets in a between-subjects design. EEG activity at the frequency of stimulus presentation (6 Hz and harmonics) and the categorization frequency (1 Hz and harmonics) is compared.Beneficial effects of IDS over ADS on visual processing, as compared within subjects, are expected. Moreover, it is anticipated that a social target category is more easily recognized than a non-social one when accompanied by a human voice.This study aims to deepen the knowledge about neural correlates of multisensory processing using an innovative EEG method.

P.356 - The Long Shadows of Early Experiences: Evaluating Prevailing Theories Linking Childhood Maltreatment to Psychopathology Using a Fear Conditioning Paradigm

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Adverse childhood experiences (ACEs) are strong risk factors for somatic and psychopathological conditions. Environmental input – such as exposure to ACEs – shapes cognitive and emotional processes through learning mechanisms, making fear conditioning a prime paradigm in this context. Different theories have been proposed on how this link might be established, resulting in substantial heterogeneity in ACE operationalization and highlighting the necessity to evaluate prevailing theories.N=1402 healthy participants underwent a fear conditioning paradigm including a fear acquisition and generalization phase, while acquiring skin conductance responses (SCRs) and ratings (arousal, valence and contingency). We operationalized ACE exposure as assessed by the childhood trauma questionnaire (CTQ) using (1) dichotomization based on published cut-offs, (2) the specificity model, (3) the cumulative risk model, and (4) the dimensional model.In general, individuals exposed to ACEs showed blunted physiological reactivity in SCRs during fear acquisition and generalization, and reduced discrimination between CS+ and CS-, mainly driven by blunted CS+ responding. However, there were no group

differences in ratings. The different operationalizations employed suggest that dichotomization into exposed and unexposed individuals fits the data best.In the literature, a remarkably different pattern of increased responding to the safety signal has been described in patients suffering from anxiety and stress-related disorders. Given that exposure to ACEs is an important risk factor for psychopathology, exposed individuals may represent a distinct patient subgroup that has not been previously identified. Further research is needed to refine theories connecting ACEs to psychopathology, which could inform novel prevention or intervention approaches.

P.409 - Densely Sampling the Development of Multisensory Mapping While Learning to Read

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Poster Session 1

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Learning to read is a cognitive milestone with lifelong impact. Reading is traditionally seen as fine-tuned visual object recognition However, it actually goes beyond visual processing as it builds on mapping visual input to pre-existing auditory representations. The emergence of this type of multisensory processing in the developing brain is poorly understood. It is also unclear whether the underlying developmental changes are culturally universal or not.To tackle these questions, we conducted a dense-sampling study in 4–9 year old children from rural areas in Northern India. They underwent six longitudinal fMRI sessions in three-month intervals while learning to read in their native alpha-syllabic script (Devanagari). Our focus was on changes in individual brain responses to spoken and written pseudowords over the course of learning to read (intervention group) or learning math (active control group). A large number of trials per session was collected to render statistical modeling at the single-subject level possible.Univariate analyses allowed us to test the hypothesis that reading-related visual responses gradually emerge in a non-linear fashion in cortices that had already been tuned to auditory processing before reading onset. These univariate results were extended by exploring multivariate response patterns, in particular, longitudinal changes of the similarity and stability of visual and auditory activation patterns.Our aim is to generate causally relevant insights into the neurodevelopmental trajectories underlying the emergence of audiovisual mapping while accounting for the cultural diversity of the world's writing systems.

P.563 - Temporal Neural Mechanistic And Developmental Aspects Of The Theory Of Event Segmentation

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Poster Session 1

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Humans are exposed to the environment in a continuous flow of experiences, and the brain naturally divides these experiences into discrete parts in order to interpret and organize them. A model for such a partitioning process has been specialized in Event Segmentation Theory (EST) (Zacks et al., 2009, J. Exp. Psychol., https://doi.org/10.1037/a0015305). Despite the number of studies on this topic, the electrophysiological brain mechanisms that underpin this segmentation process and how it changes during years of maturation, which can be tracked using high temporal resolution technologies such as EEG, are still poorly understood. In the work presented, healthy adults and adolescents performed an event segmentation paradigm, i.e., they watched a narrative video and were asked to divide it into meaningful segments while EEG was recorded. The findings show the relevance to event segmentation of oscillatory activity in various frequency bands originating in different brain areas along with their interrelations by utilizing EEG analysis methodologies such as beamforming approaches. The research reveals a contribution of different cognitive processes that explains how the brain partitions and structures natural scenes while integrating current models of the situation, perception, and previous experience, as well as how these elements may be influenced by developmental factors.

P.567 - Biomarkers of Age-Related Decline in Executive Functions

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Poster Session 1

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One of the hallmarks of cognitive ageing is a decline of executive functions (EF). Previous research has demonstrated that age differences in EF are associated with age differences in a number of biomarkers. However, limited data are available on the predictability of EF using biomarkers, and age dependency of these associations. This study aimed to explore whether immune (CRP, IL-6, sTNF-R1), metabolic (cholesterol, triglycerides), and cardiovascular parameters (blood pressure, pulse) at middle age would be predictive of EF at old age, and whether predictive accuracy of biomarkers would depend on age at the time of measurement and the age group (65-80 years vs. over 80 years). We included the subsample (N=126) from the population-based cohort study of the elderly population of the city of Halle. Biomarkers measured at middle age were available for at least two occasions over the 4 years of follow-up. Cognitive testing at old age included laboratory assessment of visual and auditory updating, inhibition and task-switching ability, each at two levels of difficulty. Higher levels of inflammatory and metabolic markers at first occasion (MAge=57) were associated with poorer task-switching performance in the over 80-group in difficult condition. At first occasion and in both groups, cardiovascular parameters predicted inhibition performance in difficult condition, and metabolic parameters predicted visual updating performance in easy condition. The results indicate that biomarkers measured earlier in life can be used to predict the decline in EF in old age. If doing so, particular biomarker, task difficulty and age differences need to be considered.

P.211 - Investigating the Course of Endocannabinoid Hair Concentrations in Women with Childhood Maltreatment and their Children from late Pregnancy to One Year after Birth

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Poster Session 1

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Childhood maltreatment (CM) exerts long-lasting psychological and biological alterations in affected individuals and presumably in the following generation. Thereby, CM might affect the endocannabinoid (eCB) system which critically modulates inflammation and the endocrine stress-response. Thus, we investigated the eCB-system of women with and without CM and their infants using hair samples representing eCB level accumulated during the last trimester of pregnancy (t0) and 10–12 months after parturition (t2). CM exposure was assessed with the Childhood Trauma Questionnaire. At both timepoints, 3cm hair strands were collected from mothers and children (N = 170 resp. 150) to measure the eCB anandamide (AEA), 2/1-arachidonoylglycerol (2-AG/1-AG), stearoylethanolamide (SEA), oleoylethanolamide (OEA), and palmitoylethanolamide (PEA). In mothers, over time 2-AG/1-AG levels increased and SEA level decreased. Additionally, CM was associated with lower levels of SEA and in trend higher 2-AG/1-AG at t0, but not at t2. In the children's hair, 2-AG/1-AG level increased and SEA, OEA, and PEA level decreased over time. Maternal CM was associated with higher OEA levels in infant hair at t0, but not at t2. We provide first longitudinal evidence for changes in the eCB-system in mothers and infants from pregnancy to one year later. Maternal CM influenced the eCB in mothers and their unborn. As this intergenerational association was limited to pregnancy, maternal CM seems not to persistently alter their offspring's eCB-system regulation. Future research needs to investigate consequences of prenatal alterations in the eCB-system for the course and immunoregulation of pregnancy and the development of the child.

P.236 - Network Topology And Cognitive Control In Very Preterm-Born/Very Low Birth Weight Young Adults With And Without ADHD

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Poster Session 1

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Very preterm (VPT) birth (<32 weeks of gestation) or very low birth weight (VLBW; <1500 g) are commonly associated with lower self-regulation of cognition, alterations in the brain network topology of the cognitive control circuit, and an increased risk of Attention Deficit Hyperactivity Disorder (ADHD). Even though these deficits have been thoroughly studied in VPT children, it is not yet fully understood whether they persist into adulthood. Aiming to fill this gap, we investigate long-term consequences of VPT/VLBW birth on cognitive control in a multimodal approach. The study is based on a dataset of N(PT) = 67 VPT/VLBW and N(FT) = 81 full term (FT) 26-year old individuals that was acquired as part of the Bavarian Longitudinal Study (BLS, https://platform.recap-preterm.eu/pub/study/best_bls). We firstly infer a latent variable of cognitive control to be compared between VPT/VLBW and FT young adults. Secondly, we compare the topology of the cognitive control structural brain network between both groups based on graph theoretical parameters measuring network integration and nodal importance. In all analysis steps, the moderating role of ADHD symptom severity will be accounted for. We expect VPT/VLBW young adults to exhibit lower levels of cognitive control, as well as higher segregation and decreased node centrality of the cognitive control network. We additionally predict higher ADHD symptom severity to be associated with lower cognitive control, higher segregation and lower node centrality in both groups. Lastly, we explore whether network topology predicts cognitive control. The poster will outline the theoretical background and the methodology of the project.

P.239 - Psychobiologische Stressdiagnostik von Patientinnen und Patienten mit Depression

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Poster Session 1

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Zur psychobiologischen Eingangsdiagnostik von Patientinnen und Patienten, die unter stressassoziierter Symptomatik leiden, wird an der Psychotherapeutischen Hochschulambulanz für stressbedingte Erkrankungen der Universität Freiburg der Trier Social Stress Test (TSST) eingesetzt. Der TSST stellt ein valides und reliables Verfahren dar, um eine psychobiologische Stressreaktion zu provozieren (Kirschbaum et al., 1993; Labuschagne et al., 2019). Der Einsatz als Instrument zur individuellen Stressdiagnostik ist aktuell nicht etabliert. In einer Pilotuntersuchung durchliefen 52 unselektierte Patientinnen und Patienten mit unipolarer Depression den TSST. Im Zusammenhang mit depressiven Störungen wird Stress und Stressbelastung eine große Relevanz zugeschrieben. Insbesondere psychosoziale Belastungsbedingungen stellen für die Entstehung, die Verschlechterung sowie für Rückfälle und die Chronifizierung depressiver Erkrankungen einen bedeutsamen Faktor dar (Gilman et al., 2013; Harkness et al., 2014).Ausgangspunkt der Untersuchung war, dass depressive Störungen potenziell mit Veränderungen der endokrinen Stressreaktion einher gehen (u.a. Pariante Lightman, 2008). Eine Auswertung der Daten erfolgte im Hinblick auf den Zusammenhang zwischen akuter Cortisolreaktion sowie der antidepressiven Medikation. Medizierte Patientinnen und Patienten zeigen eine signifikant höhere AUCG, einen signifikant höheren Increase der Cortisol-Sekretion sowie eine größere AUCI als Nicht-Medizierte. In allen untersuchten Parametern des subjektiven Stressempfindens zeigen sich keine signifikanten Unterschiede zwischen medizierten und nicht-medizierten Testpersonen, wobei auf deskriptiver Ebene teils gegensätzliche Effekte unterschiedlicher medikamentöser Substanzgruppen zu beobachten sind. Die Ergebnisse zeigen, dass eine umfassende Stressdiagnostik psychobiologische Parameter unbedingt einschließen sollte.

P.250 - Mechanisms Between Self-compassion And Mental Health: A Narrative Review And A Transactional Model

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Poster Session 1

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In today's fast-paced age of performance and self-optimization, people are often their own harshest critics. Self-compassion offers an alternative way of relating to oneself, characterized by kindness in the face of suffering and perceived personal shortcomings. It is widely accepted that practicing self-compassion is closely linked to improved mental health. Self-compassion improves both facets of mental health: higher psychological well-being and lower levels of psychopathology. However, there has been little research regarding the specific mechanisms self-compassion employs to positively affect mental health. With the aim of summarizing potential underlying mechanisms, we analyzed existing literature and conducted a narrative literature review. Based on our findings, we present a transactional model that links self-compassion and mental health. We argue that changes in self-compassion and emotion regulation as well psychological coping mutually positively influence each other. Furthermore, we theorize the mediation of these changes via underlying neurophysiological processes. The main neurophysiological changes are the sympathetic deactivation and parasympathetic activation, which initiate a cascade of physical changes such as adjustments in hormone production. Our model provides a unifying, testable basis for a more focused approach in future research, enhancing our understanding of how self-compassion works and how positive changes in mental health can be achieved. The information presented here is relevant for researchers, clinicians, and other practitioners and can be applied to psychotherapeutic interventions of different degrees. Such interventions could allow clinical and non-clinical populations to benefit from exercising self-compassion to strengthen their own mental health.

P.266 - Oxytocin-augmented Cognitive-behavioral Group-based Short-term Intervention for Loneliness

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Poster Session 1

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Loneliness poses a significant health problem and many lonely individuals do not benefit from existing psychological interventions. Given preliminary evidence for impaired oxytocin signaling in chronic loneliness, the current proof-of-concept study used a randomized, double-blind, placebo-controlled design to probe intranasal oxytocin (IN-OT) as an adjunct to a short-term cognitive-behavioral group intervention for individuals suffering from high loneliness (HL). Seventy-eight healthy HL participants (56 women) received five weekly group psychotherapy sessions targeting negative cognitive biases in loneliness. After a first orientation session, HL participants received IN-OT or placebo before therapy. Trait loneliness was measured at baseline as well as within a week and three months after the intervention. Perceived stress, quality of live, and the therapeutic relationship were assessed at each session, while state loneliness was tested before and after each session. As an additional control group, 49 healthy participants reporting low loneliness (26 women) were also tested twice. The intervention significantly reduced perceived stress over the course of the sessions and improved trait loneliness, which was still evident at the 3-month follow-up. IN-OT had no significant effect on these primary outcomes or quality of life. However, IN-OT significantly facilitated the decrease in state loneliness within sessions and significantly enhanced positive aspects of the therapeutic relationship across sessions compared to placebo. Conclusively, the short-term group psychotherapy intervention improved trait loneliness, but IN-OT did not significantly augment this effect. Further studies are needed to determine the optimal duration of the intervention to translate the observed acute effects of IN-OT into long-term benefits.

P.287 - Loved-Familiar Faces As A Mean To Improve Exposure Therapy: Insights From A Classical Conditioning Protocol

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Recent approaches in the field of exposure-based treatments of anxiety disorders have used photographs of support figures as a means of enhancing inhibitory learning in classical conditioning protocols. Nevertheless, it is not known whether these beneficial effects are specific to certain learning modalities or whether they can be extended to individuals with inhibitory learning deficits. The aim of the present study was to replicate previous findings and to determine whether the advantages derived from the use of highly relevant stimuli during extinction learning also apply to individuals with high anxiety-trait scores. Twenty-five participants underwent an aversive conditioning protocol in which two neutral, unknown faces served as CS+s, whereas a third face acted as a CS- during the acquisition block. Heart rate, skin conductance, corrugator EMG, and startle responses were collected during the entire procedure (habituation, acquisition, and extinction). During the extinction phase, the aversively conditioned stimuli were paired with either a photograph of a romantic partner or a photograph of a stranger. The results showed that levels of trait anxiety had no modulatory effect either during the acquisition phase or the extinction block. However, the pairing of conditioned stimuli with photographs of loved ones was associated with a pattern of physiological responses typical of a positive motivational state: increases in skin conductance, a biphasic pattern in heart rate, and inhibition of corrugator muscle activity. The present study highlights the need for further inquiry into new ways to improve the effectiveness of exposure-based treatments for anxiety disorders.

P.294 - Subclinical Autistic Traits Influence Processes Of Visual Category Learning

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Poster Session 1

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Autism spectrum disorder is a neurodevelopmental condition characterized by challenges in social interaction, communication, and repetitive behaviors. Beyond these core symptoms, autistic individuals often exhibit atypicalities in non-social cognitive processing, such as the grouping of items into meaningful categories based on their holistic visual appearance. This cognitive ability also referred to as 'perceptual categorization', is essential for everyday learning and has been discussed as a precursor to social difficulties. However, it is unclear whether such difficulties also occur in neurotypical individuals with autistic traits and how they can be explained at the process level. To this end, neurotypical individuals performed a feedback-supported training phase and a transfer phase without feedback of a single-category perceptual categorization task in a 3T magnetic resonance imaging (MRI) scanner. Stimuli were black and white polygons. Using a jittered event-related design, neural correlates during initial visual processing, decision-making, and feedback processing could be examined. Autistic traits were measured by the 50-item version of the Autism Quotient (AQ) questionnaire. Consistent with findings in autistic individuals, strong autistic traits were associated with difficulties in correctly categorizing category members during the training and transfer phases. Categorization difficulties were positively related to the 'social difficulty' AQ-subscale. At the neural level, differences were limited to neural correlates of decision-making and feedback processing and occurred in superior/inferior frontal and inferior temporal areas. Current data show that categorization difficulties are related to autistic traits in neurotypical individuals and can be most likely attributed to the decision-making and feedback-processing stages.

P.304 - Emotional Face Perception and Personal Relevance in Autism Spectrum Conditions

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Poster Session 1

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Autism Spectrum Conditions (ASC) are characterized by difficulties in social interactions, which are accompanied by alterations in the neural processing of faces in general, and of emotional facial expressions in particular. In this study, we aimed to investigate the role of personal relevance in face processing in ASC, which has been shown to increase activations in the core and extended face processing network in non-autistic individuals. Autistic individuals and matched controls (N=46) performed an emotion recognition task on photographs of a personally relevant person and a matched stranger, displaying fearful, happy, and neutral facial expressions, while we recorded simultaneous EEG-fMRI. Both groups showed significantly increased hemodynamic activity for relevant faces compared to stranger's faces in the core and extended face processing network, including fusiform gyrus, medial PFC and precuneus, with no significant group differences. Crucially, emotion effects in ASC were limited to relevant faces. In EEG data, group differences were evident in early sensory processing, with increased P1 amplitudes to relevant vs. stranger's faces being observed only for the non-autistic group. Our results indicate preserved processing of faces and emotional facial expressions in ASC, specifically for personally relevant faces. Thus, face processing in ASC seems to be characterised by a higher specificity, rather than a general dysfunction. However, in line with previous findings, we report alterations of early sensory processing of faces in ASC. Our results speak to the importance of accounting for personal relevance in face processing, in order to allow for the investigation of real-life social information processing.

P.323 - Modulation of Motor Inhibition in the Affected Hemisphere Differentially Supports Movement Initiation of the Paretic and Non-paretic Hand in Chronic Stroke Patients

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Poster Session 1

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The selection and control of movements relies on the dynamic modulatory influence of GABAergic inhibition in motor cortex. After a stroke, GABAergic inhibition is pathophysiologically altered, potentially reflecting a mechanism of cortical reorganisation.[1] However, it remains unclear whether modulation of preparatory motor cortical inhibition changes concerning task performance and motor impairment after stroke.30 chronic stroke patients and 25 healthy age-matched control subjects performed a two-choice delayed-response task comprising a fixation period, a cue indicating which response to prepare, and an imperative stimulus. Preparatory inhibition was quantified by the quotient of muscle-evoked potentials elicited in the paretic hand via transcranial magnetic stimulation applied over the ipsilesional primary motor cortex during fixation and cue presentation.[2] Stroke patients were divided into fully- and non-fully recovered patients according to their Jebson Taylor hand function test performance.Control subjects and fully recovered patients showed similar levels of preparatory inhibition which correlated negatively with reaction times for both hands for control subjects, and for fully recovered patients exclusively with reaction times of the paretic hand. Modulation of preparatory inhibition was diminished in chronic stroke patients with persistent motor deficits.Our findings indicate that modulation of preparatory inhibition is related to reaction time in healthy subjects. However, action preparation of the paretic versus non-paretic hand is differentially modulated within the ipsilesional hemisphere post-stroke which may reflect a mechanism of functional cortical reorganization and motor recovery after stroke.[1] Blicher et al., 2015, Neurorehabilitation and Neural Repair[2] Greenhouse et al., 2015, Journal of Neuroscience

P.324 - Deficits in Reading Negative Social Cues Extend Beyond the Face in Autism

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Poster Session 1

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Nonverbal expressions play a crucial role in social communication and interaction. Impairments in recognizing emotions from facial expressions have been described in various mental disorders, such as autism and social anxiety. Since avoidance of eye contact is highly prevalent in these populations, it is unclear whether observed impairments reflect actual impairments in emotion recognition or incomplete processing of facial cues. To answer this question, alternative sources of nonverbal information other than faces must be included in research. In this study, we explored and compared emotion recognition from facial and bodily expressions. We compared 30 adult men with autism spectrum disorder to age- and IQ-matched control participants regarding their ability to recognize angry, happy, and neutral expressions from dynamic face and body stimuli. Autistic men showed impairments in recognizing angry expressions from both face and body stimuli, while recognition of happy and neutral expressions appeared unimpaired. Autism-related deficits in recognizing angry faces were best predicted by gaze avoidance, while deficits in recognizing angry bodies were best predicted by deficits in social interaction and autistic traits. Our findings suggest that autism-related deficits in reading negative social signals extend beyond the face and represent a more global impairment in processing social cues.

P.331 - Dopaminergic And Cholinergic Modulation Of Delay- And Effort-Based Decision Making In Humans

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Poster Session 1

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Impulsive decision making and motivational deficits are frequently observed in clinical disorders such as Parkinson's Disease, attention deficit hyperactivity disorder, or major depression. In laboratory tasks, motivation and impulsivity are often captured using effort and temporal discounting, respectively. The literature thus far indicates a prominent role for dopamine, in particular acting at D2 receptors, in both temporal and effort discounting, with human studies in the domain of temporal discounting being less conclusive. In the striatum, there is reciprocal antagonistic interaction between dopaminergic and cholinergic transmission. However, the potential role of acetylcholine has thus far not been studied in humans. Therefore, we studied the effects of both a dopamine D2 (haloperidol, 2 mg) and an acetylcholine M1 receptor antagonist (biperiden, 4 mg) on delay and effort discounting of monetary rewards in a placebo-controlled, counter-balanced, double-blind, within-subjects design in 62 healthy volunteers. We found that haloperidol and biperiden exerted opposing effects on effort discounting, with haloperidol increasing, and biperiden decreasing effort discounting. In terms of temporal discounting, both drugs exerted more complex effects on the degree to which choices were governed by delay and reward magnitude. Using a well-powered sample, our results contribute to the understanding of the neuropharmacology of human effort- and delay-based decision making.

P.342 - The Role of Rumination and Adverse Childhood Experiences on Resting-State Neural Activity and Connectivity in Depression

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Both ruminative thought processes and childhood maltreatment are strongly associated with and can significantly contribute to the psychopathology of depression. In order to investigate the neurobiological basis of these constructs, we examined resting-state functional magnetic resonance imaging data of 44 individuals diagnosed with acute depressive episodes of varying symptom severity. More specifically, fractional amplitude of low-frequency fluctuations (fALFF) and functional connectivity were computed in three large-scale neural networks putatively related to processes affected in depression: the default mode network (DMN), the salience network (SN), and the central executive network (CEN). Correlational and regression-based analyses were utilized and adjusted for sex. Based on the region of interest analyses, we found that increased spontaneous neural activity (i.e., fALFF values) in hubs of the DMN was associated with the extent of rumination, as measured by the Response Styles Questionnaire (RSQ-D), and depression severity, as measured by the Beck Depression Inventory (BDI-II). No significant associations emerged in regions of the SN or CEN. In addition, no significant findings in relation to self-reported adverse childhood experiences, as measured by the Childhood Trauma Questionnaire (CTQ), emerged. Functional connectivity results also revealed no significant findings. Overall, our results do not fully adhere to previous literature but also contribute to a more dimensional and symptom-based understanding of depression-related network imbalances.

P.362 - Women with Borderline Personality Disorder Show Elevated Salivary Testosterone Regardless of Social Exclusion

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Borderline personality disorder (BPD) is marked by unstable relationships and fear of abandonment. Studies suggest that patients with BPD are highly sensitive to social exclusion and show deficits in trust and cooperation. Such prosocial behavior is known to be influenced by the hormone testosterone, which regulates aggressive and caring behavior. Study results show elevated testosterone levels in women with BPD at baseline and after psychosocial stress, while results after social exclusion are missing.We investigated the effects of social exclusion on prosocial behavior (sharing and punishment) and salivary testosterone in women with BPD. Ninety-eight women with BPD and 98 healthy women matched for menstrual cycle were randomly assigned to an inclusion or exclusion condition of the virtual ballgame Cyberball. Afterwards, participants played two games in which they could share money with a fictional player ("dictator game") and accept or reject (= punish) offers from a player ("ultimatum game").Women with BPD displayed higher testosterone levels than the control group before and after Cyberball. Testosterone was not affected by social exclusion. Contrary to our expectations, women with BPD showed more prosocial behavior by sharing more money than controls and equally punishing co-players for unfair offers. Testosterone levels after Cyberball positively correlated with shared money.In a large sample, we replicated previous findings of elevated testosterone in women with BPD and showed that it is not affected by experimentally induced social exclusion. We will discuss whether the display of more prosocial behavior in women with BPD might reflect a submissive social strategy.

P.365 - The Association Between Brain Activity During Resting State and Cognitive Processing in Major Depressive Disorder

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Previous investigations revealed performance deficits and altered neural processes during working-memory (WM) tasks in major depressive disorder (MDD). Apart from task-based functional magnetic resonance imaging (fMRI) studies, resting-state fMRI is increasingly used to characterize aberrant neural mechanisms of MDD-associated symptoms, such as working-memory deficits. It has been proposed that activity during the resting-state represents characteristics of the brain-wide functional organization during task-states, which could be highly relevant for the efficient execution of cognitive tasks. Nevertheless, the underlying dynamics linking resting-state properties and task-evoked activity remain poorly understood. Therefore, the present study investigated the correlation between the Amplitude of low frequency fluctuations (ALFF) at rest and WM-evoked activity. 69 patients diagnosed with an acute MDD episode and 69 matched healthy controls underwent the fMRI scanning procedure. Within both groups, positive correlations between the ALFF and task-activation were found in core regions of the central-executive network (CEN), whereas the ALFF correlated negatively with the task-deactivation in regions associated with the default mode network (DMN). Compared to healthy controls, patients showed a decreased rest-task correlation in the prefrontal Cortex (CEN) and an increased negative correlation in the precuneus/posterior cingulate Cortex (DMN). Interestingly, no significant group-differences within those regions were found in solely the resting-state or during the task. The results underpin the potential value and the importance of resting-state markers for the understanding of dysfunctional network mechanisms, cognitive processes in general and the prediction of its neural substrates.

P.391 - Match-mismatch vs Stress Sensitization: The Interaction of Early Life Adversity and Work-related Stress on Burnout and Depression

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Early stressful life events and chronic stress are both associated with symptoms of burnout and depression. Two hypotheses address the interaction between adverse childhood experiences (ACE) and chronic stress in adulthood on psychiatric disease vulnerability. The "stress sensitization model" assumes that the effects of stress accumulate. This build-up of allostatic load leads to greater susceptibility to mental disorders. Contrarily, the "match/mismatch hypothesis", which is predominantly investigated in animal studies, assumes that early life challenges prepare for later stressful events and can therefore be beneficial in the long-term. In a "match" situation, the demands of the early environment shape the individuals' coping and adaptive capacity to a similar stressful environment later in life. In a "mismatch" situation, e.g. stressful events in childhood but not in adulthood or vice versa, the early-programmed environment does not match the late environment resulting in an increased disease vulnerability.To investigate these apparently opposing hypotheses, we assessed burnout and depressive symptoms (questionnaires and diagnostic interviews) as well as hair cortisol/cortisone concentrations and inflammation (high-sensitivity C-reactive protein) from 147 individuals. Participants were divided into four groups based on the experience of ACE and chronic stress at work, assessed through effort-reward imbalance ratio. While work-related stress had a significant positive effect on depression and burnout symptoms, ACE or interactions with ACE were not significant but showed tendencies in the direction of stress sensitization. No significant effects on biomarkers were found. Potential reasons for our findings are discussed.

P.392 - Latent Trajectories of Perceived Control over Aversive Stimuli Predict Depression and Mood

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The importance of stressor controllability for resilient coping has been demonstrated by extensive animal research on learned helplessness (Maier Seligman, 2016). However, human studies implicate that the perception of control over adverse stimulation predicts stress responses better than the objective action-outcome contingencies (Wanke Schwabe, 2020).We randomly assigned 168 participants (84 female) to three experimental conditions: Participants in the escapable condition (Esc) experienced stressful stimulation (white noise and non-painful electric shocks) but were able to escape it by completing a simple task. Participants in a yoked inescapable condition (Inesc) were coupled with the Esc group and experienced the same duration of aversive stimulation, but had no instrumental control over stressor offset. Participants in a no-shock baseline condition received no stressful stimulation.Comparison of the Esc and Inesc groups yielded no significant differences except for perceived control and helplessness. Latent class growth analysis of perceived control over the course of the experiment revealed different trajectories that were associated with differing mood changes. The best-fitting model had three classes with one class perceiving continuous low control (low), one reporting rising control (rising) and one showing continuous medium perceived control (medium). Compared to the rising and medium classes, the low class reported significantly more helplessness and depression. For mood, we found an interaction with gender: only women in the low class reported a greater increase in negative mood.Taken together, these results corroborate the importance of perceived control over aversive events for the etiology of depressive symptoms and mood disorders.

P.414 - Using Neural Loss and Reward Processing To Classify Alcohol Use Disorder, Major Depressive Disorder And Their Comorbidity

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Alcohol use disorder (AUD) and major depressive disorder (MDD) are both characterized by altered processing of rewards and losses. Although these response patterns are substantially different, both disorders show a high comorbidity. These alterations can be used to classify individuals with AUD and MDD and potentially identify sub-groups of comorbid (COM) patients. Since current research mainly focuses on the reward mechanism in classification, the present study investigated the viability of classification in the context of a single win or loss task as well as a combined analysis of both tasks.160 patients (AUD N=86, MDD N=51; COM N= 23) completed a Monetary Incentive Delay task during functional magnetic resonance imaging (fMRI). We generated 1013 brain parcels by combining Schaefer's cortical and Choi's subcortical parcellation, extracted standardized activation effects and trained a random forest (RF) classifier with a stratified four-fold cross-validation on the reward, loss and combined reward and loss data. 100 permutations were carried out to assess the robustness. The classifier with the highest performance was subsequently applied to an independent dataset of comorbid patients to identify potential sub-groups of primary and secondary AUD.The combined classifiers trained on win and loss processing achieved a weighted accuracy between 66 and 72%, win only achieved 64 – 70%, and loss 69-77%.Our results demonstrate the suitability of neural reward and loss processing to classify AUD and MDD patients far beyond chance. Particularly loss processes seem to play and important role in the classification of groups of AUD, MDD and comorbid patients.

P.421 - Inverse Association Of Depressive And Burnout Symptoms With Neutrophil Deformability – A Mechanistic Approach

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Cell deformability, which is linked to cellular function, is affected by glucocorticoids and inflammatory markers, two biomarkers integrated in the pathophysiology of depressive disorders and burnout syndrome. Recently, we found depressive symptom severity to be positively associated with cell deformability of immune cells. Due to the ongoing debate regarding the distinction between depression and burnout, on a symptomatic and biological level, we were interested in the distinctive effect of these disorders and their shared biomarkers on cell deformability. To address this, we conducted a longitudinal study with two annual assessments (T0 and T1) as part of the Dresden Burnout Study. Depressive symptom severity and burnout symptoms were measured at T0 and T1 with the Patient Health Questionnaire (PHQ-9) and the Maslach Burnout Inventory (MBI-GS) in 152 participants. Similarly, glucocorticoid levels and inflammation levels were assessed by hair cortisol concentration (HCC) and high-sensitive C-reactive protein (hsCRP) at T0 and T1. By taking a capillary blood sample at T0 and T1, cell deformability was assessed by real-time deformability cytometry (RT-DC) combined with a semi-automated cell sorting algorithm. Using linear mixed models, we revealed a robust significant positive effect of depressive symptom severity and a robust significant negative effect of burnout symptoms on neutrophil deformability, controlled for age, BMI, cell size and gender. However, glucocorticoid and hsCRP levels could not explain additional variability in cell deformability, leaving unaddressed predictors for examination. This study, however, offers new insight into the distinctive effects of depression and burnout on a cellular level.

P.252 - Invasive Vagus-Nerve Stimulation Modulates Rhythmic Alpha Activity in Widespread Cortical Networks

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The autonomic nervous system shapes neural population dynamics and behavior. In particular, the locus-coeruleus noradrenergic system is known for its role in modulating the excitation/inhibition balance and thereby sensory gain control. However, causal evidence in humans in support of this framework remains sparse. Here, we fill this gap by recording electroencephalography (EEG) in patients with invasively implanted vagus-nerve stimulators, enabling a direct transfer from neuromodulation to cortical brain states. We demonstrate that rhythmic alpha activity, a prominent marker for neural excitability, is desynchronized upon stimulation of the vagus-nerve. Our results therefore provide causal evidence for a role of the noradrenergic system in shaping cortical brain states in humans.

P.282 - Galvanic Vestibular Stimulation Induces A Shift In Subjective Postural Vertical

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Background: Pusher syndrome is a disorder of body orientation in space following brain damage. It is characterized by the fact that those patients feel upright when they are actually tilted to their ipsilesional side, i.e. the side of their brain damage. This deviation of body verticality is measured by means of the subjective postural vertical (SPV), which indicates uprightness in relation to gravity. For therapeutic purposes, i.e. realigning the displaced SPV, it is of great interest whether or not this measure can be influenced by stimulation of the vestibular system.Methods: To test whether galvanic vestibular stimulation (GVS) has an effect on the SPV, we first tested healthy adults. The SPV was measured while healthy participants were seated in a tilting chair with their eyes occluded. Non-invasive and painless GVS, which stimulates the otoliths of the vestibular system with electrodes placed over the mastoids, was applied under three different conditions, including a control sham condition.Results: GVS significantly affected the SPV in healthy adults and induced a body tilt in roll plane, measured by the SPV, towards the anodal side of the stimulation.Conclusion: Galvanic vestibular stimulation had an impact on the perception of body upright orientation in healthy adults. This indicates that the SPV can be altered by targeting the vestibular system. The next step will be to transfer and apply this finding to patients with pusher syndrome to determine if it might represent a valid and effective therapeutic option to enhance rehabilitation.

P.334 - Is The ACC Crying For Help? Characterizing The Neural Network Of Performance Monitoring By Implementing Simultaneous TMS-EEG

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A fundamental mechanism of cognitive control is to adapt behaviour after committed errors to prevent future errors. These adaptative processes (e.g., measured as post-error slowing, PES) are triggered by the performance monitoring system, represented by the error-related negativity (ERN) in the event-related potential. The ERN, originating in the anterior cingulate cortex (ACC), reflects automatic error processing, while the required behavioural adaptation is assumed to be implemented by the dorsolateral prefrontal cortex (DLPFC). Yet, it is unknown whether the functioning of the ACC is independent of subsequent processes associated with the DLPFC.Here, we probe the functional relationship between the ACC and DLPFC by (i) disrupting activity within the (right) DLPFC through triple-pulse TMS shortly after errors, and (ii) observing changes in ERN peak amplitude after DLPFC stimulation compared to a control stimulation condition (primary motor cortex). To this end, we applied simultaneous TMS-EEG, while participants engaged in a demanding cognitive control task (i.e., the speeded-inference game).Data from the first participants of the ongoing study (n = 21) show that interfering with DLPFC activity reduces PES, while other behavioural measures such as response accuracy or response time are unaffected. In addition, we observe a higher ERN peak amplitude after DLPFC stimulation in comparison to the control stimulation. This suggests that disrupting the functioning of the DLPFC immediately after errors reduces adaptive processes, which is accompanied by an intensified error signalling. These preliminary results indicate that the ACC and DLPFC might build the interdependent core of the performance monitoring system.

P.410 - Functional Connectivity Modulation After Multisession Brain Stimulation Accompanied Cognitive Training In Older Adults With Prodromal Alzheimer's Disease

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Due to the worldwide growing older population, the prevalence of age-related diseases like Alzheimer's disease (AD) is increasing. Effective interventions against age-associated cognitive decline are highly needed. One promising intervention is the combination of cognitive training with non-invasive brain stimulation techniques such as transcranial direct current stimulation (tDCS).We investigated whether a three-week tDCS-accompanied executive function training yields substantial benefits compared to sham in older adults with prodromal AD. During the intervention, participants (n = 46) were administered a tablet/computer-based training (letter updating, decision-making) combined with either anodal tDCS (1 mA, 20 minutes) or sham (30 sec) over the left dorsolateral prefrontal cortex (LDLPFC). We hypothesized that training gains after the intervention would be superior in the anodal compared to the sham group. Resting-state magnetic resonance images were acquired before and 7-months after the intervention to explore the effect on functional connectivity.All participants improved through training, but we found no group difference on performance at trained tasks. We observed an increased functional connectivity between the stimulation target (LDLPFC) and right fronto-parietal brain regions.In sum, our results do not support the benefit of tDCS-accompanied multisession cognitive training on the trained function. High inter-individual variability of the effects indicated that rather individualized protocols, instead of one-size-fits-all approaches, may be required. Stimulation effects on functional coupling within the executive control network suggested long-term network effects despite the absence of performance benefits. Future studies should investigate (task-)specificity of behavioral effects of tDCS-accompanied training and the potential of individualized stimulation protocols.

P.418 - Modulation der Resting-State-Konnektivität von Salienzstrukturen mittels elektrischer Stimulation olfaktorischer Nervenbahnen

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Zentrale Strukturen der Emotions- und Salienzverarbeitung weisen eine enge topografische und funktionelle Verwandtschaft mit primären und sekundären olfaktorischen Strukturen auf und legen damit einen Zusammenhang zwischen Riechen und affektiven Störungen nahe.Wir haben die Möglichkeit untersucht Konnektivitätsmuster in Salienzstrukturen durch minimalinvasive elektrische Stimulation des Geruchsepithels zu modulieren. Hierzu wurden von 30 gesunden Proband*innen Resting-State-fMRT-Daten erhoben, jeweils nach olfaktorischer Stimulation sowie nach trigeminaler Stimulation als Kontrollbedingung. Die funktionelle Konnektivität zwischen den Salienzregionen (anteriore Insula, anteriorer cingulärer Kortex, Amygdala) wurde mittels ROI-to-Roi Analyse in den Stimulationsbedingungen analysiert und miteinander verglichen. Darüber hinaus wurde explorativ die funktionelle Konnektivität der Salienzregionen zum gesamten Gehirn mittels Seed-to-Voxel Analyse beider Stimulationsbedingungen miteinander kontrastiert.Es zeigten sich signifikante Resting-State-Konnektivitäten innerhalb der Salienzstrukturen in beiden Stimulationsbedingungen. Die Kontrastierung der Stimulationsbedingungen ergab eine signifikant erhöhte funktionellen Konnektivität innerhalb der Salienzregionen in der olfaktorischen Bedingung. Außerdem war die funktionelle Konnektivität der Salienzregionen nach olfaktorischer Stimulation signifikant erhöht zu frontalen Arealen als auch olfaktorischen Strukturen im Vergleich zur trigeminalen Stimulation und gleichzeitig signifikant reduziert zu Strukturen des Default-Mode-Netzwerks. Die erhöhte funktionelle Konnektivität innerhalb des Salienznetzwerkes bei gleichzeitiger reduzierter Konnektivität des Salienznetzwerkes zum Default-Mode-Netzwerks durch minimalinvasive elektrische Stimulation des Geruchsepithels eröffnet neue Therapiemöglichkeiten für Menschen mit affektiven Störungen deren Salienznetzwerkstrukturen funktional beeinträchtigt sind. Im nächsten Schritt sollte die Übertragung unserer Ergebnisse in einer klinischen Stichprobe untersucht werden.

P.160 - The Physical and Mental Health Benefits Of Affective Touch: A Comparative Systematic Review And Multivariate Meta-analysis

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Receiving touch is of critical importance for human well-being. Several studies show that affective touch can improve mental and physical well-being. Here we conduct a systematic review as well as a large-scale multivariate multilevel meta-analysis encompassing 154 studies (183 cohorts, 10847 participants and 700 effect sizes) to identify critical moderating factors and inform factors to target for interventions. We find that affective touch has comparable and medium-sized (g 0.5) effects on both mental or physical health. Affective touch was especially effective in regulating cortisol levels and increasing weight in newborns, as well as reducing pain, feelings of depression and anxiety for adults and children. Touch interventions involving objects or robots resulted in similar physical health but lower mental health benefits than human interactions – a difference likely mediated by missing skin-to-skin contact. Clinical cohorts profited more strongly in mental health domains but showed comparable physical health benefits as healthy individuals. Familiarity between the touch dyad was inconsequential in children and adults but critical in newborns. Massages did not show increased health benefits compared to other kinds of touch interventions. The number of sessions positively correlated with increased mental and physical health benefits while session duration did not show significant effects. We believe that leveraging the factors that we find to influence the efficacy of affective touch will help maximize the benefits of future social touch intervention and focus research in this field.

P.219 - Stress Shapes Long-term Memories of Real-life Episodes

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Poster Session 1

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Memories of stressful episodes appear more accurate, vivid, and detailed compared to neutral memories. To understand how stress shapes the memory of the stressful episode itself, we ran an experiment where we monitored the effect of stress on encoding, early, and long-term systems consolidation. Participants experienced twelve distinct, standardized real-life episodes that were accompanied by two types of experimenters: Team A was friendly and tried to make episodes 1-3 and 10-12 as agreeable as possible for the participants. The episodes 4-9 with Team B were friendly in half of the participants and stressful in the other half. We acquired physiological and psychological markers of stress (subjective ratings, wearable ECG, cortisol levels) and visual attention (wearable eye-tracker). We assessed early consolidation using sleep EEG in the first night after the episodes. On the next day, participants underwent an fMRI scan while remembering the episodes allowing for a quantification of the involvement of brain regions in the retrieval process and of the representations of the episodes. Finally, we conducted an autobiographical memory interview (AMI) to measure the accuracy and richness of detail of the memories. Participants rated stressful episodes and memories thereof as emotionally more negative. Using the AMI, we were able to assess the objective accuracy and detailedness of their memories and contrast it to their subjective vividness. Ongoing analyses of the fMRI data show that the imagination of episodes was associated with activity in a widespread network of brain regions including the hippocampus, the precuneus, and the prefrontal cortex.

P.220 - The Causal Role of Worrying in Increasing Exploration Behaviour

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Poster Session 1

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Introduction: The relationship between anxious and depressive traits and exploration behavior has been examined in several studies with mixed results. Across two studies, our results suggest worrying to be a causal factor linking anxious and depressive traits to increased exploration behaviour.Methods: Two studies were conducted. The first study compared exploration behavior on a risky and a safe version of a multi-armed bandit task. We measured a range of traits implicated in anxiety and depressivity and used computational modeling to assess potential task strategies. The second study used only the risky version of the multi-armed bandit task and a psychotherapy-based intervention to reduce worries.Results: In the first study, traits related to worrying were found to be associated with increased exploration behavior, particularly in the risky version of the task. Computational modeling revealed that subjects with a high propensity to worry were less likely to switch to a more risk-averse strategy in the risky task, leading to increased exploration behavior. In the second study, experimentally reducing worries resulted in the expected decrease in exploration behavior.Conclusion: These results suggest that worrying may be a causal mechanism connecting anxious and depressive traits to increased exploration behavior, particularly when there are risks involved. The findings also highlight the potential effectiveness of psychotherapy-based interventions targeting worries in altering behaviour.

P.237 - Can Exposure to a Sensorimotor Game enhance Stress Reactivity towards the Open TSST-VR as mediated by Increased Immersivity?

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The Trier Social Stress Test (TSST) has been transferred to virtual reality (TSST-VR) previously. Meta-analyses by Helminen et al. (2019) confirmed virtual stress induction paradigms to reliably induce stress though effect sizes of cortisol responsivity consistently undercut in-persons applications. However, Helminen et al. (2019) identified immersivity of the specific paradigm to moderate effect sizes: immersive paradigms were shown to produce larger effect sizes than non-immersive paradigms.We increased perceived immersivity of the Open TSST-VR (von Dawans et al., 2022) to enhance resulting subjective stress and cortisol reactivity. We investigated in how far exposition to virtual reality prior to the Open TSST-VR might increase feelings of immersion by means of priming / enhanced sensory-perceptual, and mental readiness for the virtual environment. In a 2 x 2 factorial design, participants first completed (a) a sensorimotor game in virtual reality, or (b) a comparable game in the real world. Subsequently, participants either underwent (i) the stress version of the Open TSST-VR, or (ii) a placebo version of the Open TSST-VR (pTSST-VR).At the time point of abstract submission, we are still in the process of data collection. Data collection procedures and analyses are preregistered (OSF). Results will be presented at the conference. Publication will adhere to open data policies.Our study will clarify in how far it is possible to increase stress reactivity towards the TSST-VR by enhancing immersivity. While advantages of the TSST-VR over its in-person application are obvious, reported patterns of lowered stress reactivity may represent a target for further improvement.

P.240 - Brain Activation Changes as Predictors of Stress Responses in Daily Life over 13 Months

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The LawSTRESS project is a controlled prospective-longitudinal study on psychological, endocrine, central nervous and genetic predictors of responses to long-lasting academic stress in a homogenous cohort.Law students from Bavarian universities (n=452) have been studied over 13 months. Students assigned to the stress group (SG) prepared for their first state examination, while students in the control group (CG) were in the mid-phase of their study program. Ambulatory assessments comprising frequent measurements of perceived stress and the cortisol awakening response (CAR) were administered at six sampling points starting 12 months prior exam. In a subsample of 124 participants, the fMRI paradigm ScanSTRESS was applied additionally.As predicted, a significant increase in perceived stress and a blunted CAR over time could be detected only in the SG. Remarkably, this CAR effect was neither associated with the increase in perceived stress nor with anxiety, depression symptoms, test anxiety or chronic stress at baseline. Additionally, neural acute stress responses at baseline (ScanSTRESS paradigm) were related to trait anxiety. Moreover, it could be shown that stress induced activation changes in amygdala, hippocampus, and medial prefrontal cortex were significantly associated with the trajectory of perceived stress but not with the CAR in the SG.Summing up, the LawSTRESS project successfully assessed multidimensional stress trajectories over 13 months, documented the significant burden, law students are exposed to during preparation for the first state examination, and yielded first evidence for the usefulness of the described neural stress responses as stress vulnerability / resilience marker.

P.242 - High-Resolution Mapping of Neural Mechanisms for Emotion-Cognition Interaction in Space, Time, Frequency, and Information Transfer

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Poster Session 1

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The interaction between human emotion and cognition is a complex phenomenon that has been explored for decades. While these processes were once thought to be separate, more recent research has shown that they are interconnected. However, the exact neurophysiological basis of their interaction has not been fully understood. In this study, we aimed to uncover the neural mechanisms of emotion-cognition interaction using an emotional Flanker task and EEG/FEM beamforming in a large cohort of healthy human participants (N=121). Our results show that emotion and cognition processing overlap in the right inferior frontal gyrus (rIFG), specifically in pars triangularis. We also found that there is a stronger interaction in the beta-band power during the transition from emotional to cognitive processing, leading to worse behavioral performance. Additionally, our findings suggest that rIFG plays a broad role in both inhibitory control and emotional interference inhibition. This has potential clinical implications for understanding psychiatric disorders such as major depression and substance use disorder, in which patients struggle to regulate emotions and execute inhibitory control. Our study provides new insights into the neural mechanisms of emotion-cognition interaction in space, time, frequency, and information transfer, revealing the central role of -band activity in rIFG.

P.249 - Investigation of Socio-Affective and Socio-Cognitive Mechanisms in the Processing of Witnessed Traumatic Events

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Poster Session 1

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Witnessed traumatic events are highly prevalent and can cause immense individual and societal burden. In addition to known risk factors for symptom development, socio-affective mechanisms may play a crucial role for the processing of such events. Identifying different socio-affective pathways at the neural level, as well as the biological and psychological factors that contribute to these different pathways, could improve the prediction of adverse reactions to witnessed trauma. This poster will present a planned study, in which we aim to investigate the causal nature of these pathways by using an experimental laboratory design.We intend to recruit a total sample size of N=400 participants at two study sites with subsamples of n=300 (Hamburg) and n=100 (Dresden). After an online screening, eligible participants are invited to the respective site. Participants complete a questionnaire battery and the EmpaToM task that measures socio-affective and cognitive processes. The Trauma Film Paradigm will be used as a well-established analogue model of exposure to witnessed traumatic events. Only in Dresden the EmpaToM and the Trauma Film Paradigm will be presented in the MRI scanner. During the EmpaToM and film presentation, electrocardiogram (ECG) as autonomic arousal markers of empathic distress will be recorded. In the course of the study session, saliva samples are taken to measure cortisol levels as endocrine indicators of stress reactivity. The laboratory session will end after debriefing and a resting period. During the seven days following film presentation, participants will be asked to document every intrusive memory, using mobile devices (e-diary).

P.260 - Electrocortical Responses In Anticipation Of Avoidable And Inevitable Threats

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Poster Session 1

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In many mammals, freezing is an adaptive defensive response to prepare for subsequent escape from approaching threats. However, it is still unclear to what degree such responses occur in humans and the underlying neural mechanisms are not yet well understood. Here, we assessed physiological, and attentional responses in anticipation of avoidable and inevitable threats. Fifty participants observed naturalistic images while electrocortical activity, heart rate, skin conductance, and eye movements were recorded. The color of the fixation cross preceding each trial was indicative of the trial type and predicted an inevitable shock, no shock, or an avoidable shock after picture offset. In the latter condition, the shock could be evaded by quickly hitting the space bar upon stimulus offset. Regarding the electrocortical responses, we found a reduction in alpha power after picture onset, which was greatest for the avoidable shock condition, but did not differ significantly between inevitable shock and safety trials. We found a similar pattern for skin conductance and pupil dilation with higher responses only in the avoidance trials. Fear bradycardia was observable in both, avoidable and inevitable shock trials, but again, responses were strongest for the avoidable condition. Further, we found gaze centralization in the avoidable threat trials as compared to the other trials, as indicated by decreased average fixation distances from the center of the screen. These findings suggest that freezing to approaching threats is characterized by a multimodal response pattern on the electrocortical, physiological and behavioral level to enhance perceptional processing and action preparation.

P.280 - Affective Priming Of Subjective, Autonomic And Facial Responses to Pain

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Poster Session 1

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Introduction:Priming affects pain perception, with stronger pain responses following exposure to pain-related stimuli (e.g. facial expressions of pain as primes). Now the question is whether these observed priming effects are pain-specific or rather valence-specific. Therefore, in our study, we aim to investigate whether different affective primes (facial expressions of pain, as well as facial expression of anger, sadness, happiness) have a different effect on pain responses (subjective, autonomic and facial).Method:Subjective (intensity and unpleasantness ratings), autonomic (skin conductance response, SCR) and facial (Facial Action Coding System) responses of 56 participants (31 female) to phasic heat stimuli of "painful" and "non-painful" intensity were recorded. Before the heat stimuli, participants saw computer-generated facial expressions (pain, anger, sadness, happiness) of male and female avatars.Results:Compared to happiness, the presentation of negative valent facial expressions led to increased pain ratings (intensity and unpleasantness), increased SCR and increased facial responses to pain. However, we found no significant differences between the different negative valent primes. The previous exposure to facial expressions of pain had a similar effect on pain responses as facial expressions of anger as well as sadness.Discussion:The presentation of negative valent facial primes not only leads to higher subjective pain ratings, but also to increased autonomic and facial responses to experimentally induced pain. This may suggest that the entire pain system is susceptible to the valence of a prime, particularly because the effects are observed across all channels.

P.308 - The Relative Efficacy of Mindful Sensory Focus Versus Distraction on Pain Experience

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Poster Session 1

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Pain research and recent imaging studies have shown, that pain experience can be influenced by the control or the direction of attention. Diverting attention from pain as well as (sensory) focusing on pain has been proven to be beneficial in reducing pain intensity. The relatively new self-guided 30s Mindfulness Interoceptive Exposure Task (MIET) is easy to learn and simple to apply. This study investigates the distinct effects of sensory-focused attention and distraction on experimental pain reduction.Eighty-seven participants (mean age = 24 years, 62 % female) completed questionnaires about pain processing behaviors and cognitions and were then randomized to a MIE-task, distraction task or a control condition (CG). Cold pressor (CPT) pain threshold, pain intensity and pain aversiveness were assessed twice; first as an individual baseline measure and second while performing the respective task instructions.The MIET and distraction tasks both reduced pain intensity and aversiveness ratings compared to baseline, while pain tolerance was increased through the MIET. These effects were significant in comparison to the change in the no-task habituation control condition (CG). Additionally, individuals with reduced ability in mindful observing appeared to benefit more from the MIET task, particularly in terms of pain tolerance and aversiveness. Conversely, higher pre-experimental levels of fear of pain reduced the analgesic effect of the MIET on pain intensity.This study demonstrates the efficacy of attention directing tasks on pain processing and showed distinct advantages of an exposure based mindfulness task on pain tolerance.

P.358 - GAUDIE: Development, Validation and Exploration of a Naturalistic German AUDItorily Emotional Database

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Poster Session 1

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Despite a great need in the German-speaking area, thoroughly validated naturalistic speech stimulus database for emotion induction are rare. Therefore, we present a novel and richly annotated database GAUDIE (German AUDItorily Emotional Database). GAUDIE comprises 37 audio speech sequences with a total length of 92 minutes for the induction of positive, neutral, and negative emotion: comedian shows intending to elicit humorous and amusing feelings, weather forecasts, and arguments between couples and relatives from movies or television series. Twenty-six healthy volunteers (mean age = 24.69 ± 3.41 years, 19 females) participated in the validation study. In naturalistic scenarios, experienced emotions are highly context-dependent and reveal a high variability over the course of time. Therefore, stimuli were rated not only in a post-presentation rating but also continuously to capture the variation of their valence and arousal over time. These annotations allow, among others, future studies to correlate peripheral- and neurophysiological reactions with valence and arousal ratings. Additionally, post-presentation ratings examined discrete emotion classification and potential moderators. For the assessment of stimulus quality, we quantify how well audio sequences differentiate on the valence-arousal-dominance system and generalize regarding the perceived emotional strength and other ratings across participants. In order to find an optimal stimulus selection, we used Monte Carlo Simulation based subtractive comparisons. GAUDIE represents a validated speech database of naturalistic scenarios suitable to investigate emotion processing and its time course with German-speaking participants. Information on using the stimulus database for research purposes can be found at the OSF project repository GAUDIE https://osf.io/xyr6j/.

P.445 - Motivated With Joy or Anxiety: Does Approach-Avoidance Goal Framing Elicit Differential Reward-Network Activation In The Brain?

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Poster Session 1

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There have been a considerable number of behavioral studies showing that approach goals (i.e., achieving success) and avoidance goals (i.e., avoiding failure) lead to different motivational states. Approach goals are associated with positive emotional outcomes, whereas avoidance goals tend to elicit negative emotional states such as anxiety. In this study, we investigated the neural correlates of goal-directed behavior under these goals using fMRI with a game-like, intrinsically motivating task. We especially focused on the key regions implicated in previous work, i.e., the striatum, midbrain, lateral prefrontal cortex, and ventromedial prefrontal cortex. Our findings indicate that despite the fact that approach and avoidance goals produce different motivational states, the striatum, and other key areas are insensitive to the goals. For example, the striatum is activated after a successful outcome in both approach and avoidance goal conditions. These findings suggest that the striatum may encode general motivation or effort mobilization, not the positive motivational state such as intrinsic motivation. Furthermore, we found that the hippocampus was more activated after successful feedback in the approach condition and after failure feedback in the avoidance condition, which suggests that it encodes salient events.

P.178 - Responsible Research Assessment: How To Move Beyond Impact Factors And H-Index In Psychology

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Poster Session 1

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Traditional metric indicators of scientific productivity (e.g., journal impact factors, h-index) are being criticized because (a) empirical studies cast doubt on their validity and (b) they seem to foster a culture that prioritizes pure quantity over content quality. Calls for specific, more valid alternatives to the performance measures currently in use are therefore growing louder. After adopting both DORA and CoARA, the German Psychological Society tasked a work group with outlining a more responsible form of research evaluation for psychology. Here, we report on the current status of this project: Specifically, we propose a two-stage evaluation process that combines the objectivity and efficiency of metric indicators (phase 1) with an in-depth, discursive evaluation of actual research content (phase 2). We argue in favor of broadening the range of relevant research contributions and propose quality criteria for published research articles, datasets, and research software that focus on these contributions' methodological rigor. In phase one of the evaluation process, these criteria are used to establish a certain minimum threshold of methodological rigor which candidates need to pass in order to be considered for hiring or promotion. In contrast, the second phase of the evaluation process focuses on the actual content of the candidate's research. We offer ready-to-use templates that already underwent some testing in actual assessment practice. Our goal is to initiate a broad discussion about the topic, and ultimately to help strengthen the role that scientific quality plays in the course of academic hiring and promotion proceedings.

P.371 - Rethink Funding

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Poster Session 1

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The allocation of research grants is a critical process that influences the direction of scientific research. However, there are growing concerns about the effectiveness of the traditional peer review process and grant allocation decisions in predicting overall grant productivity. Furthermore, these processes are often perceived to be unfair, expensive, and conservative, promoting incremental science over explorative proposals with potentially high impact.Recently, alternative approaches such as lotteries at the last stage of the process have been proposed, but comparing these different grant allocation scenarios is difficult due to limited sample size and vague definitions of grant quality and bias. To address this, we propose a simulation-based approach that explicitly defines quality and bias parameters, allowing for a direct comparison of different grant allocation scenarios.Our approach also takes into account the costs of the process for society, incorporating the time and effort researchers spend on writing and evaluating proposals. To make this method easily accessible, we have implemented it as a shiny app (code on GitHub), providing a user-friendly framework for meta-science, funders interested in exploring new grant systems, and individuals searching for the grant allocation scenario with the highest probability of success.By providing a transparent and quantitative approach to compare different grant allocation scenarios, our method can foster discussions about relevant parameters and their interplay in the evaluation of grant allocation schemes. This can ultimately lead to more efficient, fair, and effective grant allocation decisions that better serve the scientific community and society as a whole.

P.405 - How to Build an Open Science Community From Scratch? Lessons learnt from the Chinese Open Science Network (COSN)

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Poster Session 1

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Open Science is becoming a mainstream scientific ideology in psychology and related fields. However, researchers, especially early-career researchers (ECRs) in developing countries, are facing significant hurdles in engaging in Open Science and moving it forward. In China, for example, various societal and cultural factors discourage ECRs from participating in Open Science, such as the lack of dedicated communication channels and the norm of being modest. To make the voice of Open Science heard by Chinese-speaking ECRs and researchers at large, the Chinese Open Science Network (COSN) was initiated in 2016. With its core values being grassroots-oriented, diversity, and inclusivity, COSN has gradually grown from a small Open Science interest group to a nationally and globally recognised network. Since Covid-19, despite the challenges it imposed on researchers, COSN has escalated in terms of

both its scale and breadth, as virtual events are getting increasingly appreciated. So far, COSN has organised three workshops, 12 tutorials, 48 talks, and 55 journal club sessions and translated 15 Open Science-related articles and blogs from English to Chinese. Currently, the main social media account of COSN (WeChat) has been subscribed to by more than 25,000 followers. Albeit its success, this process was not easy and relied on many hidden curriculums. To make it truly open and transparent, we share our experience in building such a network in encouraging ECRs especially from developing countries, to start their own Open Science initiatives and engage in the global Open Science movement.

P.505 - Making fNIRS Research More Transparent: A Preregistration Guide and Template for Open and Reproducible fNIRS Research

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Poster Session 1

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Study preregistration is an essential tool for reproducible and confirmatory research, especially regarding complex measurements that require plentiful design and analytical decisions. Several recent efforts have developed guidelines for preprocessing, analyzing, and reporting practices for functional near-infrared spectroscopy (fNIRS) studies in general. For the planning stage of fNIRS studies, similar guidance was missing. Preregistration helps researchers to design their study in a transparent and comprehensive way before conducting it. Through the a priori definition of scientific hypotheses,, materials and methods, as well as analyses preregistration mitigates researcher and publication bias.To facilitate study planning and preregistration, we created a guide about the design and analysis steps involved in fNIRS studies (https://doi.org/10.1117/1.NPh.10.2.023515) and provide a preregistration template specifically for fNIRS studies (https://osf.io/hb4um/).On a step-by-step basis, we walk the reader through key methodological and analysis-related aspects central to a comprehensive fNIRS study design. These include items specific to the design of continuous-wave (CW), task-based fNIRS studies, but also sections that are of general importance, including an in-depth elaboration on sample size planning.By introducing these open science tools to the community, and providing researchers with an overview of key design aspects and

specification recommendations for comprehensive study planning, we hope to achieve more openness and robustness in the research landscape. As such it can be used as a template to preregister fNIRS studies or merely as a tool for transparent fNIRS study design.

P.599 - Navigating the Complexities of Multimodal Data Integration in an Interdisciplinary Virtual Research Environment

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Good scientific practice requires reproducibility of research results and adherence to the FAIR (Findable, Accessible, Interoperable, Reusable) data principles. These principles call for effective information and research data management to facilitate daily scientific work, particularly in collaborative projects. The Collaborative Research Centre 265 "Losing and regaining control over drug intake" investigates substance use disorders in 20 interrelated human and animal subprojects. This results in a vast amount of data, including fMRI, EEG, time series, animal, modeling, genetic, questionnaire, and experimental data, both in cross-sectional and longitudinal designs. The interdisciplinary consortium relies heavily on data integration and sharing via a Virtual Research Environment (VRE), developed by the information infrastructure subproject.The VRE includes a participant management system (PAMS), recruitment of participants (ORSEE), study and data management (REDCap), MRI image management (XNAT), neuropsychological test batteries (Experiment Factory), document sharing and editing (Nextcloud with OnlyOffice), and a knowledge management system (Wiki). These tools were integrated into one system to automize research processes and data flows, taking into account data security and privacy. To date, over 4500 participant screenings and over 1000 interviews have been managed via the VRE.The poster will present how the VRE integrates these systems, how access management enables all partners to participate, and how the functionalities ensure compliance with good scientific practice. The project offers a case study for collaborative work and research data management in interdisciplinary neuroscience research projects, with implications for research data management standards in biopsychological research, long-term archiving, data quality control, and Open Science practices.

Poster session 2

Computational Methods and Neuroimaging

P.480 - Self-Regulation of the Activity in the Visual Word Form Area with Real-Time fMRI Neurofeedback

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Poster Session 2

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Reading is a key skill in our society. One brain region strongly associated with reading performance is the visual word form area (VWFA) in the ventral occipito-temporal cortex. Here, we investigated whether VWFA activity can be voluntarily regulated using real-time fMRI neurofeedback. Forty typical readers were either instructed to upregulate (UP group) or to downregulate (DOWN group) their VWFA. All participants underwent six neurofeedback training runs and a no-feedback run before and after neurofeedback training. When comparing the UP to the DOWN group during neurofeedback runs we observed significant activity across the whole reading network, including the VWFA, the left inferior frontal gyrus, the left superior temporal gyrus, and the left precentral gyrus. For VWFA activity during no-feedback runs, we observed a significant interaction between the conditions run (PRE, POST) and group (UP, DOWN) ($F(1, 35) = 5.21$, $p = 0.03$). Importantly, t-tests showed no significant difference between the groups before neurofeedback training ($t(36)=0.11$, $p=0.91$), but higher VWFA activity in the UP group as compared to the DOWN group after neurofeedback training ($t(36)=2.27$, $p=0.03$). Our results indicate that regulation of the VWFA using neurofeedback is indeed feasible and that, once learned, self-regulation can even be performed in the absence of feedback. This provides the foundation for the development of brain-based neurofeedback interventions for reading impairments such as developmental dyslexia.

P.488 - Influence Of Brain State, A Priori Feature Selection, And Individualized Parcellation On Connectivity-Based Predictions Of Behavior

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Poster Session 2

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Behavior prediction based on brain data can contribute to our understanding of human brain functioning. Various approaches may improve this prediction: using task-based functional connectivity (FC) rather than resting-state FC [1]; using feature-reduction methods [2–5]; or individualizing brain features [3,6,7]. We here systematically investigated the influence of all three approaches (brain states, task-based feature reduced networks, and individualization of brain features) on prediction of individual task performance.Using openly available behavioral and fMRI data from the HCP-YA [8] (440 subjects, 234 women; mean age: 29) dataset, we predicted performance in three different domains: working memory (WM), theory of mind (ToM) and emotion matching (EMO). FC features were obtained from four task states (resting/WM/ToM/EMO), two connectome representations (whole brain vs. task-related networks), and two parcellation schemes (non-individualized vs. individualized Schaefer atlas [9] granularity of 100).Overall, prediction accuracies were generally low, but revealed a benefit of predicting behavior from task versus resting state. Further, prediction improved for individual WM performance relative to the other behavioral domains, in particular when predicting from FC within the WM state. There was no difference in prediction between whole-brain and task-based networks and there was no improvement of prediction performance based on the individualized FC.In conclusion, predicting complex behavior based on FC remains a significant challenge. However, we would argue for using task states for prediction and using task-specific networks for sparsity and better interpretability. To gain further insights into the effects of individualization, we suggest considering different parcellation granularities and individualization methods.

P.491 - Alkoholkonsumstörung und Interozeption: Eine Metaanalyse struktureller und funktioneller neuroimaging Daten

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Poster Session 2

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Die Wahrnehmung und Verarbeitung körperinnerer Signale (Interozeption) könnte eine wichtige Rolle bei der Entstehung und Aufrechterhaltung der Alkoholkonsumstörung (AUD) spielen. Erste Studien verweisen auf eine schwächere Wahrnehmung der Effekte des Alkohols auf den Körper und eine Diskrepanz zwischen interozeptiver Sensibilität und interozeptiver Genauigkeit bei Patient:innen mit AUD. Zudem wird vermutet dass die neurotoxischen Wirkungen des Alkohols, für die Interozeption wichtige Hirnstrukturen schädigen können. Gezielte Studien zu den neuralen Veränderungen mit Auswirkungen auf die Interozeption bei AUD fehlen allerdings, sodass die genaue Lokalisation der betroffenen Hirnregionen weitegehend unklar ist. Das Ziel dieser präregistrierten, koordinatenbasierten Metaanalyse war es daher, die räumliche Überlappung von strukturellen Veränderungen der Grauen Substanz bei der AUD und die funktionellen Repräsentationen der Interzeption über eine Konjunktionsanalyse zu testen. Nach zwei systematischen Literaturrecherchen wurden 27 Studien zur AUD mit 1045 Patient:innen und 25 Studien zur Interozeption mit 645 gesunden Proband:innen in die Analyse integriert und mittels der Activation Likelihood Estimation auf Konvergenz getestet. Mittels einer Konjunktionsanalyse wurde anschließend geprüft ob und wo sich die Konvergezcluster der beiden Metaanalysen überlappen. Die Ergebnisse zeigen, dass die Konvergenzcluster der AUD- und der Interozeptionsanalyse innerhalb der beiden Insulae in unmittelbarer Nähe zueinander liegen, sich aber nicht überlappen. Die Veränderungen der Grauen Substanz bei AUD scheinen somit nicht direkt Regionen zu betreffen, die bei der Verarbeitung interozeptiver Informationen aktiviert werden. Die Daten einer behavioralen Charakterisierung der Ergebniscluster weisen eher darauf hin, dass es zu einer veränderten Integration interozeptiver Informationen in Regionen höherer Ordnung kommen könnte, die mit Emotionsprozessierung, Aufmerksamkeits- und Salienzsteuerung assoziiert wurden.

P.522 - Inversion Effects in Humans and Deep Neural Networks

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Poster Session 2

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Modern deep neural networks reach human level performance in varying visual perception tasks. Additionally they pose as potent models for human behaviour and neural processes. But just like humans, deep neural networks are not invariant to variations of input data like contrast or orientation. In humans, inversion disproportionately impairs the recognition of faces compared to objects; the so-called face inversion effect. With the advent of neural networks as models for human face and core object recognition, we can test whether this bias for upright orientations manifests itself across different object categories. The aim of this work is to investigate whether neural networks exhibit inversion effects and whether they can predict inversion effects and behaviour patterns in humans. Exploratory analyses were performed with different neural network architectures to rank object categories according to their inversion effects and then to investigate these in humans. In a classification task, subjects had to categorise objects that were presented either upright or inverted. The same task was adapted for fine-tuned neural networks and the response patterns between humans and DNNs were subsequently compared. The findings suggest that neural networks exhibit significant behavioural inversion effects, which are also reflected in superordinate categories. However the model architecture does not affect the magnitude of this effect. In humans, high correspondences to the response patterns of neural networks were observed even if no significant differences between the inversion effects of the selected objects were evident. These results highlight the significance of neural networks as models of human visual processing.

P.531 - Track – a New Algorithm and Open-source Tool for the Analysis of Pursuit-tracking Sensorimotor Integration Processes

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In daily life, sensorimotor integration processes are fundamental for many cognitive operations. The pursuit tracking paradigm is an ecological and valid paradigm to examine sensorimotor integration processes in more complex environments/tasks. However, the analysis of pursuit tracking performance is complicated, and parameters quantified to examine performance are sometimes ambiguous regarding their interpretation. We introduce a new open-source algorithm (TRACK) to calculate a new tracking error metric, the spatial error, based on the identification of the intended target position for the respective cursor position. The identification is based on assigning cursor and target direction changes to each other as key events, based on the assumptions of similarity and proximity. By applying our algorithm to pursuit-tracking data, we show that the spatial error replicates known effects such as learning or practice effects. Beyond replication of established findings, we show that the spatial tracking error fits our behavioral data better than the temporal tracking error and provides new insights and parameters for the investigation of pursuit-tracking behavior. Our work provides an important step towards fully utilizing the potential of pursuit tracking tasks for research on sensorimotor integration processes.

P.539 - Differences and Similarities in the Temporal Correlation of the Hemodynamic Response Measured Simultaneously with fMRI and NIRS During Motor and Mental Tasks

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Poster Session 2

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Previous multimodal fMRI-NIRS imaging studies using motor or cognitive tasks reported on a wide variance of the temporal correlation between the fMRI BOLD signal and the NIRS signal. Generally, oxygenated hemoglobin (HbO) as assessed with NIRS seems to have the highest temporal correlation with the fMRI signal ranging from 0 to 0.8. In the present study, 15 right-handed healthy individuals performed a motor execution task as well as a motor imagery task with their dominant and non-dominant hand during synchronous fMRI-NIRS recordings. Both tasks led to a strong contralateral activation in the motor cortex as revealed by the fMRI and NIRS results indicating spatial correspondence between both recording modalities. The temporal correlation between the fMRI and NIRS signals was higher for the motor execution (HbO*BOLD r = 0.82 to 0.98; HbR*BOLD r = -0.63 to -0.95) than for the motor imagery task (HbO*BOLD r=0.09 to 0.38; HbR*BOLD r=-0.05 to -0.18) over motor areas. No prominent correlations between the fMRI and NIRS signals could be found over a motor-unrelated control brain area. Hence, similar time courses in the hemodynamic response as assessed with fMRI and NIRS were only found in task-related brain areas and were stronger during motor execution than imagery. Our results provide evidence that the temporal correlation between the fMRI and NIRS signal depends on the functional task, which might be of relevance for future investigations of human brain function using these imaging techniques.

P.546 - Mechanisms of Mistrust: A Bayesian Account of Misinformation Learning

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Poster Session 2

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Misinformation presents a challenge to societies worldwide, yet the cognitive computations underlying its processing remain scarcely understood. Here, we present a behavioural task and accompanying Bayesian models that allow us to study key aspects of the phenomenon and frame it as a learning problem about the trustworthiness of information providers. Specifically, we formulate a dual learning process where agents simultaneously learn about topics covered as well as the qualities of the news provider. In our task, participants are confronted with several different types of (mis-)information, ranging from a lying source to a source with biased reporting. Computational modelling of participants choices reveals both failures and successes of this learning process and sheds new light on how people come to trust, or distrust, a wide variety of information sources.

P.548 - Validation of an fMRI-based Olfactory Cue Reactivity Task

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Poster Session 2

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Alcohol Use Disorder (AUD) is one of the most prevalent substance use disorders, and it affects millions of people worldwide. It is hypothesized that while AUD progresses, the brain's dopaminergic reward networks are heightened towards "wanting" of alcohol; meanwhile "liking" of alcohol may even be reduced. Individuals with substance use disorders have an increased urge to consume drugs when they are exposed to cues related to drug use, which is known as cue reactivity and is associated with a higher likelihood of relapse. The classical cue reactivity task (CRT) elicits enhanced activations of dopaminergic reward areas in the presence of alcoholic stimuli, which was shown using fMRI measurements. Adding olfactory cues to the classical visual CRT, we aim to show the effectivity of olfactory cues compared with the tried and tested image-only CRT. Individuals with harmful alcohol consumption behaviour, confirmed by Alcohol Use Disorders Identification Test, are invited to the validation study. In the combined cue reactivity task, synchronous olfactory and visual alcoholic and non-alcoholic cues are presented to participants lying in the MRI using an olfactometer and an MRI compatible screen. This was contrasted with a classical CRT in a balanced order. We hypothesize that the combined stimulation will elicit stronger cue reactivity than the visual stimulation alone. Two iterations of the task have been performed with different non-alcoholic cue types and the data analysis are ongoing. The results from the comparisons of both iterations will be presented.

P.575 - Mindfulness-based Instruction to Improve Real-time fMRI Neurofeedback Efficiency in Problematic Alcohol Use

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Poster Session 2

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Hyperreactivity towards alcoholic cues is a key aspect in understanding and treating alcohol use disorders, particularly in the ventral striatum (VS). Real-time fMRI neurofeedback (rt-fMRI NF) is a newly emerging non-invasive method to reduce ventral striatal alcohol-cue reactivity. Existing studies have found its capacity on decreasing cue-induced craving and empowering participants modulating their brain processes. However, the efficacy of rtfMRI NF might be subject to effective strategies that participants can employ to regulate the brain process. Mindfulness, which aims at building insight and non-reactive acceptance of one's own experience, might provide promising strategies to regulate brain activity elicited by alcohol triggers. In our randomized, double-blind, sham-controlled study, we investigate the hypothesis that mindfulness-based instructions will increase the rtfMRI NF training efficiency in reducing ventral striatal alcohol-cue reactivity for participants with problematic alcohol use.A total of 111 participants will be enrolled and randomly assigned to one of three groups: NF (signal from VS) with mindfulness-based instruction, NF with control instruction (a length-matched neutral message), and sham NF (signal from A1) with control instruction. Participants receive a 2-session NF training at a Siemens 3 T Scanner. Our preliminary analysis with 55 participants suggests that mindfulness-based instruction might increase the rtfMRI NF training efficiency on both clinical outcomes (reducing self-reported cravings) and neurobiological outcomes (decreasing alcohol cue-induced VS activity) for people with problematic alcohol use. However, solid conclusions couldn't be made so far due to limited statistical power. The study is currently ongoing and updated results will be presented.

P.614 - Noradrenergic And Dopaminergic Modulation Of Control And Metacontrol

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Poster Session 2

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Humans and animals use multiple control systems for decision-making, with the differential involvement of model-free (MF) and model-based (MB) systems casting light on psychiatric disorders. This involvement is subject to metacognitive regulation - as a form of control over control, meta-control. Here, we perturbed norepinephrine (NE) and dopamine (DA) neuropharmacologically with Propanalol and L-Dopa and examined control and metacontrol. We examined the effects of the drugs on choice and confidence ratings in two tasks: a conventional perceptual decision-making task used to study to confidence judgements, and a two-outcome task that offers an exquisitely fine decomposition of model-free and model-based choice and credit assignment. Using hierarchical Bayesian fitting, we found that Propranolol significantly decreased meta-cognitive ability while there was no effect of Levodopa-B. In the two-outcome task, Propranolol increased model-based behavior but had no effect on model-free behavior, while Levodopa-B had no effect on either. Regarding control over control, when control systems disagree, meta-control might naturally be exerted to determine which one should be favored. For instance, when decision-makers lack confidence, the model-based controller should be preferred because it is statistically superior. However, if decision-making is uncertain, the model-based system may not be reliable. In support of this hypothesis, we found that model-based behavior was less likely to increase after low confidence. Overall, we suggest that our study sheds new light on the role of noradrenergic and dopaminergic systems in different levels of control and points to potential avenues for mitigating dysfunction within and between these systems.

P.624 - The Search for Replicability: Using Cross-validation to Obtain Accurate and Replicable Mass-univariate Brain-wide Associations

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Introduction: Statistical effect are overestimated in small samples, leading to poor generalizability and replicability of findings. We investigated the impact of cross-validation to counteract this issue, in univariate voxel-based brain-wide associations, using body mass index (BMI) as an exemplary predictor.Methods: A total of n=3401 adults were included. Brain-wide associations between BMI and gray matter structure were tested using a standard linear mass-univariate voxel-based morphometry (VBM) approach. Traditional non-cross-validated effect sizes were compared with cross-validation-derived test set effect size estimates (applying linear effects to new data in a 5-fold cross-validation approach). This was investigated across a variety of sample sizes, simulating samples from n=25 to n=3401, using bootstrapping.Results: BMI was mainly negatively associated with VBM in the full sample, with a maximum brain-wide effect size of R^2p=.036. Effects were overestimated exponentially with decreasing sample size, with effect sizes up to R^2p=.429 in samples of n=25 for the voxel with the brain-wide smallest effect (underlying null effect). When applying cross-validation, largest effects started generalizing to new data at n=100 participants (explaining variance >0), while n=400 were needed for smaller effects of R2p=.005 to generalize. Effect size estimates obtained with and without cross-validation approached convergence in large samples.Discussion: Cross-validation is a useful method to counteract the overestimation of effect size particularly in small samples and to assess the generalizability of effects. Cross-validation should be applied in voxel-based mass-univariate analysis to foster accurate effect size estimation and improve replicability of neuroimaging findings.

P.241 - Gene-Environment Interaction Effects on Perceived Stress and the Cortisol Awakening Response in Daily Life over 13 Months

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The LawSTRESS project is a longitudinal study on psychological, endocrine, central nervous and genetic predictors of responses to long-lasting academic stress. Law students (n=452) have been studied over 13 months and as environmental variable, we used the preparation for the first state examination. While exam students formed the stress group (SG), students in the mid-phase of their program were assigned to the control group (CG).The association between genetic factors and stress response trajectories was studied on two levels. LEVEL 1: We examined the joint association of 936 single nucleotide polymorphisms in the genes coding for neuropeptide S (NPS) and its receptor (NPSR1) and three phenotypes with gene-set analyses (GSA) to overcome well known limitations of candidate gene studies. While the GSA did not confirm associations between genetic variability in the NPS/NPSR1 system and changes in perceived stress (measured by frequent ambulatory assessments, n=401) and anxiety symptoms (n=397), we found a significant GxE interaction for the changes in cortisol awakening responses (CAR; n=176). LEVEL 2: We investigated whether polygenic scores for depression (DEP-PGS) and neuroticism (NEU-PGS), are associated with perceived stress trajectories, depression symptoms (n=432) and the CAR (n=196). While the DEP-PGS was not significantly associated with the phenotypes, we found a significant GxE effect for the NEU-PGS. Only in the SG, a higher PGS for neuroticism predicted stronger perceived stress increases until the exam.In a relatively small but extensively phenotyped sample we found evidence for GxE effects on chronic stress responses with two different genetic approaches.

P.376 - The Love Triangle Of Narcissistic Traits, Insula Structure And Emotional Expressive Suppression

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Poster Session 2

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Introduction: Emotion regulation deficits are prevalent in many psychiatry disorders; in particular in the affective and personality pathology spectrum. The strategy of emotional expressive suppression is associated with traits like narcissistic vulnerability and correlations with insula anatomy have been reported. In this study we tested interrelations of brain structure, narcissistic traits, and emotional regulation strategies.Methods: In a sample of 172 psychiatrically healthy individuals we applied the Pathological Narcissism Inventory (PNI) for assessing narcissistic traits and the Emotion Regulation Questionnaire (ERQ) to measure the dispositional use of emotional regulation strategies. We used 3T MRI to acquire high resolution T1 weighted images for analyses of voxel- and surface-based structural parameters with SPM and cat12 software. We tested the interrelation of insula structure, narcissistic traits and expressive suppression using a GLM approach and mediation models.Results: PNI sub-scales were positively associated with gyrification of bilateral anterior insulae, thickness of left precuneus and negatively correlated with thickness of left anterior temporal gyrus. PNI scales (Total, Grandiosity, Vulnerable) mediated the association of bilateral insula cortices (volume gyrification) and ERQ Suppression. ERQ Suppression mediated the association of right insula volume and PNI (Total, Vulnerable) and the association of right insula gyrification with PNI scales (Total, Grandiose, Vulnerable).Discussion: Our results provide evidence for a mediated relationship of insula structure, expressive suppression and narcissistic traits. Furthermore, structural correlates indicate a neural network including temporal, parietal, and insular cortices for the narcissistic phenotype expanding previous brain imaging studies.

P.386 - Traumatic Stress And Genomic Integrity: Alterations Of DNA Repair In Immune Cells Of Patients With Posttraumatic Stress Disorder

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Introduction: Traumatic stress compromises genomic integrity through elevated oxidative stress levels. We previously demonstrated increased DNA damage in immune cells of patients with posttraumatic stress disorder (PTSD). Accordingly, we hypothesized that induction of cellular DNA repair capacity with functional changes in DNA-repair kinetics is required to maintain genomic integrity in PTSD.Methods: To investigate the expression of DNA-repair genes X-ray repair cross complementing 1 (XRCC1), poly (ADP-ribose) polymerase 1 (PARP1), and polymerase ? (Pol?) as well as the functional relevance for DNA repair in immune cells, we conducted semi-quantitative polymerase-chain reaction and Fluorometric Detection of Alkaline DNA Unwinding after ex vivo induction of DNA damage, respectively. The final study cohort comprised 14 PTSD patients and 15 controls.Results: We found significantly higher XRCC1 expression in PTSD patients compared to controls (U = 161.0, p = 0.009, Cohen's r = 0.49) and positive correlations between PTSD symptom severity and the expression of XRCC1 (rS?=?0.57, p?=?0.002) and PARP1 (rS?=?0.43, p?=?0.022). Higher XRCC1 (F?=?2.39, p?=?0.010, ?2p?=?0.10) and PARP1 (F?=?2.15, p?=?0.022, ?2p?=?0.09) expression implicated slower repair of experimentally X-ray irradiation-induced DNA damage.Conclusion: PTSD involves elevated oxidative stress and DNA damage in immune cells which necessitates the induction of DNA-repair to achieve a physiologically tolerable equilibrium between DNA damage and repair. This first evidence of compensatory regulation of DNA-repair mechanisms in PTSD may be related to cellular senescence, premature ageing, and physical morbidity.

P.413 - Intra- and Interhemispheric Variability of Cortical Folding Patterns in Broca's Area

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The left hemisphere of the brain is traditionally associated with language functions. The lateralization of language can be reliably determined in an individual person using functional MRI or the Wada-Test. However, it still remains vastly disputed and therefore unclear if language lateralization can be inferred from brain structure alone. Given that the folding patterns of the cortical sheet develop in a systematic way (e.g., to optimize neuronal wiring), they allow for the delineation of cytoarchitectonic subregions. Therefore, interindividual differences in macroanatomy can reflect cytoarchitecture and function.In the present study, we utilized structural data from the "Narratives" dataset. We selected data from 50 healthy, right-handed participants. The left- and right hemisphere of each structural MRI were extracted using FreeSurfer and all right hemispheres were mirror-reversed, resulting in 100 separate hemispheres, all oriented to the left.In our ongoing work, three blinded raters are hand-tracing the sulci in and around Broca's area, without knowing to which side or to which individual each hemisphere belongs to. Proceeding the completion of all ratings, the data will be unblinded and we will analyze the shapes, orientations and co-occurrence patterns of all sulci. Variability within each hemisphere as well as systematic differences between the two hemispheres will be analyzed using mass-univariate and multivariate approaches.While the present study is limited by the assumption that the left hemisphere is always the language-dominant hemisphere, follow-up work will include respective fMRI data for each participant, allowing to directly evaluate the relationship between macroanatomy and function.

P.458 - The Relationship Between Chronotype, Sex And Heat Pain Threshold In A Sample Of Young Adults

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Poster Session 2

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Chronotype indicates the biological preference for timing of activity and sleep, ranging from very early (larks) to very late (owls) sleepers. While we know that chronotype influences many performance and health parameters, it is still unclear, whether chronotype plays a role in pain perception.Given the scarce literature on this topic, the aim of this study was to explore whether chronotype might be linked to pain sensitivity. We assessed chronotype and other sleep variables (e.g., sleep duration) with the micro Munich ChronoType Questionnaire (micro MCTQ) in a combined sample of (N=316) young healthy adults (141 males and 175 females; mean age = 22.3 ± standard deviation (SD) = 2.7 years). Heat pain threshold was assessed with the method of adjustment.Chronotype was not significantly associated with heat pain threshold. Similar null findings were obtained for the other sleep variables. The only variable significantly associated with pain threshold was sex, with female participants having a lower pain threshold, in line with previous studies.Our results suggests that chronotype and sleep do not influence pain threshold in a sample of young healthy adults. More studies are needed to clarify the relationship between chronotype and pain sensitivity in different age populations, while also considering distinct pain modalities, and other types of pain tests. Moreover, based on recent findings suggesting a time-of-day variation in pain sensitivity, future studies should consider time of day of testing and explore possible interaction effects with chronotype.

P.486 - Weak Associations Between Contraceptive Choice And Personality

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Poster Session 2

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Due to methodological difficulties, prospective randomized controlled trials on the impacts of hormonal contraceptives (HC) on the brain are uncommon. Therefore, cross-sectional studies contrasting HC users and non-users provide the majority of data regarding the effects of HC on the brain. It is crucial to be mindful of potential confounds related to women's contraceptive decisions when interpreting these results. It seems pertinent to find variables linked with women's attitudes toward HC and determine whether they may serve as confounds for neuroscientific studies given the current trend toward decreased HC use increased skepticism toward HC. In the current study, we investigated whether a woman's personality was related to her decision to use HC in the present, past and future, as well as the type of HC she selected. 1,391 females between the ages of 18 and 45 took part in an online survey that asked them about their current and past use of contraception as well as their attitudes and experiences with it. We contrasted (i) current, past, and never users of HC, (ii) women who were against future HC use, and (iii) current IUD users to current oral contraceptive users. Findings showed that there was little correlation between personality and the choice to use HC, but personality variations were seen according to contraceptive type. IUD users demonstrated greater levels of extraversion and agreement than current OC users. The findings imply that personality, rather than the decision between hormonal and non-hormonal options, is significantly related to the type of contraceptive chosen.

P.543 - Individual Differences In Generalizing Fear Extinction Learning Across The Spectrum Of Trait Anxiety

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Poster Session 2

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This study investigates the process of fear extinction generalization across the spectrum of trait anxiety and in clinical patients.Three groups of 25 healthy subjects each with low, moderate, and high levels of trait anxiety, and 25 anxiety patients participated in two newly developed paradigms. One paradigm was designed to investigate extinction generalization across a range of cues, including a fear-conditioned and extinguished cue, a fear-conditioned but not extinguished cue, a non-conditioned safety cue, and several generalization cues. The other paradigm focuses on context-related extinction generalization, or the recall of extinction learning in several generalization contexts. Both protocols involve instructed fear acquisition and a 24-hour consolidation phase before extinction training and subsequent generalization tests immediately following extinction and 24 hours later. Outcomes included skin conductance responses, fear-potentiated startle, and heart rate. Additionally, unconditioned stimulus (US) expectancy ratings and skin conductance responses (SCR) during US omission (omSCR) were used to evaluate prediction error processes.As of this submission, we have successfully recruited a cohort of 94% of the intended subjects. Processing of different levels of data (i.e., physiological measures) is still ongoing, but initial analysis indicates that the paradigms we established are capable of effectively measuring the extent of extinction generalization across different cues and contexts, possibly providing valuable insights into individual differences of fear extinction processes. We look forward to presenting our results at the EMHFC, specifically focusing on whether or not subjects with a higher anxiety load express less pronounced cue- and context-related fear extinction generalization capacities.

P.556 - Does the Interplay of Emotion-Related Personality Traits and Reproductive Hormones Predict Individual Variation in Emotion Recognition?

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Poster Session 2

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Person-related variation has been identified in many socio-cognitive domains, and there is evidence for links between certain personality traits and individual emotion recognition. Some studies, using the menstrual cycle as a hormonal model, attempted to demonstrate that hormonal fluctuations could predict variations in emotion recognition, but with merely inconsistent findings. Remarkably, a potential interplay of hormone fluctuations and other potentially influential person-related factors in emotion recognition is yet understudied. In the current study, we examined if the interactions of emotion-related personality traits, namely openness, extraversion, and neuroticism, and the ovulatory cycle predict individual variation in facial emotion recognition in healthy naturally cycling women. We collected salivary ovarian hormones measures from N = 131 (n = 74 validated via LH test) women across their late follicular and mid-luteal phases of the ovulatory cycle. Individuals with higher scores in openness performed better in emotion recognition in the late follicular phase, confirmed via LH test, as compared to the mid-luteal phase. We also found that higher neuroticism scores were negatively associated with emotion recognition in the mid-luteal phase and elevated levels of progesterone. Overall, the current study emphasized the significant role of person-related factors' interactions in predicting individual variation in emotion recognition.

P.571 - Genetic Risk for Inflammation and Psychopathology: a Transdiagnostic Network Analysis

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Background: Low-grade inflammation has been linked to various mental health disorders, as well as increased disease severity and treatment resistance. In this regard, network analysis is a promising approach to better understanding the complex relationship between inflammatory markers and specific psychopathological syndromes. Methods: To investigate this relationship, data on psychopathological syndromes (derived from factor-analysis) and genetic liability for higher systemic inflammation markers were obtained in a cohort of European descent, including n = 993 transdiagnostic patients and n = 794 healthy controls. Polygenic risk scores (PRSs) for TNF-a, IL-6, IL-10, and CRP were calculated using the continuous shrinkage prior approach implemented in PRS-CS. A network analysis was performed to investigate the relationship between psychopathological syndromes and inflammation-marker PRSs, including childhood trauma (as assessed by the Childhood Trauma Questionnaire) as a potential moderator. Results: Network analysis revealed the strongest PRS-Syndrome connections between IL-10 PRS and the factor negative syndrome and between CRP PRS and increased appetite, which appeared to be stable across bootstrapping iterations. Moreover, IL-10 PRS and negative syndrome are relevant nodes at the conjunction between the cluster of increased systemic inflammation-marker PRSs and that of psychopathological syndromes. Childhood trauma exhibits a moderating effect on the connection between IL-6 PRS and paranoid hallucinatory syndrome and on the connection between TNF-a PRS and depression syndrome. Conclusion: The findings provide insight into the complex relationship between inflammatory and psychopathological components. Incorporating PRSs and network analysis can help to identify risk groups and guide targeted interventions.

P.647 - Genetics of EEG Oscillations Reveal Novel Biological Insights into the Links Between Brain Structure, Function, and Behavior

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Poster Session 2

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Oscillations in neuronal brain activity play a crucial role in information processing and have extensively been studied as biological markers of human behavior and psychopathology. Although traditional twin studies suggest that brain oscillations are highly heritable, our understanding of their molecular genetic architecture is still very limited. Here we present findings from the largest resting-state EEG brainwave GWAS to date, which combined data from nine cohorts and included up to 14,361 participants. Using harmonized analysis protocols, we examined the power of the EEG frequency bands alpha, beta, delta, theta, and broadband at the vertex site, as well as alpha power and alpha peak frequency at occipital leads. Our results suggest a substantial genetic component, with heritability estimates (h^2_{SNP}) ranging from 14% to 27% (SE: 3.7%). We identify two genome-wide significant loci, i.e., an intergenic region at 13q12.3 ($p = 6.6 \times 10^{-9}$), and an intronic region of FANCA at 16q24.3 ($p = 1.4 \times 10^{-8}$), both associated with alpha peak frequency. Using genetic correlations, we demonstrate a shared genetic basis between EEG power and MRI-based cerebral white matter volume ($r_G = -0.33$, $p = 3.0 \times 10^{-7}$) as well as cortical surface area ($r_G = -0.26$, $p = 2.0 \times 10^{-4}$), with the top regional associations implicating the orbitofrontal, anterior cingulate, and precuneus surface area. Our analyses also point towards a genetic overlap with depressive symptoms, neuroticism, and alcohol use, although these results did not survive stringent control for multiple testing. In sum, we here corroborate and extend previous findings on the genetics of brain oscillations and provide novel insights into the links between brain and behavior.

P.184 - Detecting Cognitive Overload State From Pupil Size And Oscillatory Brain Activity

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Poster Session 2

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Objective methods for detection of cognitive overload are needed. In this study, we investigated how exceeding individual working memory capacity limit (digit span) affects psychophysiological indicators of working memory function such as frontal midline theta, posterior alpha, and pupil size. 137 participants were presented with a digit span task with serial presentation of the digits and serial recall while 64-channel EEG and pupillometry were recorded. Each trial consisted of sequences of visually presented digits. The sequence length was individually adjusted to either correspond to the digit span (at least 70% of the sequences correctly recalled in the right order, "span" condition) or to exceed the digit span by one digit ("overload" condition). Although, the overload condition was perceived as more challenging, as indicated by NASA-TLX subjective cognitive load ratings and behavioral accuracy, the psychophysiological indexes of cognitive load failed to distinguish between the conditions. Independently of the individual digit span the temporal dynamics of pupil size (reaching asymptote at 5-digit load), alpha suppression (reaching asymptote at 7-digit load), and theta enhancement (continuous increase till the end of the retention period) remained similar across individuals. We can conclude that cognitive overload state as indicated by behavioral outcomes lead to the saturation but not to an immediate drop or surge of physiological indexes of working memory load.

P.433 - Sleep Disturbances Caused By Noise: A Question Of The Subjective Mindset?

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Poster Session 2

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Noise at night impairs our sleep. In addition to the acoustic properties the subjective evaluation of the noise source might play an important role to explain the effects of noise on sleep. Particularly, negative mindsets towards the noise seem to lead more strongly to poorer sleep quality. However, it is still unknown whether it is possible to voluntarily change the evaluation of a noise source before sleep and thereby affect objective and subjective sleep quality.To address this scientific gap, 24 participants spent two experimental nights in the sleep laboratory. During the two nights, church bells repeatedly rang at varying volumes. Prior to sleep, participants were instructed to evaluate the ringing of church bells either positively or negatively, in a counterbalanced within-subject design. They were also instructed to maintain their respective evaluations during the night. Sleep was recorded using polysomnography.Preliminary analyses showed that participants tended to wake up more often when church bells were evaluated negatively prior to sleep in comparison to the positive condition. We did not find any significant influence of the evaluation on sleep stage duration and event-related responses to the sounds.This observed trend indicates that subjective intentions and evaluation can be voluntarily influenced prior to sleep and can be maintained during sleep. Thus, psychological interventions targeting the subjective evaluations of noises might have the potential to improve sleep quality in the presence of sleep-disturbing noises.

P.434 - Temporal Dynamics of the Influence of Pre- or Anticipated Post-Sleep Stress in Dream Content

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Poster Session 2

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Psychosocial stress is known to induce stress responses at physiological and cognitive levels which disrupts subsequent sleep. A recent study from our group has shown that stress-induced changes are dynamic: Stress before sleep led to prolonged sleep latency and changes in early sleep periods. However, when post-sleep stress was anticipated when going to bed, changes in sleep were mostly observed in later periods of sleep.A possible explanation is that anticipated stress is spontaneously reactivated in a dynamic fashion. As reactivations might be linked to dream content, here we aimed at testing the influence of anticipated stress vs. pre-sleep stress on dream content in early and late night periods.To investigate the impact of pre-sleep and anticipated stress on cognitive activity during sleep, one group of participants performed either a stress or a relaxation task before sleep; while another group was informed before sleep that the stress or relaxation task will occur in the morning. During sleep, they were regularly woken up and asked about their cognitive activity. The awakenings happened in the early and late sleep period, while polysomnographic data was recorded.Preliminary analyses show that participants remembered significantly more dreams in the late sleep period in all conditions. However, participants reported higher emotional intensity in the late sleep period only in the anticipated stress condition. The emotions tended to be more negative in the stress condition, regardless of the sleep period. Further analyses on the dream content and on the group with pre-sleep stress will also be presented.

P.444 - Sleep Is Sufficient But Not Necessary For Long-Term Visual Gist Abstraction

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Poster Session 2

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Memory processing involves a slow transformation from episodic to gist-like memories which is thought to benefit from sleep. We previously used a non-verbal version of the Deese-Roediger-McDermott (DRM) paradigm to investigate sleep-dependent gist abstraction. Healthy volunteers learned sets of abstract shapes derived from common prototypes. Subsequently, memory performance was measured for learned shapes, new shapes, and unseen prototypes. Results indicated a beneficial effect of sleep on gist abstraction only after a one-year delay.Here, we aimed to investigate delayed gist abstraction in more detail by testing memory immediately after learning; after an interval of one week; and after one year. In addition, we separated stimuli into those that closely resembled their prototype, and those more removed from the prototype. We then recorded data from 16 healthy volunteers in a within-subjects design, where different sets of shapes were learned either in the morning or in the evening, followed by consolidation during wake or sleep, respectively.Our results indicate high levels of prototype recognition across all measurement points. In particular, we found higher recognition rates for the non-learned prototypes than for the actually learned shapes after one year. However, in contrast to our previous findings, this effect was not sleep-dependent. This divergence may be due to our manipulation of stimulus similarity, which resulted in a reduction of the number of shapes per set. If so, our results may indicate sleep is required for gist abstraction only under conditions of high information load.

P.449 - Presence Of Online Fear Ratings Reduces Fear Learning And Contingency Awareness

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Poster Session 2

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Contingency awareness is a key aspect of fear conditioning, involving the explicit recognition of the relationship between conditioned stimuli (CS) and unconditioned stimuli (US). Understanding how contingency awareness is acquired and how it affects fear learning is crucial for understanding the mechanisms underlying fear-related psychopathology and developing effective treatments. In this study, we aimed to investigate the factors associated with contingency awareness and its role in fear conditioning. Our study included 145 participants recruited through Prolific. They were presented with CS+ (geometrical shapes, 11 trials) that were paired with US (unpleasant pictures), while CS- were never paired with the pictures. One group of participants provided fear ratings of the CSs before and after the acquisition phase, while the other group, in addition, rated the CSs on fear six times during acquisition. Prior to conditioning, participants completed the Intolerance of Uncertainty Scale, BIS/BAS scales, and the State-Trait Anxiety Inventory questionnaires, and a working memory task. Only participants who reported explicit contingency awareness demonstrated fear conditioning, as indicated by significant changes in differential affective responses to the CSs. Including online fear ratings reduced the proportion of contingency aware participants from 75.3% to 47.2%. We also found that younger adults were more likely to become aware of contingencies, while lower BIS scores predicted higher awareness acquisition and lower BAS Fun Seeking scores predicted lower awareness acquisition. Our findings support the notion that contingency awareness is necessary for human fear conditioning and highlight the importance of considering individual differences when studying fear learning.

P.464 - Factorization of Graphs in the Compositional Reuse of Experience

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Real-world experiences are often complex, generated by the interplay of multiple dynamic sub-processes. Discovering and abstracting these sub-processes affords strong generalization in case of partial overlap or abstract resemblance between previous and current experience. Using a sequence learning task and computational modeling, we tested whether humans (N=238) factorize experienced state spaces and subsequently reuse the sub-processes underlying their experience in new contexts. During a prior learning phase, we exposed one group of participants to sequences of compound images produced by the interaction of a 4-state cyclic graph and a 6-state path-graph, while another group experienced an interaction of a 4-state path-graph and a 6-state cyclic graph. During a transfer learning phase, all participants experienced the product of a 4-state cyclic graph and a 6-state cyclic graph with entirely new stimuli. Knowledge of graph factors was assessed by asking participants to make predictions about upcoming compound images and inferred unobserved transitions. We found that prediction accuracy in transfer learning for the 4-cycle graph was higher in the 4-cycle prior group; likewise, the 6-cycle graph prior group showed improved 6-cycle performance. Successor feature models did not explain this transfer effect. Instead, a Bayesian hypothesis testing model best captured the behavioral data. Our findings support the idea that humans discover, decompose, and abstract the factors generating their experiences. Through the compositional reuse of these factors, humans may rapidly adapt and generalize within new contexts, reflecting a key feature of human cognition.

P.496 - The Effect of Sleep on Multielement Associative Structures - Enhancing Pattern Completion

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Poster Session 2

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Sleep plays a pivotal role for hippocampus-dependent memory consolidation. This has been demonstrated particularly for simple associations. However, in real life, events have much more complex structures, including multiple elements with different association strengths. Because of the associative structure linking the individual elements, a partial cue (e.g., a single element) can recover an entire multielement event – a process referred to as pattern completion. It is currently unknown how sleep affects the associative structure within multielement events and their retrieval based on a partial cue. Here, we investigated the effects of post-encoding sleep, in comparison with nocturnal wakefulness (followed by a recovery night), on multielement associative structures using a verbal associative learning task including strongly, weakly, and not directly encoded associations. We show that sleep selectively benefits memory for weakly associated elements as well as for associations that were not directly encoded, but not for strongly associated elements within a multielement event structure. This was accompanied by a beneficial effect of sleep on the ability to recall multiple elements of an event based on a single common cue. In addition, we found positive correlations between sleep spindle activity and retrieval performance. These findings demonstrate that sleep differentially benefits the consolidation of individual associations - including those that were not directly encoded - and strengthens the retrieval dependency of the elements of an event. Together, our results suggest that sleep plays a fundamental role in strengthening associative structures, thereby enhancing pattern completion in complex multielement events.

P.537 - Imagined Experiences Shape Real-Life Preferences via Reinforcement Learning

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Poster Session 2

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Our ability to imagine hypothetical episodes has much in common with our ability to remember past episodes. Such episodic simulation is largely based on the same core network of brain regions and exhibits similar phenomenological properties. Here, we further examine the hypothesis that we also vicariously learn from merely simulated episodes, in much the same way as we learn from actual experiences. Using functional MRI and computational modeling, we tested the hypothesis that this simulation-based learning is based on a common mechanism of reinforcement learning. Our participants made a series of choices between two people that they were personally familiar with. They then vividly imagined an interaction with the chosen person (serving as the conditioned stimuli) in a presented scenario that was either pleasant (e.g., eating ice cream on a sunny day; positive unconditioned stimuli) or unpleasant (e.g., getting stuck in a thunderstorm; negative unconditioned stimuli). Critically, over the course of the experiment, participants acquired a preference for the person that they had imagined more frequently in a pleasant scenario. They moreover showed a positive shift in their attitude towards that person. Notably, this simulation-based learning can best be accounted for by a Rescorla-Wagner model of reinforcement learning that is mediated via a striatal prediction error. This region supports the updating of value by interacting with the dorsomedial prefrontal cortex, a region that encodes representations of individual people and their value. The study thus highlights that mere simulations shape our real-life preferences and elucidate the underlying computational and neural mechanisms.

P.545 - Repetitive Transcranial Magnetic Stimulation to Enhance Fear Extinction Learning Processes

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Poster Session 2

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Anxiety disorders are among the most prevalent mental health disorders. The gold standard treatment for anxiety disorders is psychotherapy, however, not all patients benefit sufficiently from this approach. Fear extinction is suggested as a crucial underlying learning process of exposure-based therapy and is associated with neural activation of the ventromedial prefrontal cortex (vmPFC). Non-invasive brain stimulation techniques such as repetitive transcranial magnetic stimulation (rTMS) are increasingly being discussed to modulate vmPFC activation and to enhance extinction learning processes in psychotherapy. However, the available evidence is still insufficient. The aim of this quasi-randomized, placebo-controlled, and double-blinded study is to transfer the promising results of activating rTMS during extinction learning (Raij et al., 2018) to an intermittent theta burst stimulation protocol (iTBS) before and after extinction learning. For this, 99 volunteers performed fear conditioning in the first session (day 1), active or sham rTMS before or after extinction learning during the second session (day 2), and spontaneous recovery, reinstatement, and extinction recall in the third session (day 3). A neuronavigation system was used to target the MNI coordinates (-56, 2, 40) of the left posterior frontal cortex, which is functionally connected to the ventromedial prefrontal cortex (Raij et al., 2018). Fear reactions were measured using skin conductance responses (SCR) during CS+ and CS- presentation, and subjective fear ratings after each CS+ and CS- presentation block(s). The data collection is still in progress, and results will be presented at the time of the congress.

P.552 - Rapidly Emerging Engrams In The Human Neocortex Code The Content Of Complex Narratives

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Poster Session 2

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The term 'memory engram', which was introduced in 1904 by Richard Semon, describes a physical memory trace in the brain. New neuroscientific methods, such as diffusion MRI, make it possible to observe such rapid microstructural brain plasticity in human grey matter.Recent studies have shown that during repeated encoding and retrieval of an object–location association task a memory engram is formed rapidly in the parietal cortex, within a single learning session. Whether neocortical memory engrams can arise at similar time scales when encountering new complex episodic information like narratives remains unclear.In the present study, we used functional and diffusion-weighted MRI to investigate the formation of memory engrams after encountering complex naturalistic stimulus material.Moreover, we were interested if these physical memory traces reflect the content of the learning task. To this end, 40 healthy participants repeatedly watched and freely recounted four movie clips that were set either in a restaurant or in an airport.We found that the rapidly emerging functional and microstructural changes in the parietal cortex remained long-term stable and predicted memory retention at the behavioural level. Using representational similarity analysis we show that the functional as well as the microstructural changes code the content of the movie context. We thus demonstrate that the partial cortex rapidly forms stable, content-specific memory engrams for complex episodic information.

P.553 - Sleep Integrates Representations Across Multiple Memory Systems

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Sleep has been linked to memory consolidation and synaptic plasticity. It supports stabilization of explicit, declarative memory and enhances implicit, procedural memory. Moreover, it has been suggested that beyond strengthening, sleep may change the quality of memories. Explicit and implicit memory systems can interact during learning. Whether they continue to interact during off-line periods remains unclear. Here, we show for feedback-driven classification learning that sleep integrates explicit and implicit aspects of memory. Testing humans in a specially developed behavioral paradigm we find that over sleep, but not wakefulness, the inherent structure of memory representations is modified. In particular, implicit and explicit components of memory become more cooperative after sleep. This sleep-dependent change in the memory representation leads to a conversion between implicit and explicit knowledge of the task. In an additional fMRI experiment we observe that concurrent changes in brain activity reflect a symmetric, bidirectional information exchange between implicit and explicit learning systems. After sleep, the hippocampus, usually linked to explicit memory, contributes to implicit task recall, whereas the striatum, believed to govern implicit, habit-driven responses, becomes involved in explicit recollection. Additionally, both systems cooperate after sleep: correlations between explicit and implicit performance measures change from negative before to neutral after sleep, performance in a task that allows the cooperative use of both types of memory improves, and functional connectivity between the hippocampus and striatum increases. Thus, sleep combines information learned by different routes into an integral structure and helps us respond optimally to contingencies we encounter in everyday life.

P.566 - Encoding and Maintenance of Audio-visual Objects in Working Memory

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Poster Session 2

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While the previous literature primarily considers the senses in isolation, little is known about how multisensory information is encoded and maintained in working memory. Thus, we investigate how audio-visual objects are stored in working memory and if this storage is further modulated by memory load. Using an audio-visual working memory task, participants are presented with either one (low load) or two (high load) audio-visual memory items. As instructed by task conditions, they maintain either visual, auditory, or both features (conjunction condition) in a block-wise manner. After a short delay interval, participants judge if the probe matches one of the task-relevant memory features or objects. Differences in task accuracy show that the task-irrelevant feature interferes with recall in the visual and auditory condition, suggesting that despite the task instruction to focus on only one modality, task-irrelevant features are still represented in working memory to some degree. Furthermore, with an increasing memory load, task-irrelevant features interfere with recall more strongly than with a lower memory load. Modulations of an ERP correlate of auditory working memory load (sustained anterior negativity, SAN) show further evidence of multisensory interactions, with clear load effects on SAN in the conjunction condition, but only a marginal load effect in the auditory condition. Finally, alpha power modulations indicate a stronger desynchronization when attending to visual or audio-visual features versus auditory features only. Overall, these results point out multisensory interactions modulated by memory load and attention.

P.568 - Processing of Musical Cues in the Context of Targeted Memory Reactivation for Lower-Limb Motor Learning

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Poster Session 2

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Targeted memory reactivation allows for the selective reactivation of memories during sleep and has been shown to benefit different kinds of learning, including skill learning. It is hypothesized that presenting sensory cues that have previously been associated with the learned content during sleep facilitates hippocampal replay and the consolidation of cue-related memories in the neocortex. This hypothesis is supported by literature showing cue-related modulations in the EEG or fMRI signal in the context of declarative learning. However, the neuronal signatures related to motor memory reactivation have yet to be thoroughly examined. In this study, healthy participants learn a new walking pattern on a treadmill, using real-time visual feedback on a selected gait measure. During the task, a melody is continuously played in the background. It is presented again during sleep in half of the participants, while in the other half, cue flags are recorded, but the melody is not played (silent). All participants also undergo an adaptation night, where another melody is played that is not associated with any mnemonic content (control), and a baseline night, where only silent cues are presented. Nights are monitored by EEG. Using time-frequency and event-related potential analyses, we quantify responses elicited by mnemonic cues versus silent or control cues and assess if distinct melodies imprint distinct processing patterns based on salient musical features. We are analyzing data from 20 participants who have completed the study and present the preliminary results at the conference. We expect insights into mechanisms of motor memory processing during sleep.

P.570 - Hunger Drives the Formation of Long-term Spatial Memory via Sleep-independent Mechanisms

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Poster Session 2

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Consolidation of spatial memory is promoted by sleep. However, recent evidence suggests that memory formation under starvation condition does not require sleep. In this study we aimed at investigating whether long-term spatial memory can also be formed during wakefulness in the hunger state and how the neural correlates differ from the sleep consolidation.An object-place recognition (OPR) task in rats was used to assess memory for spatial location. Rats explored two identical objects in an arena (Encoding), and then either remained awake or slept for 2 hours. For retrieval testing 24 hours later, one of the two objects used in the encoding phase was displaced to a novel location. Spatial memory was assessed based on the exploration preference to the displaced object. To investigate the state-dependent effects on spatial memory consolidation, three groups of rats were food-deprived for 24 hours prior to the encoding of OPR task. Two groups received food immediately after the encoding (Wake-Full and Sleep-Full), while another group had a prolonged period (2 hours) of food deprivation (Wake-Hunger).While the Wake-Full condition failed to detect the spatial location change at the retrieval testing, the Wake-Hunger and Sleep-Full conditions showed significant long-term OPR memory. Expression of cFOS and GAD67 proteins, markers for neuronal activation and inhibition, revealed distinct patterns of neuronal activity underlying spatial memory retrieval between the Wake-Hunger and Sleep-Full conditions in prefrontal, cingulate, perirhinal and entorhinal cortices, and hypothalamic nuclei. Our findings suggest two distinct mechanisms to form long-term spatial memory via sleep-dependent and -independent processes.

P.573 - Effects Of Anticipation And Age On Working Memory In The Context Of Task Interruptions

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Poster Session 2

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Task interruptions are characterized by brief suspensions of primary tasks due to the handling of a secondary task. Prior research indicated advantages of the possibility to prepare for an interrupting task. Here, we used EEG to investigate the effects of anticipation and age on underlying neuro-cognitive processes. In a grouped design, 32 younger and 28 older participants performed a visual working memory task. Following a retro-cue, they retrospectively had to report the orientation of a target bar within a memory array. Within blocks of 10 trials, they were either always, never, or randomly interrupted by a 2-AFC arithmetic task before the onset of the retro-cue. Primary task performance was decreased following interruptions, and even more so in older participants. The older participants seemed to benefit from anticipation which was seen in lower angular error, and the effect of interruptions on their response times to the working memory task differed between the anticipation conditions. Moreover, an increased theta power following the memory array could be seen in the older group, while a reduced theta response to the retro-cue following interruptions was seen in both age groups. However, in young participants, theta response to non-anticipated interruptions was increased relative to anticipated interruptions. Additionally, when not interrupted, young participants exhibited a sustained alpha power increase following the memory array, probably indicating protection of working memory content. This was not found in older participants, pointing to age-related differences in strategies for coping with task interruptions.

P.583 - In-phase Fronto-parietal Theta-tACS Improves Verbal Working Memory When Task Demands Are High Enough

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Poster Session 2

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Correlational research supports the importance of theta phase coherence for efficient information transfer within long-range neural networks, such as between human frontal and parietal brain areas for working memory processing. Studies using tACS even provided a causal link of fronto-parietal theta coherence and working memory, demonstrating a modulation of working memory performance depending on whether in-phase or anti-phase tACS at theta frequency was delivered. Recent work, however, suggests that such phase-dependent tACS effects might require populations with deficits or tasks with a high level of cognitive demand. In this study, we investigated whether phase-dependent tACS effects on behavioral performance are facilitated by the right level of cognitive challenge in young neurotypical adults - depending on an individual's cognitive capacity, as measured by digit span performance, and on cognitive demand in a Sternberg working memory task. Our data showed that for task conditions with higher cognitive demands (Load 10), working memory performance was improved during in-phase focal tACS at theta frequency over fronto-parietal brain areas, compared to no stimulation in a sham condition. This was not the case for task conditions with lower cognitive demands (Load 4 or Load 8). The stimulation effect, however, did not depend on individual's cognitive capacity in this sample of young neurotypical adults with a digit span of 4 to 9 items. Yet, this indicates that in-phase electric brain stimulation can potentially be used not only for compensating cognitive deficits, but even for increasing peak performance in young, neurotypical adults when cognitive demands are high enough.

P.585 - Functional Connectivity Dynamics Underlying Audiovisual Working Memory

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Poster Session 2

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Functional interactions between brain networks are crucial for higher-level cognitive functions such as working memory (WM). Specifically, the integration of individual object-features into a coherent representation requires a functional link between distributed areas. Yet, to date, the role of EEG-based connectivity measures in this context remains controversially debated. Hence, in this study, we investigate EEG functional connectivity measures in an audiovisual as compared to an auditory and visual WM task. Participants were presented with one or two audiovisual memory items, followed by an audiovisual mask. In three separate blocks, participants were told that the visual, the auditory, or both auditory and visual features (conjunction condition) were task-relevant. After a short delay, an audiovisual probe was presented and participants indicated whether the task-relevant probe feature(s) correspond(s) to the feature(s) or object(s) in memory (delayed match-to-sample task). Notably, the behavioral data analysis shows that when the task-irrelevant feature of the probe was incongruent (e.g., tone A and orientation C were present at encoding in the auditory condition, but tone A and orientation B were presented as a probe), a decrease in accuracy was evident. This interference effect suggests that the task-irrelevant features are encoded into WM to some degree. Preliminary EEG data analysis results show increased inter-areal theta phase coherence between occipital and parietal as well as occipital and fronto-central regions in the conjunction compared to the auditory condition. Ongoing EEG-based connectivity analyses focus on local theta-beta phase-amplitude coupling (PAC), attempting to replicate previous reports of increased theta-beta PAC during audiovisual WM.

P.586 - It's A Match! The Impact Of Three-dimensionality And Contextual Factors In Virtual Reality On Recognition Memory

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Poster Session 2

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Recent psychological research provides evidence for a memory superiority effect for Virtual Reality (VR) experiences when compared to conventional laboratory experiences. However, it is still unclear under which conditions mnemonic processing benefits most from VR presentations. A previous EEG study suggests that VR stimulus presentation affects memory processes already at early encoding stages. To further investigate whether the VR environment per se or the actual presentation of stimuli in immersive VR influences memory performance, participants were presented with 60 videos of different scenes either in immersive VR or on a 2D monitor presented in a VR environment. The following day, they performed an old/new recognition memory task, either matching the modality of the retrieval phase with the modality of the encoding phase or switching modalities, providing a cross-modality comparison. Our results further underpin the influence of contextual factors on mnemonic processing: Retrieving the information in the encoding-matched modality led to equal memory performance in both conditions, whereas memory performance was lower when transferring the video content from 2D to immersive VR. In comparison to this transfer, the transfer from immersive VR to 2D led to better memory performance and equal memory performance compared with the matching modalities. Therefore, our data suggest more efficient encoding mechanisms in immersive VR that facilitate the transfer to other contexts. These results provide the basis for an electrophysiological follow-up study comparing encoding and memory performance between 2D, VR and reality to further specify the impact of different degrees of reality on perceptual and mnemonic processes.

P.589 - Detecting Up and Down States of Slow Oscillations During NREM Sleep Independently of the Scalp EEG Polarity

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Poster Session 2

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In non-rapid eye movement (NREM) sleep, slow waves in the delta range [0.2-4Hz] are a typical activity pattern in the cerebral cortex. Previous studies suggest that this slow (<1Hz) oscillatory activity synchronizes other neural activity at higher frequencies, which play an important role in memory consolidation processes.In human scalp EEG, a slow oscillation (SO) is commonly defined as a negative peak below an amplitude threshold representing a hyperpolarized state of neuronal silence (down state), followed by a positive peak interpreted as an active depolarization state (up-state). However, this definition of up and down states has been used independently of the recording site and reference, ignoring the possibility of an inverted signal polarity caused by variability in source location, recording site and referencing. The correct interpretation of EEG polarity is crucial when analyzing phase for the temporal coupling between SO and sleep spindles. Besides, defining down-states by their sign is problematic in MEG sleep data where the polarity is ambiguous.Our aim in this study is to find features independent from the sign of the EEG signal to define down states, by finding stable differences between negative and positive peaks.We investigated amplitude, duration and power features of SOs detected in 36 full night EEG recordings with 128 channels acquired from 18 participants (2 nights each, after a habituation night).When detecting SOs in a symmetric way after flipping the signal sign, we observe a difference between negative and positive peaks in power features at the spindle [12-16Hz] frequency range.

P.602 - Been There, Done That: Testing Effects of Sensorimotor Learning and Its Viewpoint-Dependency on Auditory ERP Attenuation During Action Observation

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Poster Session 2

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Previously, we found viewpoint-dependent ERP amplitude attenuation for sounds caused by observed actions compared to un-cued externally-generated sounds. We hypothesized that this might reflect differential ease of learning to predict sensory effects of observed actions from a first-person compared to a third-person perspective. In the current experiment we directly tested such learning-related changes in auditory ERP attenuation during action observation, and their viewpoint-dependency, while controlling for temporal predictability of the two types of sounds (observed-action-generated vs cued-externally-generated). 86 participants underwent the action observation contingent paradigm (once with a first-person and once with a third-person perspective on the observed action) after completing a training phase with one of four tasks (between-subjects) related to the motor action being observed (i.e., a button press): (a) execution-only (n=23), (b) observation-execution (n=19), (c) observation-imagery (n=23), or (d) observation-only (n=21). Since the N1 component is discussed to reflect motor-related predictive processes, we expected training- and viewpoint-dependent modulations primarily for the N1, but examined also the P2 component. For both components, we found a significant interaction between the type of sound and the viewpoint for participants practicing motor-imagery in the training phase. However, subsequent simple slope analyses did neither provide clear evidence for significant ERP differences between the two equally predictable sound types, nor that type of training or viewpoint significantly affected this. Taken together, our results do not support the hypothesis that motor-related predictive processes, susceptible to sensorimotor learning, underlie auditory ERP attenuation during action observation, but rather suggest that general predictive processes are at work.

P.603 - The Temporal Dynamics of Aperiodic Activity Track Changes in Sleep Structure

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Poster Session 2

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The electrophysiological signal decays as a function of increasing frequency. The slope of this decay, often termed the spectral slope, of the electroencephalogram (EEG) signal has been shown to discriminate between different sleep stages. However, previous approaches that analysed aperiodic activity during sleep had two main methodological concerns: a) using very simplified estimation-models that poorly reflect the underlying signal and (b) had a low temporal resolution.In this study, we explored the influence of changing the parameters and the complexity of the model used to estimate aperiodic activity on its performance. Thereafter, we used the new models to track sleep dynamics in a time-resolved fashion. We used a dataset of high-density EEG from 17 healthy humans during a full night of sleep. We used the specparam toolbox for the parametrization of neural data.We demonstrate that switching from the narrowband frequency range (30-45Hz) that has been usually used in sleep literature to a broader frequency range improves the model performance. Further, using a more complex estimation model that incorporates the knee frequency, i.e., the frequency at which the slope of the power spectrum changes, provides a better reflection of the underlying signal. Finally, we show that temporally-resolves estimation of the spectral slope closely tracks the transition between sleep stages and inter-stage variability.Our results suggest that aperiodic activity during sleep tracks changes in sleep (micro-)structure. Furthermore, we propose several guidelines for the estimation of aperiodic activity in neural data that would result in a better representation of the electrophysiological signal.

P.604 - EEG-Spectral Fingerprints Of Sleep Deprivation Induced Hyperalgesia

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Poster Session 2

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Sleep deprivation (SD) shifts the nociceptive system towards hyperexcitability and induces increased sensitivity to painful stimuli (hyperalgesia; Kourbanova et al., 2022; Schuh-Hofer et al., 2013). Still, it is unclear in which areas the amplification occurs (Kourbanova et al., 2022) and how increased anxiety influences hyperalgesia (Schuh-Hofer et al., 2013). In this study we study the effect of SD on the excitation of cortical networks by using a recently proposed surrogate marker for the balance of excitatory and inhibitory cortical neural activity (E: I-balance): The power law exponent (slope) of the electrophysiological power spectrum (Gao et al., 2017). We performed spectral power and slope analysis in an existing EEG dataset that was registered in N = 12 healthy subjects (6 females) after habitual sleep and a full night of SD using Matlab R2020a and the Fieldtrip toolbox (20221014). Besides resting state data, the dataset contains laser-evoked potentials under three different task conditions (neutral, attention (focusing on the painful stimulus), and distraction (calculation task)) as well as behavioural measurements (pain and anxiety ratings). We hypothesized that SD shifts the cortical E: I-balance towards increased excitation and that this imbalance correlates with SD-induced hyperalgesia. Cluster-based permutation statistics confirmed a significant flattening of the slope after SD indicating brain hyperexcitability in the resting state and pain-evoked data. The latter significantly correlated with hyperalgesia after SD. Moreover, we found evidence for an impact of attention modulation on the PSD slope after SD and we aim to present how anxiety relates to slope changes and SD-induced hyperalgesia.

P.608 - Reactivating A Relaxation Exercise During Sleep To Reduce Cortical Hyperarousal In People With Frequent Nightmares

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Poster Session 2

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IntroductionCortical hyperarousal, i.e. high-frequency EEG activity in the beta and gamma band is associated with nightmares. Relaxation exercises can reduce high-frequency EEG activity during practice and recent research shows that relaxing memory content can be reactivated using odor cues during sleep in healthy young adults. In this study, we investigated whether the reactivation of a relaxation intervention during sleep reduces cortical hyperarousal and improves nightmare symptoms in participants with frequent nightmares.Methods25 (21 female, mean age (SD) = 24.94(5.01)) participants with at least one nightmare per week practiced a deep breathing exercise for one week while exposed to an odour. Nightmare symptoms and subjective sleep quality were measured before and after the intervention. In two nights in the sleep lab, the associated odour or a control odour were presented in randomized order while recording high-density EEG.ResultsDuring the relaxation task, alpha activity was significantly higher and beta activity lower compared to a control task indicating that the intervention successfully increases the level of relaxation. Exposure to relaxation-related odor cues leads to a reduction of beta and gamma activity during REM but not NonREM sleep. Data analysis is still ongoing and will be presented at the conference.DiscussionOur data indicates that the reactivation of a relaxation intervention using odour cues during sleep lead to a reduction of cortical hyperarousal during REM sleep. Further analyses are needed to test whether these effects on sleep EEG activity are paralleled by an improvement of subjective sleep quality and nightmare symptoms.

P.618 - Odor Cues During Sleep To Improve The Efficacy Of Imagery Rescripting In Healthy, Young Adults

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Poster Session 2

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Imagery rescripting (IR) is a well-established psychotherapeutic intervention aiming at modifying a person's maladaptive autobiographical memories using his/her imagination. The modification results in a less distressing version of the original memory that needs to be stored again. Targeted Memory Reactivation (TMR) stabilizes new memories by presenting odor cues during post-learning sleep. Our study aims to test whether TMR can be used to support the efficacy of IR.31 participants (Myears=24.00) underwent 2 sessions of IR each of both aiming at modifying one of two moderately distressing memories. During the modification of each memory, a neutral odor was presented. In the congruent condition, the same odor was presented during the subsequent night, while a new odor was presented in the incongruent condition. Changes in memory were quantified using script-driven imagery, a free recall test, and an autobiographical memory characteristics questionnaire. Linguistic analyses on memory changes over time are ongoing.Self-reported distress of the dominant emotions, cognitions, and arousal improved significantly in both conditions. TMR led to a decrease in self-reported sensory information and specificity of the distressing memory. Moreover, SWA was increased while fast spindle activity was decreased during TMR.Our findings can be interpreted in the context of the active system consolidation theory which postulates that long-term memory consolidation during sleep results in a transformation of memories which among others lead to a reduction of episodic details.

P.622 - Increased Arousal Before Immediate Extinction

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Poster Session 2

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Introduction. Exposure-based therapy is effective in reducing anxiety, but relapse is common. The timing of extinction may be one important factor contributing to its success. Both animal and human studies indicate increased arousal during immediate compared with delayed extinction (+24 h). Increased arousal during extinction is assumed to impair learning.Methods. Here, we reanalyzed data from hundred-three participants without current neurological or psychiatric disease from a recent Pavlovian conditioning and extinction study. To fully assess subjective and physiological stress responses, various arousal measures were collected, namely ratings of arousal, tonic electrodermal activity, and salivary cortisol. As the first step, we analyzed whether arousal was increased before immediate extinction. In the second step, linear regression analyses were performed to predict the return of fear from pre-extinction arousal measures. Return of fear was defined as the increase from the last trial of extinction to the first trial of the retention test.Results. As expected, we found increased pre-extinction subjective arousal. In addition, tonic electrodermal activity showed a smaller reduction from pre-fear acquisition to pre-extinction in the immediate extinction group. Interestingly, pre-extinction tonic skin conductance predicted a general return of fear in both groups and a differential return of fear in the delayed extinction group. Consistent with other studies, salivary cortisol was not increased after fear acquisition and also did not predict the return of fear. In summary, we found empirical evidence that the timing of extinction influences sympathetic arousal. In addition, this pre-extinction sympathetic arousal seems to impair extinction learning.

P.628 - The Influence Of Personality Traits And Technical Affinity On Insomnia Severity And Sleep Quality In App-Based Digital CBT-I – Preliminary Results

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Poster Session 2

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Introduction:The role of personality-traits in insomnia and CBT-I has been broadly researched, however the knowledge on the influence of personality-traits on digital CBT-I remains sparse. Due to the increasing number of dCBT-I-programs, it is necessary to investigate these correlates to understand how these programs can be adjusted accordingly so that more individuals can benefit from dCBT-I.Methods:In our current pilot RCT-study, we investigate the efficacy of a 6-week CBT-I-based app-program for better sleep including daily objective sleep measurement. At the beginning of the 2-week baseline (T0), at the start (T1) and end of the 6-week app-phase (T2), as well as at a follow-up after 4 weeks (T3), the Pittsburgh-Sleep-Quality-Index (PSQI) and Insomnia-Severity-Index (ISI) are completed; personality-traits are measured using the Big-Five-Inventory-10 (BFI-10) and Affinity-for-Technology-Interaction-Scale (ATI).To date, 23 subjects (16 female) aged 22-75 years (M=45.57, SD=14.30) have completed the app-phase.Results:Preliminary analyses showed that higher levels of conscientiousness are associated with greater improvements in PSQI (?=.57, p=.005**) and ISI (?=.73, p<.001***) from T0-T2. Interestingly, higher levels of agreeableness were associated with smaller improvements in PSQI (T1-T2; ?=-.45, p=.030*) and higher ATI-values were linked to smaller changes in ISI (T0-T2; ?=-.42, p=.048*). In the preliminary sample, no significant correlations were found between sex, age, extraversion/openness/neuroticism, and PSQI/ISI (p's>.254).Conclusion:Our preliminary results indicate potential associations between personality-traits and their effects on changes in sleep and insomnia during dCBT-I. These findings may therefore contribute to a deeper understanding of the factors influencing the efficacy of dCBT-I.

P.632 - The Efficacy Of A Smartphone-Based App-Program On Sleep Quality, Insomnia Severity And Quality Of Life: Preliminary Results

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Poster Session 2

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Background: Due to a lack of sufficient treatment options for sleep disorders, there is an urgent need for easily accessible and effective treatment solutions. In our ongoing-study, we evaluate the efficacy of a 6-week smartphone-based app-program for improving sleep and quality of life.Methods: Twenty-four volunteers (mean age 46.38±14.56, 17 female) suffering from sleep difficulties are included in the current analysis.After a 2-week-baseline, participants are randomly allocated to either an intervention group (EG, n = 12) or a control group (CG, n = 12). During the 6-week-period, the EG use the app-program (NUKKUAA) and an ECG breast-belt daily to monitor their sleep. Additionally, participants complete CBT-I-based exercises and receive individualized feedback and recommendations based on the sleep-data provided. In contrast, the CG uses the app-program exclusively for sleep monitoring at least 3 times a week, while not being provided with any feedback to the data recorded.Sleep and quality of life is assessed subjectively via questionnaires (Insomnia-Severity-Index, Pittsburgh-Sleep-Quality-Index, Brief-Symptom-Inventory, WHO Quality-of-Life-Questionnaire) at four time points (i.e., baseline, pre- and post-intervention, follow-up).Results: Preliminary results show improvements from pre- to post-intervention in general sleep quality ($p = .024$) and severity of insomnia symptoms ($p = .009$), as well as a trend towards an improved general psychological well-being ($p = .054$) and physical health ($p = .093$) only in the EG, but not in the CG (p's $> .21$).Conclusion: Preliminary results indicate the beneficial effect of low-threshold, digital programs for improving sleep and quality of life, which can help to improve the current healthcare situation.

P.651 - The Influence of Acute Stress on the Interplay of Episodic Memory and Semantic Information during Scenario Construction

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Poster Session 2

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Episodic memory retrieval can be conceptualized as construction of a scenario, but this process is error prone. The framework from Cheng, Werning and Suddendorf (2016) proposes that during scenario construction only the gist of an episodic event is retrieved, and missing details are substituted by semantic information. We developed a new virtual reality-based paradigm, that allowed us to investigate the interaction of episodic memories and semantic knowledge during scenario construction. In the initial behavioral validation study participants interacted with several household objects in a virtual apartment. Half of the objects were placed at odds with common semantic memory driven expectations (e.g. the toaster was placed in the bathroom) to create a conflict between episodic memory and semantic knowledge. Our behavioural study (Zöllner et al., 2021) showed that participants relied more on prior knowledge in case of episodic memory failure. In the current study we use this paradigm to investigate the influence of acute stress on the scenario construction process. Stress is ubiquitous in everyday life and its (impairing) influence on memory retrieval is well studied. Using the social evaluative cold pressure test (SECPT) we induced psychosocial stress prior to retrieval. We expect this manipulation to result in reduced episodic memory retrieval accompanied by increased semantic substitutions. We will present the results of our currently ongoing analysis. This work adds knowledge to the influence of stress on the interplay of episodic memory and semantic knowledge.

P.451 - Frontal Alpha Asymmetry as a Marker of Approach Motivation? Insights from a Collaborative Forking Path Analysis

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Poster Session 2

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For many years, resting frontal alpha asymmetry (FAA) has been put forward as a marker of bot state and trait approach motivation, however according to recent meta-analyses, associations with self-reports of relevant traits are either very small or non-existent. Aiming to explain this lack of replicability, it was suggested that individual differences due to traits (i.e. FAA) should be pronounced in situations where individuals show differences in their predisposition to approach (state-trait interaction). In order to test this idea, we drew on data from the CoScience project, which allows to test this probably small association with sufficient statistical power (n = 720). We quantified FAA during a resting period, a picture viewing task, and a gambling task, with the rationale that the later would trigger different levels of approach motivation (in some individuals more than others) due to the positive nature of the pictures and the offered monetary incentives, respectively. Analyses showed that FAA was sensitive to some of the manipulations in the tasks, but did not show any association with self-reported trait approach motivation, for neither of the conditions. To confirm this lack of effects, we supplemented all analyses with Bayesian statistics and a Cooperative-Forking-Path analysis exploring analysist's degrees of freedom. Together, this extensive analyses of a very large dataset suggest, that FAA is not a marker of trait approach motivation.

P.503 - Robust and Replicable? A Stage-II Registered Report on Cathodal Transcranial Direct Current Stimulation (tDCS) Effects on Cognitive Performance

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Poster Session 2

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Neurostimulation with transcranial direct current stimulation (tDCS) is an increasingly popular research tool to experimentally manipulate cortical activation and probe its causal function for behavior. However, the interpretation of tDCS results is rather challenging: Results do not always replicate, especially regarding cathodal tDCS in cognitive tasks, or they are qualified by third variables. Moreover, few studies tested the robustness and specificity of tDCS effects in a single-study design. Our registered report (Stage-I acceptance: https://doi.org/10.1002/jnr.24559) focuses on the robustness of cathodal tDCS effects on spatial-numerical associations (i.e., the SNARC effect), the numerical distance effect, and inhibitory control (i.e., stop-signal reaction time; SSRT). According to power analyses, N = 160 healthy volunteers were randomly assigned to one of five groups to receive sham tDCS or 1 mA cathodal tDCS to one of four stimulation sites (left/right prefrontal cortex, left/right posterior parietal cortex). Recruitment was stratified by gender to investigate individual differences and we preregistered math anxiety as moderator. In the predefined analyses, we replicated the reduction of the SNARC effect by left prefrontal tDCS relative to sham and left parietal tDCS, but contrasts with the right hemisphere were not significant. In further exploratory analyses, tDCS effects on inhibitory control appeared time-dependent, with delayed practice-related improvements in SSRT due to cathodal tDCS. The numerical distance effect was not modulated. Overall, we show that the regional specificity of tDCS is weak, that individual differences can moderate tDCS effects, and that registered reports are instrumental for advancing a reproducible understanding of neurostimulation effects.

P.525 - Tyrosin Modulates Exploration Behavior During Reinforcement Learning in a Gender-Balanced Sample

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Poster Session 2

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Introduction. Adaptive behavior requires balancing exploration and exploitation, and recent work implicated the dopamine-system in regulating this balance (Chakroun et al.,2020). Freely available supplements targeting this system promise performance enhancements, while their exact influences on basic decision processes remain unclear. Recently, Mathar et al. (2022), reported reduced reaction times and higher model-based control in a RL-task under the catecholamine-precursor Tyrosine (2g). Here we present partial results from a preregistered, double-blind, placebo-controlled, within-subject study, which set out to replicate and extend these findings in a gender-balanced sample.Methods. N=64 healthy participants (N=32 self-identified female) completed a temporal-discounting and RL-task (4-armed restless bandit), following ingestion of 2g of Tyrosine or Placebo, in counterbalanced order.For the full study description see: https://osf.io/4z39r/?view_only=c26d1419180646dab1af18999725e58fAnalyses used both model-agnostic approaches and comprehensive computational modeling comparing hierarchical Bayesian RL-models which consider various mechanisms that might drive directed exploration.Results. Across both genders, we found an increase in optimal choices and reaction times under tyrosine. Switching behaviour was reduced under tyrosine and generally lower in men. Model-free analyses revealed no interaction between tyrosine and sex. In both drug conditions computational models of uncertainty-guided learning along choice-components dissociating perseveration and exploration best accounted for the data. Based on the winning model we will evaluate drug-related changes in relevant latent processes in more detail.Discussion. Results are discussed in light of well-established dopaminergic influences on learning and decision-making as well as understudied gender-specific effects in this regard. We further examine the significance of present results to community and clinical populations.

P.527 - Information Content of Intracranial EEG Signals: Theory and Behavioral Relevance

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Poster Session 2

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Intracranial electroencephalography (iEEG) has become an important tool to bridge the gap between invasive animal and non-invasive human electrophysiology. The key advantage of human iEEG by means of electrocorticography (ECoG) and stereoelectroencephalography (sEEG) is the exceptional spatiotemporal resolution. Specifically, high frequency activity (HFA, 70-150 Hz), a surrogate of multiunit firing, constitutes a valuable proxy of local cortical processing. However, it remains unknown if different intracranial electrodes provide a comparable information content. Here, we addressed this question by comparing multiple types of neural information as extracted from either ECoG or sEEG recordings. Neural information was defined by univariate, multivariate, behavioral, and information-theoretical approaches. Our results demonstrate that HFA better predicted behavior (single trial reaction times) in sEEG as compared to ECoG. Furthermore, sEEG signals exhibit earlier peak timing with higher amplitudes as well as lower contrast entropy. These findings were robust after rigorously accounting for potential confounds. Collectively, our results demonstrate that HFA as captured by ECoG and sEEG electrodes is not equivalent. Specifically, sEEG electrodes capture a higher degree of behaviorally-relevant information, which might be important for future clinical applications such as seizure-onset localization or brain-computer-interfaces.

P.551 - Facing Placebo Effects -Placebo Hypoalgesia Reduce Pain Ratings and Facial Pain Responses

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Poster Session 2

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Introduction: The induction of placebo effects is capable to reduce the perception of pain on various levels of the pain processing system. While placebo hypoalgesia has been demonstrated for e.g., pain reports and neuro- physiological indicators of pain, behavioral markers of pain processing, especially facial pain expressions, have been widely neglected. Therefore, we investigated whether placebo hypoalgesia would come along with decreased facial responses following pain administration.Methods: sixty healthy, young participants underwent a heat pain placebo manipulation in which they received a alleged analgesic cream (placebo cream) and an ineffective control cream on their non-dominant forearm. Each heat pain stimulus lasted for 10 seconds and was adjusted to the subject's individual pain threshold. To create the impression that the cream was effective, during placebo conditioning the temperature on the placebo area was lowered, unbeknownst to the participants. During the test phase the temperature on both areas was identical. In addition to pain intensity and unpleasantness ratings the participants facial expressions following pain administration were videotaped and offline analyzed using the facial action coding system.Results: We found that facial pain responses were significantly decreased in the placebo condition compared to the control condition during the test phase, paralleling results for pain intensity and unpleasantness ratings. Further, placebo effects in facial responses and pain ratings were significantly correlated.Discussion: The present findings demonstrate that placebo analgesia becomes evident even for behavioral pain markers, which may serve a crucial complement in the multidimensional assessment of placebo effects.

P.558 - Resting State Functional Connectivity Is Differentially Related To Cognitive Performance In Males And Females

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Poster Session 2

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Males and females differ in certain cognitive domains as well as in their functional brain architecture. However, the relationship between cognitive sex differences and brain function is not yet fully understood. Here, we examined the link between regional resting state functional connectivity (RS-FC) and performance across five different cognitive domains.Contrasting male and female participants from the human connectome project (n = 861) demonstrated sex differences for visual spatial tasks, vocabulary knowledge, and fluid intelligence, while processing speed and cognitive flexibility showed no evidence for sex differences.Subsequently we trained separate support vector machines to distinguish males and females based on regional RS-FC profiles, assuming that classification accuracies should be highest in regions where males' and females' connectivity profiles are most distinct. We investigated the relationship between RS-FC profiles of the ten best classifying parcels and the performance in the five cognitive tasks using Representational Similarity Analyses (RSA). RSAs revealed a differential pattern of the function-to-behavior relationship: Males showed overall positive relationships between regional RS-FC profiles and cognitive tasks, indicating that similar functional architecture leads to similar behavioral performance. In contrast, females showed negative relationships between regional RS-FC profiles and cognitive tasks, indicating that similar cognitive performance can be based on different patterns of functional brain organization.These results suggest that males and females might differ in the neuronal basis of cognitive functions.

P.564 - Why Does The Error Negativity Peak Higher When Accuracy Is Emphasised Over Speed? The Impact Of Noise And Single-Trial Latency Variability Challenges Traditional Interpretations

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Poster Session 2

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Understanding human error processing is a highly relevant interdisciplinary goal. More than 30 years of research in this field have established the error negativity (Ne) as a fundamental electrophysiological marker of various types of erroneous decisions (e.g. perceptual, economic) and related clinically relevant variations. A common finding is that the Ne is more pronounced when participants are instructed to focus on response accuracy rather than response speed, an observation that has been interpreted as reflecting more thorough error processing. We challenge this wide-spread interpretation by demonstrating that when controlling for the level of non-event-related noise in the participant-average waveform and for single-trial peak latency variability, the significant speed-accuracy difference in the participant-average waveform vanishes. This suggests that the previously reported Ne differences may be mostly attributable to a more precise alignment of neuro-cognitive processes and not (only) to more intense error processing under accuracy instructions, opening up novel perspectives on previous findings.

P.572 - Can Prediction Error Explain Predictability Effects on the N1 during Picture-Word Verification?

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Poster Session 2

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Predictive coding models posit that brain activity scales with prediction error: the difference between ascending (bottom-up) input and descending (top-down) predictions. Prediction error captures two key variables: magnitude and certainty of the ascending-descending difference. Greater violations of expectations should elicit greater prediction error signals, and this effect should become larger as certainty increases. We asked whether such a simple predictive coding account could describe neural activity indexed by the N1 (170 ms) event-related potential component elicited by words. Indeed, findings have shown that the word-related N1 is sensitive to predictions, with unpredicted words generally eliciting greater-amplitude N1s than predicted words. However, effects of error magnitude and certainty have mostly been investigated in isolation, providing incomplete tests of predictive coding. In our pre-registered study, we tested the account via the interaction between prediction congruency (error magnitude) and predictability (certainty). We recorded electroencephalograms for 68 participants while they completed a picture-word verification paradigm. PICTURE-word pairs were congruent (e.g., ONION-onion) or incongruent (e.g., ONION-torch), while predictability was manipulated continuously based on norms of picture-name association (% name agreement). Pre-registered analyses failed to find evidence that the direction of the congruency-predictability interaction matched that expected under a simple predictive coding account. Exploratory Bayesian analyses found strong evidence against the account, with the congruency-predictability interaction 51.52 times more likely in the opposite direction. Specifically, higher predictability elicited larger N1s for picture-congruent words, and smaller N1s for picture-incongruent words. We argue that a simple predictive coding account of the N1 is either incorrect or requires elaboration.

P.577 - Hirnstrukturelle Korrelate der Mustertrennungsfähigkeit

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Poster Session 2

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Die Mustertrennungsfähigkeit, ein im Hippocampus lokalisierter Prozess der Differenzierung zwischen ähnlichen alten und neuen sensorischen Informationen sowie deren Abspeicherung als distinkte Gedächtnisinhalte, spielt eine zentrale Rolle in mit Furcht verknüpften Lernprozessen. Eine durch schlechte Differenzierung zwischen Gefahren- und neutralen Reizen bedingte Furchtreaktion auf ungefährliche Reize spielt insbesondere bei der Ätiologie von Angststörungen eine zentrale Rolle. In diesem Zusammenhang wird immer wieder eine enge Verknüpfung des furchtmodulierenden Hippocampus mit der für die Furchtexpression relevanten Amygdala deutlich. Gleichzeitig konnten einige Studien auch einen Einfluss von Emotionen und Arousal vermittelt über die Amygdala auf die Mustertrennungsleistung des Hippocampus feststellen. Eine psychisch gesunde Stichprobe (N=36) absolvierte zunächst eine behaviorale Mnemonic Similarity Task und im Anschluss eine anatomische MRT-Messung. Die Untersuchung des Volumens grauer Substanz erfolgte mittels voxelbasierter Morphometrie. Erste Ergebnisse zeigen signifikante negative Korrelationen zwischen der Mustertrennungsfähigkeit und dem Volumen der bilateralen Amygdala und des linken Hippocampus. Die Ergebnisse werden vor dem aktuellen Stand der Literatur diskutiert.

P.578 - Pharmacological Effects Of The Catecholaminergic System On Event File Coding In Response Inhibition Depend On Theta Band Modulability

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Poster Session 2

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An efficient integration of sensory and motor processes is crucial to goal-directed behavior. Despite this high relevance, and although cognitive theories provide clear conceptual frameworks, the neurobiological basis of these processes remains insufficiently understood. We examined the relevance of catecholamines for perception-motor integration processes in a double-blind, randomized placebo-controlled pharmacological study. However, the magnitude of effects of catecholaminergic manipulation is heterogeneous. Theoretical considerations suggest that the voluntary modulability of theta band activity can explain this variance. Thus, we further aimed to investigate to what extent interindividual differences in catecholaminergic effects on response inhibition depend on voluntary theta band activity modulation. In order to do so, the individual's ability to modulate theta band activity was measured by applying a neurofeedback-like setup. Recorded EEG data were analyzed using temporal decomposition and multivariate pattern analysis (MVPA). Methylphenidate effects and voluntary modulability of theta band activity showed an interactive effect with different event file coding demands on response inhibition performance. The MVPA revealed that methylphenidate effects interacted with voluntary modulability of theta band activity at a stimulus processing level, whereas during response selection methylphenidate effects interacted with the complexity of the Nogo condition. The findings suggest that an individual's theta band modulability indicates the responsiveness of their catecholaminergic system. In individuals with high theta band modulability, pharmacological intervention is more effective compared to those with lower theta band modulability. Thus, the pharmacological effects of the catecholaminergic system on cognitive control most likely depend on the existing ability to self-modulate relevant brain oscillatory patterns.

P.581 - Characterizing Human Habits in the Lab: A Comprehensive Investigation of Experimental Approaches to Habitual Behavior

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Poster Session 2

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Habits pervade our everyday lives and dominate some forms of psychopathology but are extremely hard to elicit in the lab. In this Registered Report, we developed two novel behavioral tasks based on computational models, which suggest that habit strength should be proportional to the frequency of behavior and, in contrast to previous approaches, independent of outcome values. As the validity of our novel tasks but also of those used in previous studies of human habits is still an open question, we added four previously used tasks and all three currently available self-report questionnaires of real-life habits to this study. Extended testing of 220 participants over five consecutive days in the lab and an additional online session created the most comprehensive dataset regarding habitual behavior to date (which will be made publicly available upon publication of the Registered Report).Linear mixed-effects models revealed that previous choice frequency significantly increased current choice frequency and decreased response times during a test session on the fifth day of assessment in line with our hypothesis. Exploring computational models of choice behavior corroborated the finding that previous choice frequency informs participants' behavior. We could not find substantial correlations between the six habit tasks (i.e., no evidence for construct validity). Furthermore, the relations with self-reported real-life habits were small (i.e., no evidence for criterion validity). These findings call for the development of new tasks including manipulations of choice frequency and validating them against innovative measures of real-life habits beyond self-report like ecological momentary assessment.

P.587 - The Neurophysiology Of Continuous Action Monitoring

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Poster Session 2

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Continuous monitoring of actions is crucial for goal-directed behavior, but the neural mechanisms underlying this process are not well understood. Previous studies in cognitive neuroscience have primarily focused on monitoring of short-term and regularly reinstating tasks, whereas continuous monitoring requires different processes. Our research demonstrates that the superior parietal and frontal cortices are important in continuous action monitoring, with beta band activity playing a key role in maintaining the sensorimotor program. Theta and alpha bands are also likely involved, supporting attentional sampling and information gating, respectively. Alpha and beta band activity are most relevant during the initial tracking period when sensorimotor calibrations are most intense. Theta band activity remains relevant throughout tracking but shifts from parietal to frontal cortices, indicating a shift from attentional sampling to action monitoring. When sensorimotor processes need to be adjusted, resource allocation processes in prefrontal areas and the parietal cortex's stimulus-response mapping play vital roles. Our study fills a crucial knowledge gap in neural processes during action monitoring and provides new avenues for examining neural processes related to sensorimotor integration in more naturalistic experiments.

P.588 - When Your Brain Needs a Personal Trainer: Effects of Losing Control on Executive Effort Readiness

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Poster Session 2

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The concept of cognitive effort, despite its multifaceted influences on everyday life behavior, is not easily accessible. Assessment is time-consuming and costly and it remains unclear, what factors might influence the decision to invest or refrain from investing cognitive effort? The Expected Value of Control Theory (Shenhav et al., 2016) predicts that the ACC evaluates potential costs and benefits of a given action and selects responses that offer the highest net value, taking into account various factors, such as required cognitive resources, conflicting and emotional stimuli, and outcome probabilities. This study explored the factors underlying cognitive effort by inspecting behavioral indices and self-report measures associated with changes in effort readiness. We assumed that experiencing a loss of action control in a cognitive reasoning task that was due either to non-contingent and unpredictable feedback or to an extremely demanding task difficulty, may differentially attenuate the willingness to invest effort in a forced-choice effort discounting paradigm. Our manipulations targeted different processing mechanisms in the ACC that were expected to induce distinct behavioral response patterns. Our results indicate that reduced action control may increase negative affect and modify behavioral response patterns in both experimental conditions. However, these conditions appeared to be differently associated with trait measures such as the disposition of increased behavior inhibition. Thus, our findings illustrate that behavioral response patterns in cognitive effort discounting paradigms may provide insights into the latent construct of mental effort. This might lead the way for a future neuropsychological assessment of effort readiness in clinical populations.

P.596 - Causes and Consequences of Effort in Foraging Decisions

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Poster Session 2

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In many decisions in everyday life, choice options arise sequentially and agents need to decide whether to stay with the current option or leave and search for a better one. Typically, when making such foraging-style choices, both staying and leaving requires effort, but effort costs have received little attention in prior work. In addition, beyond effort requirements, also subjective estimates of the current reward rate can influence how much effort is exerted. We developed a novel foraging task in which human participants invested physical effort into foraging from a patch or leaving it. Patches varied in their starting richness, but depleted over time. Participants had to infer the patch richness from received outcomes and decide when to leave. Patches also varied in the amount of button presses required for foraging. Furthermore, the proportion of rich patches, the travel time to the next patch, and whether rewards gained new energy or stopped the loss of energy varied across blocks. Participants stayed longer in richer and lower-effort patches, but shorter in richer environments and under longer travel times. They exerted more effort after rewards, in richer patches, and when rewards gained new energy, potentially reflecting Pavlovian invigoration. Effort invested on past trials biased them to stay longer than optimal, reflecting sunken costs. Overall, choices were better explained by a reinforcement learning model that incorporated background and foreground effects than by Bayesian observer models. This work sheds light on how effort both influences and reflects valuation in foraging decisions.

P.598 - Neurocognitive Predictors Of Individual Differences In Task Switching - The Role Of Working Memory, Fluid Intelligence And Neural Updating Efficiency

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Poster Session 2

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Research on individual differences in multitasking has shown that individuals either prefer a more serial or a more parallel mode of task processing. So far, little is known about the underlying neurocognitive mechanisms guiding the task processing preference. However, previous results suggested working memory capacity and fluid intelligence as promising predictors for task switching costs so they might also be relevant for the preferred processing mode. In addition, it has been shown that fluid intelligence is associated with neural task-updating efficiency, which quantifies the distance between the fMRI connectivity matrix during resting state with the connectivity matrix during task state. Participants showing a smaller distance between rest and task tend to have higher scores on fluid intelligence.In our preregistered study, we combine those cognitive and neurocognitive parameters to predict the individual task processing preference. The task-processing modes can be assessed with the Task-Switching-With-Preview (TSWP) paradigm that allows but does not oblige individuals to pre-process the stimulus of the upcoming task switch in a predictable task sequence (AAABBB...). 67 participants were probed with the TSWP paradigm, with a listening and a complex operation span task, the figural relations subtest of the German Intelligence Test, and MRI connectivity-based measurement of brain resting state, respectively. Surprisingly, first preliminary results from a stepwise regression analysis indicate no relationship between the processing modes and the cognitive and neurocognitive parameter, which we would like to discuss against the background of further exploratory analyses.

P.611 - On Sex Effects in Placebo Hypoalgesia and Pain Processing

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Poster Session 2

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Placebo effects are capable to drastically reduce the perception of pain. While the influence of sex on pain processing in general is well investigated, indicating higher pain sensitivity for female compared to male individuals, research regarding sex difference for placebo hypoalgesia is inconclusive. Previous studies report rather mixed results, suggesting somewhat stronger placebo effects for male participants. To further elucidate the potential role of sex for placebo hypoalgesia, we investigated a sample of 204 (102 females) young healthy participants, who first underwent a placebo conditioning procedure, during which a placebo cream was paired with moderately painful heat pain stimuli, while highly painful stimuli were administered on skin patches, treated beforehand with a control cream. In the subsequent test phase, identical pain stimuli were administered on placebo and control patches. In the beginning of the experiment, the participants pain threshold was assessed, and pain stimuli were adjusted accordingly. Placebo effects were analysed based on the difference in pain intensity and pain unpleasantness ratings between placebo and control patches during the test phase, taking into account the participant's sex.Preliminary data analysis of pain ratings shows successful placebo hypoalgesia, irrespective of the participant's sex. However, female participants reported significantly lower pain thresholds than male participants, and higher pain ratings in general.In line with earlier findings, the present study revealed higher pain sensitivity for female individuals but fails to demonstrate sex differences in placebo responding. Future studies might consider the variation of the experimenter sex relative to the participant.

P.615 - Prediction Error Representations in Immediate and Delayed Feedback Processing – A Single-Trial-Based Event-Related Potential Study

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Poster Session 2

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Findings obtained with functional neuroimaging and in patient studies suggested that the neural mechanisms involved in the processing of performance feedback depend on the delay between action and feedback. For immediate feedback the striatum plays an important role, while for delayed feedback the hippocampus is involved. In event-related potential (ERP) studies, the amplitude difference between the processing of positive and negative feedback has consistently been shown to be reduced for delayed feedback between 200 and 300 ms after the feedback, which is the time window of the feedback-related negativity (FRN). Evidence from our own lab has shown that there are also similarities between the processing of immediate and delayed feedback, for example, with respect to effects of expectancy. In the present study we investigated effects of feedback delay on prediction error (PE) representations by means of single-trial-based ERP analyses, as the PE is central to learning from feedback. In the FRN time window we found that for both immediate and delayed feedback the amplitude reflected the magnitude of the PE, however, only for positive but not negative feedback. For the N170 ERP component, which has recently been linked to delayed feedback processing, we did not find effects of the PE. Overall, our findings confirm that there are similarities in immediate and delayed feedback processing and that the signal between 200 and 300 ms after feedback presentation is best described as a reward positivity.

P.617 - Measure of Meta-cognitive Sensitivity in Value-based Learning

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Poster Session 2

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Meta-cognition, i.e., our ability to assess the quality of our own decisions, is a critical contributor to the regulation of choice. Various ways of formalizing the sensitivity and bias of our confidence judgements have duly been related to neural processing and have helped distinguish cognitive disorders. However, most of these studies focus on immediate rather than sequential choice – for instance, perceptual decision-making or value-based decision-making for known outcomes. Here, we treat sensitivity and bias for value-based decision-making problems in which outcome values must be learned across trials. We repurpose the central idea underlying the meta-cognitive assessment measure, meta-d'. Crudely, d' quantifies the sensitivity of choice (of an 'actor') in perceptual decision-making; and meta-d' quantifies the sensitivity of confidence judgements (made by a 'rater'), by measuring how well the rater could have made the original choice (interpreting confidence as a form of probability judgement). In the learning case, we build two computational models: a Forward model, characterizing the subjects' choices and generating 'first order' confidence from the modelled probability of being correct; and a Backward model, which generates choices whose first-order confidence best matches the subjects' confidence reports. The Performance of Backward and Forward models are in the roles of meta-d' and d' in our measure of meta-cognitive sensitivity, called MetaRL.Ratio. Our results demonstrated that MetaRL.Ratio was consistence with previous measures of meta-cognitive sensitivity and also differentiated high and low meta-cognitive behavior. This study suggests that MetaRL.Ratio is a promising tool for assessing meta-cognitive sensitivity in the value-based learning domain.

P.630 - When Sound SPARCs Cognitive Control: An fMRI Study of Response Conflict From Spatial Pitch Associations

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The spatial-pitch association of response codes (SPARC) effect indicates that mappings of high-pitch auditory stimuli to high-positioned response locations lead to faster responses than do mappings of high-pitch stimuli to low-positioned response locations, and vice versa for low-pitch stimuli. Thus, spatial implications of pitch height that are incompatible with instructed spatial response requirements are assumed to elicit a response conflict. We investigated the brain circuitry associated with such SPARC incompatibilities and how the SPARC-related interference effect is modulated by response complexity and age.We used fMRI to measure brain activity in 43 young and 36 older adults while performing speeded two-choice reactions to high- or low-pitched tones by pressing upper or lower response buttons with one or both hands concurrently. The compatibility between stimulus-pitch-implied and actually required response locations as well as the level of response complexity (unimanual vs. bimanual responding) was varied between blocks of trials.SPARC-incompatibility (vs. compatibility) significantly slowed responding. While this effect was enhanced with higher response complexity, response slowing with higher age was found to be additive to these effects. Neurally, SPARC-incompatibility elicited activation in bilateral prefrontal, parietal, midcingulate, and anterior insular cortices, with cerebellar involvement being mainly driven by dual-response execution, supporting its role in coordinating responses. While age did not modulate the incompatibility-related network, age-related hyperactivation was observed in premotor cortex, possibly reflecting neural dedifferentiation. Overall, our results corroborate the idea that pitch-associated spatial representations automatically activate response tendencies which, if incompatible with instructed pitch-to-location mappings, require effortful top-down control to be overruled.

P.633 - Neural Feedback Processing During a Guessing and a Learning Paradigm: Comparison of the RewP and the P300 Across Tasks

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Poster Session 2

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Background: Evaluating and learning from feedback is essential to maximize gains and minimize loss. Two event-related potentials (ERPs), namely the Reward Positivity (RewP) and the P300, have been identified as electrophysiological correlates of feedback processing in reward tasks. Whereas the P300 assumingly reflects value updating, the RewP encodes initial reward sensitivity. Research further points to a relation between outcome expectancy and both ERPs.Methods: In this study, we will employ two feedback tasks to investigate processing of reward and punishment across paradigms, as qualified by the RewP and P300. The doors task is a simple guessing task incorporating trial-wise monetary reward or loss. In the consecutive reversal learning task, participants are instructed to learn which of two differently colored doors is rewarded, based on previous feedback. Feedback is probabilistic, resulting in irregularly unexpected valence. Both tasks are comparable in trial structure, timing, and feedback stimuli. Based on prior findings, we expect RewP enhancement following rewards across tasks. We will investigate the link between feedback expectancy and both ERP amplitudes across tasks. Furthermore, we will examine potential modulation of P300 magnitude by learning rate.Results: We aim to collect and present data from 30 healthy participants. Data collection is ongoing.Implications: Aberrant feedback processing has been found in internalizing disorders; its predictive value foreshadowing treatment response has been discussed. As part of a larger scale data-collection from patients with internalizing disorders, these first results will foster understanding of feedback processing in mental disorders.Funded by the German Research Foundation (DFG-Forschergruppe 5187).

P.634 - A Fine-Grained Investigation of Single-Trial N400 Amplitudes and Reaction Times in Abstract and Concrete Word Priming

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Poster Session 2

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Concreteness, contextual embedding, the type of prime-target relations as well as the prime-target stimulus-onset-asynchrony are well known to affect word processing. Research investigating the interplay of (some of) these factors enhanced our understanding of contextual semantic processing while yielding partially conflicting results. So far overlooked was the semantic diversity of the prime, which should affect priming-related neural mechanisms. In this study, we thus manipulated the primes' semantic diversity together with the target words' concreteness, the prime-target-pairs' relation-strength based on semantic association and similarity, and the prime-target stimulus-onset-asynchrony. We measured single-trial N400 amplitudes as a marker of semantic integration effort and lexical decision times reflecting processing speed in separate samples of, respectively, 40 and 70 young and healthy participants performing lexical decisions. The linear mixed effects analyses confirmed that for abstract target words, the N400 was more strongly modulated by relation-strength than for concrete ones. Unexpectedly, the primes' high semantic diversity partially reversed similarity-driven N400 reductions observed for primes with a low semantic diversity, yielding higher amplitudes for more strongly related prime-target pairs, irrespective of concreteness and especially for a short stimulus-onset-asynchrony. Regarding reaction times, the primes' semantic diversity reduced priming effects whereas the prime-target relation-strength enhanced priming effects, again irrespective of the target words' concreteness. Our results support the semantic control hypothesis and controvert the assumption of differential representational frameworks for concrete and abstract words. Additionally, a primes' semantic diversity seems to directly affect whether the prime-target relation strength reduces semantic retrieval effort and eventually facilitates semantic word processing.

P.472 - Measuring Changes In Sustained Attention By Manipulation Of Inter-regional Frontal Theta Phase Coupling

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Poster Session 2

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Recently, transcranial alternating current stimulation (tACS) has been shown to improve executive functioning by enhancing (vs. disrupting) theta coherence between the medial frontal cortex (MFC) and right lateral prefrontal cortex (lPFC) (Reinhart 2017). Clayton and colleagues (2015) argue that theta synchronization between these same MFC and right lPFC regions is critical for sustained attention (SA). However, the causal inter-dependency between these two regions for attention is still unresolved. In this poster, we present our proposed project to use the gradual onset continuous performance task to characterize fluctuations in SA (Esterman et al. 2013; continuous performance task) during concurrently theta (6Hz) tACS. Specifically, we propose three different within-subject manipulations: theta in-phase, theta anti-phase, and sham stimulation in three different sessions. Each session consists of 20 minutes of stimulation, framed by 8 minutes of task without stimulation before and after the stimulation phase to test for baseline and plasticity effects.In line with previous research (Reinhart 2017), we expect in-phase stimulation of the MFC and lPFC to enhance SA and anti-phase stimulation to disrupt SA.

P.479 - Baseline- And Magnitude- Dependent Detection Of Changes In Dynamic Visuomotor Mapping

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Poster Session 2

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We asked whether the processing of visuomotor delay changes follow the Weber-Fechner law; i.e., whether processing depends not only on the magnitude of the delay change, but also on the current delay. We used a data glove to transmit participants' movements to a virtual hand model. Participants performed continuous, simple grasping movements, aligning the rhythm of the movement with the rhythmic oscillation of a target sound. Thereby the visual delay of the virtual hand movements, relative to the real hand, changed repeatedly and unpredictably (between 0ms and 700ms) with the magnitude of changes ranging from +/-100ms to +/-400ms. Participants were instructed to indicate a perceived delay change by key press. A preliminary behavioural analysis (ANOVA, N=33, data collection in progress) showed that larger delay changes were detected better ($F(3,1020) = 14.77$, $p<.001$). Surprisingly, we also found that delay changes were detected better and faster, the larger the current delay level ($F(7,1016) = 12.12$, $p<.001$; $F(7,1016) = 4.05$, $p<.001$). Using signal detection theory, we found that with increasing current delay level, there was an increase in sensitivity (d') and a decrease in response criterion. Our results suggest that the perception of visuomotor delay does not universally follow the Weber-Fechner law. We speculate that this may be due to attentional capture of visuomotor delay per se and/or attentional influences of virtual hand embodiment.

P.484 - Predictions Of Hand Movement Direction And Visuomotor Congruence In Fronto-Parietal Cortices

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Poster Session 2

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When planning a movement, the brain generates predictions about the sensory consequences of these actions; e.g., it predicts which visual feedback of its own body position it will receive when executing this specific movement.To examine aspects of these visuomotor predictions, i.e. movement direction and visuomotor congruence, we designed an event-related fMRI experiment. Healthy participants (N=30) performed a virtual reality-based open-or-close hand movement task, controlling a photo-realistic virtual hand model via data glove and observing its (congruent or incongruent) movements. Crucially, in a brief preparation period before each movement, a cue predicted (via colour) congruent or incongruent virtual hand behaviour during movement execution, inducing visuomotor expectations. These expectations of visual action consequences were induced orthogonally to visuomotor congruence. Furthermore, to examine how expectations of a specific movement direction influenced these visuomotor predictions, cue shape predicted future movement direction in half of the trials. Lastly, in 25 % of trials the visuomotor congruence of the virtual hand did not fit the cued prediction, inducing expectation violation.During the preparation phase, we observed that expectations of visuomotor incongruence and specific movement direction shared neural substrates, both inducing activation in fronto-parietal motor regions, i.e. the dorsal premotor cortex, anterior intraparietal sulcus and superior parietal lobe. In turn, expectations of movement direction during the preparation phase lead to reduced activity in these areas during movement execution. Additionally, expectations could be induced comparably for both congruent and incongruent visuomotor mappings, as activation related to expectation violation was independent of visuomotor congruence.

P.493 - Response Priming Meets Flanker: EEG Evidence for Incongruence Effects During a Flanker Task with Several SOAs

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Poster Session 2

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Interference between relevant and irrelevant stimuli depends on the extend to which irrelevant stimuli are processed. Hence, large interference costs are expected when irrelevant incongruent stimuli (partially) initiate an incorrect motor response. Here, we focus on the temporal dynamics of incompatible response activation and (un)successful response inhibition. EEG was recorded while 55 young adults completed a task in which irrelevant flanker stimuli were presented before (SOA of 100 ms, 67 ms or 34 ms) or along with the target stimulus (SOA 0 ms). As predicted, behavioral interference costs (RTs / error rates) varied as a function of SOA and reached a plateau at 67 ms. N2 latency in correct trials was only modulated by congruency, whereas N2 amplitudes were higher for error compared to correct trials except for the longest SOA. By contrast, LRP latency was higher for incongruent trials and increased as a function of SOA. More negative LRP amplitudes were observed for incongruent flankers preceding the target. Together, these results illustrate the temporal dynamics of (partially)activated incompatible responses even in correct trials, particularly when irrelevant stimuli precede target information by less than 100 ms.

P.499 - Supramodal Encoding Of Predictive Context In Human Prefrontal Cortex

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Poster Session 2

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The brain exploits statistical regularities in the sensory environment to generate predictions of upcoming stimuli. These regularities comprise not only simple frequency distributions, but also predictive relationships between sensory inputs. The conditional probabilities defining such relationships can be thought of as 'context' of a given observation and provide a basis for generating predictions in a top-down manner. To investigate whether contextual processing generalizes across sensory modalities, we analyzed intracranial recordings from prefrontal and temporal cortices of 18 patients with pharmaco-resistant epilepsy. Integration of predictive context from an ongoing stream of sensory events improved behavioral performance in visual and auditory target detection tasks. Notably, individual performance gain was correlated across modalities, indicating sensory modality-independent, higher-order integration of predictive context. High-frequency broadband activity (HFA), a proxy for local neural firing, signaled top-down predictions and correlated with perceptual decisions. Specifically, HFA predicted sensory evidence integration, which was increased for predicted stimuli in prefrontal cortex, but not temporal cortex. In sum, these results provide evidence for supramodal processing of predictive information in human PFC to guide adaptive behavior in probabilistic sensory environments.

P.529 - 50% of the Time, Tones Come Every Time: Strong Prediction Error Effect on Sensory Attenuation Specific to Self-Generated Tones

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Poster Session 2

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We use the term sensory attenuation to describe the N1/P2 amplitude reduction for self-generated tones in comparison to external tones in electroencephalography (EEG), which has recently also been described for action observation. Whether this effect is dependent on motor-based or general predictive mechanisms is unclear. Using a paradigm, in which a self-performed or observed action (a button press) elicited a tone in only half of the trials, this study examined how the processing of the tone is modulated by the prediction error in each trial. Additionally, we considered the effect of temporal predictability by adding a condition, in which a visual cue was followed by an external tone in half of the trials. For the N1, we found evidence of attenuation relative to un-cued external tones for tones following actively performed and observed button presses, while the P2 amplitude was attenuated only for the action observation but not for the action performance condition, and for cued relative to un-cued tones. Interestingly, we found a prediction-error effect for both N1 and P2, in that greater errors coincided with greater amplitudes. This effect was stronger for tones following button presses compared to cued external tones, but only for performers. Taken together, our results suggest that attenuation effects are partially driven by general predictive mechanisms irrespective of self-performed actions. However, the stronger prediction-error effects for self-generated tones suggest that motor-related factors beyond temporal predictability play a role in the underlying mechanisms.

P.530 - A Dissociable Functional Relevance of Theta and Beta Band Activity During Complex Sensorimotor Integration

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Sensorimotor integration processes play a central role in daily life and require that different sources of sensory information become integrated. That is, the information related to the object being under control of the agent (i.e., indicator), and the information about the goal of acting. Yet, how this is accomplished on a neurophysiological level is contentious. We focus on the role of theta and beta band activity and examine which neuroanatomical structures are involved. Healthy participants (N=41) performed three consecutive pursuit tracking experiments in which the source of visual information available for tracking was varied (i.e., that of the indicator and the goal of acting). The initial specification of indicator dynamics is determined through beta band activity in parietal cortices. When information about the goal was not accessible, but operating the indicator was required nevertheless, this incurred increased theta band activity in the superior frontal cortex signaling a higher need for control. Later on, theta and beta band activity encode distinct sources of information within the ventral processing stream: theta band activity is affected by the indicator information, while beta band activity is affected by the information about the action goal. Complex sensorimotor integration is realized through a cascade of theta and beta band activity in a ventral-stream-parieto-frontal network.

P.579 - Pre-Trial Fronto-Occipital Electrophysiological Connectivity Affects Perception-Action Integration In Response Inhibition

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Poster Session 2

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Inhibition of inappropriate behavior is relevant in many everyday situations. Nevertheless, the mechanisms that induce response inhibition based on sensory information and what influences these mechanisms are not entirely understood. We examined neurophysiological processes of perception-action integration according to the Theory of Event Coding in response inhibition and the impact of the pre-trial neurophysiological functional connectivity state in the theta and alpha band on these integration processes. Within the trial, fronto-medial theta band activity and occipital alpha band activity revealed an opposing interplay depending on the necessity of (re-)binding event files during response inhibition. When response inhibition required the reconfiguration of event files, this was associated with increased theta band activity but lower alpha band activity, and vice versa for situations without such a reconfiguration. Notably, the most substantial impact of pre-trial connectivity on the within-trial differences between conditions that require reconfiguration and those that do not during response inhibition occurred between fronto-medial areas and areas of the ventral stream in the theta frequency band. This suggests a preparatory top-down control of sensory areas before stimulus presentation. Increased pre-trial connectivity was associated with a decreased event file binding effect in the alpha frequency band and an increased event file binding effect in the theta frequency band during response inhibition. This implies an impact of the pre-trial functional connectivity state on inhibitory gating processes of relevant information and event file (re-)binding during response inhibition. The study shows how perception-action integration during response inhibition is affected by preceding transient neurophysiological connectivity states.

P.584 - Evaluating The Perception Of Phase Transitions In High Frequency Flicker

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Poster Session 2

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Alternating two different visual stimuli induces the perception of flicker. Such stimulation is often used to induce steady state visually evoked potentials in the Neurosciences. If the stimuli are alternated at a higher frequency above their flicker-fusion threshold they are perceived as non-flickering. For example, alternating black and white at a high frequency is perceived gray. Nevertheless, a transition between phases is still perceived (e.g., when switching from sequential presentation of black-white to white-black, the white stimulus is presented twice in direct succession; which creates a noticeable percept). If it were possible to reduce the perceptibility of such phase transitions, we could improve and generalize the stimulation sequences used for steady state visually evoked potentials. In a study with n=24 participants, we will focus on reducing perceptibility of such phase transitions. We will investigate different types of phase transitions in black-white flicker stimuli: (a) gradients between extrema, which uses gradual shifting between black and white for reducing the contrast and embedding a transition at the perceived mid gray level, (b) (high- and bandpass) filtered direct transitions, and (c) flipping pixels in which individual pixels are changed from one phase to the other (e.g., from white to black). We will compare sensitivity of participants to transitions created by those techniques using two-alternative forced choice tasks and thereby identify techniques that are best suited to render phase transitions almost imperceptible.

P.436 - The Effect Of A Bogus Genetic Feedback On Acute Stress Reactivity

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Recent years have seen an impressive rise of direct-to-consumer genetic testing such that millions of individuals have received personalized genetic information by now. However, first studies suggest that receiving personalized genetic feedback without medical counseling can have detrimental effects, for instance, worsening symptom reports or reducing feelings of self-control.Currently, genetic tests for stress reactivity are highly sought after, but the effect of a known genetic risk for stress is unclear. In this preregistered study, we investigated whether a believed high (group 1) vs. low (group 2) genetic susceptibility to stress affects subjective and biological markers of stress reactivity. To account for unspecific effects of genetic risk feedback, we included another group told to be at risk for diabetes. Participants (n=76, mean age 22.0±2.41) provided a buccal sample, returned to the laboratory 3-10 days later and received bogus genetic feedback according to their group assignment before undergoing the Trier Social Stress Test (TSST). Manipulation checks demonstrated successful implementation of bogus genetic feedback in all groups (ps<.001). Supporting a nocebo effect, participants with high-stress feedback were more troubled after receiving their bogus DNA results compared to the other groups ($p < .001$), more restless than the low-stress group before the TSST (p=.014), and recovered more slowly than the control group after the TSST (p=.013). In contrast, physiological stress markers (pulse, blood pressure, cortisol concentrations) were not affected. Our study supports prior research that individualized genetic feedback can induce nocebo effects on a subjective level. Potential implications and limitations will be discussed.

P.438 - Effects of Acute Stress on Path Integration

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Acute stress affects hippocampal functioning, a relationship that has often been shown for episodic memory, but rarely for human spatial navigation. One specific navigational strategy is path integration, which plays an important role in spatially scarce environments with little information and absence of external cues. Path integration is related to grid cell firing in the entorhinal cortex, which is part of the hippocampal formation, but further neural systems including retrosplenial cortex, hippocampus, or striatum can be recruited when spatial cues like boundaries or landmarks provide additional information.Here, we investigated the influence of acute stress on path integration. A sample of healthy young participants was subdivided into two groups, one of which (stress group; n = 32) was stressed by the socially evaluated cold-pressor test, whereas the other (control group, n = 34) underwent a non-stressful control procedure. Stress manipulation was confirmed via physiological and subjective markers. Twenty minutes following experimental manipulation, participants started a virtual path integration task on a desktop computer. The task included one environment with no spatial cues and another containing a landmark to distinguish between pure path integration and landmark-supported path integration. Acute stress impaired path integration performance during trials with high difficulty and led to greater decline of performance when the landmark was removed. The deficits were more strongly related to compromised distance estimation, and to a lesser extent to altered rotation estimation. Altogether, we provide first evidence for acute stress-induced impairments of path integration in humans, possibly due to compromised grid cell activity.

P.447 - Effects of Ovulation on the Cortisol Awakening Response

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The cortisol awakening response (CAR) is commonly assessed as a measure of hypothalamus-pituitary-adrenal axis regulation and is thought to be dependend on several influencing factors, such as the menstrual cycle. Previous studies investigating menstrual cycle effects on CAR report mixed results, with some showing an increased CAR during ovulation compared to other cycle phases. However, the effects of ovulation and its preceeding increase in estradiol have not been directly investigated in this context. We therefore aimed to extend previous findings by taking a closer look at changes in CAR in the periovulatory phase. In the present study, saliva samples of 30 healthy naturally cycling women were collected on seven consecutive days around ovulation to measure CAR and estradiol. CAR was assessed at 0, 15, 30 and 60 min after awakening and compliance was monitored with a smartphone app that recorded sampling times. Ovulation was verified using LH-surge based ovulation predictor test kits. Effects of ovulation on intraindividual changes in CAR were examined using multilevel modelling. In four separate models, day of ovulation and estradiol concentrations were included as predictors of post-awakening cortisol concentrations (AUCg) and increase (AUCi). Results indicated that neither ovulation nor estradiol was associated with AUCg or AUCi. In conclusion, the present results suggest that ovulation-specific changes in hormone concentrations do not effect CAR. Therefore, the assessment of CAR should be reliable even during the periovulatory phase.

P.453 - Body Composition Changes Across The Menopause Transition And Their Association With White Matter Hyperintensities: A Longitudinal Study

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Background. The menopause transition involves risk for central obesity and metabolic syndrome. Poor cardiometabolic health is linked to microvascular brain lesions, which can be detected as white matter hyperintensities (WMHs) on Magnetic Resonance Imaging (MRI) scans. Although women show higher WMH volume post-menopause, it remains unclear whether this is specifically linked to changes in body composition occurring during the menopause transition.Methods. We assessed longitudinal changes in body mass index (BMI) and waist-to-hip ratio (WHR) over the menopause transition in 376 UK Biobank females, using linear polynomial fits to model individual slopes based on BMI and WHR values measured at three timepoints (premenopausal, perimenopausal, and postmenopausal). Using linear regression, we examined whether age-adjusted BMI and WHR slopes were associated with WMH volume post-menopause. Additionally, we examined whether markers of metabolic health measured pre-menopause (lipids, glucose, and blood pressure; only available at baseline) were associated with WMH volume post-menopause.Results. Both BMI (t=4.50, ?=0.002±0.001, p=1.0×10-5) and WHR (t=3.81, ?=0.002±0.001, p=1.6×10-4) increased across the menopause

transition, but changes in BMI and WHR were not significantly associated with WMH volume post-menopause (?-values<0.03±0.05, p-values>0.60). However, baseline markers of metabolic health measured pre-menopause were associated with post-menopausal WMHs (?-values>0.104±0.05, p-values<0.03).Conclusion. Although adipose tissue may increase on average over the menopause transition, these changes do not necessarily indicate a specific menopause-related risk for WM lesions. Nevertheless, metabolic health measured prior to the menopause transition appears to be an important contributor to female brain health in midlife and beyond, emphasising the importance of early health interventions.

P.463 - How do Mindfulness-based Trainings Reduce Physiological Stress? Assessing Changes in Attention and Acceptance Traits and Their Role in Cortisol Reduction

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Mindfulness-based interventions have become a popular means to reduce stress. However, the mechanisms driving observed stress reduction remain understudied. Prior research has benefitted from dissecting mental training interventions into distinct training modules containing different types of mental practices. This had led to the development of the Monitor and Acceptance Theory. This asserts that during mindfulness training, attentional and interoceptive capacities are first developed which may lead to initial emotional agitation. However, through the secondary cultivation of acceptance, individuals learn how to manage these affective states, and thus stress reduction occurs. Methods: In the ReSource project, healthy participants underwent three 3-month mental training modules targeting either attentional (Presence module), socio-affective (Affect module) or socio-cognitive skills (Perspective module). We tracked the development of a range of attention or acceptance related mental capacities and examined the changes of these with participants' stress-reactive cortisol levels following standardized psychosocial stress induction. Results: We found that monitoring and acceptance capacities modulated stress sensitivity. However, this was dependent on the type of training undergone. Those who trained presence showed increased stress sensitivity in relation to increased attention-based capacities, however the reverse effect was found for those who trained in the Affect of Perspective modules. Trend level effects were observed for acceptance related capacities. Discussion: Our results corroborate the requirement of monitoring to fully access the supporting emotional capacities to build stress resilience, whereby acceptance may be a benefactor in lowering cortisol stress reactivity. Overall, mental training relies on several interacting processes to successfully attenuate stress.

P.497 - Investigating The Parasympathetic-Sympathetic Interaction Under Stress And Relaxation

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The autonomic nervous system (ANS) and the neuroendocrine system enable the body to dynamically react to challenging or stressful situations, as well as engage in regenerative processes when appropriate. The “rest/digest” or "relaxation" response, is crucial for regeneration processes, physiological homeostasis, and sustainment of physiological and psychological health. Whether regenerative processes are impaired in the presence of acute stress is however poorly investigated. Thus, we investigated the effects of a relaxation intervention in acutely stressed individuals on neuroendocrine and autonomic markers and looked into the interaction of the sympathetic and parasympathetic branches of the ANS. Healthy participants (N = 71, 52.11% female) completed the socially evaluated cold pressor test before receiving a relaxation induction consisting of diaphragmatic breathing and guided imagery. Heart rate, heart rate variability (continuous electrocardiogram), salivary cortisol and salivary alpha amylase (saliva samples) were assessed as biological stress and relaxation markers. Mixed ANOVAs revealed a significant effect of the socially evaluated cold pressor test on cortisol levels and subjective stress. Additionally, a significant effect of the relaxation intervention on heart rate variability and heart rate was revealed (all $p < .001$). No significant differences in the ratio of the reactivity of the autonomic branches under stress and relaxation were found. While this study does not support the hypothesis of a significant impairment of regenerative processes in the presence of acute stress, it can serve as an initial observation for future studies investigating the impact of chronically stressed states on the regulation of energy systems and the parasympathetic-sympathetic interaction.

P.517 - Geschlechtsabhängige Effekte des Kaltwassertests auf Speichelcortisol, Aggression und Sprachproduktion

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Als aggressives Verhalten wird die Schädigung eines anderen Lebewesens bezeichnet, um etwas zu schützen, zu erlangen oder zu verteidigen. Dabei wird Aggression als ein multifaktorielles Phänomen betrachtet, das durch eine Vielzahl biologischer, psychologischer, kognitiver und umweltbedingter Faktoren beeinflusst und ausgelöst wird. Interessanterweise gibt es nur geringe Hinweise auf geschlechtsspezifische Unterschiede bei den jeweiligen neurobiologischen Grundlagen der Aggression, auf Verhaltensebene zeigt sich jedoch ein konsistenter Geschlechtsunterschied dahingehend, dass Männer häufiger aggressives Verhalten zeigen als Frauen (Schirmer, 2013).In der aktuellen Studie haben wir mittels eines sozial evaluierten Kaltwassertest (SECPT) die Cortisolspiegel von Männern und Frauen erhöht und anschließend situationsbezogene Aggression mit dem State-Trait-Ärgerausdrucks-Inventar (STAXI) gemessen. Darüber hinaus haben wir Frequenzanalysen von Sprachproduktionsdaten durchgeführt, um zu testen, ob im Sprachsignal stressinduzierte Veränderungen nachweisbar sind.Unsere Daten zeigen eine geschlechtsunabhängige Erhöhung des Cortisolspiegels für die Kaltwasser- aber nicht die Warmwasser-Gruppe. Für die STAXI-Daten finden wir eine Interaktion von Gruppe und Geschlecht, dahingehend, dass nur bei Männern in der Kaltwassergruppe die STAXI-Werte signifikant steigen. Dieser Anstieg korreliert positiv mit dem Cortisolspiegel der Männer. In den Sprachdaten finden wir einen stressinduzierten geschlechtsunabhängigen Anstieg der Power in höheren Frequenzbändern (2000-2800 Hz) in. In niedrigeren Frequenzbändern (0-800 Hz) hingegen steigt die Power nur für die Männer.Zusammenfassend deuten unsere Daten darauf hin, dass sich akuter Stress geschlechtsunabhängig auf Cortisolwerte auswirkt, der Einfluss auf Aggressionsparameter und niedrigere Frequenzanteile in der Sprache bei Männern jedoch stärker ist.

P.519 - Do Stress and Lack of Sleep reduce Prepulse Inhibition?

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Psychosocial stress and sleep deprivation alter the brain's function to filter sensory information (= sensorimotor gating) and may increase the risk for psychoses. To investigate the impact of sleep quality, sleep duration, psychosocial and chronic stress on sensorimotor gating, we recruited 185 healthy individuals (MAge: 22.82 years; 57.3 % female). Participants were presented with 14 startle stimuli (50 ms white noise; instantaneous rise time) before and after a Socially-Evaluated Cold Pressor Test (SECPT) or control condition with warm water. Chronic stress was assessed using the Trier Inventory for Chronic Stress (TICS). The SECPT group (n = 126) showed a comparable prepulse inhibition (PPI) before and after stress (Md = 56.43, n = 61; Md = 54.34, n = 49; p = .25), whereas the control group showed a reduction of PPI after the control task (Md = 30.75, n = 30; Md = 19.21, n = 21; p = .02). We found significant correlations between PPI and the TICS scales "social isolation" (r = .20; CI [.05, .35]) and "excessive demands at work" (r =.16; 95 % CI [.01, .31]) indicating that chronic stress influences the ability to filter information. Lastly, regression analyses revealed a significant relationship between sleep quality and PPI in the SECPT group, indicating that better sleep quality led to greater PPI ($F(1,107) = 4.55$, p = .35), with an R2 of .041. Contrary to our hypotheses, acute and chronic stress was not associated with reduced PPI. Instead, higher chronic stress levels and better sleep quality seem to enhance sensorimotor gating.

P.547 - Associations Between Hair Cortisol and Subjective Stress Measures in a Large Occupational Sample

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Background: Hair cortisol concentrations (HCC) are commonly used to capture long-term cumulative cortisol secretion in stress research. However, data on associations between HCC and subjective stress measures have been inconsistent. This may partly be due to bias introduced by smaller-sized academic samples. Here, we investigate associations between HCC and (work-) stress-related measures in a large occupational, predominantly male, sample.Methods: Demographic, anthropometric, and self-reported data were collected as part of an occupational health assessment for employees of an airplane manufacturing company (N = 1258). Hair samples (3 cm) were obtained and glucocorticoid concentrations (HCC and hair cortisone, HairE) were analyzed using liquid chromatography-tandem mass spectrometry.Results: HCC and HairE were unrelated to self-report measures of perceived stress, work-related stress (effort-reward imbalance, overcommitment), and other stress-related constructs. Group-based analyses concerning associations with job strain revealed a small effect of individuals with high job strain (n = 281) exhibiting higher HCC than the remaining sample (n = 811).Conclusions: Our data replicate previous findings of no consistent associations between hair glucocorticoids and subjective stress-related questionnaire data, besides evidence for elevated HCC in a high job strain group. Further research addressing open methodological questions regarding HCC by means of advanced stress assessment methods is needed.

P.550 - Furcht-konditionierte Bradykardie bei imaginierten unkonditionierten Reizen

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Aversive Lernerfahrungen sind wichtige Faktoren in der Ätiologie und Aufrechterhaltung der Sozialen Angststörung (SAD). Ein zentraler Mechanismus ist Klassische Konditionierung, wobei ein konditionierter Reiz (CS) mit einem unangenehmen Reiz (US) gepaart wird. Viele Pat. mit SAD erinnern sich aber nicht explizit an eine spezifische negative Lernerfahrung. Gleichzeitig ist bekannt, dass die Imagination in bzw. von sozialen Situationen eine wichtige Rolle bei der Aufrechterhaltung der SAD spielt. Die Imagination von negativen Erfahrungen in sozialen Situationen könnte mittels Konditionierung für die Störungsentwicklung von Bedeutung sein. Aus Konditionierungsstudien mit physisch dargebotenen US (z.B. elektrische Reize) ist bekannt, dass die Furchtakquisition (a) zu einer Beschleunigung der Herzfrequenz auf den US und (b) zu einer Verlangsamung der Herzfrequenz in Reaktion auf den CS führt (konditionierte Bradykardie). Ziel war zu prüfen, ob imaginierte sozial relevante US auch zu einer Modulation des Herzschlags als konditionierte Reaktion führen. Hierfür haben wir ein neues Imaginations-basiertes Paradigma entwickelt und an gesunden Personen validiert. Während der Akquisition wurden neutrale Gesichter (CS) mit einer unangenehmen (CS+aversiv) oder neutralen (CS+neutral) sozial relevanten Imagination gepaart. Ein weiterer CS wurde mit keiner Imagination gepaart (CS-). Zur Messung der konditionierten Reaktion wurde u.a. die Herzfrequenz mittels EKG aufgezeichnet. Die Furchtkonditionierung mit imaginierten Reizen war erfolgreich. Wie erwartet, führte die aversive Imagination (verglichen mit einer neutralen Imagination und mit keiner Imagination) zu einer Beschleunigung der Herzfrequenz (unkonditionierte Reaktion). Die Präsentation des CS+aversiv (verglichen mit dem CS+neutral und dem CS-) führte dagegen zu einer Verlangsamung der Herzfrequenz (konditionierte Reaktion). Soziale Ängste können folglich bereits durch Imagination gelernt werden.

P.559 - Weekly Dynamics Of Mental Resilience During COVID-19

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The COVID-19 pandemic has evolved from a physical health emergency into a crisis that also threatens mental health across the globe. Therefore, protective factors that can mitigate the consequences of stress exposure associated with this crisis need to be identified. Here, we investigated the dynamic process of resilience during the COVID-19 crisis using a longitudinal approach.Over six weeks of app-based assessments, participants reported stressor exposure, mental health problems, and resilience factors. Hypotheses were tested cross-sectionally at baseline (N=558) and longitudinally (N=200), using mixed effects models. Specifically, the design allowed us to ask whether the (stable) between-subject-effects also exist within a given individual, at contemporaneous and lagged time points.RFs at baseline were negatively associated with stressor reactivity, both cross-sectionally and prospectively. In the longitudinal analyses, RFs positive appraisal (of stressors generally and specifically of the Corona crisis) and general self-efficacy were negatively associated with stressor reactivity in a contemporaneous, but not lagged fashion.We identify psychological RFs which prospectively predict resilience and co-fluctuate with weekly stressor reactivity within individuals. The prospective results endorse that these associations do not exclusively reflect mood-congruency or other temporal bias effects. We further confirm an important role for positive appraisal in resilience.

P.565 - Effect Of Smartphone-based Heart Rate Variability Biofeedback On Mental Health, Attentional Control And Heart Rate Variability

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Poster Session 2

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Heart rate variability biofeedback (HRVBFB) has been shown to improve a wide range of emotional and cognitive outcomes, including stress, depression, anxiety, insomnia, and sports performance. However, in practice, this method is not widely used due to the cost and difficulty of operating biofeedback devices. While several smartphone apps promising similar functionality are already on the market, there are few scientific studies validating smartphone-based HRVBFB.In an ongoing study, we are investigating the validity of smartphone-based HRVBFB on a number of outcomes. Using a waitlist-control design, 40 participants are taking part in two or three laboratory sessions 4 weeks apart. Between two of the sessions, they practice HRVBFB for 5 minutes daily using an app based on the software development kit by Kenkou GmbH. The outcome measures taken before and after the training include depressive symptoms, premenstrual symptoms, stress, burnout symptoms, attentional control, and vagally mediated heart rate variability.Preliminary analysis (n = 16) shows a trend in the expected direction for all outcome variables for the before and after training comparison. Mixed models show a significant interaction effect, indicating greater improvement in depressive symptoms and vagally mediated HRV during the intervention than during the waitlist period. The study is preregistered on the Open Science Framework (osf.io/68fzq).

P.569 - Self-reported Chronic Stress in Schoolteachers is Not Associated with Cardiac Interoceptive Accuracy

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Poster Session 2

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Interoception, refers to the perception of organ activity and other bodily sensations. Chronic stress (e.g., high work burden), on the other hand, may result in a chronic dysregulation of physiological stress axes (e.g., hyper-secretion of cortisol or hyper-activity of sympathetic nervous system). Altered activation of physiological stress axes can result in changes in interoception, which could ultimately promote the generation of somatic symptoms. To clarify if cardiac interoception is affected by chronic stress, we investigated N=53 schoolteachers, who are at specific risk for being exposed to chronic work stress. As conscious perception of cardiac signals is reflected by the accuracy to correctly perceive one's own heartbeats (interoceptive accuracy/IAc), participants underwent a heartbeat counting task (HCT). We did not find an association between chronic stress (assessed via the Trier Inventory for Chronic Stress) and IAc (for all scales, $p>.05$). Our findings suggest that cardiac interoception is not altered by chronic stress. This may be due to the fact that many chronically-stressed teachers may not yet have clinically manifested stress disorders and associated symptoms. Furthermore, somatic symptoms may be limited to other organ systems than the cardiovascular system. As cardiac IAc in the HCT is affected by potential confounders, such as reporting strategies (e.g., estimation processes) and cardiodynamics (e.g., cardiac signal strength), future studies should focus on alternative methods to assess cardiac IAc. Finally, we suggest multi-method approaches (including cardiac modulation of startle and heartbeat-evoked potentials) to assess different stages of interoceptive signal processing in chronic stress.

P.620 - Cardioafferent Traffic Differentially Modulates The Horizontal And Vertical Simon Effect Independent Of Stress: Evidence From Behavior And Frontocentral EEG Activity

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Poster Session 2

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Stress leads to an increase in cardioafferent traffic via both humoral and neuronal pathways. Variations in cardioafferent traffic are relayed to the brain via arterial baroreceptors and have been shown to modulate sensorimotor processing. However, less is known about the cognitive-behavioral consequences of these effects and their role during stress. 30 participants performed three blocks of a combined horizontal and vertical Simon task, which is characterized by either sensorimotor or cognitive response conflicts, respectively. To assess the effect of stress and cardioafferent traffic, subjects were exposed to the cold pressor test (CPT) before each block and stimulus presentation was aligned to the cardiac cycle, targeting systolic versus diastolic phases i.e., high versus low cardioafferent activity. The CPT increased saliva cortisol, cardiovascular parameters, and subjective ratings of stress and arousal compared to the control condition. We found the expected Simon effect i.e., incompatible compared to compatible trials showed higher response times, lower accuracy, increased latency of the lateralized readiness potential, and an increased frontocentral N2. RT distributions of the horizontal and vertical Simon effect differed as expected, pointing to distinctive cognitive mechanisms. Interestingly, we found an increased horizontal and a decreased vertical Simon effect during systole compared to diastole independent of CPT condition. Stress led to a reduced N2, independent of compatibility and cardiac cycle phase. These results show how cardioafferent traffic differentially modulates sensorimotor and cognitive aspects of conflict processing. However, they do not suggest a particular role during stress.

P.621 - EEG During Cold Pressor Stress: Disentangling Somatosensory From Stress Related Processes

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Poster Session 2

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Stress is triggered by the hypothalamus which directly senses homeostatic challenges but is also receptive to threat signals originating from the limbic system, the occurrence of which is determined by higher-order processes tying arbitrary stimuli to potential threats. However, little is known about how exactly cortical processing participates in the brain's reaction to stress and how such effects could be me measured. While laboratory stressors offer the possibility to quantify cortical processing via EEG, disentangling procedural from stress-specific effects poses a major challenge. The widely used Cold pressor test (CPT), for instance, is characterized by a strong somatosensory component that may dominate EEG recordings and thus obscure the central-nervous processes of interest. Here, we leveraged the lateral specificity of somatosensory projections by repeatedly exposing 40 participants to unilateral left vs. right feet CPTs as well as the respective warm water control procedures, according to a within-subjects design. Each exposure was conducted under both eyes-open and eyes-closed conditions and lasted 3 minutes during which EEG was derived from electrodes contra- and ipsilateral to the respective side of stimulation. Cortisol, cardiovascular and subjective reactions were measured to quantify stress responses. The CPT induced substantial stress reactions across measures and independent of site of exposure. Compared to control, increases in beta-band power could be observed over bilaterally over parietal electrodes along with increases in fronto-central theta power, which were more pronounced over ipsi- than contralateral electrodes. These results may facilitate research on early central-nervous processes that are responsible for the emergence of stress.

P.625 - Inverse U-shape Relationship Between HR and Cognitive Performance During Stress

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Poster Session 2

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The Yerkes-Dodson law predicts an inverted U-shaped relationship between physiological arousal and task performance, with peak performance at intermediate arousal levels. Acute stress activates the sympathetic nervous system (SNS) which has been associated with attentional deficits, but conflicting results have been reported. The Paced Serial Addition Task (PASAT) is a challenging mental arithmetic task that assesses cognitive function, in particular divided attention and working memory. We hypothesized that the relationship between stress induced SNS activation and PASAT performance during stress follows the Yerkes-Dodson law. Seventy-three participants (pooled data from different studies in our lab) underwent a bilateral feet Cold Pressor Test (CPT) while being simultaneously challenged with PASAT. Performance was quantified as the percentage of correct responses. Heart rate (HR) served as a measure of SNS activity. Regression analysis revealed a quadratic relationship between PASAT performance and stress HR ($p<.001$), but not with HR reactivity. Thus, as predicted by the Yerkes-Dodson law, stress and/or SNS activity modulate cognitive performance following an inverse U-shaped relationship. The current finding results from a between-subject design. Additional within-subject data is still warranted.

P.631 - Akuter Stress Nach Perzeptuellem Herzwahrnehmungslernen Erhöht Die Interozeptive Genauigkeit in Der Herzschlagzählaufgabe, Aber Nicht in Der Herzschlag-Diskriminationsaufgabe

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Poster Session 2

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Akuter Stress in der Konsolidierungsphase kann das deklarative Gedächtnis verbessern. Es ist bislang unbekannt, ob auch perzeptuelles Lernen durch Stress in der Konsolidierungsphase beeinflusst wird. Diese Fragestellung ist deshalb relevant, da perzeptuelles Lernen z.B. bei Interozeption eine Rolle spielt, während eine veränderte Interozeption einen wichtigen Mechanismus für die Symptomentstehung bei Stress-bezogenen Krankheiten darstellt. Das Ziel dieser Studie war es daher, zu untersuchen, ob Herzwahrnehmungstraining (HWT) die interozeptive Genauigkeit (IG) erhöhen kann und ob akuter Stress in der Konsolidierungsphase diesen Lerneffekt verstärkt.Methoden: 99 gesunde Teilnehmer haben entweder ein HWT oder eine visuelle perzeptuelle Lernaufgabe (VPLA) absolviert und durchliefen danach entweder einen sozial-evaluativen Kaltwasserstresstest (SEKWT) oder eine Kontrollaufgabe (=4 Gruppen). Die IG wurde zu drei Messzeitpunkten mittels einer Herzschlagzählaufgabe (HZA) sowie einer Herzschlag-Diskriminations-Aufgabe (HDA) gemessen, d.h. vor dem Training, 30 Minuten nach SEKWT/Kontrollaufgabe und einen Tag später.Ergebnisse: Der SEKWT führte zu einem signifikanten Anstieg von Herzrate und Blutdruck. Die Gruppe, die sich dem HWT, sowie dem SEKWT unterzogen hatten, zeigte zudem einen signifikanten Anstieg der IG vom Messzeitpunkt 2 zu 3. Außerdem zeigte sich ein Anstieg der IG über die Messzeitpunkte der HZA, jedoch nicht der HDA.Schlussfolgerungen: Die Ergebnisse implizieren, dass das HWT die IG in der HZA erhöhen kann, sofern akuter Stress in der Konsolidierungsphase erlebt wird. Dieser Effekt könnte eine Rolle für die Symptomentstehung bei Stress-bezogenen Erkrankungen spielen. Weitere Untersuchungen müssen klären, warum diese Effekte auf IG in der HZA limitiert sind.

P.639 - Circadian and Homeostatic Modulation of Human Retinal Function: A Pilot Study

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Poster Session 2

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BackgroundDaily physiological and behavioural patterns are governed by two independent processes: an endogenous circadian rhythm and a sleep homeostat. The synchronisation of the circadian rhythm with the external environment depends on light cues that are processed by the retinohypothalamic pathway connecting the retina to the internal clock in the hypothalamus. Thus, visual input is a critical circadian signal. Based on evidence for time-of-day dependency in image-forming (e.g., luminance perception) and non image-forming functions (e.g., pupillary light response), we hypothesise that the sensitivity of the visual system may also be modulated by the circadian clock.MethodsIn a 16-hour protocol, we measured variation in early stages of visual processing in two healthy participants. Whilst staying in constant conditions, they provided repeated measures of ocular structures and functional mechanisms in 3-hour intervals. Pupillometry during exposure to chromatic light was used to address photoreceptor sensitivity, and psychophysical thresholds were determined with silent substitution stimuli to characterise variations in post-receptoral retinal mechanisms underlying luminance and colour perception. We collected salivary melatonin and core body temperature as biomarkers of circadian phase.Results DiscussionOur results suggest considerable intra- and inter-individual variability in eye physiology and visual function. Along with the procedural insights from the pilot study, these can inform experimental design and analysis of future studies aiming to disentangle circadian and homeostatic influences on retinal mechanisms. Thoroughly characterising circadian influences on visual functions has important implications for our understanding of the complex interplay between internal physiological processes and external environmental cues.

P.640 - Heart rate variability changes after an App-based stress-reduction training – a Pilot Study

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Poster Session 2

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Stress can result from an imbalance of external demand and internal resources. Self-related attitudes, e.g. "I have to be perfect" can increase perceived stress by greater demand to oneself. Therefore, approaching stress-reducing attitudes on the one hand, and avoiding stress-enhancing attitudes on the other hand should decrease perceived stress. We were interested if a four days App-based Approach and Avoidance Modification Training [AAMT] of stress-associated attitudes can reduce perceived stress and enhance heart rate variability (HRV) and entropy as a biomarker of resilience. Since conventional motoric methods to approach or avoid were arguable in AAMTs, we applied emotional actions for approaching/avoiding. Twenty-four participants with high subjective stress trained to approach stress-reducing attitudes by acting with a positive emotion. Avoidance of stress-inducing attitudes was reached by acting with a negative emotion. Breathing rate and heart activity was measured on the first day (pre) and after the training on the fourth day (post) during a three minutes resting phase. Psychophysiological data was determined contactless via a highly innovative radar device. Frequency-domain und entropy analysis of HRV can provide insight in sympathetic-parasympathetic and other effects on heartbeat regulation. After four days of App-based stress-reduction training, participants showed a reduced subjective stress level. Proportion of high frequency HRV and entropy was increased after training. This refers to an enhanced parasympathetic impact and greater complexity of heartbeat influencing system after our App-based AAMT of stress-associated attitudes and may indicate an increase in stress resistance.

P.641 - Herzfrequenzmessung zur Erforschung des Einflusses von Gleichaltrigen auf die Emotionsregulation bei Vorschulkindern

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Poster Session 2

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Welche Rolle spielen Gleichaltrige für die Emotionsregulation von Vorschulkindern? Bisher wurden bei der Forschung zu Emotionsregulation im Kindesalter hauptsächlich Eltern und Fachkräfte als soziale Einflussfaktoren untersucht. Ab dem Eintritt in Betreuungsangebote bilden aber auch Gleichaltrige (Peers), einen wichtigen Teil des sozialen Erfahrungsraumes. Emotionsregulation kann bei Kindern im Vorschulalter noch nicht differenziert verbal erfasst werden und physiologische Messungen sind unverzichtbar.Um den potentiellen Effekt eines Spielpartners auf die Emotionsregulation eines Kindes zu untersuchen, verwendete diese Studie das Social Relations Model nach Kenny La Voie (1984). Pulsmessungen, Videobeobachtungen sowie Eltern- und Fachpersonenfragebögen wurden eingesetzt, um Emotionsregulation zu messen. Etwa 100 Schweizer Spielgruppenkinder (2-5 Jahre, Datenerhebungen laufen noch) spielen nach dem Round Robin Design jeweils zu zweit in halbstandardisierten Spielsituationen. Als Referenz wurden in Einzeltestungen Emotionswissen und -ausdruck erfasst. Um einen Einfluss auf die Emotionsregulation abzubilden, soll die Synchronizität der Herzraten während der Spielsituationen mithilfe von Wavelet Coherence Analysen abgebildet werden. Erste Ergebnisse werden präsentiert und diskutiert. Die Ergebnisse sollen in weiterführender Forschung dazu verwendet werden, effektive Einflussstrategien von Peers zu identifizieren und fördern.

P.426 - Is Heart Rate Synchrony in Romantic Couples Related to Adult Attachment Style and Acute Stress?

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Heart rate synchrony (HRS) is the temporal alignment or correspondence in changes in heart rate between two or more interaction partners, and has been found in different relationships and contexts. HRS in romantic couples depends on various trait and situational factors. Here, we investigate whether being exposed to acute stress influences HRS between partners. As adult attachment style (AAS) has been shown to influence physiological stress responses as well as relationship dynamics in general, we hypothesize that there is an interaction between AAS and stressor exposure to predict HRS in romantic couples. To test these hypotheses, we collected data from 150 participants (75 couples; mean age=22.69 (SD=2.97), 52% female). Partners were separated upon arrival at the lab. For half (N=38) of the couples, one partner underwent a stress induction through the Socially Evaluated Cold Pressor Task while the other partner underwent a nonstressful control task. For the other half of our sample, both partners completed the control task. Afterwards, partners were re-united and completed a silent synchronization task, where they were instructed to empathize with the other person. Heart rate measurements were obtained throughout using Polar(tm) sensor based electrocardiograms. We calculated HRS between partners using cross-wavelet power and coherence. AAS was assessed using the Experiences in Close Relationships questionnaire. Results will be presented at the conference. The findings will allow insights into how traits and experiences in close relationships shape inter-personal interactions.

P.432 - Translation and validation of a German version of the Oxford Utilitarianism Scale: impact of COVID-19 pandemic

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In this study, we have translated and validated a German version of the Oxford Utilitarianism Scale (OUS-DE). The scale consists of two subscales: Impartial Beneficence (IB) and Instrumental Harm (IH), representing both positive and negative dimensions of utilitarian moral theory, respectively. We conducted validation and cross-validation procedures in two independent samples (N = 378 and N = 348) pre and post Covid-19 pandemic. Confirmatory Factor Analysis (CFA) demonstrated a good fit of a two-factor model for OUS-DE, while internal consistency and construct reliability were found to be acceptable in both samples. Sex differences emerged in both samples, with women scoring significantly higher in the IB subscale than men. We also found a time effect when comparing the IB subscale means between pre- and post-pandemic samples: agreement with IB subscale decreased after the pandemic. In a separate third sample (N = 39), we observed an inverse U-form relationship between moral behaviour related to quarantine requirements and IH subscale, as measured during the peak pandemic restrictions in late 2020. Repeated OUS-DE measurement in this sample showed stability in responders' utilitarian inclinations post-pandemic (early 2023). In conclusion, OUS-DE is the first available measurement of utilitarian inclinations in German language. Our results demonstrate relative stability of the scales, which is appropriate for a trait measure. The scale is well-suited to enable further research on how utilitarian preconceptions affect behaviours in German population.

P.457 - Interactions Within the Social Brain: Co-Activation and Connectivity Among Networks Enabling Empathy and Theory of Mind

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Poster Session 2

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Empathy and Theory of Mind (ToM) have classically been studied as separate social functions. However, recent advances demonstrate the need to investigate the two in interaction: naturalistic settings often blur the distinction between affect and cognition and demand the simultaneous processing of such different stimulus dimensions. This meta-analytic connectivity modeling study investigates how empathy and ToM-related brain networks interact in contexts wherein multiple cognitive and affective demands must be processed simultaneously. Building on the findings of a recent meta-analysis and hierarchical clustering analysis, we perform meta-analytic connectivity modeling to determine patterns of task-context-specific network changes. We analyzed 140 studies, including classical empathy, ToM tasks, and complex social tasks.Co-activation networks associated with classical empathy (e.g., insula, supramarginal gyrus, inferior frontal gyrus) and ToM studies (e.g., precuneus, angular gyrus, medial prefrontal cortex) corresponded well with previous descriptions of empathy and ToM neural networks. Interestingly, for studies at the intersection of empathy and ToM, neural co-activation patterns included areas typically associated with both empathy and ToM (e.g., anterior insula, precuneus, medial prefrontal cortex, anterior cingulate cortex).Network integration is discussed as a means of combining mechanisms across unique behavioral domains. Such integration may enable adaptive behavior in complex, naturalistic social settings that require simultaneous processing of various affective and cognitive information.

P.465 - Testing for Grid-Like Activity in Human Prefrontal Cortex during Social Navigation

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Poster Session 2

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Humans navigate complex social environments. To do so, they often use personality traits when thinking about themselves and others. Thinking about personality traits reliably and robustly activates medial prefrontal cortex. However, the underlying neural coding principles are unknown. Here, we tested whether coding principles that have been described for navigation in physical (Doeller et al., 2010; Bellmund et al., 2018) and conceptual spaces (Constantinescu et al., 2016; Schafer Schiller, 2018) play a similar role for navigating a "personality trait space." That is, we tested whether a grid-like, hexagonal activity pattern—which has been identified in the medial prefrontal cortex for moving in physical and conceptual spaces—relates to navigating a personality trait space. In a preregistered study (https://osf.io/pxs7m), we collected behavioral and fMRI data on two consecutive days. In the scanner, participants (total n=42; final n=36) saw moving bars that corresponded to ratings on two orthogonal personality traits (diligent and generous). In a series of behavioral tasks, we found that participants learned the positions of six individuals in this two-dimensional space, without being aware that these six individuals could be located in such a space. Participants memorized these learned positions and were able to generalize them to related personality traits. Furthermore, participants could use this personality trait space to position their friends. However, we have not found evidence for grid-like activity in the medial prefrontal cortex by using the preregistered fMRI analyses. We will discuss reasons why results from previous tasks may not generalize to our task.

P.471 - Loss Avoidance Can Increase and Decrease Cooperation

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Poster Session 2

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Decisions in social dilemmas lead to outcomes for oneself and others. These outcomes can be gains or losses. In non-social decision-making there is a vigorous debate whether people decide differently when the outcomes are gains or losses. This debate is not settled, is not rigorously applied to social situations, and mainly focuses on one aspect, loss aversion (minimizing losses), while neglecting another crucial aspect, loss avoidance (avoiding losses entirely). Thus, we have a limited understanding of how losses and gains affect social decisions. We systematically varied whether the outcomes of social dilemmas (Prisoner's Dilemma, Stag-Hunt, Chicken) were losses, gains, or combinations thereof. Across 7 experiments (4 preregistered; N Offline = 197, N Online = 1,653), participants consistently tried to avoid losses altogether (loss avoidance), but they did not try to minimize losses (loss aversion). If cooperation avoided losses, people cooperated more, if defection avoided losses, people defected more, even if this imposed a loss on someone else. Loss avoidance was larger for one-shot than for iterated games and was present in all games studied. Our results suggest that loss avoidance, rather than loss aversion, systematically influences how people cooperate. Further, our findings align with research from ecological and moral decision-making, suggesting that loss avoidance might be a generic principle of human decision-making.

P.501 - Steady State Visual Evoked Potentials Correlates Of Psychopathic Personality Traits

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Poster Session 2

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Attentional preference for emotional facial expressions can be reflected in steady-state visual evoked potentials (ssVEPs), which are representations of frequencies of attended stimuli in the EEG signal. As psychopathic personality has been related to reduced arousal responses to emotional facial expressions as well as less attentional distraction by fear-provoking emotional cues, but also attentional bias towards angry facial expressions, this preregistered study investigated the relationship between ssVEPs in response to angry, fearful and neutral facial expressions.We included 63undergraduate students assessed with the Psychopathic Personality Inventory Revised (PPI-R-40). Pairs of facial expressions were presented, one flashing at 15Hz, one at 20Hz. Across 6 (pairings of angry, fearful and neutral expressions) *64 trials, ssVEPs from occipital electrodes (O1-Oz-O2) were averaged for 100-2900ms after stimulus onset.Results show that sub-facets of psychopathy were not significantly associated with an attentional bias toward any of the assessed facial expressions when considered separately. However, exploratory analyses indicated that interaction effects of Fearless Dominance and Self-Centered Impulsivity might explain null effects for separate models: Individuals high in Fearless Dominance showed less attention toward fearful faces but more toward angry faces only at low levels of Self-Centered Impulsivity. This suggests that investigations of attentional biases in psychopathy using ssVEPs need to include interaction effects in planned analyses.

P.508 - Neuronal Responses Towards Social Feedback Depending On Self-congruence, Sender Expertise And Feedback Expectation: An EEG Study

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Poster Session 2

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Social feedback is fundamental to our social lives and influences our decisions and actions in many ways. In healthy participants, feedback integration is constrained by our desire for coherence and positivity.One line of neuroscientific research examined feedback expectancy, showing that unexpected rejection specifically increases the so-called Feedback Related Negativity (FRN). Another line of research that examined evaluative trait feedback demonstrated increased early and late for both negative and positive feedback that can be further modulated by sender characteristics (e.g., ascribed expertise).In a novel paradigm, we combined expectancy and self-congruence of evaluative trait feedback to enable learning about specific sender behaviour. While EEG recording, feedback was sent by supposed experts or peers, who provided overly positive or overly negative feedback. We tested how feedback expectations changed by learning about sender contingencies and how this affected self-view updating processes. We further examined behavioural and neuronal responses to feedback that were either congruent or conflicting with the self-view. Our findings show that both sender and feedback characteristics modulated early and late ERP responses. Importantly, we separated feedback expectancy from self-view violations, showing an increased FRN for positive rather than negative self-incongruent feedback. Therefore, our findings highlight the need to dissect those different aspects of social feedback and contribute to a better understanding of social information processing.

P.523 - Individuals With High Stress Levels During A Laboratory Stressor Show Increased In-Group Favoritism And Out-Group Derogation

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Although psychosocial stress keeps increasing in society, the conditions under which stress facilitates ("tend and befriend") or hinders ("fight or flight") prosocial behavior remain unclear. Given that social interactions often occur in inter-group contexts, it is particularly relevant to understand how stress affects social behavior towards individuals of the same (i.e., in-group) or different (i.e., out-group) social groups. Here, 130 male members of natural social groups (holding a positive or negative attitude towards refugees) experienced either acute psychosocial stress (n = 65) or the control condition (n = 65) of the Trier Social Stress Test for Groups. Participants then engaged in an incentivized inter-group resource allocation game, which enabled us to disentangle four behavior types: universal prosociality (benefiting all individuals), "weakly" parochial prosociality (in-group benefiting), "strongly" parochial prosociality (in-group benefiting plus out-group harming), and egoism (benefiting only oneself). Overall, participants' social behavior during acute stress was indistinguishable from that of participants in the control condition. However, individuals with higher subjective stress levels exhibited reduced universal prosociality in favor of increased both in-group benefitting and out-group harming behavior. Those individuals also released more cortisol and made more negative stress appraisals (e.g., experiencing more threat and less control). Our findings suggest that it is not the stress exposure per se, but an individual's stress appraisal that modulates social behavior. Moreover, higher stress levels seem to be associated with a selective "tend and befriend" pattern towards in-group members, as well as a "fight or flight" pattern towards out-group members.

P.535 - Basal Endocannabinoid Plasma Levels in Chronic Non-Medical Prescription Opioid Users and Its Link to Social Exclusion

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Poster Session 2

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The U.S. is suffering from a persistent opioid epidemic emphasizing the need for a better understanding of the neurobiological mechanisms underpinning opioid use disorder. Recent preclinical and clinical evidences suggest that the endocannabinoid system (ECS), including the main endocannabinoids 2-arachidonylglycerol (2-AG) and anandamide (AEA) and the structurally related N-acylethanolamines oleoylethanolamide (OEA) and palmitoylethanolamide (PEA), plays a key modulatory role in stress response and reward behavior, both crucially involved in the development of substance use disorder (SUD). Although recent animal models postulate a link between ECS and SUD, human translational studies are lacking yet. Thus, we tested previous preclinical findings by investigating plasma endocannabinoids in chronic non-medical prescription opioid users (NMPOU) and its association with laboratory-induced social stress. We compared basal 2-AG, AEA, PEA, and OEA plasma concentrations between chronic NMPOU (n=21) and opioid-naïve healthy controls (n=29). Correlations between endocannabinoid levels and social stress, induced by social exclusion using the Cyberball task, were analyzed. We found significantly elevated AEA, OEA, and PEA plasma levels in NMPOU compared to controls, but no differences in 2-AG. Within NMPOU, higher AEA levels were associated with lower perception of social exclusion. Together with our recent findings of elevated basal 2-AG plasma levels in dependent cocaine users, present results indicate substance-specific alterations of the ECS suggesting different pharmaco-therapeutic targets within the ECS as novel treatments of SUD. Moreover, elevated AEA in NMPOU might have protective effects against social stress, which may explain early results reporting stress relieving effects of opioids to social exclusion/isolation in animals.

P.562 - Is the Bad Apple or the Bad Basket to be Blamed? Distinguishing the Role of Rational Self-interest and Conformity During the Contagion of Dishonesty

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Poster Session 2

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Learning from others' dishonesty usually involves various motivations, such as the desire to pursue self-interest (rational self-interest propensity) and the tendency to conform to a dishonest group norm (dishonesty conformity). However, these different processes have rarely been dissociated, which impedes our understanding of how an individual dishonest act propagates in a community. We built a comprehensive model based on the framework of reinforcement learning (RL) to depict both processes and examine their roles when people learn to act dishonestly. With an agent-based simulation and empirical studies with samples of diverse cultural backgrounds (N=2349), we found that rational self-interest propensity was the primary driver of the propagation of dishonest behaviors. In contrast, the effect of dishonesty conformity was conditional and context-dependent. With an fMRI experiment, we found distinct networks underline dishonesty conformity when it serves different goals. Additionally, the rational self-interest propensity and dishonesty conformity were implemented by various brain circuits. In the background of the COVID-19 pandemic, where public coordination is in high demand but at the cost of self-interest, we found that these two processes of dishonesty exerted discrepant effects on residents' attitudes toward local epidemic controls and impacted the prevalence of pathogens unevenly.

P.591 - Longing for a Lost Connection: Associations Between Loneliness and Yearning for a Romantic Ex-Partner During Covid-19 Lockdown

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Background: Yearning for an ex-partner is common after romantic breakup and loss. Amongst others, it is linked to depression, anxiety, and complicated grief, showing its direct clinical relevance. It has been proposed that the subjective feeling of disconnectedness, e.g., loneliness, might increase yearning. The aim of our study was to analyze associations between loneliness and subsequent yearning in the general population during times of extreme social isolation.Methods: Self-report data were collected both during initial lockdown in 2020 (timepoint 1) and one year later (timepoint 2). At timepoint 1, participants filled out demographic characteristics and the UCLA loneliness scale. One year later, they additionally answered a questionnaire on yearning (Yearning in Situations of Loss Scale) together with characteristics of the breakup. Multiple regression analyses are being conducted to analyze the associations between lockdown loneliness (timepoints 1 2) and yearning while controlling for age, sex, current relationship status and characteristics of the breakup.Results: Statistical analyses are currently being conducted. The results will be presented at the conference.Discussion: Results of this project can help identify risk groups who have difficulties in adapting to a breakup or loss. This might serve as a basis for interventions to improve well-being of lonely individuals and help prevent long-term psychological impairments.

P.595 - Early Visual Processing Of Social Content And Emotional Valence: A Combined EEG And Eye-tracking Study

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To cope successfully with the complexity of our immediate environment, our brains have developed mechanisms to prioritise the most relevant information from the abundant stream of incoming stimuli. While emotionally evocative stimuli were initially thought to be most relevant to our survival throughout the lifespan, more recent accounts also emphasise the intrinsic relevance of social information. The exact neural mechanisms underlying the rapid attentional capture of emotionally and socially relevant stimuli are not yet fully understood. The present study aimed to further disentangle the temporal dynamics of social and emotional relevance processing during the perception of complex visual scenes by combining ERPs with eye-tracking measures. 24 participants viewed images of complex visual scenes varying in social and emotional content while simultaneously undergoing EEG and eye movement recordings. We implement single-trial linear mixed model analyses of ERP amplitudes (P1, EPN, P300, LPC) and eye-movement metrics (saccade latency and amplitude, number and duration of fixations). In addition, our analyses take into account the physical saliency, complexity and content relevance of the images. Although data analysis is ongoing, preliminary results show an early processing bias towards social content in positive pictures, followed by a long-lasting effect of negative stimulus valence independent of social content. Our study supports the important role of emotional but also social content at an early perceptual stage of visual processing, which could be explained by the crucial role of sociality in the evolution of the human social brain.

P.609 - The Influence Of Gonadal Hormones And Stress On Social Hierarchy Learning In Young Adults

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Poster Session 2

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Social hierarchies are ubiquitous in human societies, and navigating them is particularly important for young adults. While stress appears to play a critical role in learning and maintaining social dominance hierarchies, the underlying mechanisms, including their modulation by gonadal hormones, are less clear. We examined neuroendocrinological mechanisms underlying social hierarchy learning in 18- to 25-year-olds. So far, we have recruited 70 out of 75 participants (men, women in the luteal phase, and women taking hormonal contraceptives). Morning levels of estradiol, testosterone, progesterone, and allopregnanolone were analyzed from saliva samples. Participants underwent the Trier Social Stress Test or a neutral control on two consecutive days in a balanced order. Afterwards, they completed a computer-based social hierarchy learning task. Preliminary analyses showed that estradiol, progesterone, and allopregnanolone predicted higher post-stress cortisol, yet only in women in the luteal phase. Stress led to a trend-wise impairment of social hierarchy learning. Further, it significantly changed the learning strategy: As expected, stressed participants preferred the relatively weaker over the stronger opponent, suggesting that they avoided a social challenge in the stressed state. This effect was driven by the women with hormonal contraception. While estradiol appeared to promote the selection of the relatively superior opponent during stress, allopregnanolone had a contrasting impact, particularly in women in the luteal phase. Avoiding competition is effective in the task as a strategy to maximize total gain. Still, it may contribute to worsening subjective social status in people under constant stress or promote psychopathology.

P.616 - Preliminary Evidence for a Dynamic Organization of Autonomic Defensive Responses to Social Threat

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In constantly changing environments, a dynamic organization of defensive responding is a prerequisite for survival. Indeed, autonomic defensive responses have been found to adapt to the imminence of a threat and availability of escape options. Formalized as the defense cascade model, it was shown that an approaching inevitable threat (e.g., electric shock) elicits a state of parasympathetically-dominated attentive immobility, marked by increasing cardiac deceleration and skin conductance. However, if the threat can be actively avoided, the organism is under growing sympathetic control, indicated by cardiac acceleration and even more increased skin conductance.In the current pilot study, we tested whether such dynamic organization of autonomic defensive responding also applies to the social domain. Twenty-one healthy participants underwent a novel social defense cascade paradigm, in which increasing social threat imminence was operationalized by pictures of neutral faces, that gradually changed to full-blown angry expressions accompanied by auditory negative devaluations. In half of the trials, participants could actively avoid the auditory social threat by a fast button press, while in the other half of trials social threat was inevitable.In line with prior research using electric shocks, we found that cardiac deceleration and moderate increases in skin conductance defined the defensive response pattern when participants were exposed to approaching inevitable social threat. If social threat was avoidable, however, cardiac deceleration switched to acceleration when threat was most imminent, accompanied by a profound increase in skin conductance.These preliminary results suggest dynamic defensive responding to approaching social threat, extending the defense cascade model.

P.643 - An Active Inference Approach To Second-Person Neuroscience

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Social neuroscience has often been criticized for approaching the investigation of the neural processes that enable social interaction and cognition from a passive, detached, third-person perspective, without involving any real time social interaction. With the emergence of so-called second-person neuroscience, investigators have evinced the unique complexity of neural activation patterns in actual, real-time interaction. Social cognition that occurs during social interaction is fundamentally different to that unfolding during social observation. However, it remains unclear how the neural correlates of social interaction are to be interpreted. Here, we leverage the active inference framework to shed light on the mechanisms at play during social interaction in second-person neuroscience studies. Specifically, we show how counterfactually rich mutual predictions, real-time bodily adaptation, and policy selection explain activation in the default mode, salience, and frontoparietal networks of the brain, as well as in the basal ganglia. We further argue that these processes constitute the crucial neural processes that underwrite bona fide social interaction. By placing the experimental approach of second-person neuroscience on the theoretical foundation of the active inference framework, we inform the field of social neuroscience about the mechanisms of real-life interactions. We thereby contribute to the theoretical foundations of empirical second-person neuroscience.

P.648 - Is Your Avatar Real? Cortical Speech Tracking Investigation of Lip Movements in Virtual Environments

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Poster Session 2

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Facial expressions and lip-movements aid speech comprehension, especially in challenging listening scenarios. We used virtual environments (VEs) in combination with mobile electroencephalography (EEG) to study the cortical tracking of ongoing speech. Specifically, we compared cortical tracking for videos showing real speakers with videos showing their virtual avatars. We predicted better cortical speech tracking for real speakers, and a benefit of lip movements as compared to lip-masked conditions, in particular in the presence of background noise.Using the toolbox for acoustic scene creation and rendering (TASCAR) VE, 20 participants were presented audio-visual scenes comprising one out of six speakers at a time, telling unscripted stories. Videos showed real speakers or their virtual avatars with visible lip movements or a masked mouth. Listening difficulty was manipulated by comparing speech with and without babble noise. Additionally, auditory and visual only conditions were included. Conditions changed in a pseudo-randomized order every 30s while the story naturally unfolded. Cortical tracking of speech was used as dependent variable and derived from concurrent mobile EEG recordings.Preliminary results confirmed higher cortical speech tracking for the audio-visual scenes with lip movements compared to the unisensory conditions. This effect was present for the real speaker conditions but absent for the avatar conditions. Interestingly, the masked mouth condition performed comparable to audio-only for real speakers, while lip movements of virtual speakers resulted in lower speech tracking. Our results demonstrate the value of cortical speech tracking measures for the development and validation of realistic VE communication scenarios.

P.448 - On How To Use Observed Outcomes For Learning: Evidence From Three Developmental Studies

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Observational learning (i.e., learning from others' choices and outcomes) allows us to reduce the potential risks of individual trial-and-error learning and with that serves as an important ontogenetic mechanism. However, little is known about its underlying computational mechanism across development. In three independent studies, with in total 84 8-10 years olds and 53 18-30 years olds, we studied developmental differences in observational learning (as compared to individual learning) in a two-alternative forced choice task using reinforcement learning (RL) models. Across observational and individual learning, children showed more decision noise and performed less accurate than adults. However, children benefitted in performance to the same extend as adults from observational learning (compared to individual learning). RL modeling results also indicated that children used more complex learning strategies for observational learning, similarly to adults, but not when learning individually. To reach this comparable performance as adults, children slowed down their reaction times and showed less decision noise during observational learning as compared to individual learning. The current findings pave the way for a better understanding of the underlying computational mechanism of observational learning across development.

P.450 - How Childhood Emotional Abuse Shapes the Social Brain in Adulthood – The EmoCort Study on Neural Profiles of Childhood Maltreatment Subtypes

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Poster Session 2

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Previous studies suggest that a history of childhood maltreatment can have different, long-lasting effects on the structure and function of the adult brain specifically depending on the type of maltreatment (emotional, sexual, or physical abuse). The present study aims to characterize the neurocognitive profile of individuals who suffered from emotional abuse (EA). Previous research suggests that EA is associated with altered structure and function in cortical midline structures (CMS), brain regions associated with social cognition and self-referencing, as well as impaired performance in social cognitive tasks. N = 28 women with a history of EA and a control group matched for age and socioeconomic status performed a self-referential task during functional magnetic resonance imaging (fMRI) designed to activate the CMS. Furthermore, empathy and theory of mind were assessed using the movie for the assessment of social cognition (MASC) and the multifaceted empathy task (MET). Preliminary results support the view of a specific neurocognitive profile of women with a history of EA. By including behavioral measures of social cognition, behavioral avoidance of social situations in everyday life and social anxiety, the present study yields an explanatory model on the pathways by which EA modulates the functioning of the social brain longitudinally. The knowledge gained from this study aids our understanding of the physiological risk factors of psychopathologies associated with EA, including persistent affective disorders.

P.466 - Differential Predictability Of Cognitive Profiles From Brain Structure In Older Males And Females

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Structural brain imaging parameters may successfully predict cognitive performance in neurodegenerative diseases, but mostly fail to predict cognitive abilities in healthy older adults. One important aspect contributing to this might be sex differences. Behaviorally, older males and females have been found to differ in terms of cognitive profiles, which cannot be captured by examining them as one homogenous group. In the current study, we examined whether the prediction of cognitive performance from brain structure, i.e. region-wise grey matter volume (GMV), would benefit from the investigation of sex-specific cognitive profiles in a large sample of older adults (1000BRAINS; N= 634; age range 55-85 years). Prediction performance was assessed using a machine learning (ML) approach. Targets represented a) a whole-sample cognitive component solution extracted from males and females, and b) sex-specific cognitive components. Results revealed a generally low predictability of cognitive profiles from region-wise GMV. In males, low predictability was observed across both, the whole sample as well as sex-specific cognitive components. In females, however, predictability differences across sex-specific cognitive components were observed, i.e. visual working memory (WM) and executive functions showed higher predictability than fluency and verbal WM. Hence, results accentuated that addressing sex-specific cognitive profiles allowed a more fine-grained investigation of predictability differences, which may not be observable in the prediction of the whole-sample solution. The current findings therewith not only emphasize the need to further investigate the predictive power of each cognitive component, they also emphasize the importance of sex-specific analyses in older adults.

P.474 - How Adverse Childhood Experiences Get Under The Skin: A Systematic Review, Integration And Methodological Discussion On Threat And Reward Learning Mechanisms

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Exposure to adverse childhood experiences (ACEs) is a major risk factor for the development of behavioral, somatic and psychopathological conditions. Learning is the central mechanism through which environmental inputs shape emotional and cognitive processes as well as behavior. In this review, we lay out a systematic and methodological overview and integration of the impact of ACEs on threat and reward learning processes in experimental paradigms based on systematic literature (following PRISMA guidelines) which resulted in a total of 66 studies (threat: N=36, reward: N=29). Across the threat and reward learning fields, we observed a converging pattern of blunted learning in individuals exposed to ACEs independent of sample characteristics, ACE subtypes and outcome measures. Specifically, blunted threat learning was reflected in reduced discrimination between threat and safety cues, primarily driven by blunted responding to threat cues, while attenuated reward learning manifested in reduced accuracy and learning rate. Importantly, this pattern emerged despite substantial heterogeneity in ACE assessment and operationalization. we conclude that blunted threat and reward learning may represent two mechanistic routes by which ACEs may become biologically embedded and ultimately increase the risk for psychopathology. In closing, we discuss potentially fruitful future directions for the research field, including methodological and assessment considerations.

P.485 - Effects Of Early Life Adversity On Physiological And Psychological Relaxation In Response To Breathing Relaxation Interventions

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Personal regeneration and restoration are important for mental and physical health. Early life adversity (ELA) is associated with psychological and physiological diseases. The current study tested whether impairments in the physiological and psychological relaxation response might be systematically linked with ELA.We exposed subjects to a 7-minute paced breathing intervention (5s inhale, 5s exhale), with and without a virtual reality component (forest in the background). We assessed physiological relaxation via the root mean square of successive differences (RMSSD) and psychological relaxation via the Relaxation State Questionnaire (RSQ). 48 healthy participants (meanage=23.51±0.30, 50% female) completed both interventions, in counterbalanced order. To assess ELA participants completed the parental bonding instrument (PBI). 19 subjects (39.58%) could be characterized as suffering from a form of ELA.A mixed model ANOVA showed a significant main effect of time for RSQ ($F(1,90)=39.73$, $p<0.001$) and RMSSD ($F(3,270)=20.05$, $p<0.001$), but no effect of the type of breathing intervention. Looking at the influence of PBI, we found a main effect of paternal overprotection for RSQ ($F(1,88)=6.78$, $p<0.01$) as well as RMSSD ($F(1,88)=8.62$, $p<0.01$). For RMSSD we additionally found a main effect of maternal overprotection ($F(1,88)=8.84$, $p<0.01$), and an interaction of time and maternal overprotection ($F(3,264)=3.43$, $p<0.05$). Post-hoc tests for all ANCOVAs revealed an association between lower RSQ and RMSSD values and higher maternal and paternal overprotection.The results suggest an increase in physical and psychological relaxation in reaction to a relaxation intervention and a blunting of the physiological and psychological relaxation response in subjects with specific forms of ELA.

P.536 - The Impact of Inhibitory Control on the Acute Stress Response Comparing Young and Older Adults

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Poster Session 2

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Inhibitory control is a core executive function. It involves our ability to think before we act and allows an individual to control their automatic impulses. Executive functions are a mechanism of the prefrontal cortex, which is highly stress sensitive. Research suggests that executive functions positively influence the stress response, with higher executive functions supporting a more successful stress regulation, but it is unclear if that is also the case in older age.To investigate this, healthy young (18-30 years) and older participants (65+ years) were asked to perform two inhibitory control tasks (Stroop-Color-Word task and Go/Nogo task) and were then assigned to a stress condition (Trier Social Stress Test) and to the control condition in counterbalanced order in a two-session design. Cardiovascular parameters and self-reported stress were used as indices for the stress response.First analyses suggest that better inhibitory control is associated with less agitation for the TSST condition in both, young and older adults. While the relationship between response inhibition and the stress response seems to be age-unrelated, preliminary results suggest an age-depended impact of interference control on the physiological stress response.Since cognitive decline comes with age, older people may be more affected by stress, this could be counterbalanced by training executive functions.Therefore, these results highlight the importance of inhibitory control and suggest the possibility that enhancing executive function may improve stress management.

P.636 - Cognitive Modulation Of Pain By Attention: The Role Of Executive Functioning In Aging

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Poster Session 2

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Attention is acknowledged as an effective strategy to modulate pain, as shown by various studies of acute and chronic pain. Here executive functioning (EF) plays a key role, with poorer EF related to less successful inhibition of pain, both relying on the prefrontal cortex (PFC). With age, structural and volume changes in the PFC are accompanied by age-related cognitive decline. So far, only a few studies investigated how age-related cognitive decline affect cognitive distraction from pain.In a two-session design, healthy young (18-30 years) and older participants (60+ years) performed four EF tasks shown to either reveal age-related cognitive decline or not. Afterwards, participants performed a pain distraction task, a n-Back working memory task with low and high cognitive load, during which participants received individually adjusted transdermal electrical pulse trains in non-painful and moderately painful intensities to the inner forearm. Participants rated them regarding their intensity and unpleasantness. Stimulus-related (EF tasks) and pain-related evoked potentials were recorded with a 64-channel EEG.Preliminary results suggest a similar effective subjective pain relief during high and low working memory load in both age groups, which is reflected in a similar reduced N1-P2 pain-related ERPs in older but not in younger participants. However, including executive functioning showing age-related cognitive decline, revealed less successful pain reduction in the high working memory load condition in older adults. These findings could lead to a better understanding how to adapt pain treatments in the older population by including selective cognitive trainings, optimizing pain modulation settings.

P.159 - Biopsychological alterations in work-related burnout: Main findings from the Regensburg Burnout Project

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Background: Previous studies on biopsychological alterations in burnout often revealed inconsistent results, probably due to the heterogeneity of selected samples. Accordingly, the Regensburg Burnout Project followed a multi-methodological approach to investigate biopsychological differences between a conceptually strictly specified group of individuals suffering from the burnout syndrome (BO group) and a healthy comparison group (HC group).Methods: After a multi-stage recruitment procedure with strict inclusion criteria based on burnout symptomatology and pathogenesis, groups were compared regarding an index of allostatic load (AL) and hair cortisol concentrations (HCC) at two measurement time points (t1 and t2 7 months apart) as well as regarding salivary cortisol and neural responses to acute psychosocial stress (ScanSTRESS).Results: First, the BO group showed significantly higher AL-scores in comparison to the HC group at both time points. Second, in terms of HCC, cross-sectional analysis revealed no association between burnout and HCC in the total sample. When the analysis was restricted to the BO group, HCC was positively associated with burnout symptoms at t1, but not at t2. Additionally, burnout symptoms at t1 were a significant negative predictor of HCC at t2. Third, no group differences emerged in terms of cortisol responses to acute stress. Fourth, neural responses did also not differ between groups in general, but the HC group showed a more pronounced decreasing activation over stress exposure time within a striato-limbic cluster.Conclusions: Although the findings from the Regensburg Burnout Project indicate that burnout comes along with various biopsychological alterations, respective results remain partially inconclusive.

P.209 - Does Dorsolateral Prefrontal Cortex Activation During Working Memory Performance Predict Therapeutic Success in Patients with Psychosis?

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Impairments in cognitive function are common among patients with psychosis and are accompanied by aberrations in fronto-parietal activity. While neurocognitive abilities have already been linked to therapeutic success, it remains unclear whether neural activity may predict patients' response to psychiatric treatment.Thirteen inpatients with psychosis and eight healthy controls (data collection ongoing) performed the Callicott N-Back task during functional magnetic resonance imaging. We compared neural activation during 2-back and 0-back conditions, both within- and between-groups. Further, we computed dorsolateral prefrontal cortex (dlPFC)-activation in the psychosis group and correlated it to therapeutic success, measured as the difference in positive and negative symptom severity and social functioning at discharge from and on admittance to a psychiatric ward. fMRI data was acquired with a 3 T Siemens Syngo and was analyzed with SPM 12.Preliminary whole-brain analyses show activation in the bilateral anterior and mid cingulate gyri, anterior insula, cerebellum, parietal and dorsolateral prefrontal cortices and in the right pallidum. No significant differences in working memory performance, reaction times or brain activation were found between groups. Bilateral dlPFC activation, however, predicted positive symptom remission and increases in social functioning, but was not related to negative symptoms.First analyses indicate that dlPFC activation during working memory performance predicts therapeutic success in patients with psychosis. While this finding warrants further investigation and the demonstration in a larger sample, our results underline the importance of neurocognitive function for psychosis treatment.

P.439 - Stärkere kardiovaskuläre Aktivierung, aber normale Herzschlag-evozierte Potenziale und kardiale interozeptive Genauigkeit bei somatoformen Störungen und Major Depression

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Das Wahrnehmungs-Filter-Modell basiert auf der Annahme, dass medizinisch-unerklärte Symptome (MUS) durch drei Stufen begünstigt werden: (I.) Verstärkte körperliche Signale, (II.) verringerte Filterfunktion, um relevante von irrelevanten Signalen zu differenzieren und (III.) veränderte Wahrnehmung von Körpersignalen. In dieser Studie wurden diese Kernannahmen in Patienten mit somatoformen Störungen (SFS; n=24), Major Depression (MD; n=24), sowie gesunden Kontrollprobanden (GK; n=22) getestet. Herzrate (HR), Herzratenvariabilität (HRV) und Blutdruck dienten als Indikatoren für Körpersignale (I.), Herzschlag-evozierte Potenziale (HEPs) während Ruhe gegenüber der Durchführung einer Herzschlagzählaufgabe indizierten die Funktionalität des Filtersystems (II.), während die interozeptive Genauigkeit (IG) in der Herzschlagzählaufgabe als Indikator für Körperwahrnehmung herangezogen wurde. Alle Indikatoren wurden vor, sowie nach einem sozial-evaluativen Kaltwasserstresstest (SEKWT) erhoben, der das Potenzial hat, Körpersignale und deren Wahrnehmung zu verstärken. Der SEKWT führte zu einem Anstieg von diastolischem Blutdruck und Speichelcortisol bei allen Gruppen, jedoch zeigte sich kein Effekt auf HR und systolischem Blutdruck. Ebenso zeigte sich keine Veränderung auf HEPs (II.) oder IG (III.). Hinsichtlich Körpersignalen (I.) zeigten sich eine geringere HR, ein geringerer diastolischer Blutdruck, sowie eine höhere HRV bei GK-Probanden als bei Patienten mit SFS und MD. Keine Gruppenunterschiede konnten bezüglich (II.) HEPs und (III.) IG gefunden werden. Diese Ergebnisse implizieren, dass lediglich eine Modellannahme des Wahrnehmungs-Filter-Modells, die der verstärkten körperlichen Signale, bezüglich ihrer Rolle bei MUS bestätigt werden konnte. Da ähnliche Effekte bei SFS und MD gefunden wurden, ist es zudem möglich, dass verstärkte Körpersignale ebenfalls bei anderen psychischen Störungen an der Entstehung körperlicher Symptome beteiligt sind.

P.478 - Reduction Of HPA Axis Activity In Patients Suffering From Temporomandibular Disorder During Occlusal Splint Therapy

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Poster Session 2

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Patients suffering from temporomandibular disorder (TMD) - a frequent state of facial pain associated with disorders of muscles and joints of the jaw (Qvintus et al. 2020) - were shown to have an increased activity of the hypothalamic-pituitary-adrenal axis (HPA) (Staniszewski et al. 2018). While occlusal splints are frequently applied for therapy (Ommerborn et al. 2010), placebo-controlled randomized controlled trials (RCT) examining the effects of such interventions on the HPA axis activity are missing so far. We, therefore, conducted a therapy study using a Michigan splint and examined 25 TMD patients (mean age = 35.8±15.1, 24 women) randomly allocated to two interventions (immediate vs. delayed onset of splint therapy) measuring saliva cortisol and self-reports (movement pain, Perceived Stress Scale). One-sided independent samples t-tests showed that compared to delayed treatment, patients starting immediately reached stronger decreases in cortisol level (awakening response; CAR) ($p=.053$) and in pain intensity ($p=.051$) after 6 weeks. However, the reduction in perceived stress was comparable between groups ($p=.470$). Generally, decreases in perceived stress and in CAR were positively correlated ($p=.022$). Our RCT suggests that Michigan splints are capable of not only reducing subjective pain intensities but also hyperactivity of the HPA axis in TMD patients.

P.487 - Investigating Mu Rhythm and Its Source Localization During the Observation of Human Social Interaction and Biological Movement in Young Adults with Autism

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Suppression of the mu rhythm (8-12 Hz, recorded from central electrodes) during action observation has been suggested as a potential EEG marker for human mirror neuron system activation. Previous studies had suggested lower mu suppression in participants diagnosed with autism spectrum disorder. In our study, 18 participants with autism and 19 neurotypical participants (age range: 16 – 39 years) underwent 64-channel EEG recording at rest and during observation of two-minute videos showing either (1) non-biological movements (moving balls), (2) not goal-directed biological actions (simple hand movements), (3) goal-directed biological actions toward an object such as grasping (complex hand movements), or (4) social interaction scenes. We assessed mu power (8-12 Hz) in a 100-second segment of artifact-free data per condition. A Mu suppression index (MSI) was calculated relative to the moving ball's condition as the baseline. Surprisingly, initial results in the frequency domain suggested higher mu suppression in autistic than neurotypical participants during the observation of biological movements in all conditions, with the highest MSI during the observation of social interactions. Source reconstruction and cluster-based permutation t-tests to evaluate the pattern of mu activity across the cortex will also be reported. Considering that our results in the frequency domain are at variance with those from previous studies, we suggest that more research is required to explore if and how mu EEG suppression can be an indicator of the human mirror neuron system and of a putatively altered functioning of this system in autism.

P.509 - Neural Underpinnings of Response Inhibition in Substance Use Disorders: Weak Meta-analytic Evidence for a Widely Used Construct

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Substance use disorders (SUDs) rank among the most severely debilitating psychiatric conditions. Therapeutic regimens achieve only moderate effects and relapse is frequent risk that needs to be challenged. Among others, decreased response inhibition capacities could make it more difficult for patients to abstain from drug use and maintain abstinence. However, meta-analyses on the neural basis of response inhibition in SUDs yielded conflicting results. In this study, we revisited the neuroimaging research field and summarized the existing fMRI literature on response inhibition (in particular, on Go/NoGo and stop-signal paradigms) across different SUDs. We performed a systematic literature review and an activation likelihood estimation (ALE) meta-analysis to investigate the actual convergence of functional deviations observed in SUD patients. We identified k=21 eligible studies for our analysis. Results indicated a significant cluster of convergence with its statistical peak in the right anterior insula. Consecutive analyses, however, indicated strong susceptibility towards publication bias and overall lacking robustness due to liberal correction thresholds of contributing studies. If we were to adhere to state-of-the-art recommendations for neuroimaging meta-analyses by only allowing strictly corrected original study results, the analysis proved to be a null finding. Additionally, a post-hoc random effects meta-analysis of the behavioural parameters of Go/Nogo and stop-signal paradigms reported by included studies revealed no significant differences in task performance comparing SUD patients and healthy controls. We discuss that response inhibition needs to be reconsidered as an overarching marker for SUD pathology as our results fit into an inconsistent and unpromising literature in this regard.

P.513 - Prosocial Tendencies in Women With Borderline Personality Disorder

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Persons with borderline personality disorder (BPD) seem to differ from healthy persons in their prosocial tendencies as measured by explicit ratings, fairness perception, and cooperative behavior in economic games (De-Panfilis et al., 2019; Polgár et al., 2014; King-Casas et al., 2008). However, findings on prosocial tendencies of persons with BPD in economic games remain inconsistent (Hepp Niedtfeld, 2022). Specifically, it is unclear how prosocial tendencies relate to impairments in reactive but not active cooperation (Thielmann et al., 2014).We have tested 60 female participants in a study that includes diagnostic interviews, different personality questionnaires, and economic games. In initial analyses of personality differences and their link to cooperative behavior, we found that patients with BPD score lower in agreeableness and higher in dissociality than healthy participants. In a one-shot dictator game, participants split 10€ with another anonymous person. In the ultimatum game, participants accept or reject offers (splits of 10€) from 6 anonymous persons. We have not yet analyzed these existing data due to a pending preregistration. We will show data on how the differences in self-reported agreeableness and dissociality relate to behavior in the economic games. We expect no group differences in active cooperation (dictator game) but higher rejection rates in reactive cooperation (ultimatum game) in the BPD group versus healthy controls.By investigating individual differences in prosocial tendencies of persons with and without BPD across a variety of measures, our study will inform theories on how maladaptive personality traits relate to cooperative behavior under specific situational affordances.

P.518 - Altered Food Liking in Depression Is Driven by Macronutrients

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Major depressive disorder (MDD) is characterized by changes in appetite and body weight as well as blunted reward sensitivity ("anhedonia"). However, it is not well understood which mechanisms drive changes in sensitivity, specifically regarding food where patients show increases or decreases in appetite as a stable marker of differences across episodes.Here, we used a sample of 99 participants (52 patients with MDD; 47 healthy controls) as part of an ongoing study on gut-based neuromodulation of reward. Participants came to the lab after an overnight fast to determine blood levels of hormones and completed various reward tasks to estimate inter-individual differences in four facets of anhedonia. This battery included a food-cue reactivity task with ratings of wanting and liking for 60 food and 20 non-food items. To evaluate which food qualities may drive altered food reward in depression, we tested for associations with macronutrients of the depicted items.In line with previous studies, we found reduced ratings of food liking and wanting in patients with MDD compared to matched healthy controls. Notably, these differences were largely driven by lower ratings for high-fat food, not food with a high density of carbohydrates either alone or combined with fat.To conclude, our results suggest that depression-related alterations in food reward are more specific to the macronutrient composition of the food than previously anticipated. These preliminary findings raise the intriguing question whether interventions that target vagal afferents, such as non-invasive vagus nerve stimulation, could help normalize aberrant reward signals for fatty foods.

P.524 - Startle Responses and Event-Related Potentials during Threat Anticipation in Patients with Anxiety Disorders

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Poster Session 2

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Background: Attentional processes and defensive responding in anticipation of threat might be core mechanisms underlying clinical anxiety. Here, we sought to examine psychophysiological correlates of diagnostic categories across the anxiety spectrum alongside transdiagnostic anxiety symptom dimensions.Method: Four groups (total N = 160, patients with obsessive-compulsive disorder, social anxiety disorder, specific phobia, and healthy controls) completed the NPU-threat test in which the temporal predictability of shocks was manipulated. The startle reflex was measured via electromyography and startle probe locked event-related potentials N1 and P3 via EEG, capturing automatic attentional engagement (N1) and attentional allocation (P3). Transdiagnostic symptom dimensions (i.e., trait worry, intolerance of uncertainty, and anxious arousal) were measured via questionnaires.Results: Task effects included increased startle and N1 in shock anticipation relative to no shock. The P3 to startle probes was suppressed in shock anticipation, irrespective of shock predictability. Regarding associations with anxiety, no significant effects of the diagnostic groups emerged. However, irrespective of the diagnostic groups, trait worry was associated with increased N1 in unpredictable threat anticipation. Intolerance of uncertainty was associated with suppressed P3 in unpredictable threat anticipation.Discussion: Trait worry increases early attentional responding (N1) during threat anticipation in anxiety across diagnostic categories. The P3 suppression associated with intolerance of uncertainty implies increased attentional allocation to threatening contexts in patients who perceive unpredictability and the associated feeling of uncertainty as aversive. The results highlight the significance of considering attentional mechanisms from a transdiagnostic perspective in anxiety, given the association between transdiagnostic symptom dimensions and attentional processes.

P.532 - Reliability of Ambulatory Psychophysiological Assessment under Naturalistic Conditions

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Ambulatory assessments refer to a wide range of assessment methods, capable to simultaneously derive physiological, behavioral and self-report data while participants move freely within naturalistic environments. Thereby, ambulatory assessments can compensate for common problems associated with single methods collected in laboratory settings, including biased introspection and limited ecological validity. Ambulatory assessments appear promising to understand how environmental stimuli and external cues might affect internal subjective states and real-world behavior. However, only limited evidence exists on the reliability of such measures under naturalistic conditions, especially regarding psychophysiological indices. A total of 26 participants (n=15 female, 18-34 years) completed the same urban walking route (»2.1 km, »30 min walking duration, »temperature M=19.8°, R=12°-37°) on two separate testing days, while GPS-locations and psychophysiological indices (electrodermal activity, electrocardiograms) were continuously recorded. Test-retest reliabilities of single measures and aggregate scores (derived via principal component analysis (PCA)) were computed. The first PC (PC1) accounted for 38% to 50% of variance across physiological measures. Coefficients of the PCA were consistent across recording days. Test-retest reliability of PC1 across days was acceptable (rSpearman=.69) exceeding reliabilities of all single physiological variables (HR=.67, HRV=.59, SCL=.46, SCR=.61, SCR-amplitude=.38). The results confirm the reliability of the ambulatory assessment and the proposed aggregate score across physiological measurements under realistic conditions. Ambulatory physiological assessment has considerable potential for basic research and clinical applications requiring naturalistic settings with high ecological validity. Our work confirms that compound scores across multiple physiological measures show good test-retest reliability, rendering them suitable target variables for various applications.

P.533 - Post-Error Behavioral Adjustment in Healthy Individuals and Individuals with Obsessive-Compulsive Disorder: Insights From Post-Error Slowing, Skin Conductance Response, and Post-Error Accuracy

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Flexible, goal-directed behavior requires monitoring of ongoing actions and initiation of adjustments when errors occur. This process may be altered in individuals with obsessive-compulsive disorder (OCD) and other psychopathological conditions. While error-related brain activity has been extensively studied in OCD, less attention has been paid to post-error slowing (PES) as a behavioral adjustment following errors. To provide further insights into the functional significance of PES, we investigated its relation to skin conductance response (SCR), a component of the orienting response, and post-error accuracy, an index of control-related adjustment. We then examined whether these aspects of post-error adjustment are altered in OCD. Two studies were conducted: one with 30 healthy individuals using a go/no-go task, and another with 28 patients with OCD and 28 healthy individuals using a flanker task. In both studies, incorrect responses were associated with increased SCR, PES, and a post-error increase in accuracy. SCR positively predicted PES at the trial-by-trial level, and larger PES was associated with higher post-error accuracy across participants, indicating that PES may represent a behavioral manifestation of both an orienting response and a control-related adjustment of the speed-accuracy trade-off. No group differences were observed in PES and post-error increase in accuracy, consistent with the notion that behavioral indices of error monitoring are unaltered in OCD. Moreover, there was no evidence for group differences in the relation between PES and both SCR and post-error accuracy, suggesting that mechanisms underlying post-error behavioral adjustment may be similar in individuals with OCD and healthy individuals.

P.538 - Reinforcement Learning Impairments in Gambling Disorder are linked to Maladaptive Decision Threshold Adjustments

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Poster Session 2

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Introduction: Disordered gambling is linked to impairments in decision-making and reinforcement learning, but the specific underlying computational mechanisms are still poorly understood.Methods: Individuals suffering from disordered gambling (n=23) and matched controls (n=23) completed a stationary reinforcement learning task during function magnetic resonance imaging. Behavioral data were modeled using reinforcement learning drift diffusion models (RLDDMs) with extensions to allow for time-varying adjustments in decision threshold and/or non-decision times.Results: Individuals suffering from disordered gambling exhibited significantly impaired learning. In controls, performance improved and RTs decreased over the course of learning. In contrast, gambling disorder was associated with a similar reduction of RTs over time, but this effect was only in part accounted for by reinforcement learning. Model extensions then revealed that gamblers, more than controls, reduced decision thresholds over the course of learning, and this mechanism accounted for RT reductions in gamblers.Conclusions: Our data reveal that impaired reinforcement learning performance in gambling disorder is linked to both attenuated learning-related effects, but also maladaptive adjustments in decision thresholds.

P.540 - Interaktion von Negativer Affektivität und Rumination: Studienprotokoll einer multimodalen Untersuchung transdiagnostischer Risikofaktoren

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Poster Session 2

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Die Persönlichkeitsdimension Negative Affektivität (NA) und der dysfunktionale Verarbeitungsmechanismus Rumination werden als transdiagnostische Risikofaktoren für verschiedene Psychopathologien angesehen. Während NA vorrangig mit der Aktivität im septo- hippocampalen System und der Amygdala, sowie deren Konnektivität mit dem medialen Präfrontalkortex (mPFC) assoziiert wird, scheint für Rumination eher das Default Mode Network (DMN) relevant. Zusammenhänge zwischen Selbstberichtsmaßen von NA und Rumination sowie zum Teil überlappende neuronale Korrelate legen nahe, dass beide Konstrukte miteinander interagieren. Obwohl NA und Rumination bereits separat mit neurowissenschaftlichen Methoden untersucht wurden, hat bislang jedoch noch keine Studie deren Zusammenspiel auf neuronaler Ebene exploriert. Dieses Studienprotokoll hat die Untersuchung dieser Interaktion auf Selbstberichtsebene und mit funktioneller Magnetresonanztomografie (fMRT) zum Gegenstand.In dieser Querschnittsstudie werden 120 junge gesunde Erwachsene zunächst eine Reihe an Fragebögen zu NA und Rumination bearbeiten sowie im Rahmen einer fMRT-Messung zwei Experimente durchlaufen. Das erste Experiment umfasst die Darbietung von negativen emotionalen Gesichtern zur Aktivierung emotionaler Verarbeitungsprozesse. Im zweiten Experiment denken die Probanden anhand einer vorgegebenen Instruktion (Fragen) über eine selbst gewählte negative Situation nach, mit dem Ziel ruminative Prozesse zu evozieren. Die fMRT-Daten werden hinsichtlich der Aktivität und Konnektivität der Amygdala, des septo-hippocampalen Systems und des DMNs ausgewertet und im Rahmen einer Regressionsanalyse in Zusammenhang mit den Selbstberichtsmaßen gesetzt. Zudem soll die mögliche Interaktion von Rumination und NA bezüglich der Aktivität und Konnektivität der oben genannten Regionen untersucht werden.Diese Studie zur Interaktion zwischen NA und Rumination hat potenziell Implikationen für die Entwicklung von Biomarkern sowie für die Behandlung und Prävention von psychischen Erkrankungen.

P.549 - Depression Is Associated With Blunted Food Reward Ratings During Anticipation But Not Consummation

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Anhedonia is a core symptom of major depressive disorder (MDD) and predictive of poorer treatment response. Yet, a mechanistic understanding of anhedonia in reward processing is lacking because different facets of reward are conflated in the definition (e.g., anticipation vs. consummation).In this ongoing study on gut-based neuromodulation of reward, we investigated inter-individual differences in four facets of anhedonia in a sample of 97 participants (51 patients with MDD; 46 healthy controls [HCP]). Participants came to the lab after an overnight fast to determine blood levels of hormones. As part of a battery of reward tasks, participants completed a taste test with repeated ratings of food liking and wanting to measure reward anticipation and consummation. Participants also completed the Snaith-Hamilton Pleasure Scale (SHAPS) which intends to assess anhedonia based on hedonic tone.We found that patients with MDD (vs. HCP) exhibited decreased wanting but not liking for food rewards during visual anticipation, and these group differences disappeared once patients had the opportunity to inspect (and then also taste) the food. Intriguingly, higher SHAPS scores were more strongly associated with reduced food wanting compared to liking ratings and a stronger increase of wanting across phases.Overall, our results demonstrate that anhedonia is characterized by reduced anticipation of future rewards rather than a reduced ability to experience consummatory pleasure. Ultimately, behavioral assessments pave the way for a more mechanistic understanding of anhedonia, which is needed to address the gap in treatment options.

P.554 - Canonical Correlations Reveal Associations Between Brain Morphometry and Sensory Profiles in Autism

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Poster Session 2

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Autism is a diverse and heterogenous clinical condition where alterations in sensory processing can range from hypo- to hyperreactivity. We expected to find the biological underpinnings of these alterations already on the structural brain level and investigated if sensory processing profiles are an eligible candidate to stratify the autism spectrum.We used canonical correlation analyses to unravel underlying patterns between sensory processing profiles (assessed with the Short Sensory Profile questionnaire) and vertex-wise estimates of cortical and subcortical volumes of 203 autistic participants (Mage = 16.12, SD = 5.34, range = 7 − 31 years, 29% female).Our results show that sensory profiles were associated with structural brain features (RV-coefficient = 0.06, p = .002). Comparing participants with low levels of sensory alterations to participants with high levels, our analyses suggest that the underlying brain volume patterns were different between those groups (Tucker's congruence coefficient = .71). Despite those differences on a morphological level, our findings indicate that for the clinical phenotype, i.e., the sensory processing profiles, there is a common, underlying latent factor underlying both groups. Exploratory analyses showed that this latent factor was associated with scales assessing repetitive behavior (r = -.42) and ADHD symptomatology (rhyperimpulsivity = -.41, rinattentiveness = -.30) in our sample.We conclude that sensory processing is an important aspect to stratify and describe the autism spectrum. Underlining the associations between sensory processing and clinical symptoms like repetitive behavior and ADHD, our findings are also of practical clinical relevance and might spark future research within this domain.

P.557 - Association of Indicators of Stress, Sleep and Brain-Derived Neurotrophic Factor (BDNF) in a High-risk Sample of Young Adults with Previous Youth Residential Care

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Background: Children in institutional care have a high risk to experience childhood adversities (CAs) with consequences for physical and mental well-being. The long-term effects of CAs on the brain, including consequences for neuronal plasticity and sleep, are poorly understood. This study examined the interplay between stress (including CAs), sleep, and brain-derived neurotrophic factor (BDNF), a prominent marker for neuronal plasticity.Method: Participants (N=131, mean age = 26.3; SD age = 3.4 years, 40 females) with residential youth-care history completed questionnaires measuring CAs (Childhood Trauma Questionnaire, CTQ), psychological well-being (World Health Organization-Five Well-Being Index, WHO-5), and sleep disturbances (Pittsburgh Sleep Quality Inventory, PSQI). Hair cortisol and serum BDNF concentration were measured using enzyme-linked immunosorbent assays. The analyses were conducted by using bootstrap regression models.Results: There was no association of stress parameters or sleep with BDNF concentration. However, we found a significant association of CAs and well-being with sleep disturbances. Last, we found an association between CAs and BDNF in sleep-healthy but not sleep-disturbed participants.Conclusion: Our findings emphasize the importance to consider sleep quality in the association between stress and BDNF. Still, further studies are warranted using vulnerable groups at-risk to understand long-term effects on mental health and sleep.

P.626 - Investigating the Relationship between Frontal Alpha and Midline Theta Measures and Learned Helplessness-Induced Depression

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Poster Session 2

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Depressive episodes are a common and recurring condition that are often correlated to symptoms of anxiety, a lack of motivation, and ruminative thoughts. Previous research has demonstrated that electrophysiological correlates in the theta and alpha band are associated with these symptoms specifically and depression scores in general. Particularly, frontal alpha asymmetry and midline theta measures have been implicated. While previous studies on the relationship between individual symptoms and these electrophysiological measures often used experimental approaches, the relationship between alpha (theta) power and overall depressiveness is largely explored via non-experimental methods.In contrast to these approaches, we aim to contribute to the understanding of this relationship by employing a learned helplessness paradigm that is thought to induce a general, depression-related state instead of individual symptoms. 40 Participants were presented with a modified unsolvable anagram task including 50 trials, while an EEG was recorded using a 64 electrode setup. By analyzing alpha activity at dorsolateral prefrontal electrode sites and theta power in midline electrode positions on a single-trial level, we investigated the progression of these measures over the course of becoming (non-clinically) depressed. Our study contributes to the current understanding of the relationship between electrophysiological measures and depression and provides insight into the progression of these measures over the course of becoming helpless.

P.638 - Changes in Brain Activity as Possible Predictors for Phantom Limb Pain in Leg Amputees – a Longitudinal Study

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Phantom limb pain (PLP) describes chronic pain that occurs after severe peripheral nerve injury in the missing body part in up to 80% of amputees. PLP has been associated with brain changes. However, the causality of the neuronal and perceptual changes is still unclear. Therefore, we conducted a longitudinal study to examine brain excitability in leg amputees longitudinally.We examined nine leg amputees within the first six month (Time 1) and followed them up 1.5 years (Time 2) after amputation and gender- and age-matched healthy controls. Five participants suffered from phantom limb pain and 4 were pain-free. The activation of brain regions involved in the processing of pain after painful heat stimulation was examined using functional magnetic resonance imaging (fMRI). Based on the brain activation of the healthy controls, we extracted brain masks within our regions of interest: somatosensory cortex, the posterior Insula and the anterior ACC.In early stages after amputation we found differences between amputees with and without PLP: neural activity was increased in S1, Insula and ACC using acute painful stimulation adjacent to the side of amputation in amputees with PLP and adjacent to the intact limb in amputees without PLP. In late stages after amputation we found a decreased neural activity in S1, Insula and ACC at Time2 compared with Time1 in amputees with PLP and an increased neural activity in Insula and ACC in amputees without PLP.In summary, it can be assumed, that the respected brain regions might be involved in pain chronicity.

P.526 - Modulation Of The Interoceptive Brain Network Activity Using Repetitive Transcranial Magnetic Stimulation And Its Effects On Interoceptive Accuracy : A Pilot Study

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Communication between the brain and peripheral body organs is fundamental for health or disease. The perception and processing of signals arising from peripheral organs, i.e. interoception, is mediated by the interoceptive brain network (IBN). A high functionality of the IBN may be protective against stress-related disorders, such as somatic symptom disorder. One way to manipulate the activity of brain regions is repetitive transcranial magnetic stimulation (rTMS). In this pilot study, we used different protocol to inhibit or enhance the activity of the IBN, using respectively continuous theta burst stimulation (cTBS) or intermittent theta burst stimulation (iTBS) of the inferior frontal gyrus. These protocols were compared to a neutral condition with intermediate theta burst stimulation (imTBS), which is expected to have no effect on IBN activity. We evaluated the effects of these stimulations on interoceptive accuracy (IAc) using different paradigms: the Heartbeat counting task (IAcHBCT) and the heartbeat discrimination task (IAcHBDT) in 4 participants. In the neutral condition (imTBS), both IAcHBCT and IAcHBDT scores slightly increased. Enhancing stimulation (iTBS) descriptively increased IAcHBCT, but did not affect IAcHBDT scores, whereas inhibiting stimulation (cTBS) increases IAcHBDT, but decreases IAcHBCT scores. However, the results are not significant and should be interpreted with caution due to the small sample size. Our findings suggest that the current TMS protocol to manipulate activity in the IBN is feasible and exhibited promising findings when relying on the HCT. Studies with larger sample sizes should confirm the feasibility of the current TMS protocol for manipulation of the IBN.

P.592 - Effects of Transcutaneous Vagus Nerve Stimulation on Gastric Rhythm During Caloric Load

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The vagus nerve plays a fundamental role in the communication between gut and brain. Previous studies have shown that transcutaneous auricular vagus nerve stimulation (taVNS) increases stomach-brain coupling, potentially influencing interoception. However, it remains unclear whether taVNS leads to discernable effects on gastric myoelectric activity depending on metabolic state and side of the stimulation (left vs. right).We conducted a randomized cross-over study on 37 healthy individuals (20 F, 17 M) administering right and left taVNS (vs. sham) before and after caloric intake (400kcal). Gastric motility indexes (frequency, amplitude) were assessed through electrogastrography (EGG). Each session was divided into 3 phases: baseline (without stimulation), stimulation, and caloric intake (during stimulation). Hunger and satiety ratings were collected every 15 min.Consistent with previous research, caloric load was followed by a short drop in gastric frequency ($p < 0.001$) and a robust increase in power 15 min later ($p < 0.001$). Frequency drop magnitude was correlated with metabolic-state ratings 30 min after caloric load ($p = 0.045$). In line with our preregistered hypothesis, left taVNS led to a larger frequency drop after load ($p = 0.03$). Moreover, across sides, power reached a plateau about 15 min after increase for taVNS vs. sham sessions.Our results support the idea of side-specific effects of taVNS on gastric motility, indicating that left taVNS is more effective in modulating gastric frequency. They also identify changes in frequency immediately after a caloric load as a potential early predictor of load-induced satiety.

P.612 - Mechanisms for Survival: Vagal Modulation of Interoception Versus Exteroception

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The vagus nerve plays a vital role in the communication between peripheral organs and the brain to ensure energy homeostasis. Despite emerging evidence from animal studies pointing to a broader involvement of vagal afferents in regulating reward-related behavior, such as food seeking, there is still a debate about their relevance in humans.Here, we draw upon data from several projects using non-invasive transcutaneous vagus nerve stimulation (tVNS) to elicit acute changes in reward-related behavior, electrophysiology, and brain responses. Specifically, we use fMRI with concurrent electrogastrography and tVNS (vs. sham) collected at rest and during the presentation of food cues in a food bidding paradigm to investigate potential shifts in interoceptive (as indexed by stomach-brain coupling) vs. exteroceptive processing (as indexed by stimulus-locked synchrony).In accordance with theories on gut-based reward, we found that subcortical regions remain more strongly coupled with signals from the stomach compared to cortical regions, which shift toward exteroception during the food bidding task. Notably, we also observed tVNS-induced changes in cue-induced shifts in core regions of the ingestive circuit, such as the nucleus accumbens and the insula, indicating that vagal afferents may help regulate the relative weights on interoception versus exteroception.To conclude, our results highlight the potential of combining imaging modalities with non-invasive brain stimulation to test influential theories on the intricate regulation of reward-related behavior by bodily signals. Aberrant integration of interoceptive signals may contribute to diverse deficits of reward across mental disorders, thereby providing an avenue for translational research on somatic mechanisms.

P.619 - Facilitatory Stimulation of the Pre-SMA Enhances Semantic Cognition via Remote Network Effects in Task-Based Activity and Connectivity

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Poster Session 2

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The continuous decline of executive abilities with age is mirrored by increased neural activity of domain-general networks during task processing. So far, it remains unclear how much domain-general networks contribute to domain-specific processes such as language when cognitive demands increase. The current neuroimaging study explored the potential of intermittent theta-burst stimulation (iTBS) over a domain-general hub to enhance executive and semantic processing in healthy middle-aged to older adults. We implemented a cross-over within-subject study design with three task-based neuroimaging sessions per participant. Using an individualized stimulation approach, we stimulated each participant once with effective and once with sham iTBS over the pre-supplementary motor area (pre-SMA), a region of domain-general control. Subsequently, task-specific stimulation effects were assessed in functional MRI using a semantic and a non-verbal executive task with varying cognitive demands. Effective stimulation increased activation relative to sham stimulation only during semantic processing in visual and dorsal attention networks. Further, iTBS induced increased functional connectivity in task-specific networks for semantic and executive conditions with high cognitive load. Notably, stimulation-induced changes in activation and connectivity related differently to behavior: While increased activation of the parietal dorsal attention network was linked to poorer semantic performance, its enhanced coupling with the pre-SMA was associated with more efficient semantic processing. Our findings show that iTBS modulates networks in a task-dependent manner and generates effects at regions remote to the stimulation site. These neural changes are linked to more efficient semantic processing, which underlines the general potential of network stimulation approaches in cognitive aging.

P.637 - The Impact Of Interoceptive Sensibility On The Perception Of Pain

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Interoceptive sensibility is the self-perceived dispositional tendency to be internally self-focused and interoceptively cognizant. One would expect that persons with high interoceptive sensibility would be more consistent in their subjective ratings to pain stimulation, i.e., the same intensity would be rated similarly across different time points of the session. The present study investigated the relationship between interoceptive sensibility and perception of acute pain, realized by transcutaneous electrical stimulation to the inner forearm, compromising both the subjective pain ratings and the cardiovascular response to the painful stimulation in young healthy adults. To determine the interoceptive sensibility the MAIA-2 was used. In a two session design participants received short, individualized pain stimuli in the non-painful to moderate pain range, which they rated regarding subjective intensity and unpleasantness on visual analog scales. The task was repeated three times in one session.Preliminary results suggest a positive relationship between different subscales of the MAIA-2 and the intensity and unpleasantness ratings of painful and non-painful stimulations. Over the three repetitions of stimulation, a differentiated picture forms with respect to possible sensitization or habituation of the participants.These findings suggest that there is an impact of interoceptive sensibility on the perception of pain.Using the MAIA-2 to determine the interoceptive sensibility is an economical approach, since previous studies worked with the heartbeat detection task or other experimental paradigms.Incorporating interoceptive sensibility could be helpful for future interventions and possible treatments in pain patients.

P.642 - Brain Connectivity-informed Transcranial Magnetic Stimulation (TMS) of Deep Brain Regions and Proof of Target Engagement Using Concurrent TMS and Functional Magnetic Resonance Imaging

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Transcranial magnetic stimulation (TMS) is a non-invasive brain stimulation technique, widely used in both basic biopsychological research and clinical applications to manipulate regional neuronal activity in humans. Due to its limited penetration depth, TMS likely unfolds its therapeutic effects by indirectly modulating distant brain regions that are functionally and/or structurally connected to the directly stimulated, superficial brain area. To test this hypothesis, we combine TMS with concurrent functional magnetic resonance imaging (fMRI). TMS-fMRI provides a unique means to map immediate causal network effects of TMS and provide proof of target engagement across the whole brain. We are particularly interested in indirectly modulating the deeply located ventromedial prefrontal cortex (vmPFC), due to its involvement in fear extinction memory consolidation. For that, we first personalize TMS coil placement and stimulation intensity based on both the individual resting-state fMRI-derived functional connectivity between vmPFC and the superficial dorsolateral prefrontal cortex (DLPFC) as well as simulations of the TMS-induced electric field. The person-specific optimal coil positioning and intensity are then used in a concurrent TMS-fMRI experiment, applying single TMS pulses to the left DLPFC and an active control site. Preliminary data suggest that TMS indeed modulates both the directly stimulated as well as distant, functionally connected brain regions, including the vmPFC. If this holds true in further subjects, personalized, functional connectivity-informed TMS could be used to indirectly modulate vmPFC activity and thereby potentially manipulate the consolidation process of fear-related memories.

P.431 - Effects of Working Memory Load on Emotional Face Processing

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Previous research indicates that working memory load (WML) affects cognitive processes such as emotional face processing. However, the precise nature of interacting WML and valence remains unclear. Therefore, we conducted a whole-head magnetoencephalography dual-task study. 47 participants performed a facial emotion recognition task (happy, angry, neutral) alternating with a spatial n-back task (low: 1-back, high: 2-back). Our primary objective was to investigate neuronal correlates modulated by WML and valence in both tasks. Statistical comparisons in source space revealed that emotional face processing was strongly modulated by WML and valence from approx. 220 ms after face onset at the brain level. Processing of negative compared with neutral faces during low WML resulted in increased neuronal activity in the left posterior insula cortex and face regions of the sensorimotor cortex. For negative compared with neutral faces during high WML and compared with positive faces during both levels, these modulatory effects in the insula and sensorimotor cortex increased further. Additionally, we observed increases in the left superior temporal sulcus, right inferior frontal gyrus, and bilateral occipital cortex. We found no effects when comparing positive and neutral faces. For the contrast high-low WML, we observed a decrease in occipital regions, left posterior insula and bilateral sensorimotor cortex as well as an increase in the right inferior frontal gyrus in all face conditions. These findings suggest that social and embodied cognition, affective evaluation, as well as control mechanisms affecting sensory input, play a role during the interaction of working memory load and emotional face perception.

P.476 - Pupil Dilations Track Emotional Arousal During Evocative Movie Viewing

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Previous research investigated neural responses underlying emotional arousal (EA) in highly controlled task designs with repeated stimulus response scenarios. However, the temporal dynamics of EA across seconds and minutes are poorly understood. The aim of this study was to assess neural responses underlying arousal fluctuations as measured with pupil size (PS) during emotionally evocative movie viewing.In four independent data sets, individuals watched movies while undergoing functional magnetic resonance imaging and PS recordings: Faces of death, documenting animal slaughtering, 21 Grams, inducing sad emotions, Butterfly Circus with mixed emotional content and Son's Room as neutral movie. Independent component analysis estimated data-driven brain network activation patterns. A linear mixed model was used to estimate individual PS and brain network activity.Movies with intense negative content induced a negative association between PS and neural activation: for faces of death, voxels within bilateral insula, and for 21 grams within the sensory-motor network. For Butterfly Circus, there was a positive association between PS and temporal regions of the ventral default mode network (vDMN). For the neutral movie, there was no significant effect.Negative content might suppress networks supporting interoception, possibly reflecting cholinergic system suppression of interoceptive signals induced by negative stimulus. For movie material without extremely negative content, PS seems to cohere with activation levels of the vDMN, often reported to reflect self-referenced evaluation. Altogether our findings suggest that PS could be a marker to track neural responses underlying EA during naturalistic scenarios.

P.498 - Psychophysiological Assessment Of Emotional Interference: A Design Of A Longitudinal Study Of Transdiagnostic Outpatient Treatment

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Emotion dysregulation in mental disorders is common. Accordingly, interventions improving emotion regulation are applied in many mental disorders. However, studies with several data collection points from different modalities, including biological markers, are sparse. We present the design of a naturalistic longitudinal study with psychophysiological measures during experimental tasks that is currently in preparation.In our outpatient clinic, we are going to assess psychophysiological markers during rest (baseline) and during the emotional Stroop task (EST). Heart rate, electrodermal activity and the breathing pattern will be examined up to five times: shortly before approved psychotherapy sessions, after 24 sessions, if available after 60 or 80 sessions and as a follow-up 6 months as well as 12 months after ending therapy. Matched healthy controls will be observed three times in 6 month intervals. Newly registered patients at our outpatient clinic automatically enter the study. The estimated sample size for the first two years is 144 patients. Healthy controls will be 60 participants.Our major goals are a) comparison of heart rate variability during baseline and EST between patients and healthy controls, b) analysis of transdiagnostic treatment effects over time. By applying a multimodal approach in a naturalistic setting, this study will improve our understanding of emotion regulation mechanisms in psychotherapy.

P.512 - Self-Determination: Motivational and Affective Processing Depend on Task Context

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Effects of motivation and emotion on cognition are well documented, but the influence of task context on this interaction is less understood. Previously, we showed that the late positive potential (LPP) was affected by self-determined choice and emotional picture content in a time-production task (Müller et al., 2021). In two follow-up EEG-experiments, we investigated the impact of task complexity (time-production vs. active picture-viewing) and motivational context ('denying a choice' vs. 'having no choice') on attention allocation in affective processing.32 participants viewed emotional pictures (positive, negative, neutral; 8 categories). In Experiment 1, they either chose the picture category or it was assigned pseudorandomly ('choice' vs. 'no choice'), answering content-related questions after viewing ('yes'/'no'). In Experiment 2 the same participants performed a time-production task during picture presentation – pressing a button after 2 seconds. The picture category was always assigned pseudorandomly, thus removing motivational context.In Experiment 1, 'self-determination' led to more persistent LPPs during task engagement, showing greater LPPs for 'choice' compared to 'no choice' trials, particularly for negative pictures. Consistent with previous results, the Contingent Negative Variation was greater for self-determined choices.In Experiment 2, longer production times were present for neutral and negative pictures. LPP amplitude was more pronounced for negative pictures, with a comparatively early effect of emotional content starting 200ms after picture onset.These findings indicate that attention allocation in affective processing is differentially influenced by motivational and task context. Whether early effects of self-determination, related to intrinsic motivation, persist seems to depend on task load.

P.515 - Differential Conditioning with Emotional Sounds vs. Pictures: Divergent Effects on Startle Eyeblink, yet not Pupil Dilation Responses

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Poster Session 2

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Affective pictures have long been known to serve as (secondary) reinforcers in Pavlovian conditioning. However, research on auditory conditioning, i.e., by means of emotional sounds, is scarce. Moreover, little is known about the intraindividual concordance of conditioned responses in terms of sensory modality as well as valence.In two sessions one week apart, 42 participants underwent two differential conditioning tasks. In each, two visual conditioned stimuli (CS+) were repeatedly paired (50% reinforcement) with either aversive (fear-/disgust-associated) or appetitive (erotic) unconditioned stimuli (UCS). A third stimulus (CS-) was never reinforced. UCS modality was varied between sessions (within-participants), with counterbalanced presentation of either sounds (IADS) or pictures (IAPS) (matched for normative levels of valence/arousal). Pupil dilation responses were recorded using infrared eye-tracking. Startle eyeblink responses were elicited by noise bursts and measured at the orbicularis oculi via EMG.We observed an asymmetry in differential conditioning as a function of reinforcement modality: With emotional pictures as UCS, the common valence-dependent pattern of startle modulation emerged, whereas there were no significant differences in startle magnitude between the CS- and either CS+ paired with emotional sounds. By contrast, stronger pupillary responses to both CSs+ (relative to the CS-) were found irrespective of UCS modality. While intra-session correlations between differential responses to aversive and appetitive CS+ were in the moderate-to-high range, there were weak to non-existent associations between difference scores from separate sessions (regarding both physiological response systems).Our findings suggest that reinforcement sensitivity (as a potential trait) is more dependent on UCS modality than valence.

P.516 - Validation of a Behavioral Avoidance Test in virtuo for Spider Phobia

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A key symptom of anxiety disorders is avoidance behavior. In research, avoidance behavior is often assessed via Behavioral Avoidance Tests (BATs) that employ real fear-eliciting stimuli (e.g., spiders). To improve the feasibility and standardization of BATs, virtual reality (VR) technology has successfully been used. While previous research has validated VR-BATs based on self-report measures, to date no studies have compared avoidance behavior and psychophysiological measures of fear between traditional and VR-BATs. This study aims to validate a VR-BAT regarding multiple levels of fear and avoidance.Towards this aim, patients with spider phobia (aged 18 to 65) will complete four randomized BATs, two in VR and two in vivo. BATs will involve either approaching a (virtual) spider on foot or sliding a (virtual) spider towards oneself. The final distance between the patient and the spider in each BAT will indicate avoidance behavior. Fear ratings will be given at multiple time points. Psychophysiological measures (e.g., heart rate, skin conductance level, skin temperature) will be assessed during the entire testing. To link these measures to final distance and fear ratings, anchor points will be used. Psychometric measures of anxiety will be assessed between BATs.The final distances of the VR-BATs and the BATs in vivo will be compared. To validate the BAT regarding psychophysiological measures, heart rate, skin conductance, and skin temperature at predefined anchor points (e.g., 3 meters distance to spider) between BATs.This study may contribute to research on virtual reality in research practices. Methods and planned analyses will be presented.

P.520 - Social Body Odors Improve Facial Emotion Recognition, While Stress Odors Impair It

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Poster Session 2

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The transmission of social signals via olfactory cues (i.e. chemosensory signaling) contributes crucially to social communication across a wide range of species. Yet there is surprisingly little known about the impact of chemosensory signaling on social behavior in humans. Recent evidence suggests that human body odors indeed contain a multitude of socially relevant information (e.g. about our sex, health, and emotional state). However, the precise socio-affective processes mediating the potential effects of human chemosignals on social behavior remain elusive. We examined the impact of human body odors on emotion recognition from facial expressions. A sample of 38 healthy male participants performed an emotion recognition task while being exposed to three different chemosensory conditions: stress odor (sampled from an independent male sample during the Trier Social Stress Test for Groups, TSST-G), social odor (sampled during the control condition of the TSST-G) and a non-social control odor (damped cotton pad without human body odor). Face stimuli varied in emotional valence (anger, happy, neutral) and intensity (low, high), and participants indicated via button press if they had perceived an emotional state in a previously presented face. We found that exposure to social odors improved overall emotion recognition, while stress odors reduced the sensitivity for specific emotional faces, most prominently for high-intensity happy faces. Together, these preliminary findings support existing hypotheses on chemosensory stress contagion in humans and may inspire researchers to explore the influence of chemosensory communication in clinical conditions associated with altered social interaction and emotional processing.

P.541 - Social Interaction Modulates Neural Responses To Facial Emotional Expressions

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Facial emotional expressions play a crucial role in social interactions, and recent research has highlighted their reciprocal nature. Previous findings show that the emotional expression one sends can influence how a response expression is evaluated. In the present EEG study, we investigated whether this interactive exchange of facial expressions also affects neural processing of social stimuli. Forty participants were instructed to direct a facial emotional expression (angry, neutral, or happy) toward a virtual agent in front of them. The agent then responded with either an emotional expression (angry or happy) or remained neutral. We assessed subjective experience (valence and arousal), facial EMG (Zygomaticus and Corrugator), and ERPs elicited by the response expression of the virtual agent. Our results replicated previous findings that an agent's happy facial expression was experienced as more pleasant and elicited increased Zygomaticus activity when participants had initiated the interaction with a happy expression compared to an angry expression. Importantly, we found that the initial expression also modulated the late positive potential (LPP) elicited by the response expression. Angry expressions resulted in a more positive LPP than happy expressions, but only when participants had initiated the interaction with an emotional (angry or happy) expression and not a neutral expression. These findings suggest that sending an emotional expression increases the salience of subsequent emotional expressions and enhances their processing. Moreover, our study highlights the importance of the interactive context of facial expressions when investigating the neural correlates of social processing.

P.597 - Agency, Expectations And The Bayesian Pain Model

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The Bayesian pain model is a widely accepted framework for explaining the effects of placebo hypoalgesia and nocebo hyperalgesia. However, the role of contextual factors such as agency in the model remains unclear. In the model, somatosensation (likelihood) and expectations (prior) are weighted by their precision and integrated to form a pain percept. In this study, we investigate how agency interacts with placebo and nocebo expectations and how it can be incorporated into the Bayesian pain model.Heat pain was used as a stimulus and sham-treated either externally or by the subject. Participants were given a predictive cue to create placebo or nocebo treatment expectations. We analyzed the effects of agency and expectations on pain relief and compared different Bayesian pain model variations using formal model comparison. We also used electroencephalography (EEG) to measure the neural correlates associated with the interaction of expectations and agency.Agency and placebo expectations had additive effects on pain relief, indicating that greater pain relief was achieved under self-treatment and under placebo treatment expectations. Formal model comparisons favored models that allowed for a shift in the prior mean by agency rather than differences in likelihood precision. EEG analysis revealed an effect associated with an interaction of expectations and agency that was also correlated with trial-by-trial pain ratings. This effect was found to be temporally associated with expectations, further suggesting that a shift in expectations is the mechanism through which agency can be implemented in the Bayesian pain model.

P.600 - Mental Health Symptoms in Oral Contraceptive Users During Pill Pause

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Poster Session 2

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Hormonal contraception has been linked to mood symptoms and emotional processing after short periods of treatment, while the mental health of long-term hormonal contraceptive users has hardly been investigated.We investigate whether short term hormonal withdrawal, as combined oral contraceptive users (COC) undergo once a month (pill pause), results in altered mood and emotional processing in long-term COC users.181 participants (61 women with androgenic COC-use, 60 with anti-androgenic COC-use, 60 non-users with a menstrual cycle) were tested twice, once during their active pill phase/luteal phase and once during their pill pause/menses. We compare mental health symptoms between the pill pause and active intake phase in COC users and assess how the differences compare to fluctuations along the menstrual cycle in naturally cycling women. Positive and negative affect, anxiety and mental health problems were assessed during each session.COC-users showed significant mood worsening during the pill pause compared to the active intake phase irrespective of the contraceptive formulation. The effect size of this change was comparable to mood changes along the menstrual cycle in naturally cycling women. Mood worsening during the pill pause was more pronounced in women with higher baseline depression scores.Withdrawal from contraceptive steroids during the pill pause results in similar mental health symptoms as withdrawal from endogenous steroids during menses. These results question the utility of the pill pause from a mental health perspective. Long-term COC users may profit more from the mood-stabilizing effects of COC in case of continuous intake.

P.605 - Studienprotokoll: Eine multimodale Untersuchung des Negativitätsbias

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Theoretischer Hintergrund: Der Negativitätsbias beschreibt, dass Reize mit negativer Valenz bevorzugt wahrgenommen und verarbeitet werden. Interindividuelle Unterschiede im Negativitätsbias sind mit Unterschieden im Erleben und Verhalten sowie mit Defiziten im Arbeitsgedächtnis und maladaptiven Copingstrategien verknüpft. Auf neuronaler Ebene ist der Bias mit gesteigerter Aktivität des Central Executive Networks (CEN) assoziiert. Darüber hinaus steht er in Relation zur Belohnungsverarbeitung, indem belohnungsbezogene Informationen verringert zur Emotionsregulation genutzt werden. Als neuronales Korrelat reduzierter Belohnungsantizipation gilt die verringerte Reaktivität des Reward Networks (RN), welches wiederum mit Anhedonie beziehungsweise verringerter hedonischer Kapazität assoziiert ist. Hedonische Kapazität impliziert die Reaktionsfähigkeit auf angenehme Reize. Ziel dieser Studie ist es den Zusammenhang zwischen Negativitätsbias, kognitiver Emotionsregulation, hedonischer Kapazität und assoziierten neuronalen Charakteristiken herauszustellen.Methodik: In einer Querschnittsstudie werden von 120 gesunden Versuchspersonen zunächst Selbstberichtsdaten zur kognitiven Emotionsregulation, hedonischen Kapazität und Temperamentseigenschaften erhoben. Im Rahmen einer darauffolgenden funktionellen Magnetresonanztomographie werden Unterschiede der Aktivität und Konnektivität des CEN und RN mittels zweier etablierter Paradigmen untersucht. Die Evaluation des Negativitätsbias auf Arbeitsgedächtnisebene erfolgt mittels behavioraler Daten der EMOBACK, einer 3-back Aufgabe mit emotionalen Wörtern. Mit der EMOBACK werden darüber hinaus funktionelle Daten des CEN ermittelt. Die Untersuchung der Aktivität und Konnektivität des RN erfolgt anhand der Social Incentive Delay Aufgabe, einem Paradigma zur Induktion sozialer Belohnungsantizipation. Der Zusammenhang behavioraler, neuronaler und Selbstberichtsdaten wird in einer Regressionsanalyse untersucht.Diskussion: Die Ergebnisse sollen ein besseres Verständnis der neuronalen Prozesse, die dem Einfluss des Negativitätsbias auf kognitive Strategien bei der Emotionsverarbeitung zugrunde liegen, ermöglichen. Mögliche praktische Implikationen ergeben sich bei der Behandlung dysfunktionaler Kognitionen.

P.610 - ERP Correlates of Negative Picture Processing Following Left Anteromedial Temporal Lobe Resections

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The medial temporal lobes and in particular the amygdalae have been theoretically linked to emotional processing of visual stimuli. It is often assumed that the amygdala upregulates responses of the visual cortex, contributing to larger event-related potentials (ERPs) for emotionally arousing compared to neutral pictures. In a previous study with epilepsy patients who had undergone right anteromedial temporal lobe resections, we found a lack of P1 modulation by negative pictures and ipsi-resectional reductions in the N1 and Early Posterior Negativity (EPN) responses whereas in the late positive potential (LPP) emotional modulation did not differ from controls. Here, we complement this evidence with data from 18 patients with left anteromedial temporal lobe resections. Following left resections, we find fully intact early emotion modulation (P1, N1) as well as larger than normal EPN and LPP potentials in response to negative pictures. Together, these data suggest that whereas the right anteromedial temporal lobe, theoretically most likely the amygdala, critically contributes to rapid emotion-related ERP responses which disappear following resection, the left anteromedial temporal lobe may exert a regulatory role in emotion processing, its resection potentially disinhibiting right hemispheric responses. These results help specify the contributions of left and right temporal lobes to different stages of ERP responses to emotional stimuli.

P.613 - How Are Electrophysiological Measures Of Emotional Reactivity And Emotion Regulation Associated With Self-Reported Emotion Regulation Capacity In Everyday-Life?

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Poster Session 2

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Introduction: The late positive potential (LPP) provides electrophysiological measures for both emotional reactivity and emotion regulation. There is some evidence for an association between LPP-based measures of emotional reactivity and habitual emotion regulation in everyday life. However, there is no conclusive evidence for an, arguably more plausible, association between LPP-based measures of emotion regulation and habitual emotion regulation. In this study, we plan to investigate the independent associations of LPP-based measures of both emotional reactivity and of emotion regulation with self-reported habitual emotion regulation. To this end, we will quantify, via the LPP, the emotional responses to positive and negative stimuli and the ability to up-regulate the former and down-regulate the latter through savoring and reappraisal, respectively.Method: We will record ERPs to neutral, negative, and positive pictures from the International Affective Picture System while participants will be instructed to maintain, reduce, or enhance emotional responding using passive viewing, reappraisal or savoring. We will assess in the same participants the tendency of emotion regulation via the Behavioral Emotion Regulation Questionnaire and the Cognitive Emotion Regulation Questionnaire.Results: Data collection is under way. We expect to report results based on at least 30 individuals.Outlook: This study aims at clarifying the relationship between electrophysiological correlates of emotional reactivity and emotion regulation on the one hand and self-reports of emotion regulation strategies on the other hand, which is of crucial relevance in the study of emotion regulation dysfunctions in clinical populations.This study is supported by the German Research Foundation (Forschergruppe 5187).

P.629 - "Antisaccade Performance in Spider Phobia and Its Association with Multimodal Correlates of Fear"

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INTRODUCTION: Anxiety disorders are characterized by excessive fear and an attentional bias to threat, and may involve impaired inhibitory control processes. The antisaccade task is a well-established measure of inhibitory control and has identified impaired inhibitory control in subclinical fearful individuals. As clinical studies are lacking, we investigated inhibitory control performance in spider phobic individuals as well as potential associations with multimodal indices of fear.METHODS: 30 spider phobic (SP) and 33 healthy control (HC) individuals completed an emotional antisaccade task (schematic stimuli of spiders and flowers). Multimodal fear indices (self-reported fear of spiders (SPQ), avoidance behavior (BAT), heart rate, electrodermal activity, fear-potentiated startle reflex) were obtained. Differences in antisaccade performance were assessed using a 2x2 mixed ANOVA for antisaccade latencies and error rate, respectively. Regression analyses were performed in SP to predict antisaccade performance from multimodal indices of fear.RESULTS: SP showed significant shorter antisaccade latencies than HC. Effects were not modulated by stimulus condition. Analyses on error rates were non-significant. Although fear indices pointed towards robust group differences, none of them significantly predicted antisaccade performance in SP.DISCUSSION: Results indicate enhanced inhibitory control performance in SP, indexed by shorter antisaccade latencies, highlighting differential effects of inhibitory control performance in subclinical fearful versus clinical populations. Furthermore, results point towards a highly efficient attentional avoidance pattern in patients with specific phobia that may be independent of psychometric, behavioral and psychophysiological indices of fear.

P.635 - Emotion Regulation Flexibility and Resilience

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Recent developments in the field of emotion regulation (ER) support the notion that no clear distinction of functional and dysfunctional ER strategies exists. Evidence further suggests that considering prevailing contextual information and reacting to contextual changes is important when determining which strategy to use in a given moment. Consequently, there has been a rise in research on variability and flexibility in ER. ER variability refers to dynamic changes in applying different ER strategies over time. ER flexibility considers variations in ER which are synchronized with contextual changes. While links between ER and resilience are well established, the relationships between ER dynamics and resilience remain to be investigated.Due to their high temporal resolution and high ecological validity, experience sampling methods (ESM) carried out via mobile devices have proven useful to investigate ER variability and ER flexibility.With this work we investigate the associations of ER variability and ER flexibility with psychological resilience in an international sample (N=226), using ESM data collected over a period of six months. We investigate both within- and between-subject effects of ER dynamics on resilience as outcome, using linear mixed models. Results are discussed.