

the stimuli is perceived, the other one is suppressed. Perception typically oscillates between the two possible images. Although it is known that probes presented to the suppressed eye interrupt the current dominance phase it has not been investigated yet whether attention can be shifted to a task-relevant probe before the dominance shift. To examine this question, a letter was presented either left or right of fixation and a distractor to the opposite side, both either to the dominant or to the suppressed eye. Fifteen participants identified the target letter, while the N2pc component was measured as an index of attentional shift in the event-related potential. This component occurs 200–300 ms post-stimulus and represents a stronger contra- than ipsilateral activity in reference to target position. If the attentional shift starts after the shift of dominance, we would expect much longer N2pc latencies for suppressed- than dominant-eye trials. The current experiment shows that the identification of a stimulus presented to the suppressed eye is impaired as reflected by an increase in reaction time. Because onset and peak latency of the N2pc component did not differ between both conditions attention is probably shifted to the target location before the dominance shift. However, a reduction in N2pc amplitude points at a sensitivity decrement for targets presented to the suppressed eye.

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EXPECTANCY-DRIVEN MODULATION OF PRIMARY AUDITORY CORTICAL RESPONSES

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Descriptors: primary auditory cortex, EEG, expectancy

Studies assessing the attentional influences on the auditory Steady-State Response (aSSR) are rare and have yielded contradictory results. In particular the role of top-down influences has not yet been very well studied. This question is of importance, however, as it could indicate whether such higher order cognitive processes are apt to modulate neuronal activity in primary auditory areas to which the aSSR had been associated. In this study we assessed the effect of expectancy on the amplitude of the aSSR. Subjects were instructed to differentiate between two tones that were essentially identical. Expectancy was modulated by giving feedback after each tone indicating which 'tone' was heard. The feedback consisted of a loud salient bandpass-noise for one of the virtual tones. The other tone was followed by silence. According to a study by Perruchet (1985) repetitive occurrence of the same feedback would lead to rising expectation of a change which was hypothesized to have an effect on the aSSR (e.g. expectation of a sound that is followed by aversive noise). This behavioral effect was replicated. Furthermore we observed a highly significant effect on the steady-state amplitude at contralateral temporal areas as well as in other areas that seem to form a network driven by auditory Steady-State stimulation. We therefore conclude that the aSSR, and therefore primary auditory responses, can be modulated by top-down processes, particularly expectancy.

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NEUROMAGNETIC ACTIVITY DURING RECOGNITION OF EMOTIONAL PICTURES

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Descriptors: magnetencephalogram, emotion, recognition memory

Emotional material has been shown to be better remembered than neutral material. This effect is associated with specific event-related potential (ERP) responses. The present experiment investigated the neuromagnetic correlates (MEG) of recognition memory for photographs varying in emotional content. The brain's neuromagnetic activity was measured during encoding and recognition of the stimuli. Highly arousing pleasant, highly arousing unpleasant, and

neutral photographs were presented to the participants with the instruction to memorize them. They were later presented together with new photographs in an old-new decision task. In line with previous ERP studies, encoding of emotional pictures led to increased MEG activity between 340 and 570 ms after picture onset. However, this enhanced activity occurred earlier for pleasant (340–570 ms) than for unpleasant pictures (430–570 ms). During recognition, a similar emotion effect occurred, as reflected in an activity enhancement for emotional pictures between 450 and 580 ms. Moreover, a long-lasting old-new effect (320–900 ms) was found: Only for the pleasant pictures did the old-new effect interact with picture content: Neuromagnetic activity was particularly increased for old pleasant pictures between 320 and 450 ms. Thus, this MEG study demonstrates that initial picture processing as well as subsequent memory processes are affected by emotional content of the items. As most effects appear earlier or are more intense for pleasant pictures these seem to attract more processing resources in healthy college students.

CHILDHOOD STRESS LOAD AFFECTS PSYCHOENDOCRINOLOGICAL RESPONSES IN PSYCHIATRIC PATIENTS

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Descriptors: stress, psychopathology, cortisol

We explored the relationship between stressful experiences before puberty and psychoneuroendocrinological responses in 76 psychiatric inpatients (48 men, age: 18–69 years; 29 schizophrenia diagnoses, 25 affective disorders, 15 alcohol/drug addiction, 7 borderline personality disorder) and 21 healthy controls (10 men, 19–70 yrs). Prepubertal stress load was assessed with the German version of the Early Trauma Inventory; endocrinological indicators of the stress axis were salivary morning cortisol (measured three times in the hour after awakening) and salivary cortisol responses before and after presentation of affective pictures (IAPS) during MEG-recording; PANAS negative affect (NA), BDI, and PANSS were used to measure psychopathology. Stress load was higher in patients than in controls ($p < .01$) and higher in patients with personality disorders than in those with affective disorders, schizophrenia, or addiction ($p < .05$). Across diagnostic groups, stress load varied with measures of psychopathology ($p < .05$). Higher levels of morning cortisol were significantly related to PANSS-P and sexual abuse in schizophrenics, while in depressives stress load was positively related to NA and BDI-depressiveness, the latter tending to vary with cortisol. Across affective stimulation (MEG), only patients with low but not with high stress load displayed a decrease of salivary cortisol response ($p < .05$) indicating a failure of normal habituation. Results suggest that early experiences may interact with the disorder in their effects on psychopathology and the endocrinological stress axis. Research was supported by DFG (FOR751).

INTENSITY INFORMATION ENCODED IN AUDITORY IMAGERY AS INDEXED BY ELECTROPHYSIOLOGICAL AND BEHAVIORAL MEASURES

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Descriptors: auditory imagery, event-related potentials

There is a long-standing debate over whether mental imagery is just symbolic representation or depictive representation as well. We address this issue in the auditory modality by investigating whether auditory imagery could encode the intensity of sounds using event-related potentials (ERPs). After learning the associations between three pure tones of different intensities (50, 75, 85 dB SPL) and three geometrical shapes (square, circle and triangle), ERPs were recorded while participants were presented only with geometrical shapes and asked to imagine hearing the corresponding sounds (imagery stage). After a short delay one of these three sounds was presented and participants were required to compare this real sound with the previously imagined one (comparison stage). Results revealed that in the imagery

stage the P270 amplitude increased with the intensity of the imagined sound. In the comparison stage, the behavioral performance was better for a high discrepancy than a low discrepancy between the SPLs of the imagined sound and the real sound, and accordingly the conflict-related N2 showed a greater amplitude for the high discrepancy condition. These results provide evidence that auditory imagery might encode intensity information, supporting the depictive theory of mental imagery.

COMPARING WORKING MEMORY CONTENTS VS. RECALLING WORKING MEMORY CONTENTS: P3 AND LATE NEGATIVE COMPONENT DIFFERENCES

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Descriptors: ERP, working memory, comparison

An ERP study was conducted to evaluate the comparison of two numbers in working memory versus recall of the two numbers. Participants were given two numbers to store and were presented with a series of arrows serially on the left or right. Subjects were to increment or decrement the corresponding number in the direction of the arrow. In the comparison condition the participants were presented with a mathematical operator (e.g. greater than) and were asked to indicate if the relation represented by the operator was the correct relation between the two numbers in working memory. In the recall condition the participants were presented with two numbers and asked to indicate if the numbers on screen matched the numbers in working memory. ERP analysis indicated a significantly larger P3 over frontal cortex in the comparison condition. This suggests that when the two numbers are integrated into a single relational representation, processing recruits frontal cortex more than a simple match of items to a sample. Previous studies have found frontal mechanisms underlying relational representations. A late negativity prominent over parietal cortex was discovered in the range of 600 to 800 ms post-stimulus. The difference between the two conditions was significant with the comparison condition showing greater negativity and a later peak. Such late negativities have been correlated with syntactic processing implying that one possible explanation for the difference is the sentence-like structure of inequalities which the participants may have constructed in the comparison condition.

INCREASED ACTIVATION OF THE FRONTAL P3 DURING ENCODING IS ASSOCIATED WITH POORER WORKING MEMORY PERFORMANCE IN MIDDLE AGED ADULTS

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Descriptors: working memory, hyperfrontality, aging

Research has shown that areas of the frontal lobes play an important role in certain processes of working memory (WM). Patients with deficits in WM (i.e., multiple sclerosis or traumatic brain injury) have been observed to produce frontal lobe hyperactivity, also referred to as overactivation, during WM task performance. Frontal overactivation has also been seen during WM task performance in healthy aging adults. This study examined the neural correlates of frontal overactivation during the different stages of WM in 26 healthy middle aged adults. The P3 component of the event-related brain potential (ERP) was recorded during the encoding, maintenance, and response selection stages of a spatial WM task. P3 amplitude, recorded during each WM stage, was related to an independent behavioral measure of WM, the Paced Auditory Serial Addition Task (PASAT). The PASAT places high demands on speed of information processing and WM. We hypothesized that hyperfrontality, as evidenced by greater ERP P3 amplitudes in the frontal scalp sites, would be related to poorer performance on the PASAT. Results supported our hypothesis only during the encoding stage of WM. The relationship was not present during the maintenance or response selection stages. This hyperfrontality finding suggests that individuals who have difficulty with WM recruit more frontal cortical resources to successfully encode information in WM.

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AN ELECTROPHYSIOLOGICAL STUDY OF AGE-RELATED DIFFERENCES IN ENCODING AND MAINTENANCE DURING A SPATIAL WORKING MEMORY (WM) TASK

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Descriptors: working memory, P3, age differences

The frontal cortex has been shown to play a significant role in WM. Evidence suggests that there are changes in frontal lobe functioning with increasing age. Neuroimaging studies reveal an age-related trend toward increased activation of the frontal cortex during working memory (WM) tasks. We examined age effects as indexed by P3 amplitude and scalp distribution during the encoding and maintenance stages of a spatial WM task. Fifteen healthy middle aged adults (mean 47.5, sd 6.4 yrs) and 14 young adults (mean 18.4, sd 0.76 yrs) participated in the study. Event-related potentials were recorded during a spatial WM task administered under two different memory load conditions (1 or 3 stimuli). A Site (Fz, Cz, Pz) \times Load (1,3) \times Stage (encoding, maintenance) by Group (young, old) ANOVA revealed a significant Site \times Stage \times Group interaction. Further analysis showed a significant Site \times Group interaction only for encoding. During encoding, there was a difference in the pattern of P3 amplitude scalp distribution between the two age groups. While younger participants had a greater parietal maximum (Pz > Cz > Fz), the older group had lower amplitude at the central/parietal sites and relatively higher amplitude at the frontal sites than the younger participants. Overall our findings show that there are significant age-related changes in the functional topography of anterior-posterior neural circuits that are related to the stages of WM and that the P3 response may be useful for following these changes over time.

ASYMMETRICAL FRONTAL EEG AND ANGER FOLLOWING SOCIAL REJECTION

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Descriptors: anger, frontal asymmetry, social rejection

Previous research has suggested that social rejection can either cause approach-motivated behaviors (such as aggression) or withdrawal-motivated behaviors. The present study sought to extend such research by examining the effects of social rejection on asymmetrical frontal cortical activity, based on research suggesting that approach motivation is related to greater relative left frontal cortical activation. In the study, participants were told they would be practicing their mental visualization skills while they played Cyberball, a computer ball toss game, against two computer-generated players. The game was designed so that participants were included for the first third of the game, and then ostracized for the remaining two-thirds. Participants completed self-report measures before and after playing the game. Results indicated a significant relationship between self-reported anger during the game and the difference in relative left frontal activation from the period of ostracism with greater left frontal activation reported being more angry to the ostracism. No significant results were found between withdrawal-related emotions and frontal asymmetry. The results of this study suggests that individuals who respond to ostracism with greater relative left frontal activation are more likely to experience anger and are perhaps more likely to become aggressive.

PHYSIOLOGICAL AROUSAL DURING NARRATION OF EMOTIONAL EVENTS IN SECURE & DISMISSIVE ATTACHED INDIVIDUALS

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Though theoretical evidence suggests that they are linked (e.g., Bowlby, 1979), there is a lack of empirical data examining associations among arousal, physiological reactivity, and adult attachment style, particularly in ethnically diverse samples. We examined these associations in a sample of 200 males and females,