ATTACHMENT CLASSIFICATION AND PREGNANT WOMEN'S PHYSIOLOGICAL REACTIONS TO CRY STIMULI

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Descriptors: attachment, respiratory sinus arrhythmia, infant cry

Parents' representations of their own early relationships shape their abilities to respond sensitively to their infants' communication signals. Certain infant signals (e.g., crying) may be physiologically arousing to parents and also affect parents' responsiveness. This study investigated the associations between primiparous women's Adult Attachment Interview (AAI) classifications (Secure vs. Insecure) and their autonomic reactivity and regulation in response to simulated infant crying. Sixty women in their third trimester of pregnancy (mean age 32.6 years) viewed four 3-minute videoclip epochs: baseline (seascape), 'simple' cry (sound of infant crying), 'complex' cry (mother/infant separation and sound of infant crying), and recovery (seascape). Psychophysiological data were recorded continuously. Afterward, participants completed the AAI. Differences between AAI classifications emerged for Respiratory Sinus Arrhythmia (RSA), a measure of self-regulatory capacity. Women classified as Insecure evidenced less effective regulation than did women classified as Secure in reaction to simple (F(1,59) = 7.54, p = .009) and complex (F(1,59) = 14.15, p < .001) cry stimuli. These preliminary results indicate, that compared to secure pregnant women, insecure pregnant women did not regulate their physiological arousal as well when exposed to infant crying. This less effective regulation in the face of a salient attachment stressor may have implications for their later capacity to manage their physiological arousal and to respond sensitively to their own infant's emotional bids.

RESPONSES TO SUBLIMINAL FACIAL EXPRESSIONS IN INDIVIDUALS AT RISK FOR PSYCHOPATHOLOGY

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Descriptors: psychopathology, startle, facial EMG

Based on previous research indicating that individuals at risk for psychopathology show abnormal processing of, and response to, facial expressions of emotion (Agin & Allen, 2002), we set out to establish whether these abnormalities extended to automatic, preconscious processing of facial expressions. From an initial screening sample of 870 students, individuals at risk for unipolar depression, anxiety disorder, and psychosis were identified using the General Behavior Inventory, the Endler Anxiety Scales, and the Chapman Psychosis proneness scales, respectively. Participants viewed a series of happy, neutral and angry expressions presented for an individually established duration that was just under that required for conscious recognition of the expression (modal exposure time 36ms). This initial prime face was then masked by a neutral expression face for all conditions. Startle probes were presented at a short latency after the onset of the masking stimulus (120ms) on a proportion of trials. Startle eyeblink responses, ERPs, and facial muscle responses were measured while viewing the faces. Consistent with previous findings (Dimberg, 2000), corrugator and zygomatic muscle responses differentiated between prime conditions. Furthermore, startle inhibition was significantly greater following an angry prime than a neutral prime. Interestingly, though, there were few differences in these responses amongst the risk groups, suggesting that previously demonstrated abnormalities in these groups do not extend to the automatic, preconscious processing of facial expressions.

CENTRAL NEURAL CORRELATES OF SALIVARY CORTISOL IN SOCIAL PHOBICS PERFORMING A SPEECH

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Descriptors: Social anxiety, public speaking, cortisol

Little is known of the relationship between cortisol secretion and central neural activity during conditions of anxiety provocation in humans. The aim of this study was to correlate cortisol levels with regional cerebral blood flow (rCBF) in social phobics performing a public speaking task. Method: Positron emission tomography with the tracer 15-O water was used to measure rCBF in 12 subjects with DSM-IV-defined social phobia at 2 time points separated by 6 weeks while they were performing a speech in front of an audience. Cortisol concentration was measured out of saliva samples 15 minutes after each speech. Results: Positive correlations between rCBF and post speech cortisol levels were found in the right hypothalamus. Conclusions: The positive correlations found in this study between salivary cortisol concentration and rCBF in the hypothalamus suggest that neural activity in this region might be related to cortisol secretion in human subjects.

DIFFERENCES IN COGNITIVE PROCESSING DURING GO/NOGO AND STOP/NOSTOP TASKS: CORRELATIONS BETWEEN REACTION TIME AND ERP-P3S

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Descriptors: reaction time, P3, correlation

Cognitive processing during a Stop/Nostop task is assumed to differ from that of a Go/Nogo task. We recorded ERP-P3s and RT during each task to scrutinize these processes. Participants (N = 50) were presented with pictures belonging to five different categories: people, cars, flowers, electrical applicants and landscapes. Under the Go/Nogo task, participants were required to press a button only to people. Under the Stop/Nostop task, participants had to inhibit responses to cars, while reacting to all other stimuli. Both the Go and the Nostop stimuli elicited two positive components: early P3 around 380ms and late P3 around 530ms. The early P3 (latency, amplitude at Pz) and the late P3 (amplitude at Cz) for the Go stimuli were highly correlated with the RT. The early P3 (amplitude at Cz) and the late P3 (amplitude at Fz) for the Nostop stimuli also showed significant correlations with the RT. It is suggested that the early P3 reflects stimulus evaluation and the late P3 involves motor-responses. On the other hand, both the Nogo and the Stop stimuli (response inhibition) elicited P3 whose amplitudes relatively increased at Cz. The Nogo P3 (amplitudes at Pz and Cz) were highly correlated with the Go RT, and the Stop P3 (latency, amplitude at Cz) with the Nostop RT, respectively. It should be noted that the processing of the Nogo or the Stop stimuli (response inhibition) is, respectively, related to the Go or the Nostop (reaction) RTs. Taken together, motor-response processing is considered play an important role during the Stop/Nostop task, in contrast to the Go/Nogo task.
REPRODUCIBILITY OF THE COLD PRESSOR EFFECTS ON CARDIOVASCULAR, ADRENOCORTICAL AND PAIN MEASURES IN MEN AND WOMEN
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Descriptors: pain, cold pressor, cortisol

The cold pressor test (CPT) is a widely used procedure to evaluate acute pain and autonomic functions. Studies have shown limited short-term reproducibility of its effects. An initial exposure to CPT may reduce situational anxiety and enhance reliability in subsequent measurements. We evaluated responses to CPT and pain perception in 17 men and 10 women over two sessions conducted on separate days. An initial session was conducted and included exposure to the hand CPT for 90 s. During the two subsequent sessions, participants performed CPT (0–4 degrees C) and rated their pain every 15 s. They also reported pain using the McGill Pain Questionnaire (MPQ). Salivary cortisol samples and cardiovascular measures were collected prior to, during, and after CPT. Pain ratings, MPQ scores, cortisol levels, BP, and HR responses to CPT did not differ across the two test sessions (ps > 0.13). The previously observed sex differences in pain reports using CPT were not significant (Fs < 1). All pain measures and cardiovascular responses demonstrated significant test-retest correlations (rs > 0.53; ps < 0.01). Cortisol levels showed the expected decline across period (p < 0.05). Reliability coefficients were also significant, especially for cortisol levels obtained during recovery (rs > 0.44, ps < 0.05). This study demonstrated that initial familiarity exposure to CPT may improve stability of the responses to this test. Absence of sex differences in pain reports suggests that situational anxiety may have contributed to previously observed differences between men and women.

AUTONOMIC CARDIAC CONTROL DURING FAMILY INTERACTIONS: ADOLESCENT AFFECT AND AFFECT REGULATION
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Descriptors: Respiratory sinus arrhythmia, preception period, social interaction

We examined the relations between tonic and phasic measures of autonomic cardiac control and self report and behavioral indices of affect and affect regulation. Participants were 25 adolescents and their parents. Physiological measures (heart rate, respiration rate, respiratory sinus arrhythmia; RSA, preception period; PEP) were obtained during a resting baseline as well as during two family interaction tasks; a Problem-Solving Interaction (PSI) and an Event Planning Interaction (EPI). The assessment also included a number of parent- and adolescent- report indices of emotion regulation, and microsocial observational coding of parent and adolescent behavior during the interaction tasks. During the EPI duration of depressive behavior was associated with increases in parasympathetic activity, whereas sympathetic arousal was associated with duration of aggressive affect. During the PSI, duration of happy affect was associated with decreased sympathetic arousal. Individual differences in reported affect intensity were associated with the degree of physiological reactivity during the PSI interaction. Finally, reported levels of trait negative affect were associated with baseline sympathetic activity (PEP) whereas reported levels of trait positive affect were associated with baseline parasympathetic activity as reflected in RSA and heart rate. Levels of parasympathetic activity correlated with the adolescents’ use of positive emotion regulation strategies, whereas baseline sympathetic activity (PEP) was associated with the reported use of negative affect regulation strategies.

DIFFERENTIAL EFFECTS OF AFFECTIVE MODULATION ON ORBICULARIS AND POST-AURICULAR INDICES OF STARTLE
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Descriptors: affective modulation, acoustic startle response

The acoustic startle response is attenuated in the presence of pleasant stimuli and augmented in the presence of unpleasant stimuli, as compared to the startle response under neutral conditions. This affective modulation of the startle response has been predominantly explored in the blink component of the startle response, as measured by the EMG activity of the orbicularis palpebrarum muscle. Affective modulation of the post-auricular response (PAR), another component of the startle response that is recorded from the retrahens auriculam muscle behind the pinna, has not been widely investigated but may be informative about different neural circuits underlying affective modulation of sensory afferents. EMG of the orbicularis palpebrarum and retrahens auriculam muscles was recorded from 55 healthy participants in a conventional affective modulation paradigm. Consistent with previous studies, unpleasant slides facilitated whereas pleasant slides attenuated the amplitude of the startle blink response compared to neutral slides. In contrast, the magnitude of the PAR response was inversely related to the magnitude of the blink response, with unpleasant slides attenuating and pleasant slides augmenting the amplitude of PAR compared to neutral slides. These findings suggest that blink and PAR measures of affective startle modulation may index distinct neural circuits associated with defensive and appetitive processes, respectively.

NEURAL SIGNALS FOR THE DETECTION OF RACE BIAS: IMPLICATIONS FOR REGULATORY ABILITY
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Descriptors: Prejudice, conflict-detection, emotion regulation

Despite egalitarian beliefs, many low-prejudice people often fail to regulate expressions of automatic race bias. We hypothesized that differences in the ability of neural systems to detect conflict between automatic race-bias and non-prejudiced intentions may underlie regulatory ability. On the basis of past research, participants’ levels of internal and external motivations to respond without prejudice were used to identify them as good, poor, or non-regulators. Participants completed a sequential priming task that induced race-biased responses on certain trials while EEG was recorded. The error-related negativity (ERN) ERP was used to index neural signals of conflict-detection. Across participants, larger ERNs to race-biased responses, relative to other response types, predicted better control on the behavioral task. However, only good regulators exhibited an increase in ERN amplitude for responses attributable to race bias. For them, this increase was associated with elevated guilt. Furthermore, their feelings of self-dissatisfaction following the task were associated with greater relative left frontal activity (inverse alpha), which in turn predicted greater behavioral control. Results suggest that the successful regulation of race bias involves a coordinated pattern of emotional and approach-related motivational responses. This pattern was not evident among poor and non-regulators. Previous work suggests that poor regulators’ increased anxiety in interracial situations may contribute to the disruption of successful race bias control.
EMOTIONAL INFORMATION PROCESSING AS A FUNCTION OF DISPOSITIONAL AFFECTIVE STYLE. AN EVENT-RELATED POTENTIAL STUDY

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Descriptors: ERP, emotion processing, affective style

Event-related potentials (ERPs) were used to examine the role of individual differences in dispositional affective style on early processing of emotionally salient information. Previous ERP studies have identified a late positive potential (LPP) displaying larger amplitudes for emotional stimuli (positive and negative) compared to neutral stimuli. Eighteen participants reporting high positive affect (PA) and eighteen reporting high negative affect (NA) were selected from a pool of 1503 undergraduate students screened with the Positive And Negative Affect Schedule. Positive, negative and neutral pictures were randomly presented for 1.5 sec. Participants were instructed to respond to positive and negative stimuli by pressing the appropriate key as quickly as possible. There was a significant valence by group interaction regarding reaction time reflecting a group – emotional valence congruency. The ERP data showed a significant group by valence interaction in the 350 to 500 ms interval representing the initial part of the LPP. There was also a significant group by valence effect as early as 100 to 150 ms. PA subjects processed stimuli in an emotionally congruent way with largest LPPs for positive stimuli. This effect was less evident in NA subjects. Generally, NA subjects generated attenuated ERPs compared to PA subjects. The results indicate that differences in dispositional affective style influence the information processing of emotional stimuli, and that such individual differences should not be neglected in non-clinical studies of brain-emotion relations.

PROCESSING RADIO PUBLIC SERVICE ANNOUNCEMENTS: AROUSING CONTENT, PRODUCTION PACING, AND CHILDREN

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Descriptors: radio, attention, arousal

This study examined how children (9–12 years old) process radio public service announcements (PSAs) which vary by Production Pacing and Arousal Content. The study predicted that the effects of Production Pacing and Arousal Content on attention (heart rate), arousal (skin conductance), and encoding (recognition) would be the same for radio PSAs as they are for video PSAs. In the experiment, 72 children listened to 24 PSAs (12 PSAs calm and 12 arousing). Within each Arousal Content level, 4 were slow paced, 4 were medium paced, and 4 were fast paced. We predicted and found that children paid more attention (had slower heart rates) to arousing content compared to calm content. We predicted that both increased production pacing and the presence of arousing content would elicit greater self-reported arousal and skin conductance. Instead, we found that for calm messages, as expected, production pacing increased arousal (physiological and self-reported). However, for arousing messages, skin conductance increased from slow to medium production pacing and then decreased for fast production pacing. We predicted and found a main effect for Arousal Content on recognition such that arousing content was recognized better than calm content. In addition, we expected and found an interaction of Production Pacing and Arousal Content such that Production Pacing increased recognition for calm messages but resulted in a decrease in recognition from slow to medium pacing and an increase from medium to fast pacing for arousing messages.

LANGUAGE LATERALIZATION IN DYSLEXIC CHILDREN: AN EEG MAPPING STUDY

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Descriptors: dyslexia, language, lateralization, Slow Potentials

In the present investigation slow evoked potentials were used to measure language lateralization in children affected by developmental dyslexia. 7 children affected by phonological dyslexia and free from Attentional Deficit Disorder with Hyperactivity participated in the experiment. 11 matched subjects served as controls. The experimental design consisted in a language-related CNV paradigm, in which two words were presented sequentially. Subjects had to read the first word and after a 2s interval and the presentation of a second word they had to decide whether the two words rhymed (phonological task) or were semantically related (semantic task). 26 EEG electrodes were fed into a DC amplifier. Data analysis included the mean CNV which develops during the interstimulus interval. The lateralization scores were computed as the difference between right and left electrode potentials. Both EEG mapping and statistics showed a left lateralization in controls and reversed (rightward) lateralization in dyslexics during the phonological task in the anterior sites. Semantic task did not differentiate the groups. Results are in agreement with the hypothesis that left frontal cortex plays a role in phonological assembly of the words and this area is functionally altered in dyslexics.

INFORMATION PROCESSING CONSISTENCY IN THE ERP: EFFECTS OF AGING AND ATTENTION DEMANDS

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Descriptors: ERP, aging, variability

An event-related potential (ERP) auditory duration oddball study was conducted with 20 younger and 15 older adults to test for the effects of task manipulation on EEG signal consistency, measured by the correlation between averaged and single trial ERPs. It was expected that (1) a dual task would adversely affect attention and performance and would reduce the signal consistency in general; and (2) there would be age-related differences on task signal consistency especially as a result of the manipulation. We examined the ERP consistency for an early (50–250 ms) and a late (250–750 ms) period separately. Primary findings: For the early period, a significant Task × Age × electrode site interaction indicated that while the younger adults signal consistency was reduced by the dual task at Fz, Cz, and Pz, the older adults values increased at Cz and Pz in the dual task condition. In addition, the older adults showed more hemispheric differentiation in signal consistency (at ventral sites AF7/C7/P7 vs. AF8/C8/P8) than did the young adults, contradicting the generally accepted notion that the hemispheres are more similar in older adults. For the later period, contrary to prediction, the dual task had a higher signal consistency in the ERP at the midlines than the single task, with significantly larger differences at posterior sites. At lateral dorsal sites, greater hemispheric differentiation in signal consistency was shown by the younger group. Signal consistency is interpreted in terms of controlled/automatic processing requirements and differences in effort due to task.
EMOTIONAL RESPONSE SPECIFICITY DURING EMOTIONAL PROCESS

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Descriptors: emotional process, response specificity, psychophysiology

Considering valence and arousal to be the strategic dimensions of the emotion word, we assume that physiological and behavioral reactions to affective stimuli should also reflect different patterns for pleasant and unpleasant stimuli. The aim of this study was to examine to emotional response specificity integrating the maximum number of correlates expressed in the emotional processing. To achieve the goal was designed a procedure according to the bioinformational theory (Lang, 1979) that include the response systems and contextual prototypic information. Fifty-five participants, (27 men), adult (M = 25 years) were asked to imagine situations designed to evoke happiness and sadness, plus a neutral scene, and at same time and along different moments correlates of the triple response system were recorded. A 5 (time) X 2 (emotion type) model repeated measures experiment was conducted. The results suggest that heart rate is dissimilar for happiness and sadness in emotional process and an interaction between time and emotion type for heart rate, skin conductance and electromyography of forearm (all ps < .05). This indicates that emotional arousal regulation regarding psychophysiological correlates, is significantly different during the both types of emotional processing (happiness and sadness) considering the temporary parameter.

P300 AS AN INDEX OF NON-TARGET FEATURE DETECTION

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Descriptors: Similar-to-target P300, Non-target P300, ERP

The present study explored the human event-related potential (ERP) correlates of processing non-target stimuli that were perceptually similar to a standard target in a pictorial multi-stimulus oddball paradigm. Participants were instructed to keep a mental count of target stimulus presentations. The target stimulus was a schematic drawing of a human face with eight distinct features: two eyes, two eyebrows, two ears, one nose, and one mouth. Non-targets varied in similarity to the target stimulus based on number of features. The target stimulus elicited significantly larger P300 components than non-target stimuli. The non-target P300 amplitude varied in magnitude as a function of physical similarity to the target stimulus. Non-target stimuli with more features (i.e., more similar to the target) generated P300 components that were significantly larger compared to those with fewer features. Counting accuracy was high, with no participant reporting a count greater than 3% different from the correct count. The data indicate that P300 amplitude can be used as an index of stimulus similarity based on physical dimensions. In a separate experiment, reaction time data were collected on a target/non-target identification task. The results, which mimic those obtained with electrophysiological measures, indicate that the time to identify non-targets decreased as the similarity between target and non-targets decreased.

EEG SYNCHRONIZATION AND SPATIAL WORKING MEMORY IN SCHIZOPHRENIA PATIENTS, THEIR UNAFFECTED CO-Twins, AND CONTROLS

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Descriptors: EEG coherence schizophrenia

Working memory (WM) performance is associated with integrated activity in a network of brain regions. Schizophrenia patients and their relatives show both impaired WM and neuropathology consistent with degraded connectivity within the brain. Hemodynamic neuroimaging suggests that disrupted connectivity underlies these WM deficits; however, the extent to which these data accurately reflect changes in functional connectivity occurring on a much smaller time scale remains controversial. In the present study, electroencephalographic recordings were taken while schizophrenia patients, their non-schizophrenic co-twins, and controls performed a task varying spatial WM load. Event-related coherence (ERC), a measure of synchronization of signals between electrodes, was used to quantify integration of distributed cortical activity on a neurally plausible time scale. Overall, ERC increased moving from visual encoding to maintenance of stimulus location in the absence of perceptual prompts. Patients showed higher ERC values than controls, but the pattern of group-wise differences was more complex than the main effect of diagnosis on behavior. Co-twins' performance was intermediate between the other groups, and their ERC values reflect patients' values in some instances and controls' in others. These results suggest that patients' elevated ERC is related to reduced neurocognitive efficiency during WM processing, and is modulated by both genetic and disease-specific factors.

EFFECTS OF BODY POSITION ON CARDIOVASCULAR MEASURES OF ATTENTION IN YOUNG AND OLD ADULTS
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Descriptors: Attention, aging, body position

Young (n = 22, 9 males, M age 20 years) and old (n = 14, 7 males, M age 69 years) adults performed three attention tasks while supine and at 30- and 70-degrees whole-body head-up tilt. Auditory stimuli (high or low pitch tone) that required manual responses (key press) alternated with visual stimuli (up or down arrow) that required pedal responses (foot flexion) in 128 s trials. Attention was manipulated by instruction to respond to one modality and ignore the other for selective attention tasks or to switch attention between modalities and respond to both in an attention switching task. The ISI was 2 s in the selective attention tasks and 4 s in the attention switching task so that responses occurred every 4 s. Blocks of 5 trials began and ended in the supine position, and participants were supine or tilted to one body position in trials 2-4. Two change scores were used to assess the effects of tilt (Trial 2-Trial 1) and recovery from tilt (Trial 5-Trial 4) on heart rate (HR) and respiratory sinus arrhythmia (RSA) during task performance. The HR increase but not the RSA decrease to tilting differed between age groups, but neither tilt response differed across attention tasks. However, RSA recovery was greater for auditory selective attention than for attention switching, and the young group, but not the old group, had greater RSA recovery for visual selective attention than for attention switching. RSA recovery suggests that old adults require more attentional resources for visual/visual task performance than young adults.
EMOTION-MODULATED STARTLE IN COMMUNITY MALES WITH PSYCHOPATHIC TRAITS

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Descriptors: psychopathy, startle, personality

Psychopathy is a clinical syndrome that encompasses two distinct facets: one reflecting emotional-interpersonal deficits, and the other chronic antisocial deviance. Many theorists have suggested that psychopaths are present in the community, but nearly all psychophysiological research on psychopathy has been conducted with incarcerated samples. Prisoners high in psychopathy, particularly those high on the emotional-interpersonal factor, do not show normal fear potentiation of the startle reflex. In a picture-viewing task, these individuals show a quadratic startle modulation pattern in which blink magnitude is inhibited during both pleasant and aversive scenes in relation to neutral. Here, we investigated relations between psychopathy and startle modulation in a sample of 305 young adult males from the community. Psychopathy was indexed using an omnibus personality inventory that has been shown to tap the two aforementioned facets of the disorder (c.f. Benning, Patrick, Hicks, Blonigen, & Krueger, in press). Participants with high scores on the affective-interpersonal facet showed a normal linear pattern of blink modulation, while participants low in this factor showed a normal linear pattern. Additionally, fear potentiation of blink modulation, while participants low in this factor showed a normal linear pattern. These findings replicate prior findings with prisoners and suggest that the affective-interpersonal facet of psychopathy reflects a similar underlying reactivity difference in non-incarcerated individuals.

AFFECTIVE ORIENTING RESPONSES: A NOVELTY P3 STUDY WITH EMOTIONAL PICTURES

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Descriptors: orienting, P3a, emotion

The orienting response is an involuntary shift of attention towards new, unexpected, or unpredictable events (Friedman, Cycowicz, and Gaeta, 2001). The current study employed a novelty P3 paradigm, as commonly used to study ERP correlates of visual processing, to assess responses to motivationally relevant emotional stimuli. Simple ovals served as the standard non-targets (70% of trials), ovals with schematic ears and nose served as the targets (15%), and affective and neutral pictures from the International Affective Picture System (IAPS) served as the novel non-target stimuli (15%). An expected parietal maximal P3 component was observed for the targets. For the novel picture stimuli, an expected earlier and more anterior P3 component was observed. Additionally, a pronounced negativity, beginning at the N1 component and maximal at the N2 component, was observed for novel picture stimuli only. This negativity was largest fronto-centrally, and smallest parietally. Significant affective modulation of the novelty P3 and an associated late positive component (LP; 500–900 ms) was observed, with amplitude greater for affective pictures (pleasant and unpleasant) neutral. This difference persisted, although less markedly, through 2000 ms. Analyses of effects for specific thematic contents and affective intensity of picture stimuli, as well as earlier ERP components, will also be presented. Implications for the study of biologically motivated orienting processes will be discussed.

ANTISOCIAL PERSONALITY, PSYCHOPATHY, AND P300 AMPLITUDE IN PRISONERS AND COMMUNITY MALES

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Descriptors: psychopathy, antisocial personality, P300

In community samples, antisocial personality disorder (APD) is reliably associated with reduced amplitude of the oddball P300 response. Prisoner studies to date, which have focused on the related construct of psychopathy, have yielded inconsistent findings (Raine, 1993). To extend prior work, we examined P300 in a visual oddball task in two samples: male prisoners (n = 50), and adult community males (n = 153). Ratings of DSM-IV APD were available for both samples, and for the prisoners, ratings on the Psychopathy Checklist Revised (PCL-R) were additionally available. In both samples, a significant negative correlation was found between P300 amplitude and number of adult APD criteria met, and in the community sample, a parallel relation was found for child APD symptoms. In the smaller prison sample, P300 was further examined in relation to two correlated factors of psychopathy indexed by the PCL-R: interpersonal-affective, and social deviance. Controlling for their overlap, the two PCL-R factors showed opposing relations with P300: r's = −.19 and −.17, respectively, with the difference approaching significance, p = .078. Our findings indicate that reduced P300 amplitude is associated with APD symptoms in both community and incarcerated males, and with PCL-R social deviance, which is related to APD. In contrast, we found evidence of enhanced P300 for the interpersonal-affective facet of psychopathy. These differential relations may help to explain inconsistencies in prior psychopathy research.

TIME-FREQUENCY DECOMPOSITION OF ERPS FROM A VISUAL ODDBALL TASK: TIME-DEPENDENT DELTA, THETA, AND ALPHA OSCILLATIONS

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Descriptors: time-frequency, oddball, P300

Recent work has shown coordinated delta, theta, and alpha activity during visual oddball tasks. To characterize this activity, single-trial time-frequency transforms (TFTs) were decomposed using PCA (Bernat, Williams, Gehring, Lorenz, & Casey, 2002). Data from 1866 17yo participants in the Minnesota Twin Family Study (979 males) from electrode Pz were used. Target data spanning 0–14 Hz and 1–1312.5 ms were chosen for decomposition. Fifteen PCs evidenced coordinated time-dependent activity as follows. Prior to P300, alpha desynchronization was apparent in two alpha PCs (fast & slow) that transitioned to a single alpha PC ending just before the P300 peak. Also, two delta PCs (100–400 ms/1–2 Hz and 250–400 ms/2–3 Hz) and two interleaved theta PCs occurred before P300. The P300 peak was associated with two delta PCs (375–475 ms/2–3 Hz and 400–600 ms/1–2 Hz). After P300, two delta PCs were evident (1Hz/600–1000 ms and 1Hz/1000ms-end). Alpha resynchronization after P300 occurred in one alpha PC that transitioned to fast and slow alpha PCs. Finally, a theta PC occurred after 900 ms. To assess stability of the solution, odd and even halves of the dataset were decomposed, producing structurally identical solutions. Target task difficulty was assessed. Easy targets produced larger and earlier alpha resynchronization, and simultaneously greater delta and theta activity. Hard targets were associated with greater delta activity preceding P300. In light of the sample size and solution stability, the decomposition appears to offer a stable and rich description of the coordinated TF ERP activity.
P300 AS AN INDEX OF CONCEPTUAL EVALUATION OF HUMAN FACES

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Descriptors: P300, ERP, Face Evaluation

The present study explored the human event-related potential (ERP) correlates of processing non-target stimuli that were in varying degrees conceptually similar to a target. A multi-stimulus oddball paradigm was employed. The target stimuli were images of black female faces. Non-targets were images from eight other categories (black male faces, white female faces, white male faces, schematic face drawings, feminine watches, masculine watches, feminine shoes, and masculine shoes). Stimuli were equiprobable within and between categories. The task was to keep a mental count of target presentations. The target stimuli elicited significantly larger P300 components than non-target stimuli. Of the non-targets, black male faces produced the largest P300 amplitude, followed by white female faces, and then male faces. The other non-target types did not produce a discernable P300. These data suggest that facial identification involves automatic conceptual evaluations of race and gender, with race the primary classification. In an analogous experiment, using the same stimuli, reaction time data were collected on a target/non-target identification task. Reaction time (RT) latency for target identification was significantly greater than all non-target types. Among the facial non-target stimuli, RT latency was greatest for black male faces, and white female faces. While there was no difference in RT latency between these groups, both were greater than the white male face group. RT latency increased as the conceptual similarity between targets and non-targets increased.

THE DYNAMIC NEUROANATOMY OF BRAIN-SELF-REGULATION: A COMBINED EEG/FMRI STUDY

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Descriptors: Thought Translation Device, ALS, EEG, fMRI

Self-regulation skills of brain potentials can be used by totally paralyzed patients to communicate with a Brain-Computer-Interface (BCI) such as the Thought Translation Device (TTD). To understand the neurophysiology of brain-self-regulation, ten healthy subjects and five patients with amyotrophic lateral sclerosis (ALS) at initial stages of the disease were trained to control their slow-cortical-potentials (SCP) in a particular operant learning procedure. They applied their ability to regulate SCP from the vertex through visual feedback in a 1.5 Tesla MR-scanner. Due to the delayed hemodynamic response (BOLD-response), image acquisition scans could be performed after the feedback task to self-produce cortical negativity or positivity. The results show in the preparation phase similar activation patterns during cortical negativity and positivity. The highest activated voxels were located in the supplementary motor area (SMA) extending to the precentral gyrus. Additionally there was a strong activation in the basal ganglia during positivity task. During performance of the negativity task the highest activations were centered on the superior parietal cortex, the supramarginal gyrus and the SMA. In the positivity task we found a strong activation shift from central to more lateral located areas including the precentral gyrus on the left side and the inferior parietal cortex on the right side. Interestingly both tasks show significant deactivations in middle and inferior temporal regions covering the location of the reference electrodes placed on the mastoids.

THE STATUS OF THE THOUGHT-TRANSLATION-DEVICE (TTD)

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Descriptors: fMRI, Learning, slow cortical potentials

The TTD consists of a web-accessible computer-platform, called BC12000 and a more specialized version (TTD proper): Slow cortical potentials (SCP) (and mu-rhythm) may be used for direct Brain-Computer-Communication in the BC12000 system for completely paralyzed patients. Patients are trained with auditory/visual feedback and rewarded for large differentiations between negative-positive SCP/mu. After achieving more than 75% correct performance, they are introduced to a hierarchically organized spelling system that allows selection of letters or words with voluntary production of SCP/mu. Eleven patients with amyotrophic lateral sclerosis (ALS), artificially respirated and fed, were trained to communicate with SCP. Three patients started training after becoming completely locked-in without any muscular control, including eye-movements and external sphincter contractions. One patient learned to respond with digital (yes-no) brain responses, the other two did not learn. Patients who started SCP-self-control before the completely locked-in state acquired SCP-control and substantial verbal communication and 2 retained the skill until the completely locked-in state. The other patients communicate alternatively with the TTD and some remaining minimal muscle control. Issues requiring attention include: slow communication speed, patient brain control variability, need for auditory reinforcers. Possible solutions will be discussed including: new on-line algorithms for EEG-classification (support vector machine algorithm), multielectrode pre-screening training for mu and SCP, shaping procedures and intermittent reinforcement during training, transcranial magnetic stimulation (TMS) during training, and quality of life measurements.

EFFECTS OF CAFFEINE AND PLACEBO AT HOMEOSTASIS

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Descriptors: caffeine, placebo, homeostasis

The homeostatic theory of placebo effects suggests that placebo effects operate to bring an organism back to equilibrium, or homeostasis. This theory predicts that placebo effects in the same direction as drug effects should only be seen during a deviation from homeostasis, such as withdrawal from an addictive drug. If the organism is at homeostasis at the time of placebo administration, then no placebo response should be seen. In fact, compensatory placebo responses in the direction opposite the effects of the drug (unconditional stimulus) may occur. This was tested in the present study by administering caffeine (hidden in orange juice) and placebo (decaffeinated coffee) to coffee drinkers (N = 20) who were not caffeine-deprived. The present study also evaluated caffeine and placebo effects in non-users of caffeine (N = 19). Thus, all participants in this study were at homeostasis at the time of testing. The homeostasis theory would be supported if nondeprived coffee drinkers and non-users showed either no placebo effect, or a placebo effect in a direction opposite that of the drug effect. Results showed that caffeine caused an increase in blood pressure and skin conductance level. Decaffeinated coffee (placebo) also caused an increase in blood pressure and skin conductance level. In nonabstained coffee drinkers, coffee also increased alertness and arousal. Thus, the placebo effects were in the same direction as the caffeine effects, arguing against the homeostasis theory of placebo effects.
Neural Correlates of Perceptual Contributions to Implicit Memory for Faces
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Descriptors: Implicit memory, Faces, ERPs

Priming refers to the implicit memory phenomenon whereby experience with a stimulus induces systematic changes in subsequent processing of that same stimulus. Looking at a face alters how that face is processed when viewed subsequently, leading to increased accuracy or reduced response time. Stimulus transformations often disrupt priming. For example, if a very different image or view of a face is presented, priming is reduced. Here, we measured event-related potentials (ERPs) associated with face priming. Subjects first attempted to memorize 80 unknown faces. The next day they viewed the same faces and 80 unfamiliar faces while making memory judgments (correct for over 80% of the faces). Each face was presented twice in this task. Initial face presentations were inverted for half of the faces and upright for the rest; second presentations were all upright. This inversion manipulation enabled us to isolate perceptual components of face priming (present for upright-to-upright but not inverted-to-upright repetition). A positive ERP modulation for second versus first presentations of unfamiliar faces (beginning at about 200 ms with a posterior topography) was apparent for upright-to-upright but not inverted-to-upright face repetition. Similar ERPs were observed with upright-to-upright familiar face repetition. The sensitivity of this ERP to inversion at first presentation suggests that it reflects altered face processing (i.e., structural encoding) for both familiar and unfamiliar faces, thus indexing the time course of priming-induced changes in perceptual processing.

Faces vs. Names in P300-Based Deception Detection
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Descriptors: P300, Detection of Deception, Countermeasures, face processing

Participants (P) viewed either the names (N) or faces (F) of Presidents Bush and Clinton in Bernoulli series of 6 other names or faces. The other Ns or Fs were of people randomly found on the internet. Facial stimuli, which included just the head, were in gray-scale and presented in Powerpoint by a slave computer driven by a master which recorded data and controlled event timing. One of the six stimuli was designated a target (TR) whose F or N the P memorized. The P was instructed to depress a yes button indicating recognition of the TR, and no button to all other stimuli, indicating non-recognition. Thus the P lied on probe trials (PR) containing presidential stimuli, and was honest in non-recognition of non-PR, non-TR stimuli, called irrelevant (IR). Each P had an N and an F block, with different presidents in each. Order of presidents and N or F were completely counterbalanced. As of 5/1/03, 10 Ps were run as simple guilty subjects, and 9 others were run using the countermeasure (CM) described last year at SPR. A 2-way ANOVA on all P's base-peak P300s found significant effects of site (p < .001) and N vs F (p < .004, F > N) and interaction (p < .02). Thus F evoked larger P300s than N. In the simple guilty group, bootstrapped amplitude difference tests on PR vs IR (peak-peak, all .95 level of confidence), 8/10 Ps were detected with F stimuli compared to 5/10 with N stimuli. However, in the CM group, only 5/9(F) and 6/9(N)Ps were detected. Non-autobiographical, well-known faces but not names are well detected but CMs are effective against both.

Processing the Nightly News: How Shot and Story Length Affect Effort, Arousal, and Encoding
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Descriptors: television, attention, recognition memory

This study investigates the effects of story length and shot length on older adults' and college students' responses to TV newscasts. Participants were allowed to change the channel between four newscasts taped the same evening in a major U.S. market. The stimuli were altered to manipulate story and shot length. Dependent measures included effort (tonic HR), arousal (SCR frequency and amplitude), encoding (recognition), exposure (time on channel), and evaluations. Students spent the most time viewing newscasts with either short stories and shots or long stories and shots. There were no effects of shot or story length on older viewers' time on channel. Older viewers exerted more cognitive effort (slower HR) during stories with slow shots and during long stories. College age viewers exerted more cognitive effort during short stories; shot length had no effect on college students' HR. It was expected that short stories and shots would lead to more frequent SCRs. Although the trends were in this direction, the differences were not significant. College students recognized the most information from stories that had either short shots and stories or long shots and stories. There were no effects of shot or story length on older viewers' recognition. College age viewers evaluated newscasts with long stories and short shots most positively. There were no effects of shot or story length on older viewers' evaluations. Thus, production pacing appears to have greater effects on college students' cognitive, evaluative, and behavioral responses than it does on those of older viewers.

Neural Correlates of Decision-Making and Response Preparation in Blocked Versus Interleaved Saccadic Tasks
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Descriptors: Saccades, Prefrontal Cortex, MEG

The same environment can require different responses depending on context. When studying neural mechanisms supporting behavioral flexibility, one must consider how neural correlates of response preparation differ over contexts that require the same or different behavior. Saccades are ideal responses to use for this purpose because they are easily measured, neural circuitry is known, and variations in behavioral expectations are easily manipulated. This study used 256-channel EEG, 150-channel MEG, and distributed source reconstruction analyses with 8 subjects to evaluate the time course and spatial distribution of cortical activity during saccadic tasks. “Blocked” pro- and anti-saccade tasks (context does not vary by trial) require performance without need for a decision process. “Long-lead” interleaved versions of these tasks (required response indicated 1 sec before the cue to move) require modification of context by trial but separate decision-making and implementation processes. “Simultaneous” interleaved versions (required response indicated simultaneously with cue to move) require concurrent decision-making and implementation. There are three main findings: (1) blocked conditions result in lower prefrontal cortex (PFC) activity; (2) long-lead interleaved conditions result in higher PFC activity to both pro- and anti-saccade cues (PFC is not just providing an inhibition signal); and (3) simultaneous interleaved versions invoke activity in cortical attention networks (performance is not imply a result of serial processing of decision-making and implementation).
COMPARISON OF PSYCHOPHYSIOLOGICAL AND SELF-REPORT MEASURES OF THE BEHAVIORAL ACTIVATION AND INHIBITION SYSTEMS

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Descriptors: BAS, BIS, affectivity

Cardiac pre-ejection period (PEP) and electrodermal responding (EDR) are empirically supported autonomic markers of behavioral activation system (BAS) reactivity during reward and behavioral inhibition system (BIS) reactivity during punishment. The self-report Carver & White BIS/BAS Scales are also reputed measures of BAS and BIS reactivity to environmental states. No studies, however, have compared EDR and PEP reactivity with scores obtained from the BIS/BAS Scales. The current study evaluated the correspondence between autonomic and self report measures of BAS and BIS reactivity among a sample of undergraduates. Participants (N = 175) completed the BIS/BAS Scales and the PANAS trait index of positive and negative affectivity. Based on PANAS negative affect (NA) and positive affect (PA) scores, 35 participants were selected for a lab task in which PEP and EDR were collected at baseline and during a computer game with reward and extinction trials. As expected, PEP shortening was observed during reward (mean change = − 3.82 ms) and EDR increases were observed during punishment (mean change = 1.4 NSF/min). However, no significant correlations were observed between the autonomic and self-report indices of BAS (r = .10) and BIS reactivity (r = − .07). Nonetheless, relations were observed between the BIS Scale and NA (r = .41) and between the BAS Scale and PA (r = .33). These results suggest that autonomic and self report indices of BAS and BIS reactivity are measuring different constructs, and that the BIS/BAS Scales may be more related to trait affectivity than to reward and punishment sensitivity.

WOMEN’S INTERCOURSE BUT NOT OTHER SEXUAL ORGASM CONSISTENCY AND FREQUENCY PREDICTS PSYCHOPHYSIOLOGICAL CONCORDANCE AND EMOTIONAL AWARENESS

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Descriptors: sex, emotion, autonomic nervous system

A frequent puzzle in psychophysiological studies has been the discordance between women’s subjective and photoplethysmographically measured vaginal pulse amplitude responses to erotica. In experiment 1, the concordance (Fisher’s z transformation of the correlation) between vaginal pulse amplitude and subjective arousal correlated r = .47 with penile-vaginal intercourse orgasmic consistency (OC) but not with other partnered or solitary sexual behavior OC. The concordance was unrelated to social desirability responding, and intercourse OC was neither less than, nor correlated with, other sexual behavior OC. In experiment 2, alexithymia scores correlated r = − .28 with women’s intercourse but not other sexual behavior frequency. It is concluded that women’s intercourse orgasm and frequency differ from other sexual behavior, and are associated with greater sensory and emotional awareness.

HEART RATE AND ELECTRODERMAL RESPONSES TO AGGRESSION IN A VIOLENT VIDEO GAME

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Descriptors: Aggression, Heart Rate, Video Games

A video game was developed using the Quake 2 platform in which an aggressor tracked and killed a target individual. The aggressor was fixed to one location in a large arena while the target was allowed to move. Each trial included four phases: a baseline phase; a tracking phase, in which the aggressor could track the target but not fire while the target was constrained within a small area; a hunting phase in which the aggressor attempted to kill the target; and a kill phase in which the target was struck by a projectile fired from the aggressor’s weapon. All participants completed six trials as the aggressor and six trials as the target (total of 12 trials). Heart rate and skin conductance were recorded throughout the experiment. Comparisons were made between the aggressor and target conditions using data measured during the first 15 seconds at each of the phases. There were no differences in cardiac or electrodermal responding between the two conditions at the baseline, tracking, or hunting phases. However, a significantly larger heart rate acceleration was observed at the kill phase of the trial for individuals participating in the target condition as compared with the aggressor condition. A similar pattern, which did not reach significance, was observed in the electrodermal responding. These data are interpreted as reflecting autonomic differences between appetitive and affective aggression for the aggressor and target conditions, respectively.

CORTICO-MOTONEURONAL COHERENCE IN SUBCORTICAL STROKE

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Descriptors: MEG, EMG, coherence

After ischemic subcortical stroke, increased activation of primary motor cortex (M1) ipsilateral to the paretic hand (iM1 = M1 of the healthy hemisphere) has been observed. This increase has been suggested to reflect neuroplastic processes involving recruitment of uncrossed pyramidal tract (PT) fibers. Coherence analysis of neuronal cortical and muscular oscillatory activity (cortico-muscular coupling) involving recruitment of uncrossed pyramidal tract (PT) fibers. We favor the interpretation that enhanced iM1 activity in well recovered patients corresponds to higher order motor processing.
STROOP EFFECT FOR FOOD WORDS DURING INSULIN INDUCED HYPOGLYCEMIA
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Descriptors: hypoglycemia, selective attention

Hypoglycemia impairs aspects of cognitive function, and also induces hunger. We examined whether selective processing of food-relevant words occurs during experimental hypoglycemia. In a single-blind repeated measures design, healthy young adults (6 of each sex, mean age 28 years; mean BMI 22.5) performed a standard Stroop word-color test, as well as a variant of the Stroop test with food words designed to detect selective processing of food cues. There were two sessions scheduled four weeks apart. In each session, a hyperinsulinemic clamp method was used to produce a normoglycemic (plasma glucose: 4.7 mmol/l) period, followed on one day by a hypoglycemic (2.7 mmol/l) testing period, and on the other day a second normoglycemic period (in counterbalanced order). Consistent with previous work, color naming verbal reaction time (RT) increased during hypoglycemia (p < .0001). Our new finding is that during hypoglycemia, RT for food-relevant words increased more than for non-food control words (p < .04). We conclude that during hypoglycemia, attention is directed selectively to food-relevant stimuli.

MOTION DETECTION IN RELATION TO MT FUNCTION IN SCHIZOPHRENIA
Ryan Brown, Karen Dobkins, Brett Clementz, & Jennifer McDowell
University of Georgia

Descriptors: Schizophrenia, Smooth Pursuit, MT

Smooth pursuit dysfunction is frequently reported among schizophrenia subjects. There are discrepancies in the literature, however, about the nature and neural correlates of this behavioral abnormality. Various researchers suggest that among schizophrenia subjects: smooth pursuit ability per se is minimally affected, smooth pursuit problems are associated with frontal cortical motor output problems, and smooth pursuit problems are secondary to difficulties with motion perception. None of the relevant studies, however, provided measures of cortical activity with high temporal resolution during processing of smooth pursuit and/ or motion stimuli. To initially evaluate cortical activity associated with processing of motion information, 15 schizophrenia and 15 normal subjects were presented with grayscale moving gratings at 5, 10, and 20 deg/sec in left and right visual fields while recording dense array (256-channel) EEG. Distributed source analyses methods with realistic head models were used to quantify spatial and temporal characteristics of cortical signals in relation to these stimuli. Beginning about 100 ms post-stimulus, both groups showed sequential activations of V1, V2, MT, and inferior parietal cortex. The magnitude and temporal sequence of activations associated with initial stimulus processing was similar between-groups. There was an indication, however, that reafferent activity between 300-500 ms post-stimulus in MT specifically and lateral occipital cortex generally is suboptimal among schizophrenia subjects.

LYING ON CONCEALED KNOWLEDGE INCREASES SKIN CONDUCTANCE
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Descriptors: skin conductance, anticipation, lie detection

Twenty-six participants completed two experimental trials. In trial one, each participant was first asked to provide the name of the participant’s intimate partner. Nineteen other names were randomly generated and presented to the participant with the name of the participant’s intimate partner. Then the participant was asked to lie to the question of the partner’s name (target name) and to answer truthfully to the other 19 names. In trial two, the participant was asked to pick one two-digit number from 11 to 99. Nineteen other numbers were generated randomly and presented with the participant’s selected number. Then, the participant was asked to lie to the question of the selected target number and answer truthfully to the other 19 numbers. The levels of the skin conductance response to each question were measured in both trials. The results indicated that the participants generated a significant increase in skin conductance levels to questions presented prior to the target questions. The largest increase in skin conductance levels occurred while lying to the target questions in both trials. There was a significant decrease in skin conductance levels to questions presented immediately after the target question compared to those presented prior to the target question as well as the target question. It is concluded that skin conductance response pattern can be used to reveal the psychological process of lying and anticipation of concealed information (target questions).

DIFFERENCES IN WORKING MEMORY CAPACITY: AN ERP STUDY
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Descriptors: working memory, attention, P300

Several aspects of memory function diminish as people age and these life-span changes have been measured extensively. Older adults show different patterns of event-related brain potentials (ERPs) when compared to young adults on working memory tasks. The reported research investigated whether the beginning of memory changes affecting older adults could be observed in two groups of young subjects, selected for whether they have high or low working memory span. We examined the performance of these two groups on several neuropsychological tests, and recorded their ERPs during three auditory oddball tasks, chosen for their differing memory and attentional loads. High-span subjects (with greater working memory and greater attentional control) showed a larger N100, an ERP component modulated by attention, on all tasks. Subjects with low-span scores over-adjusted their processing strategies based on local changes in task demands, and these over-reactions were evident in a larger P300. These results suggest that the low working memory group is more affected by the local stimulus sequence than the high group, possibly because they are less prone to focus their attention on the overall sequence and therefore are more easily swayed by ongoing changes. Although the current study does not assess older adults directly, individual differences that develop over a person’s life span could contribute to at least some of the variance seen in the behavioral and ERP data of older adults.
EMOTIONAL RESPONSES TO PICTURES OF ONE’S SELF IN HEALTHY ADULT FEMALES

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Descriptors: Body Image, Startle, Attention

Emotional responses to pictures of one’s self were investigated in college-aged volunteers using self-report and psychophysiological measurement. Thirty-two females (18–24 yrs) were screened using the Social Physique Anxiety Scale and the Eating Disorders Inventory-2. Height, weight, and body segment circumferences were measured, and body composition was obtained using dual energy X-ray absorptiometry (DXA). Participants viewed 4 categories of pictures: pleasant, neutral, unpleasant, and self. Self pictures consisted of full-length images of themselves in their bathing suit. The startle blink reflex, facial EMG (orbicularis oculi, corrugator, zygomatic), and self-reports of valence, arousal, and dominance were collected for each picture. The startle reflex and facial EMG measures exhibited decreased activation for self pictures compared to the other affective categories. Self-reports indicated that self pictures were rated as moderately pleasant, low arousing, and moderately dominant relative to the other affective picture categories. For self pictures, the reduced startle reflex coupled with the moderate self-report ratings suggest increased attentional processing of the foreground stimulus (i.e., the picture). Thus, more attentional resources may be allocated to the picture, leaving fewer resources to attend to the startle probe. The findings provide an understanding of emotional response associated with self-perception in healthy young females, and provide a basis for further study of pathological factors related to body image and eating disorders.

AFFECTIVE CHRONOMETRY OF THE EMOTION-MODULATED STARTLE REFLEX

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Descriptors: startle reflex, affective chronometry, emotion expression

This study was designed to assess conscious appraisal of emotional experience, facial expression, and the resolution of emotion-modulated action tendencies. 46 healthy young adults (mean age = 19.7) participated. Self-report of emotional experience while viewing emotionally-salient images was recorded, facial expression of emotion was assessed utilizing EMG recordings of corrugator and zygomatic facial muscles, and action tendencies in the form of eye-blink startle reflex modulation and its resolution (300 ms and 3000 ms post-stimulus offset) were recorded. The predicted linear relationships in emotional valence ratings and quadratic relationships in arousal experience ratings were observed. Corrugator EMG activity increased while viewing negative images and zygomatic EMG activity increased while viewing positive images for both groups. Startle reflex patterns were in the predicted valenced direction (i.e., greatest for negative images) while viewing images and at 300 ms post-image removal, but this pattern inverted (i.e., was greatest for positive images) at the 3000 ms probe-time. This inversion of the expected pattern at 3000 ms is discussed as a “rebound” effect, possibly resulting from the release of frontal inhibitory connections to the startle circuit, which may be a useful benchmark for comparison with groups suspected of emotion regulation dysfunction.

FACING CRISIS: ATTENTIONAL AND EMG RESPONSES TO INAPPROPRIATE LEADER DISPLAYS

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Descriptors: television, leader emotion, facial expression

An experiment was conducted to show how incongruent, or counterempathic, responses to facial expressions may be evoked in political communication. Subjects were shown a series of four crisis news stories, each followed by a 30-second televised reaction of President Bill Clinton. The story-reaction sequences varied by story topic, level of emotion, and degree of leader display appropriateness. Dependent measures included tonic HR, SCR frequency and amplitude, and zygomatic and corrugator EMG activation. The EMG data show that subjects responded negatively to positive, high-intensity (i.e., inappropriate) displays in reaction to crisis news. This condition resulted in the greatest corrugator activation and least zygomatic activation. Participants did not mimic a leader smile when it was inappropriate. Viewed over time, corrugator activity increased immediately for inappropriate positive displays but increased slowly for congruent negative displays. In a negative emotional context, subjects frowned more quickly in response to a smile than a frown. High-intensity displays also elicited greater viewer attention, as evidenced by cardiac deceleration. Valence of the display did not affect HR. When considering the news context, viewers exhibited the greatest cardiac deceleration when high-intensity displays followed negative news, in an evolutionarily consistent pattern. The frequency of SCRs was highest when negative presidential reactions followed negative news. When the presidential display was incongruent with the news context, subjects showed the lowest SCR frequency.

EXECUTIVE FUNCTION TASK DIFFICULTY INFLUENCES VAGAL TONE/HEART RATE VARIABILITY

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University of Florida

Descriptors: Executive Function, Attentional Control, Vagal Tone

The current study investigates heart rate variability/vagal tone during parametric increases in the difficulty of three cognitive tasks: a working memory task, the N-back, a version of the Stroop inhibition task, the Day/Night Stroop, and a multistep planning task, the Tower of London. All are executive function tasks theorized by Baddeley to require attentional coordination. During each difficulty level of each task five 30-second segments of respiration and second-by-second heart rate were recorded. To obtain heart rate variability data, interbeat intervals (IBIs) recorded to the nearest msec were converted to average IBI for each 0.5 second of the 30-second segments. These values were detrended and subjected to Fast Fourier Transformation (FFT) to obtain an IBI power spectrum. Power spectra for the 5 30-second segments in each condition were then averaged, and power within the 0.156–0.468 Hz respiratory band was obtained as an estimate of vagal tone. Across conditions, the Tower of London elicited significantly more power in the respiration spectrum than the Stroop task, with the N-back being intermediate. With increasing difficulty, participants showed decreases in power in the respiration spectrum in all three tasks, though this trend did not reach significance with the Tower of London. It appears that heart rate variability/vagal tone is sensitive to increasing difficulty among a variety of executive functioning tasks. Additional data collection and analysis is underway including an assessment of the relationship between task performance and heart rate variability/vagal measures.
INTRUSIVE AND NON-INTRUSIVE MEMORIES IN A NON-CLINICAL SAMPLE: THE EFFECTS OF MOOD AND AFFECT ON IMAGERY VIVIDNESS

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Descriptors: Intrusive memories, imagery vividness, affect

Intrusive memories are a common phenomenon within psychological disorders such as depression and PTSD. This study set out to assess the contribution of mood and valence on the intrusiveness of memories within an undergraduate sample. The number, valence and vividness of intrusive and non-intrusive memories in two groups (N = 20) of pre-screened high and low mood undergraduate participants were obtained. They were asked to generate as many intrusive memories (IMs) as possible from the prior two weeks, together with pleasant and unpleasant non-intrusive memories from the same period. They subsequently formed images of these memories and rated them on measures of vividness, valence, arousal and overall affect. Measures of heart rate, skin conductance and facial electromyography were also monitored. IMs were common, with participants generating a mean of 1.96 pleasant and 1.23 unpleasant IMs. They were also rated as more vivid than non-intrusive memories, a difference not due to either valence or arousal. IMs were associated with greater HR acceleration and zygomatic activity. Mood congruence was also demonstrated: negative IMs were more prevalent in low mood participants. In conclusion, whilst the results of this experiment need to be regarded with some caution, they shed some light on the nature of intrusive memories. We have established that IMs in a non-clinical sample are common, frequently pleasant rather than unpleasant, and that they are more vivid than equally valenced and arousing non-intrusive memories.

CHANGE IN P3 AMPLITUDE ACROSS LATE ADOLESCENCE IN MALES IS ASSOCIATED WITH THEIR FATHER'S SUBSTANCE DEPENDENCE AND ANTISOCIALITY

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University of Minnesota

Descriptors: P3 amplitude, substance dependence risk, growth

Developmental differences in P3 amplitude change across adolescence have been described for people at high and low familial risk for alcoholism (e.g., Hill, S.Y., & Shen, S. (2002), Biological Psychiatry, 621–631). In particular, a low intercept and flat slope of the linear growth equation are associated with high familial risk and a high intercept and negative slope is associated with low familial risk. The present study examined the relative contributions of genetic and environmental variance to individual differences in growth parameters associated with familial risk for alcoholism. One hundred seventy two monozygotic (MZ) and 88 dizygotic (DZ) male twin pairs were assessed at three points in time: at around age 17, 20, and 23 years. These twin pairs came from a community representative sample. The “rotated heads” visual paradigm was used to elicit ERPs at all points in time. Responses to target stimuli at the Pz scalp site were examined. Analysis of the twin data showed greater similarity among MZ than DZ twins, suggesting genetic influences on variance in P3 amplitude change across these ages.

HERITABILITY OF INDIVIDUAL DIFFERENCES IN VISUAL P3 AMPLITUDE CHANGE ACROSS LATE ADOLESCENCE IN MALE TWINS

Scott R. Carlson, Stephen M. Malone, William G. Iacono, & Matt McGue
University of Minnesota

Descriptors: P300 amplitude, heritability, growth

Different patterns of change in the amplitude of the visually elicited P3 event-related potential (ERP) component across adolescence and into adulthood have been associated with different patterns of familial risk for alcohol use disorders (i.e., Hill, S.Y., & Shen, S. (2002), Biological Psychiatry, 621–631). In particular, a low intercept and flat slope of the linear growth equation are associated with high familial risk and a high intercept and negative slope is associated with low familial risk. The present study examined the relative contributions of genetic and environmental variance to individual differences in growth parameters associated with familial risk for alcoholism. One hundred seventy two monozygotic (MZ) and 88 dizygotic (DZ) male twin pairs were assessed at three points in time: at around age 17, 20, and 23 years. These twin pairs came from a community representative sample. The “rotated heads” visual paradigm was used to elicit ERPs at all points in time. Responses to target stimuli at the Pz scalp site were examined. Analysis of the twin data showed greater similarity among MZ than DZ twins, suggesting genetic influences on variance in P3 amplitude change across these ages.

AFFECT MODULATION OF THE AUDITORY P50 EVOKED RESPONSE

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Indiana University

Descriptors: P50 ERP, affect modulation, sensory gating

Recent evidence indicates that indices of P50 suppression can be modified by psychological factors such as attention and stress. The present study (N = 38) examined whether affective states modulate P50 ERP components of sensory gating. Affect was manipulated using pleasant, neutral, and unpleasant slides that were displayed for 6s, during which time paired clicks were presented 3, 4, or 5 s following slide onset. Whereas the P50 suppression ratio was unaffected by affective manipulations, amplitudes were significantly attenuated in both the pleasant and negative conditions relative to the neutral condition when collapsed across S1 and S2. Results from a PCA EEG spectral power analysis in the high (20–50 Hz) frequency band followed a similar pattern, although significant attenuation was only found for the positive compared to the neutral condition. In contrast, a similar low frequency (0–20 Hz) analysis indicated an S1 effect, where power values were again significantly reduced only in response to the positive relative to the neutral slides. These results suggest that affective visual information may attenuate P50 amplitudes without affecting suppression ratios, which is consistent with previous studies that employed competing auditory stimulation. In addition, findings from the low frequency analysis indicate that the pleasant slides may have engaged the greatest processing demands, which inhibited full attentional allocation to the presentation of the subsequent S1 stimulus. Future studies will be necessary to further differentiate the affects of arousal and attentional allocation on the modulation of the P50 response.
BLOOD PRESSURE REACTIONS TO MENTAL STRESS AND FUTURE BLOOD PRESSURE STATUS: THE EFFECTS OF AGE, SEX, AND SOCIOECONOMIC POSITION

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Descriptors: Blood pressure, stress reactivity, prospective study

This study examined whether the magnitude of blood pressure (BP) reactions to mental stress was associated with future BP status and whether the strength of the association was affected by sex, age, and socioeconomic position. Resting BP was recorded at initial baseline and in response to a mental arithmetic stress task. Five-year follow-up resting BP data were available for 990 (68%) of the original participants; 333 were 23 years old at the time of stress testing, 427 were 43, and 230 were 63. There were 541 women and 449 men; 440 came from manual and 550 from non-manual occupation households. Systolic blood pressure (SBP) reactions to stress correlated positively with follow-up SBP; no analogous association was found for diastolic blood pressure (DBP) reactions and follow-up DBP. In multivariate tests, SBP reactivity remained predictive of follow-up SBP and accounted for 2.3% of the variance not accounted for by age, body mass index, and initial baseline SBP. SBP and DBP reactivity predicted five-year upward drift in SBP and DBP respectively, accounting for an additional 3.6% and 2.9% of variance respectively in multivariate models. The predictive value of reactivity was greater for participants from manual occupation households and tended to be greater for men. Thus, the results of this study indicate that BP reactions to mental stress predict future resting BP and the upward drift of resting BP over time; the magnitude of the prediction appears to vary with socioeconomic position and sex.

AFFECTIVE STIMULUS PROCESSING FOLLOWING TRAUMATIC BRAIN INJURY

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Descriptors: affective evaluation, frontal lobe lesions, slow potentials

The present study aimed at examining alterations of emotional processing in patients with traumatic brain injury (TBI). Event-related potentials (ERP) were assessed in 23 patients who had suffered moderate to severe head injury and a group of 23 matched healthy controls during the presentation of 75 IAPS-slides with three categories differing in affective valence (pleasant, neutral, unpleasant). Immediately after EEG recordings, subjects were given a free-recall test in order to assess their memory for prior presented emotional material. During a second presentation of pictures, subjects rated each slide on affective valence and arousal using the Self-Assessment Manikin (SAM). ERP analysis showed a highly significant effect of affective arousal on the P300 and subsequent slow potentials with pleasant and unpleasant pictures producing higher amplitudes than neutral slides. Differences between groups were visible only for late latencies, starting from 650 ms and lasting up to 4s. Compared to healthy controls, TBI-patients showed less activity in posterior scalp-areas for pictures with affective contents while processing of neutral pictures did not differ between groups. Recall for emotional slides was much better for highly affective slides (pleasant and unpleasant) than for neutral pictures for both patients and controls though TBI-patients showed an overall reduced memory performance. SAM-ratings demonstrated a reduced self experienced arousal for patients especially with respect to unpleasant pictures and furthermore lower ratings on affective valence independently of slide-category.

CHANGES IN INTERBEAT INTERVAL DURING DECEPTION DETECTION

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Descriptors: orienting reflex, IBI, deception

Interbeat intervals (IBIs) for heart rate were obtained from 24 participants while they performed a deception detection task. Participants viewed a videotape in which confederates alternated between periods of being truthful and not truthful about scenes they were viewing on television. EKG was recorded continuously while participants performed a task which required them to mark their EKG record through a button press each time they perceived the person on the videotape to be untruthful. The ten IBIs occurring before each button press and the ten IBIs occurring after each button press were extracted for statistical analysis. Significant slowing of heart rate was found to begin approximately six IBIs before each button press, and significant acceleration was found immediately after the button press, consistent with the occurrence of an orienting reflex. The same pattern was observed during correct detections of deception and false alarms. Changes in IBI were not observed during periods at chance level on accuracy, consistent with previous deception research. The pattern of heart rate deceleration associated with the perception of deceit was not moderated by individual differences in depression, gender, self-monitoring, or social desirability. The heart rate deceleration associated with perceived deception is interpreted to indicate that there is a novelty component to deception, as well as increased use of cognitive resources during periods of perceived deception.

AN EMPIRICAL TEST OF A VAGAL SUBTYPE OF MAJOR DEPRESSION

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University of Arizona

Descriptors: Respiratory sinus arrhythmia, major depression

Vagal mediated heart period variability (V-HPV) has been found to be lower in depressed samples, although, not all studies replicate this finding. Given the heterogeneity of major depression, it was proposed that V-HPV might covary specifically with a particular subset of the symptoms of major depression. Using Polyvagal Theory as a guide a “vagal subtype” was defined and tested in a large sample (n = 90) diagnosed with Major Depression. Little empirical support was found to suggest that V-HPV was related to the “vagal subtype”. Factor-analytically derived symptom scales were also unrelated to V-HPV. Change in two of these scales over time, however, covaried with change in V-HPV. Doussard-Roosevelt and Porges’ (1997) conceptualization of the vagus nerve as a two-tiered system is used as a guide to interpret the findings.


**EFFECTS OF GARNER INTERFERENCE BETWEEN INTEGRAL DIMENSIONS OF AUDITORY TIMBRE AND PITCH**

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Descriptors: selective attention, Garner interference, ERP, distractor variation

The behavioral and electrophysiological effects of distractor variation were investigated in the Garner filtering paradigm by testing the integral dimensions of auditory timbre and pitch. Subjects listened to a sequence of tones varying in timbre and pitch and identified by key press the pitch of tones having a designated timbre, ignoring tones having the other timbre. Selective attention failure, as measured by Garner interference in RT and accuracy, increased with the degree of variation in the unattended channel. ERP analysis indicated that physiological processing of stimuli in the attended channel (targets) was unaffected by the distractor manipulation. However, distractor variation enhanced the auditory N1 component in the unattended channel. Moreover, it progressively weakened the late processing separation between the attended and unattended channels (channel separation). Collectively, these results suggest that Garner interference may stem from disruptions in inhibitory processing of distractors, independent of excitatory processes to targets. The results also show that distractor variation affects both early and late physiological components, indicating that the locus of Garner interference to integral dimensions begins at an early stage of perceptual processing.

**AN EASILY IMPLEMENTED QRS DETECTION ALGORITHM IN THE MATLAB PROGRAMMING LANGUAGE**

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Descriptors: software, algorithm, QRS detection

The electrocardiogram (ECG) is arguably the most accessible and accurate measure of chronotropic cardiac function and serves as the basis for many studies involving heart rate and nearly all investigations of heart rate variability. In order to derive meaningful measures from the ECG an interbeat interval (IBI) time series must first be extracted. In many experimental situations this is accomplished by means of either QRS detection algorithms typically bundled with data acquisition software or is acquired during recording using a hardware trigger; however, situations sometimes arise when experimenters are presented with only raw ECG data and have no easy means by which to process it. Although many QRS detection algorithms are available in the biomedical and signal processing literatures, they are typically presented as formulae rather than programming code or software applications, or they require modification to function properly with a particular data set. This poster describes and makes available an easily implemented Matlab function which, though highly customizable, requires the user to define only a single parameter (sampling rate). The algorithm is based on the amplitude and first derivative of the ECG and includes a digital filtering preprocessing stage. Aspects of the algorithm are discussed in relation to noise resistance as evidenced in previous literature reviews and multiple examples are illustrated. Optional features include the ability to display and/or save graphical records of both the ECG and the derived IBI series for later inspection.

**MOTIVATED RESPONSE MONITORING IN SCHIZOPHRENIA AND MAJOR DEPRESSION**

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Descriptors: EEG/ERP, psychopathology, motivation

Response-monitoring deficits have been implicated in the etiology and maintenance of schizophrenia and, in the current study, are further examined in major depression as well as schizophrenia and schizoaffective disorder. Specifically, we used the error-related negativity (ERN) and P300 components of the event-related potential to examine the degree to which deficits in response monitoring 1) exist in individuals with schizophrenia, schizoaffective disorder, or major depression, 2) reflect symptom profiles, and 3) are influenced by monetary reward or punishment and reactivity to these motivation conditions. Healthy controls and individuals with psychopathology performed a flanker task under two external motivation conditions (i.e., monetary reward for correct responses and monetary loss for incorrect responses) as well as a non-monetary condition. After each response, performance feedback was provided according to accuracy and, in the monetary conditions, whether a monetary gain or loss was incurred. The ERN was used to measure the degree to which differences in response monitoring exist and are influenced by monetary reward and punishment. In addition, P300 was used to assess the salience of the motivation conditions and of the performance feedback. Anomalies in response monitoring were found to be moderated by individual differences in both symptom profile and reactivity to specific motivation conditions. Thus, the context within which response monitoring is required may facilitate or impede monitoring processes and, importantly, may influence symptomatic presentation.

**THE EFFECTS OF STIMULANT MEDICATIONS ON CHILDREN WITH ADHD AND EXCESS BETA ACTIVITY IN THEIR EEG**

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Descriptors: Attention-deficit/Hyperactivity disorder, EEG, diagnosis

Children with Attention Deficit/Hyperactivity Disorder (ADHD) typically have increased slow wave activity in their EEG, which has been interpreted as indicating CNS hypoarousal. Stimulant medications have been found to increase arousal, which usually results in a normalization of the EEG. However, a small group of children with ADHD have been identified who have excess beta activity in their EEG, which has been seen as indicating hyperarousal. This study investigated the effects of stimulant medications on the EEG of children with ADHD, and who had excess beta activity in their EEG. Twenty ADHD and 20 control subjects participated in this study. EEG was recorded an eyes-closed resting condition and Fourier transformed to provide estimates for total power, and absolute and relative power in the delta, theta, alpha and beta bands, and the theta/alpha and theta/beta ratios. Subjects were placed on a six month trial of a Methylphenidate or Dexamphetamine, and a second EEG was recorded at the end of the trial. The unmedicated ADHD group had greater absolute and relative beta, less absolute and relative alpha, a higher theta/alpha and a lower theta/beta ratio than the control group. With medication use, absolute beta activity decreased, and frontal total power, although these changes represented a reduction in power, not a normalization. These results indicate that ADHD children with excess beta activity in their EEG are not hypoaroused as previously suggested, and the beta activity may only be partially related to the symptoms found in these children.
THE HERITABILITY OF TRAIT MIDFRONTAL EEG ASYMMETRY AND NEGATIVE EMOTIONALITY: SEX DIFFERENCES AND GENETIC NONADDITIVITY
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Descriptors: EEG Asymmetry, Heritability, Personality

Midfrontal EEG asymmetry and personality characteristics derived from the Multidimensional Personality Questionnaire (MPQ) were measured in a sample of 59 pair of monozygotic and 66 pair of dizygotic twins as part of the Minnesota Twin Family Study. These data were used to 1) derive estimates of the relative genetic and environmental contributions to trait variance in midfrontal EEG asymmetry, 2) identify relationships between midfrontal EEG asymmetry and personality dimensions measured by the MPQ, and 3) estimate the degree to which relationships between midfrontal EEG asymmetry and personality are due to common genetic versus common environmental influences. Results indicated 1) that trait variance in midfrontal EEG asymmetry is modestly heritable in females, but not in males, 2) that the genetic variance contributing to female midfrontal EEG asymmetry is largely nonadditive, 3) that in females, relatively greater right midfrontal EEG asymmetry is associated with higher Negative Emotionality scores, and 4) that in females, approximately 70% of the correlation between midfrontal EEG asymmetry and Negative Emotionality is attributable to common genetic influences.

COGNITIVE CONTROL OF BEHAVIOR: ERP CORRELATES OF PREPOTENT RESPONSE INHIBITION IN STROOP
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Descriptors: Attention, ERP, Behavioral regulation

Recent research on cognitive control processes that support goal-directed behavior has distinguished between separable components of evaluative and regulative control. Evaluative control (EC) includes action-monitoring processes responsible for detecting the need for control and recruiting additional regulative resources when adjustments in control are necessary. Research has suggested that EC is instantiated in anterior cingulate cortex (ACC). This project examines ERP correlates of cognitive control component processes in a modified Stroop color-naming task. Stimuli were color-words presented in colored-script. Trials were congruent, neutral or incongruent. The relative frequency of the 3 trial-types was varied across two conditions: Mostly congruent (MC; 80% congruent trials) and Mostly incongruent (MI; 80% incongruent). Theory suggests that EC is critical on incongruent trials in the MC condition. Consistent with this, previous neuroimaging research indicates that ACC is selectively activated in this condition. In the current project, both phasic and slow wave ERPs were identified that vary with demands placed on cognitive control component processes across trials and conditions. Moreover, these ERPs are significantly correlated with behavioral indices of task performance. This research establishes the utility of indexing ERPs in this modified Stroop task to examine neurocognitive processes underlying regulation of behavior. Application of this methodology to examine behavior regulation deficits associated with drug intoxication states and psychopathology is discussed.

ARE ELECTROPHYSIOLOGICAL CNS SIGNALS ORGANIZED ALONG A DIMENSIONAL SPACE OF VALENCE AND AROUSAL IN AFFECTIVE CATEGORIZATION TASKS?
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Descriptors: affective categorization, valence and arousal, LPP

Previous research extending the oddball paradigm to affective categorization tasks reliably established the occurrence of an enhanced LPP component in response to contextual rare stimuli (e.g., a negative stimulus amongst several positive ones). This study elaborates on that line of work by resorting to a more strict control of the properties of the stimuli employed. Normatively rated affective materials are used (IAPS,1995), allowing for a simultaneous gradation of stimulus valence and arousal. An experiment is presented that combines a background made up of positive low arousal stimuli with a 3 (for valence) × 2 (for arousal) factorial design. Our goal was to disentangle the effects of both factors and their possible interactions on the LPP component of the ERP. Three EEG monopolar derivations, with a common reference to the right mastoid, were used (Fz, Cz and Pz). Results show that both factors have an impact on the LPP component, and furthermore exhibit a complex interactive pattern varying across the different recording sites. We further attempted to clarify the relationship between LPP amplitude and specific stimulus affective properties by way of principal component analysis performed over temporal data.

THE DEVELOPMENT OF ITEM AND SOURCE MEMORY IN CHILDREN AND YOUNG ADULTS: AN ERP STUDY
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Descriptors: Development, ERP, source memory

The effects of ongoing brain maturation on recognition memory are still largely unknown, although they may help answering the question if semantic and episodic memory rely on dissociable neural structures. In a developmental ERP study, item and source memory was examined in two groups of children (6–8 yrs; 10–12 yrs) and young adults. Participants were asked to remember items (inclusion task) or items and their context (exclusion task). Compared to adults, children took longer to respond and showed a more conservative response bias. Younger children performed poorer than the adults in the inclusion task, whereas both groups of children showed poorer performance in the exclusion task. Recollection but not familiarity estimates increased with age. In the inclusion ERPs, parietal old/new effects were evident in all groups, with both groups of children showing larger ERP component amplitudes and longer latencies than adults. A late posterior negativity (LPN) was found partially overlapping the parietal old/new effect for adults. An early midfrontal effect as well as a late right frontal effect were seen only in adults. Exclusion data revealed a midfrontal old/new effect in both older children and adults for hits and correct rejections to old non-targets. Taken together, these results suggest a differential development of item and source memory. They also point towards an increasing relevance of strategic processes for memory retrieval as a function of age.
SKIN CONDUCTANCE CORRELATES TO SYMPTOMS OF MOTION SICKNESS

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Humboldt State University

Descriptors: motion sickness, skin conductance, optokinetic rotation

In the present study, we used optokinetic drum rotation to provoke symptoms of motion sickness. Electrical dermal activities were indexed by recording tonic and phasic skin conductance from the sites of finger palmar and forehead. The experimental results showed that subjects' subjective ratings of motion sickness were significantly correlated with ratios of phasic skin conductance recorded in the finger palmar site between drum rotation and baseline periods (r = 0.432, p < 0.05). Sensory gating can be measured by using a paired-click event-related potential (ERP) paradigm. Sensory gating has been found to be impaired in adults with schizophrenia (e.g., Nagamoto, et al., 1989; Olincy, et al., 2000). A growing interest in measuring sensory gating in children has necessitated finding a valid method for collecting these data in young children (e.g., Myles-Worsley, et al., 1996). We recorded ERPs from 20 children, ages 5 to 10 years, in two conditions; 1) sitting quietly while listening to paired clicks (audio only), and 2) watching a silent movie while listening to paired clicks (audio + movie). We examined sensory gating by evaluating changes in the P50 and N100 components using a ratio of the amplitude of the test click to the amplitude of the conditioning click. While over 50% of the children displayed sensory gating (T/C ratio < .80), there was not a significant correlation between the 2 conditions measured at Cz (P50 - r = - .19; N100 - r = .06). Differences between the mean T/C ratios of the two conditions for the P50 and N100 were not significant because of large within group variances. These results are similar to previous studies showing that sensory gating is not consistently observed in children using traditional ratio measures (e.g., Freedman, et al., 1987). A developmental trend was found in the audio only condition where N100 suppression significantly correlated with age (r = .62, p = .004). This trend is explained by a significant decrease in the N100 amplitude of the test click with age (r = .50, p = .024).

DEVELOPMENTAL TRENDS IN SENSORY GATING MEASURED IN YOUNG CHILDREN

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Descriptors: Sensory Gating, P50, N100

BASELINE PARASYMPATHETIC TONE IS ASSOCIATED WITH AFFECT REGULATION AND MODULATION ABILITY

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Descriptors: emotion, regulation, parasympathetic tone

Although some developmental differences exist, baseline parasympathetic tone has been found to positively predict affect expression and emotion regulation ability among infants and children. Relatively little research, however, has been performed to test the generalizability of these findings in a healthy adult population. In the present experiment, 111 participants were asked to watch either an amusing or disgusting film in either a natural manner or while exaggerating their behavioral response. In each of these 4 groups, those with the 10 lowest and 10 highest levels of baseline respiratory sinus arrhythmia (RSA; an indicator of parasympathetic arousal) were assessed with regard to their self-reported emotional response to the film, as well as the valence and intensity of their facial reaction to the film. Results suggest that persons with low baseline vagal tone behaviorally evidenced a stronger emotional response to the films and were less able to modulate their behavioral emotional reactions. RSA level and viewing instructions (natural-watch or exaggerate) did not impact self-reported valence or arousal. The present research suggests that parasympathetic tone is associated with emotion regulation ability in adulthood, but future research incorporating a within-subjects design is needed to replicate and extend these findings.
EYE GAZE AND AUDITORY PROCESSING DIFFERENCES IN INDIVIDUALS WITH LANGUAGE AND SOCIAL COMMUNICATION DIFFICULTIES

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Descriptors: social engagement, eye-tracking; auditory processing

The Social Engagement System (SES) provides a neurobiological model that integrates the neural regulation of the striated muscles of the face and head and specific autonomic functions regulated by the vagus. Part of the SES is comprised of neural circuits involved in the regulation of special visceral efferent pathways responsible for looking behavior (i.e. eye lid opening, social gaze) and the processing of human voice (i.e. right ear advantage (REA) and the efficiency of middle ear muscles in extracting human voice). A compromise in this system should be evidenced by atypical behaviors in social engagement and gaze. The current study tested subjects using the SCAN (Keith, 1994) test for auditory processing disorders (i.e. REA and human voice extraction), and an eye-tracking device to contrast gaze coordinates and timing in control and language/social communication (LCD) individuals. During the eye-tracking task, a video of a life-sized face of an individual reading a story was shown on a computer monitor a few feet from the subject. Two regions of interest (ROI) were examined: 1) the EYES, and 2) the MOUTH. Coordinates outside of the ROIs were computed as OFF. Analyses showed that relative to control subjects, the LCD group had less time and fixations on the ROIs and greater OFF times and fixations. The LCD group also scored lower on the SCAN subs tests for both REA and the ability to extract human voice from background noise. Heart period and RSA were also monitored during the experiment and will be presented. The findings support the concept of a compromised Social Engagement System in LCD individuals.

CAN I HAVE YOUR ATTENTION PLEASE: REPRESSORS AND ENHANCED P3 TO EMOTIONAL STIMULI

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Descriptors: ERP, Repressive-defensiveness, Anxiety

In four experiments ERPs to emotional (negative and positive) and neutral stimuli were examined as a function of participants’ trait anxiety and repressive-defensiveness. The experiments investigated the time course of attentional bias in the processing of such stimuli. Pictures of angry, happy, and neutral faces were used in two of the experiments and pictures of mutilated, happy, and neutral faces were used in the others. ERP’s to emotional and neutral stimuli were recorded from parietal, temporal, and frontal sites. Analysis of the P3 component indicated that the peak magnitude of the P3 at the parietal and temporal sites reflected an interactive function of trait anxiety and defensiveness. Repressors (low reported anxiety, high defensiveness) showed a consistent pattern greater than the compatible trials. These findings indicate that perceivers use contextual information and processing strategy to assist in racial categorization.

RACIAL Categorization AND the STRATEGIC USE OF INFORMATION

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Descriptors: ERPs, Racial categorization, Processing strategy

Race is considered one of a few “basic” social categories used to make automatic judgments about others. The present study examined how racial information is used in the control of attention during categorization, using a modified Eriksen flanker task. Participants (N = 18) viewed Black and White male faces flanked on left and right sides either by same race faces (compatible condition) or different race faces (incompatible condition), and were asked to categorize the central target face as either Black or White. The probability of compatible trials was set at 80% (expect compatible), 50% (expect neutral), or 20% (expect incompatible) across blocks of trials. Behavioral (RT and accuracy) and ERP indices of categorization were measured. Participants were faster and more accurate in correctly identifying racial categories on compatible trials than on incompatible trials, suggesting that the racial category of flankers influenced target categorization. Furthermore, a significant interaction involving compatibility and probability level indicated strategic control of attention at the implicit level. Incompatible trials elicited larger amplitude P300s than compatible trials, and this effect was qualified by the probability manipulation, indicating processing strategy differences associated with implicit expectations. Analyses of the N100 component suggested that more attention was directed to the compatible trials than the incompatible trials. These findings indicate that perceivers use contextual information and processing strategy to assist in racial categorization.

TOWARDS THE NEURAL CORRELATES OF CONTEXT-SPECIFIC AND DECONTEXTUALIZED MEMORIES: AN FMRI INVESTIGATION

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Descriptors: learning, PFC, Hippocampus

There has been much recent interest in brain regions subserving episodic memory and, in particular, in uncovering the functional role of the hippocampus during the acquisition and consolidation of context-specific memories. This latter form of memory can be contrasted with decontextualized memories, i.e. knowledge about generalities across specific experiences. Using event-related fMRI we investigated the neural correlates of both types of memories. Volunteers had to learn conjunctions between objects and positions in several experimental blocks. In two conditions, either positions or objects were held constant within the blocks, enabling subjects to extract regularities among episodes (invariance conditions). In a context-specific condition the object-to-position assignments were randomized within the blocks. As expected performance increased within task blocks in both invariance conditions, but not in the context-specific condition. In showing a learning-related decrease of hippocampal activity and an increase in lateral prefrontal cortex (PFC) activity within task blocks, the fMRI data paralleled the behavioral findings. In the context-specific condition the hippocampal activation was constant within task blocks. These data suggest that the hippocampus is critically involved in an early phase of learning, presumably when information is encoded in a context-specific way. In contrast, the lateral PFC seems to be involved in extracting task relevant regularities among episodes and by this may control the formation of decontextualized memories. (Supported by DFG, FOR-448)
DETOUR EFFECTS OF ALCOHOL ON EMOTIONS: MULTIPLE PSYCHOPHYSIOLOGICAL INDICES

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Descriptors: Alcohol, Emotions, Startle

This study used affective modulation of the eye-blink startle response (STR), heart rate (HR), skin conductance reaction (SCR), and facial electromyography (EMG) to explore the effects of drinking on emotional reactivity. One of four levels of alcohol dose (including a no-alcohol control) was administered to each of 101 (48 female) social drinkers to evaluate the extent to which increasing blood-alcohol level (BAL) differentially influences reaction to visual stimuli that vary in their emotional content. The results indicate that increasing BAL was associated with decreasing overall emotional reactivity. Alcohol intoxication did not significantly alter the stereotypic modulation of the affective valence dimension of emotional responding in the low BAL group (i.e. STR responding to pleasant images was attenuated and STR responding to unpleasant images was augmented in a similar fashion). However, it did have this effect in the moderate and high BAL groups, suggesting a possible threshold for the stress-response dampening effects of alcohol.

PUPILLARY RESPONSES DURING AFFECTIVE PICTURE PROCESSING

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Descriptors: Emotion, Pupil

Affective stimuli that engage the brain’s appetitive or defensive circuitry can be reliably indexed from several converging psychophysiological measures of valence and arousal. Skin conductance and ERPs tend to be favored indices of arousal over pupil diameter, perhaps due to the potential for picture luminosity to confound accurate interpretation of pupil dilation. The purpose of this investigation was to revisit the pupil as a viable measure of arousal during picture perception. Participants (N = 35) viewed 72 pictures comprised of 18 different picture contents. Pictures were each viewed for a minimum of 6 s. Pupil diameter, skin conductance and heart rate were all found to significantly vary by picture content. Pupillary responses were sustained over the course of the 6 s viewing period, with animal attack, erotic couples, and loss images producing the largest pupillary change. A hierarchical multiple regression was performed on peak pupil diameter with estimates of luminosity (lux) entered in the first step followed by skin conductance (SCR), ratings of arousal, and viewing time in the second step. Results indicated that luminosity accounted for approximately 49% of the variance, F(1,70) = 68.54, p < .001, with SAM ratings of arousal, and viewing time accounting for an additional 15% of the total explained variance, F(4,67) = 29.18, p < .001. Overall, findings suggest that pupillary responses can serve as a reliable index of arousal during picture perception once picture luminosity is controlled.

NDS AND MISMATCH NEGATIVITIES (MMNS) ELICITED BY TONES IN ATTENDED, UNATTENDED AND IGNORED PARADIGMS

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Descriptors: Nd, MMN, auditory processing

In this study, the relationship between automatic and attentive processing was assessed. Standard and deviant stimuli were presented in two interwoven streams differentiated by frequency (high stream: 2000 Hz standards, low stream: 1000 Hz standards) in three conditions: attended high frequency stream, attended low frequency stream, ignore both. In one train the deviant was higher in frequency and in the other, lower in intensity. Deviant type was counterbalanced across the streams. The value of the deviant was individually set such that participants’ accuracy was approximately 90% in a forced choice, paired same/different pretest. Eight adults participated. Although discrimination was matched in the pretest, performance during the attended trials was more accurate for the intensity (89%) than for the frequency deviants (78%). Reaction times and false alarms did not differ. Nds elicited by the attended standards in the stream with the intensity deviants were larger, earlier, and longer lasting than those elicited from the stream with the frequency deviants. MMNs elicited by the intensity deviants in all three conditions were larger than those elicited by the frequency deviants. Topographic differences were also noted with intensity MMNs more lateralized to the right with less inversion at the mastoids. Nd and MMN differences may be due to the better accuracy for the intensity deviants. Alternatively, the fact that the streams were identified by their frequency may have had an impact on the channel specific representations of the frequency standards.

SYLLABLE DISCRIMINATION IN FAILURE TO THRIVE BABIES: AN ERP STUDY

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Descriptors: FTT, Infants, Syllable discrimination

Many studies attest to the ability of normal infants to differentiate speech sounds in the early days of life, but similar studies have not been done on failure to thrive (FTT) babies. This study investigates syllable discrimination in 26 FTT and 22 normal infants and toddlers (6-27 months) matched for age, race, sex, and social status (SES). Babies heard either /pa/ or /ba/ with one stimulus presented on 20% and the other on 80% of the trials (ISI = 2.5 s, stimulus duration 300 ms, sounds spoken by a male voice at 72 dB with stimuli alternated across subjects). There were two prominent waves, a positive peak occurring at about 270 ms and a positive but negative going slow wave between 500 and 900 ms. The slow wave exhibited significant differences in leads × age, condition, and in condition × age × lead (p < .039 for each). The odd stimulus produced a more negative going slow wave than the frequent stimulus. The P270 average was statistically different for condition × group, leads, and for leads × group × gender (p < .042 for each). Controls had a significantly larger positive wave than FTTs for the odd stimulus, but a smaller positive wave for the frequent stimulus. These differences were centered over F3, F4, and Cz. Our previous studies have shown that FTT subjects suffer academic difficulties during elementary school. The present findings may indicate early differences in language processing related to these later difficulties.

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REPRESENTATION OF CONCURRENT AUDITORY OBJECTS AS REVEALED BY MIDDLE LATENCY AUDITORY EVOKED RESPONSES TO INHARMONICITY

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Descriptors: Event related potentials, middle latency responses, mistuned harmonics

Sound perception in complex environments requires the simultaneous grouping and parsing of acoustic data into separate mental representations (i.e., objects). However, little is known about the sequence of neural processes underlying concurrent sound segregation. We recorded human middle latency auditory evoked potentials to complex sounds comprising several harmonic components, one of which could be mistuned such that it was no longer an integer multiple of the fundamental frequency. Both tuned and mistuned stimuli generated Na (22 ms), Pa (32 ms), Nb (41 ms) and Pb (56 ms) responses. The data also showed sensitivity to mistuning in that Pa amplitude was larger when the harmonic was mistuned by 16% of its original value. This increase in Pa amplitude was positively correlated with the likelihood of categorizing such complex sounds as mistuned by 16% of its original value. This increase in Pa amplitude was positively correlated with the likelihood of categorizing such complex sounds as mistuned by 16% of its original value. This increase in Pa amplitude was positively correlated with the likelihood of categorizing such complex sounds as two objects in a simple behavioral task. The results are consistent with low-level auditory scene analysis in which acoustic properties such as mistuning act as preattentive segregation cues that can subsequently lead to the perception of concurrent auditory objects.

VAGAL TONE AND ADDITIONAL HEART RATE IN FEMALE PATIENTS WITH BORDERLINE PERSONALITY DISORDER - AN AMBULATORY MONITORING APPROACH

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Descriptors: ambulatory monitoring, borderline personality disorder, vagal tone

Current neurobehavioral models of Borderline Personality Disorder (BPD), e.g. Linehan’s biosocial theory, suggest a dysfunction in the emotional regulation system to be a core component of the disorder. We used an ambulatory monitoring paradigm to investigate heart rate variability (vagal tone) and additional heart rate (aHR; also called non-metabolic or emotional heart rate) in this population. Physiological (heart rate, physical activity) and psychological parameters (occurrence and intensity of emotions) were assessed simultaneously throughout one day using a special ambulatory monitoring device (vitaport) capable of storing 24-h records. Fifty female patients with BPD (40 medicated; 10 unmedicated) and 50 female healthy controls (HC) participated in this study. Analysis revealed a significantly higher frequency, intensity, and variability of emotional ratings for BPD patients compared to HC. Because of physiological differences due to medications we split the patients group into medicated and unmedicated subgroups. The unmedicated subgroup of patients revealed no differences in vagal tone but a higher value for additional heart rate compared to the HC. The medicated subgroup, however, showed reduced heart rate variability combined with enhanced heart rate and reduced aHR, compared to the HC. Findings in emotional ratings and enhanced additional heart rate in the unmedicated subgroup provides strong evidence for the model of emotional dysregulation.

DOES FRONTAL EEG ASYMMETRY MODERATE OR MEDIATE RESPONSES TO THE INTERNATIONAL AFFECTIVE PICTURE SYSTEM (IAPS)?

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Descriptors: EEG Asymmetry, Emotion

Trait frontal EEG asymmetry often predicts subsequent emotional responding, and state-related change in frontal EEG asymmetry is often observed as a function of emotional responses. Little research, however, has investigated frontal EEG asymmetry in the context of one of the most widely studied elicitors of emotion, the International Affect Picture System (IAPS). Measures of frontal EEG asymmetry were therefore obtained at rest and during picture (IAPS) viewing and EEG Alpha band power was derived in 11 homologous scalp electrode pairs from 55 right-handed participants. Three questions were asked; Do the IAPS slides elicit state-related changes in frontal brain asymmetry assessed using EEG? Do resting trait levels predict state-related change in asymmetry? Finally, are any state-related changes in frontal EEG asymmetry specific to startle probed vs. non-probed trials? All analyses were repeated for each of 3 reference schemes (CZ, LM, AR). The IAPS did not reliably elicit state-related changes in frontal brain asymmetry, and resting trait levels did not significantly predict state-related changes in asymmetry. The presence of the startle probe did not alter these findings. Thus, although the IAPS pictures have been shown to evoke a wide variety of autonomic and central physiological changes, frontal EEG asymmetry appears not to be similarly responsive. The possibility remains that short state-related changes, such as those that can be seen during brief facial expressions of emotion, occurred but were not detectable in this study. Future work might profitably combine the IAPS with other metrics of emotional experience and expression to test this possibility.

EFFECTS OF MUSIC ON SUBJECTIVE AND PHYSIOLOGICAL EMOTIONAL RESPONSES TO VIEWING FILMS

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Descriptors: Music, emotion, film, EMG, HR, SCR

Despite continued acknowledgment of the importance of music in the perception of filmed events, empirical studies investigating the interaction of music with film are conspicuous in their absence. Evidence from a few isolated cognitive studies suggests that the relationship between music and film is additive. Little is known, however, about the physiology of emotional response to viewing music-film stimuli. This study utilized both self-report (SAM valence and arousal) as well as physiological measures (facial EMG, HR, SCR) to investigate the claim of an additive relationship. Six-second videos (negative or positive valence, low or high arousal) were paired with excerpts from instrumental classical music (pre-tested for valence and arousal). Results indicate main effects for both video valence (evidence from SAM valence, facial EMG, and HR) and video arousal (SAM arousal, SCR). Main effects for music valence and arousal were present in self-report of valence and arousal, but with mixed results among physiological measures. This study corroborates previous evidence regarding the subjective experience of viewing images with music. That music was less able to impact physiology when paired with negative film segments will be discussed in the context of similar finding from cognitive research.
STABILITY IN EEG POWER AND ASYMMETRY OVER 1–3 YEARS IN RELATION TO GENDER AND HISTORY OF DEPRESSION

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Descriptors: depression, stability, asymmetry

In 50 adults with a history of depression beginning in childhood childhood-onset depression (COD) and 50 control subjects with no history of depression alpha power and asymmetry were evaluated during a resting condition at two sessions (mean = 1.2, SD = .36, years apart). Scores for mid frontal, lateral frontal and parietal sites were analyzed using Analysis of Variance and Intraclass Correlation (ICC) method. Power values did not differ between COD and Control subjects. However, women had higher values in all regions. Asymmetry values did not differ for gender, but were higher for COD subjects in the lateral frontal region (COD: mean = 0.04, SD = 0.21; control: mean = –0.07, SD = 0.18). For all subjects, power values were highly stable over the 1–3 year time span (ICC: 0.86-0.94). As expected, asymmetry was less stable. Women with COD demonstrated less stable lateral frontal asymmetry values (ICC = 0.32) than men with COD (ICC = 0.58). The ICC in the control group was 0.48 and 0.59 for women and men, respectively. We tested whether depressive symptoms were related to variation in asymmetry. The asymmetry value at session 1 accounted for 37% of the variation in asymmetry value at session 2. Adding the depressive symptom level and change information based on Beck Depression Inventory (BDI) did not account of within-subject variation. In conclusion, EEG measures were stable over the 1–3 year interval, and variation was unrelated to depressive symptoms.

ADULT SEX-RELATED P300 DIFFERENCES DURING THE PERCEPTION OF EMOTIONAL PROSODY AND FACIAL AFFECT

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Descriptors: emotional prosody, facial affect, sex-related differences

Sex-related neurophysiological differences in emotion perception were investigated in 10 men and 10 women during two "oddball" emotion perception (emotional prosody and facial affect) tasks that were designed to elicit the P300. During the first task participants were required to keep a running count of utterances that depicted happy (block 1) or fear (block 2), while the second task required participants to keep a running count of faces that depicted happy (block 1) or fear (block 2). Blocks were presented to participants using a Latin square design. ERPs to emotional stimuli were recorded from 16 scalp sites, although only 10 sites were used for analysis (F3, F4, T3, T4, T5, T6, C3, C4, P3, P4). ANOVA performed on the P300 amplitude data during the emotional prosody task revealed a significant main effect for hemisphere; higher amplitude over right versus left hemisphere scalp sites was evidenced regardless of valence (happy or fear). Regarding sex differences, ANOVA for P300 latency data revealed significantly longer latency for men than women during the emotional prosody task regardless of valence or site. For the facial affect task a significant hemisphere × site interaction was evidenced for P300 amplitude. Post hoc analyses on the simple main effects revealed that significant differences were isolated to T5 and T6 scalp sites, with higher P300 amplitude over the right hemisphere, regardless of valence. There were no sex-related differences for P300 amplitude or P300 latency for the facial affect task. Likewise, no interactions or main effects were evidenced for P300 latency. These findings are supportive of the right-hemisphere model for emotion perception. However, the sex-related differences noted for P300 latency are possibly indicative of differences in cortical organization with regard to the processing of emotional prosody.

EMOTIONALITY OF SENTENCES, TRAIT ANXIETY, AND PREDICTIVE INFERENCES IN READING

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Descriptors: Anxiety, Reading, N400

Prior work (e.g., Calvo et al., 1997, Cognition and Emotion, 43–63) has suggested that high levels of anxiety lead to greater attention to text passages describing situations with potentially threatening or unpleasant outcomes, and to greater expectations of unpleasant outcomes. Low Anxious students read short context sentences that invited a predictive inference about potential outcomes (e.g., Your father collapses as he nears you). The contexts were emotionally pleasant, unpleasant or neutral. Completion sentences were then shown, one word at a time, that either confirmed (He stops breathing.) or disconfirmed (He stops smiling.) the predictive outcome. For both groups, emotional context sentences were read more slowly than neutral sentences. Differences in judgments about the materials were restricted to the unpleasant scenarios: High Anxious students judged these as more arousing (though equally unpleasant); they also judged confirming outcomes as more plausible, and disconfirming as less plausible, than did the Low Anxious students. Confirming target words were associated with a reduced N400 component in the ERPs, demonstrating that predictive inferences were being generated to these contexts, which in general was larger for the emotionally arousing sentences than the neutral ones. The magnitude of the contextual N400 effect, however, did not differ as a function of anxiety. The impact of degree of contextual constraint, and of the requirement to integrate the context and outcome sentences to make the plausibility judgment, on these results are being examined.

EMOTION AND GENDER: FUNCTIONAL ACTIVITY IN VISUAL CORTEX

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Descriptors: emotion, picture content, fMRI

Functional brain activity was assessed in men and women viewing affective pictures, during functional magnetic resonance imaging (fMRI) of the brain. A 3 Tesla GE-Signa whole body scanner acquired the functional images, using a multishot spiral pulse sequence. Seven coronal slices of 5 mm thickness each (1.5 mm gap) were acquired every 3 seconds. The scanned volume covered the posterior brain, from approximately 10 mm anterior to the ocipital pole forward to near the parietal fissure. Pictures were presented in blocks of neutral, and high (e.g., attack, erotica) and low (e.g., angry faces, families) arousal emotional contents. As revealed by random-effects analyses (SPM99), functional activity increased when viewing affective pictures compared to neutral pictures – bilaterally in occipito-temporal areas of visual association cortex, mainly within Brodmann Area 19, extending into Areas 37 and 18. Both men and women showed generally similar activation patterns in these comparisons. However, in a subsequent analysis of raw signal intensity timecourses within these activated areas, men showed greater signal changes than women in lateral occipital and temporal cortex, specifically when viewing pictures of erotica. Overall, the data emphasize consistency over gender in the occipital brain’s response to emotional pictures. They also suggest enhanced perceptual processing in men when viewing erotica.
CEREBRAL CORRELATES OF PHANTOM SENSATION AND PHANTOM PAIN

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Descriptors: phantom limb, fMRI, referred sensation

The brain correlates of phantom limb pain and nonpainful phantom sensation have so far not been identified. We selected 7 patients from a larger sample of 150 upper extremity amputees who felt nonpainful phantom sensation upon stimulation of body parts close to (e.g. upper arm or shoulder) or far removed (e.g. foot) from the amputation line and 7 matched healthy controls. Electrical stimulation was applied to the hand and mouth as well as to the sites from which referred sensation could be elicited using monophasic constant current stimuli of 200 µs duration and a mean stimulus rate of 10 Hz. Five stimulation blocks of 20 seconds were interspersed with 4 rest blocks of 40 seconds. All subjects were asked to evaluate stimulus intensity and quality experienced at the stimulation site and elsewhere in the body. Using a Siemens Vision Plus 1.5 T scanner, 74 fMRI whole brain scans were acquired. For anatomical reference a high-resolution 3D MPRAGE image data set was acquired. Group data were calculated after normalization of the individual data to the Talairach space. All fMRI data processing was carried out using Brainvoyager. A conjunction analysis of all sites active during phantom sensation revealed two clusters of activity, one in posterior parietal cortex and one in premotor cortex, regions that have been implicated in the maintenance of body image or the integration of conflicting motor commands and sensory feedback. Primary somatosensory cortex was not involved. We are currently contrasting these data with those related to painful phantoms to determine which brain regions contribute to painful versus nonpainful phantom phenomena.

CHILDREN'S EMOTION REGULATION DURING A DISAPPOINTMENT: FRONTAL EEG ASYMMETRY, VAGAL TONE, AND HEART PERIOD IN RELATION TO BEHAVIOR AND RISK FOR DEPRESSION

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Descriptors: emotion regulation, frontal EEG asymmetry, depression

Few studies have used a psychophysiology approach to investigate emotion regulation in children of depressed parents. This study examined central and autonomic nervous system activity and emotional behavior in 3-9-year-old children whose parents had either a history of childhood depression (depressed group, N = 41) or no history of psychopathology (control group, N = 16). EEG and ECG were recorded during resting and task conditions, and emotion regulation behavior was coded from videotape. In the disappointment task, children expected a desired toy, but instead received an undesired toy (bad toy condition) and then an apology and the desired toy (good toy condition). Parents completed a questionnaire on child behavior problems. For 3-5-year-olds and children with low heart period, resting right frontal asymmetry was associated with higher levels of withdrawal behavior than was left frontal asymmetry. The depressed group displayed less flexibility in heart period across task conditions than did the control group. Both groups exhibited a decrease in heart period from resting to bad toy condition, but whereas the control group exhibited an increase from bad toy to good toy, the depressed group failed to exhibit a change. Children in the depressed group with left frontal asymmetry had higher total behavior problems than those with right frontal asymmetry. Findings support the withdrawal component of the approach-withdrawal model of frontal asymmetry and predictions of emotion-regulation models of depression.

THE EFFECTS OF VARYING INTENSITY OF WHITE NOISE ON CEREBRAL ACTIVATION

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Descriptors: quantitative electroencephalography, white noise, intensity

Presentation of white noise has been found to generate changes in cerebral functioning, as measured by electroencephalography. However, relatively few studies have examined the relationship between white noise intensity and cerebral activity. Further, many of the studies investigating the cerebral effects of white noise using EEG have used very brief presentations of white noise, in terms of milliseconds. The present investigation sought to determine whether increasing intensity of white noise of longer duration also generates increasing intensity of cerebral activation at the temporal lobes, using quantitative electroencephalography. It was hypothesized that 90 dB white noise would generate greater reductions in high alpha (10 to 13 Hz) magnitude than 75 dB white noise, which in turn would generate greater reductions in high alpha magnitude than 55 dB white noise. A total of 45 men were initially asked to sit quietly while QEEG was measured. Subsequently, each intensity of white noise was presented for 90 seconds, with QEEG measured during the last 45 seconds. The results of a within subjects ANOVA indicated a significant two way interaction between white noise intensity (no noise, 55 dB, 75 dB, 90 dB) and electrode site (T3, T4, T5, T6). However, contrary to the hypotheses, 55 dB white noise generated the greatest reduction in high alpha magnitude at the right posterior temporal lobe, followed by 75 dB white noise, with 90 dB white noise generating no significant change at this location. The findings for the other electrode sites were mixed. Thus, presentation of increasing intensity of white noise of a longer duration is also found to result in differences in cerebral activation at the right temporal lobe.

THAT WAS SO FUNNY YOU CAN EVEN SEE IT ON MY BRAIN

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Descriptors: quantitative electroencephalography, emotion, intensity

Positive emotions have been associated with increased left frontal and right temporal activation. Research has also found that as the intensity of emotional arousal increases so too does cerebral activation. Interestingly, investigations of the relationship between intensity of emotions and changes in cerebral activation have used negative emotions. Thus, the purpose of the present investigation was to determine if a similar relationship exists for positive emotions. It was hypothesized that significant positive correlations would be found between intensity of mirthful memories and changes in both low beta (13 to 21 Hz) and high beta (21 to 32 Hz) magnitude at the left frontal and temporal regions. A total of 16 women with an age range of 18 to 22 years (M = 19.9, SD = 1.24) were initially asked to sit quietly while quantitative electroencephalography (QEEG) was measured (baseline condition). Approximately 5 to 6 minutes later they were instructed to recollect a mirthful memory while QEEG was measured. Afterwards they were asked to rate the intensity of the mirthful memory on a scale of 1 (low intensity) to 7 (high intensity). Correlational analyses between changes in cerebral activation resulting from recollecting the mirthful memory and intensity ratings indicated that changes in high beta magnitude were positively correlated with intensity ratings at the left frontal (r = .435) and right temporal (r = .438) regions. Thus, the present investigation indicates that the intensity of positive emotions is related positively to changes in cerebral activation.
EFFECTS OF GRAPHICS ON PROCESSING TELEVISION NEWS

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Descriptors: television, attention, memory

This study examines how graphics affect processing of science-related television news stories. Specifically, this study examines the effects of no graphics, redundant text graphics and animated graphics on viewers’ heart rate (HR) and skin conductance (SC) responses while viewing science-related news stories and on their recognition, free recall and cued recall of information from the news stories. Data were collected from 44 adults, men and women, ages 28-80 years old. Participants viewed six different science-related news stories, plus one practice story. As in a previous study using college students, this study found that animated graphics maintained attention over time, indexed by HR, while attention declined for both redundant text graphics and no graphics. However, while the redundant text graphics elicited the least attention, they also elicited higher SC levels than either animated or no graphics, also in keeping with the previous study. This may indicate more mental energy is allocated to the task of reading the redundant text graphics than to viewing the other conditions, and may even indicate a passive avoidance response to the text. As predicted, cued and free recall were best for animated graphics and worst for no graphics. There was no effect of graphics on recognition in this study, although graphics enhanced recognition for college students in the previous study. These results suggest that college students may process television messages in a more automatic fashion while older adults may engage in more controlled processing of television messages.

SEX DIFFERENCES IN RELATIONSHIPS AMONG MEASURES OF HEART PERIOD AND BLOOD PRESSURE VARIABILITY

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Descriptors: heart rate variability, blood pressure variability, gender differences

Variability in the heart period (HPV) and blood pressure (BPV) time series reflect various physiological processes. Spectral analysis of HP yields three components: high frequency (HF) respiratory-vagal power, lower frequency (LF) baro receptor-sympathovagal power, and very low frequency (VLF) power which has been attributed to extra-autonomic sources. BPV generally reflects baroreceptor function. Relationships among indices of HPV and BPV were examined in 30 female and 30 male college students during a 10-minute silent reading task (Velten). Continuous HP was derived from ECG, and semi-continuous BP readings were obtained from the radial artery pulse with the VasoTrac APM 205. Sex differences emerged in the correlations between ECG spectral power and mean arterial pressure variance (VMAP). In females only, LF was significantly related to VMAP (r = .47, p = .01). There were marginally significant associations between HF and VMAP in both sexes, but in opposite directions (males: r = -.31, p = .09; females: r = .29, p = .11). There were marginal correlations between VLF and VMAP in males (r = -.32, p = .08) that was absent in females, and between VMAP and total HP variance in females (r = .30, p = .10) that was nonsignificant in males. In general, HPV and BPV showed a positive relationship in females, but a negative relationship in males. These differences may reflect dissimilarities in physiological processes represented in the HPV bands, which in turn may be a function of hormonal factors. Such considerations may moderate the relationships between HPV and its physiological underpinnings.

ASSESSMENT OF OPIATE MODULATION OF NOCICEPTION IN MEN AND WOMEN AT RISK FOR HYPERTENSION

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Descriptors: blood pressure, risk for hypertension, pain

Based on the hypothesis that hypoalgesia in individuals at risk for hypertension may be related to enhanced endogenous opiate activity, this study examined the effects of an opiate antagonist on noceptive flexion reflex threshold and subjective pain reports in 86 men and 65 women with (n = 60) and without (n = 91) a parental history of hypertension. The noceptive flexion reflex (NFR) was assessed before, during, and after a video game task on both placebo and naloxone (50 mg) days. NFR threshold was defined as the intensity of electrocutaneous sural nerve stimulation required to elicit hamstring muscle withdrawal. Pain ratings were also obtained after each threshold assessment using a 0 (no pain) to 100 (maximum tolerable) visual analog scale (VAS). Analysis of NFR threshold was conducted using 2 Drug x 3 Trial x 2 Parental History of Hypertension x 2 Sex ANOVAs. This analysis revealed a significant Drug by Parental History of Hypertension interaction effect, Pillais Trace = .09, F (1,102) = 2.92, p < .05, reflecting no effect of naloxone on NFR threshold in offsprings of hypertensives but a significantly higher NFR threshold during naloxone versus placebo in offspring of normotensives. A similar analysis of VAS pain ratings, controlling for individual differences in NFR threshold, revealed a significant main effect of Parental History of Hypertension, F (1,93) = 9.36, p < .01, reflecting significantly lower pain ratings in offspring of hypertensives versus normotensives. These findings do not support the notion of endogenous opiate mediation of hypoalgesia in offspring of hypertensives.

BEHAVIORAL AND ELECTROPHYSIOLOGICAL EVIDENCE FOR AFFECTIVE REGULATION OF SEMANTIC EXPECTANCY

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Descriptors: Emotion, Semantics, ERP

Studies of semantic distance suggest that close and remote priming may be linked to multiple cognitive and neural mechanisms. Based on prior work, we predicted that semantic distance would be correlated with medial frontal and centrotemporal components of the event-related potential (ERP). We further predicted that negative affect (NA) and positive affect (PA) would have different influences on these two components. METHODS: 128-channel ERPs were recorded as 47 subjects performed a lexical decision task. Real-word pairs were equally divided into closely related, remotely related, unrelated, and neutral (nonprimed) stimuli. Stimuli were presented foveally, with a 200ms stimulus onset asynchrony. Subjects completed psychometric questionnaires, and were assigned NA and PA scores. RESULTS: Reaction times were faster to close and remote, versus unrelated and neutral, targets. Responses were slower to unrelated versus neutral targets. Consistent with predictions, the inhibitory effect was selectively modulated by NA: subjects high in NA, but not PA, showed a tendency to respond more slowly, particularly to unrelated targets. Semantic relatedness effects were observed over medial frontal areas at around 300ms (MFN) and between 400 and 700ms over centrotemporal areas (P300/N400). High-NA subjects had larger MFNs, reminiscent of prior studies of NA effects on medial frontal responses to errors, prediction discrepancies, and during emotional evaluation. NA also interacted with P300 latency: higher NA correlated with later P300s, particularly to unrelated targets, consistent with behavioral data.
EXAGGERATED CARDIOVASCULAR REACTIVITY TO STRESS RELATES TO HYPERACTIVATION OF THE ANTERIOR CINGULATE CORTEX IN HUMANS

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Descriptors: cardiovascular reactivity, fMRI

To determine whether individuals who show exaggerated cardiovascular reactivity to stress also show hyperactivation in brain systems that support stressor-related processing and cardiovascular function, we used fMRI to examine the blood oxygen level dependent (BOLD) response to a Stroop color-word stressor task in 7 High and 11 Low reactive individuals (40–70 yrs; 11 men). High and Low reactors were normotensive and were identified from the upper and lower tertiles of a systolic blood pressure reactivity distribution of a prior study. The Stroop task consisted of 16 alternating 90 sec blocks of congruent and incongruent color-word stimuli. A 3T scanner imaged the BOLD response (TR 1500 ms; TE 25 ms; 60° flip angle; 20 cm field of view for 34, 3.2 mm contiguous functional images). We found that High reactors showed a greater increase in the anterior cingulate (Brodmann Area 32) activation to both congruent and incongruent blocks than Low reactors (Group X Block interactions: systolic pressure F = 3.8, p < .05; BOLD response F = 10.7, p < .005, 4 voxel contiguity threshold). These results suggest that hyperactivation of the anterior cingulate may be functionally related to individual differences in cardiovascular reactivity.

RESPIRATORY SINUS ARRHYTHMIA IS ASSOCIATED WITH PULMONARY GAS EXCHANGE EFFICIENCY IN CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Descriptors: respiratory sinus arrhythmia, pulmonary gas exchange, COPD

We tested the hypothesis that respiratory sinus arrhythmia (RSA) and the phase difference between respiration and RSA are significantly associated with the efficiency of pulmonary gas exchange in subjects with chronic obstructive pulmonary disease (COPD). RSA may serve to increase pulmonary gas exchange efficiency by matching perfusion to ventilation within the respiratory cycle. RSA is attenuated patients with COPD. RSA amplitude and the phase between RSA and respiration were altered within subjects by pacing breathing at a four different frequencies separated by rest periods. Respiratory flow, oxygen consumption, exhaled carbon dioxide, heart rate, RSA, and the phase difference between RSA and respiration were measured during paced breathing in 20 subjects with COPD as part of a biofeedback-assisted breathing retraining study. Ventilatory equivalents for CO2 and O2 were used to assess pulmonary gas exchange efficiency. Across breathing frequencies, RSA and the phase between respiration and RSA were significantly and independently associated with the ventilatory equivalents for CO2 and O2 after controlling for the effects of age, respiratory rate, tidal volume, oxygen consumption, exhaled carbon dioxide, and mean heart rate. We conclude that higher RSA and smaller phase differences between respiration and RSA are associated with improved pulmonary gas exchange efficiency, as indicated by lower ventilatory equivalents, in patients with COPD. Lower RSA seen in patients with COPD may indicate reduced cardiopulmonary coordination and may contribute to impaired respiration.

TEMPORAL INTEGRATION OF STEADY-STATE AUDITORY STIMULI IN SCHIZOPHRENIA

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Descriptors: Schizophrenia, auditory evoked response, steady-state

Schizophrenia patients exhibit difficulty in differentiating signal from noise in the auditory environment. Although this abnormality is frequently attributed to “poor sensory gating,” an equally plausible hypothesis is that patients have an inflexible auditory registration system that is related to abnormally high auditory gain control. To partially evaluate the latter thesis, transient and sustained auditory evoked responses (AERs) were measured among schizophrenia patients. Auditory steady-state stimuli were used to determine how basic auditory sensory registration and ability to integrate auditory information over time are associated with schizophrenia-normal AER differences. Fifteen schizophrenia and 15 normal subjects were presented with 400 ms bursts of steady-state stimuli at 10, 20, 40, and 80 Hz while recording dense array (256-channel) EEG. Distributed source reconstructions and measures of coherence in source space were used to evaluate the sensitivity of left and right auditory cortex to low and high density auditory stimulation. There are four results of interest: (1) all subjects have increased P1/N1/P2 amplitudes with increasing steady-state burst frequency; (2) schizophrenia subjects have lower than normal P1/N1/P2 amplitudes at low (10 and 20 Hz) but not at high (80 Hz) burst frequencies; (3) schizophrenia subjects’ steady-state responses take longer to return to baseline following offset of steady-state stimulation at burst frequencies above 20 Hz; and (4) they have lower steady-state magnitudes and phase synchronies than normal for 40 Hz stimuli.
Adaptation process of reaching movement – Analysis by near-infrared spectroscopy

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Descriptors: Near-infrared Spectroscopy, reaching movement, oxy-Hb

In this study, we recorded Near-Infrared Spectroscopy (NIRS) during the adaptation process in reaching movements. The participants were instructed to move their index finger from start position to the visual target, while receiving the visual feedback by the cursor that represented their finger position. There were 10 trials per period. At first, the cursor followed the finger position (Pre-exposure period). Secondly, the cursor rotated 40 degrees from actual finger position (Exposure period). Finally, the cursor followed the finger position again (Post-exposure period). Error angle was calculated as the difference between the movement direction and that of the target. Oxyhemoglobin (oxy-Hb) and deoxyhemoglobin (deoxy-Hb) was measured at the frontal region (Fz) by NIRS. These values in the first half of trials were compared with those in the last half in each period. Decrease of error angle represents adaptation of the reaching movement. The error angle in the last half was smaller than that in the first half in each period. In addition, error angle in the exposure period was larger than that in the other periods. These results indicate the adaptation process of reaching movement, and performance difficulty of the period. Oxy-Hb decreased in the last half compared with the first half of each period. In contrast, there was no difference between the first and the last half in deoxy-Hb. Variation in oxy-Hb corresponded to that of error angle. We suggest that oxy-Hb variation at the frontal region reflects the adaptation process in reaching movement.

Temporal stability of saccadic task performance in psychotic patients

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Descriptors: antisaccade, endophenotype, schizophrenia, bipolar

Antisaccade task deficits have been posited as a potential endophenotype of liability for schizophrenia. The criteria for marker status include heritability, diagnostic specificity, and temporal stability. To date, studies demonstrated the heritability of antisaccade task performance (Malone & Iacono, 2002, Psychophys.) Howvever, the issue of diagnostic specificity remains. Tien et al. (1996, J Nerv Ment Dis) and Gooding and Tallent (2001, J Nerv Ment Dis) observed antisaccade task deficits in bipolar patients as well as schizophrenia patients. Although some studies (Hutton, 2001, Schiz Res; Calkins et al., in press, Int J Psychophys) suggest that antisaccade task performance demonstrates moderately high test-retest reliability in schizophrenia patients, the temporal stability of the deficit in bipolar patients has not been examined. DSM-IV diagnosed schizophrenia and bipolar probands were assessed at time 1 and time 2 over an interval of approximately 3 years. Paired t-test analyses of antisaccade error rates revealed a significant association between time 1 and time 2 (t(22) = 3.76, p < .01) in schizophrenia patients, though not in bipolar patients (t(9) = 0.64, n.s.). These preliminary results suggest that antisaccade task deficits show temporal stability for schizophrenia, though not for bipolar disorder. These findings will be discussed in the context of the viability of antisaccade task deficits as an indicator of a schizophrenic diathesis.

Startle probe modality: an investigation of ethnic differences

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Descriptors: emotion, pictures, ethnicity, startle

Our previous research suggested that European Americans might show larger acoustic startle responses than African Americans. To explore this further, we conducted a second study, and examined startle reflexes in response to acoustic as well as visual startle probes for both European Americans and African Americans. Stimuli included thirty six JAPS pictures representing pleasant, neutral, and unpleasant content. Facial EMG (orbicularis, occuli and corrugator) was continuously measured while participants viewed each picture. Acoustic startle probes consisted of a 50ms, 95db burst of white noise presented through headphones during 6s picture presentations; visual probes were generated by the simultaneous firing of three flash guns (not directed toward the participant) during picture presentation. Significant affective startle modulation was obtained for both European Americans and African Americans, with larger reflexes elicited when viewing unpleasant, compared to pleasant, pictures for both ethnic groups. Moreover, affective modulation was found for both acoustic and visual startle probes in each ethnic group. European Americans and African Americans did not differ in reflex magnitude. Taken together, the results suggest that the startle response is a reliable measure of emotion for European Americans and African Americans whether elicited by acoustic or visual startle probes.

Individual differences in behavioral approach: an investigation of startle, facial electromyography, and subjective ratings in response to affective pictures

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Descriptors: behavioral approach, startle, facial EMG

Few studies have investigated emotional modulation of startle among persons selected on the basis of individual differences in the experience of positive emotion. Hawk and Kownas (2003; Psychophysiology, 40, 131–138) recently reported greater valence modulation among participants high in behavioral approach (BAS) compared to Low-BAS participants. The present study sought to replicate and extend that work. Undergraduate participants low (n = 23), moderate (n = 26), and high (n = 24) in self-reported BAS (bottom 10%, middle 20%, and top 10% of BAS scores, respectively) were recruited to view a series of 54 pleasant, neutral, and unpleasant pictures. Bilateral startle blink responses, left zygomaticus EMG, and subjective ratings were assessed. Preliminary analysis of startle eyeblink magnitude showed the expected pattern of robust valence modulation among the High-BAS group, marginal modulation in the Moderate-BAS group, and non-significant modulation in the Low-BAS group. However, the critical BAS X Valence interaction was not reliable. Zygomaticus EMG showed the expected enhancement during pleasant pictures, but this effect did not vary with BAS scores. Higher BAS scores predicted greater differentiation of valence ratings for pleasant compared to unpleasant pictures. These initial analyses fail to support the hypothesis that individual differences in self-reported behavioral approach moderate the impact of emotional stimuli on startle and other peripheral psychophysiological measures.
PROGRESSIVE RESPIRATORY AND CARDIAC CHANGES DURING SEVEN DAYS OF INTENSIVE MINDFULNESS MEDITATION: A CASE STUDY

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Descriptors: mindfulness meditation, respiration, cardiac autonomic control

Mindfulness meditation is a systematic procedure to develop enhanced awareness of moment-to-moment experience of perceptible mental processes. The approach assumes that greater awareness will induce more veridical perception, reduce negative affect and improve vitality and coping. There is growing evidence that mindfulness meditation may be effectively employed to ameliorate various physical, psychological and psychosomatic conditions. However, little is known about the physiological concomitants of mindful awareness. In this study, the hypothesis that mindfulness meditation induces changes in respiratory and cardiac activity was tested in a single experienced meditator during a silent, 7-day intensive, mindfulness meditation retreat. Each day consisted of 6-7 40-min meditation sessions with rest pauses after meals, and a 1-h lecture in the evening. ECG, calibrated ventilation and accelerometry were registered 24 h/day for the entire retreat with the LifeShirt ambulatory monitor. An integrated electronic diary was used to assess perceived extent of mindfulness after each meditation session. Minute averages of cardiac (heart rate and respiratory sinus arrhythmia, RSA), respiratory (e.g. breathing rate, tidal volume, minute ventilation, inspiratory drive and duty cycle), and acceleometric (motility) parameters were derived for all data. Statistical analyses revealed progressive changes for many respiratory measures and RSA over the week (p’s < .01), suggestive of reduced metabolic and autonomic activity, although motility went unchanged. Additionally, perceived extent of mindfulness correlated with several physiological measures (p’s < .005).

FRONTAL CORTICAL ACTIVITY, ANGER EXPRESSION, AND BEHAVIORAL ACTIVATION

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Descriptors: Resting EEG, Frontal cortical activity, Motivation

The model of anterior asymmetry and emotion proposed an asymmetric representation of approach and withdrawal systems in the frontal lobes. The approach system is supposed to be related to the left prefrontal cortex and the withdrawal system to the right prefrontal cortex. Within this framework, three different theoretical concepts have been related to anterior asymmetry: Emotional valence, motivational direction, and behavioral activation. The aim of the present study was an empirical investigation on the relation between anterior cortical activity and these three concepts. Cortical activity of 59 subjects was evaluated on three occasions in monthly intervals with resting EEG. Furthermore, self-report questionnaire measures of positive and negative affect, trait-anger, anger expression (anger-out, anger-in, and anger-control), and behavioral activation and inhibition were administered. Subjects with greater left hemisphere activity showed higher trait-anger and anger-out scores as well as lower anger-control scores. This result supported the hypothesis that motivational direction is related to frontal asymmetry. Furthermore, subjects with greater bilateral frontal cortical activity showed higher scores on a behavioral activation system scale. This finding might suggest that behavioral activation comprises approach and withdrawal tendencies.

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BRAIN EVENTS RESPONSIBLE FOR MEMORY FORMATION: COMPARING FACES, NAMES, AND FACE-NAME ASSOCIATIONS

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Descriptors: memory, faces, names

Many of us find it difficult to learn the names of the people we meet. Although this type of learning can be very important socially, it is prone to failure. Here we investigated neural events associated with three types of successful memory formation: recognizing faces, recognizing names, and recognizing face-name associations. Subjects viewed a set of 140 unique faces, each presented simultaneously with a unique spoken name. Names were gender-matched but otherwise randomly assigned to faces. Event-related potentials (ERPs) were recorded from 64 channels and categorized according to subsequent memory performance. Three recognition memory tests were administered following EEG data acquisition such that ERP differences could be computed according to (1) whether the face was subsequently recognized; (2) whether the name was subsequently recognized; and (3) whether the face-name association was subsequently recognized. In a previous study we showed that ERP correlates of memory formation differed for faces later recognized with retrieval of episodic detail compared to faces later recognized with familiarity in the absence of recollection (Yovel & Paller, 2003). Under Review). Although experiential measures of recognition were not obtained in the present study, we found some similar patterns of ERP difference savings in encoding. In particular, face encoding apparently occurred earlier than name encoding, and both face and name encoding occurred earlier than the multimodal encoding of face-name associations.

CONTRIBUTION OF STIMULUS- AND RESPONSE-LOCKED COMPONENTS TO THE AMPLITUDE OF THE ERN: EVIDENCE FROM FAST ERRORS

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Descriptors: EEN/Ne, Errors, Response monitoring

The present study evaluated the degree to which stimulus-related activity may contaminate the response-locked error-related negativity (ERN). This is particularly relevant because stimulus-locked negativities, including the N2, may have peak latencies in the same range as relatively fast errors. The present study sought to evaluate the contributions of stimulus- and response-locked components to the ERN by sorting errors into four reaction time (RT) bins: 225–275 ms, 275–325 ms, 325–375 ms, and 375–425 ms. Data from 40 subjects indicate the ERN was significantly enhanced in the two fastest RT bins, and in this effect was largest for errors with RTs in the 225–275 ms range. The stimulus-locked data revealed a consistent pattern of results: although there was a negativity that peaked approximately 250 after the stimulus in all four RT bins, there was a second negative deflection (the ERN) evident in the two slower RT bins. Although it may not always be the case, the response-locked ERN can be contaminated by stimulus-locked components (e.g., the N2) when the latencies of these negative components overlap. The methodological implications of these results are discussed in terms of both between-group ERN studies and evaluating stimulus- and response-locked components in response-monitoring studies.
This study sought to investigate ERP components related to response monitoring through principal components analysis (PCA) in a hybrid go/nogo task. We examined response-locked ERP waveforms from 9 subjects for correct go, incorrect go, and incorrect nogo trials with traditional peak measurements and with PCA. Three factors accounted for nearly 80% of the variance. The first factor was the error positivity; the factor scores were consistent with the ERP data: although larger for both types of errors relative to correct trials, this factor was largest for nogo errors, and largest at Cz and Pz. The second factor represented the error-related negativity (ERN). Like the ERP data, this factor was larger on both go and nogo errors, relative to correct go trials. However, unlike the ERP data which indicated a larger frontal ERN on nogo errors, the factor scores for the ERN indicate a more protracted component along the midline, equally large for both types of errors. Subjects made very few nogo errors relative to go errors and both the ERP and PCA results indicate that the PE, and not the ERN, was sensitive to error-type frequencies. The third factor was largest for correct go trials, and had temporal characteristics similar to the ERN factor. This component appears to represent the correct trial negativity (CRN) that was evident in the ERP data and generally thought to be simply a small ERN. The PCA raises the possibility of some independence of the ERN and CRN. These results are discussed in terms of current theories of response monitoring ERPs.

A recent study reports the existence of an error-preceding positivity (EPP) in the response-locked ERP on trials that come before errors. We conducted two studies investigating this phenomenon. In the first study, we sought to replicate the existence of an EPP in a large sample of college students (N = 40). Error-preceding trials, relative to RT-matched correct-preceding trials, were characterized by enhanced positive activity peaking approximately 100 ms post-response. This error-preceding positive activity was evident at all midline electrodes and lasted nearly 500 ms. In Study 2, we sought to further investigate the error-preceding positivity by utilizing a slightly different paradigm, with a longer (5 s) inter-trial interval (ITI). Data from 20 subjects yielded error-preceding positive activity that began approximately 50 ms post-response, and again lasted nearly 500 ms. Results from Study 2, therefore, replicate those obtained in Study 1, and demonstrate the generalizability of the error-preceding positive activity across tasks and ITI. In summary, the current studies suggest that error-preceding trials may be uniquely characterized by enhanced positive activity that is protracted in time and scalp locations along the midline. These results are consistent with the original proposal that error-preceding positive activity could reflect anterior cingulate cortex (ACC) disengagement, which could lead to reduced response control, and eventually, to errors.

Prepulse inhibition (PPI) of startle, a decrement in the startle response caused by a weak prestimulus presented 60–500 ms before a startling noise, is impaired by manipulations that increase mesolimbic dopamine. Recent work demonstrated reduced PPI among smokers during craving of a lit cigarette compared to a neutral cue, consistent with the hypothesis that smoking cues stimulate dopamine release. However, a lit cigarette is more interesting than a neutral cue, and attention can also affect PPI. To test these alternative hypotheses, we examined PPI during exposure to smoking, neutral, and food cues among 29 undergraduate non-smokers (16 female) following overnight food-deprivation. Each of the 9 cue presentations (3 of each cue) lasted 4.5 min. During each cue, 9 startle probes (102-dB white noise) were presented, and a prepulse (20-ms noise 8 dB above background) preceded 2/3 of the probes by 60 or 120 ms. Despite the deprivation manipulation, only half of the sample reported reliable craving of the food cue. Percent PPI was reduced during the food cue, relative to the smoking cue, among participants who reported craving the food cue, but not among those who did not crave. Percent PPI was not diminished during the smoking cue relative to the neutral cue. Thus, the prior finding of diminished PPI during smoking cues among smokers is not likely due to a craving-independent attention mechanism. More broadly, PPI may be a useful index of cue reactivity.
SEMANTIC PROCESSING OF ILLUSORY WORDS

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Descriptors: illusion, N400, priming

The perception of an illusory word can be induced by a partial repetition blindness: If two words (W1, W2) presented within a rapid serial visual presentation (RSVP) share the same string of letters (“CREEP” – “SHEEP”), these letters will be inhibited, thus generating a free floating fragment (FR1, “SH”). FR1 is likely to be linked to a subsequently presented fragment (FR2, “IFT”) if both combine to a meaningful word (Illusion: “SHIFT”). Using event related brain potentials (ERPs), we examined whether the illusion is generated at a lexical level of word processing. RSVP streams containing two meaningful words (W1, W2) and a word fragment (FR2) were presented to the subjects (n = 14). A preceding prime word was semantically unrelated, or related either to the real word (W2), or the illusion, respectively. The probability of naming W2, but not the illusion, was 24% for unrelated, and increased to 52% for related primes. The corresponding probabilities for naming the illusion, but not W2, were 44% and 70%, respectively. If W2 was named, the semantic priming effect (unrelated - related) was reflected in an N400 effect. Most importantly, an N400 effect was also evoked by illusory words but the two effects differed both in latency and in topography with a focused left-posterior effect for the illusory words. Our ERP results support the notion that illusory words are already available at the lexical level but the differences in timing and topography suggest that priming of illusions facilitates word-form processing rather than higher semantic associations.

GAMMA BAND ACTIVITY DURING SPEECH PRODUCTION IN SCHIZOPHRENIC AND HEALTHY SUBJECTS

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Descriptors: Gamma band, Schizophrenia, Speech production

In a prior study we found evidence for suppressed alpha band coherence between the speech production area (Broca’s), via the arcuate fasciculus, and auditory cortex to voice probes during the act of speaking in schizophrenic patients. Other studies have found evidence of reduced EEG synchronization to gamma band (40 Hz) click trains in schizophrenic subjects compared to controls. Gamma band activity is thought to underlie task related cognitive binding. The purpose of this study was to investigate gamma activity during the act of speaking. We used healthy control and schizophrenic subjects to investigate the sensitivity of gamma activity to different levels of real-time alteration of auditory feedback during speaking by assessing EEG gamma coherence between frontal and temporal EEG-sites. In the speaking task subjects produced the vowel [a] with 4 randomized feedback conditions: their own or somebody else’s voice, undistorted or with a 2 semitone pitch-shift respectively. In the listening task subjects heard the recorded speaking task played back. In controls, initial results show a greater gamma coherence between left hemisphere frontal-temporal regions during speaking compared to listening and a tendency toward the greatest gamma coherence while hearing their own unaltered feedback as compared to the altered feedback conditions. Patients, however, failed to show an increase in gamma coherence during talking as compared to controls.

RSA, HEART PERIOD AND CORTISOL IN CHILDREN DURING SOCIAL AND PHYSICAL CHALLENGES

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Descriptors: RSA, heart rate, cortisol

The Polyvagal Theory (Porges, 1995, 2001) proposes a hypothetical Social Engagement System (SES) that coordinates the expression of social cues and autonomic activity to adapt to changing environmental demands. The SES contains a somatomotor component (cranial nerve regulation of the muscles involved in facial expression, extraction/amplification of human voice, mastication and vocalization) and a visceromotor component (myelinated vagal efferent pathways to the heart and bronchi). Autonomic states associated with behavioral mobilization compromise the SES by retracting the vagal regulation of the heart and the neural regulation of the striated muscles of the face and head. The current study investigated in 3-5 year-old children (N = 50) the effects of social and physical challenges on the visceromotor components of the SES. Heart period (HP), respiratory sinus arrhythmia (RSA) and motor activity were recorded and salivary cortisol was measured during three conditions: quiet play (cartoons, books), separation from parent (social challenge) and physical exercise (physical challenge). Parental perception of the child’s typical behaviors was assessed via the Child Behavior Checklist (Achenbach, 1983). The study tested the general hypothesis that the physiological variables specified in the SES (RSA, HP) will be expressed during social challenge and depressed during physical challenge. Preliminary results show a significant increase in RSA during the social challenge and significant decreases in RSA and heart period during the physical challenge.

AFFECTIVE STARTLE MODULATION USING A VERBAL EMOTIONAL FOREGROUND

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Descriptors: ERP Startle Reflex Emotion

In emotion research the human startle reflex has reliably proven to be modulated by an emotional foreground. For long lead intervals the startle eye blink component is potentiated when individuals view negative and inhibited when individuals view positive pictures. These effects are interpreted in terms of motivational priming. The aim of this study was to examine whether these effects also hold true for affective words as emotional foreground. 25 individuals viewed 180 affective words, rated as highly arousing on the Self Assessment Manikin Scale and negative or positive in valence. For 20 words from each category (negative, neutral, and positive) a startle tone (90 db SPL white noise, 50 ms rise time) was presented 2.5-4.5 sec after word onset. Word Presentation order was randomized across subjects. The startle eyelink was measured via EMG beneath both eyes and EEG was recorded from 64 scalp channels. Although the blink response did not show modulation by word pleasantness the P300 response to affective words was larger than the response to neutral words. Interestingly a negative shift of the ERP was found for negative words compared to neutral words over secondary visual areas. This ‘early posterior negativity’ reached its maximum about 230 ms after stimulus-onset and was most pronounced for highly arousing unpleasant words over the left hemisphere. These findings are discussed in the context of theories of approach and avoidance.
PLEASANT STIMULI INCREASE ACTIVITY IN LEFT DORSOLATERAL PREFRONTAL CORTEX

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Descriptors: positive affect, brain activity, fMRI

Positive affect is associated with enhanced performance on tasks of executive function. Furthermore, it has been suggested that the effects are specific to pleasant affect and not to emotion-related arousal in general, and that they are mediated by activity in particular brain regions, especially prefrontal cortex. Prior EEG findings have suggested a special role for the left hemisphere. The present research used fMRI to investigate the effects of valence on brain activity in left and right hemispheres in an emotional Stroop paradigm. Twenty (9 female) undergraduate volunteers were presented with pleasant, unpleasant, and neutral words and asked to identify the color in which the word was printed as quickly as possible. Brain activity was increased for the pleasant compared to the unpleasant words, in bilateral dorsolateral prefrontal cortex. Pleasant words were associated with an asymmetry in favor of the left hemisphere, consistent with prior EEG results. These findings suggest that this asymmetry is superimposed on a bilateral increase in activity in the presence of a positive stimulus, accounting for enhanced performance on tasks of executive function.

PACINIAN CHANNEL INVOLVEMENT IN VIBROTACTILE INHIBITION OF ACOUSTIC STARTLE

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Descriptors: startle, prepulse inhibition, vibrotactile

This experiment looked at the effect that varying vibrotactile prepulse stimulus frequency has on the acoustically elicited startle response. Different mechanoreceptive channels have been identified based on their sensitivity to vibrations of different frequencies: the Pacinian channel is optimally sensitive to vibrations at approximately 300 Hz, whereas non-Pacinian I and III channels are optimally sensitive to vibratory stimuli at approximately 30 Hz. Since the Pacinian channel is specialized for the detection of stimulus transients, we hypothesized that high frequency prepuces would result in significantly more prepulse inhibition than would low frequency prepuces. Such a result would support the hypothesis that prepulse inhibition of startle is more sensitive to transient than sustained stimulus properties. Vibrotactile prepuces with frequencies of 30 or 300 Hz and intensities of 95 or 130 V were presented for 50 msec to the dominant hand of right-handed subjects (N = 32), beginning 120 msec prior to the 95 dB acoustic startle stimulus. The 30 Hz prepulse significantly facilitated blink latency at both intensities. While all prepuces were effective inhibitors of blink probability, only the 300 Hz prepulse (Pacinian channel activator) significantly inhibited blink amplitude. This inhibitory effect was preserved across stimulus intensities. These results show that inhibition of acoustic startle amplitude is determined by the transient aspects of vibrotactile stimuli. This study also shows that different aspects of the startle response differentially reflect stimulus characteristics of the prepuces.

AGING AND PHYSICAL ACTIVITY INFLUENCES ON TASK-SWITCHING

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Descriptors: aging, physical activity, executive control

Sixty-six adults (33 female) were recruited based on age and physical activity history, such that approximately equal numbers of participants were placed into older-active, older-sedentary, younger-active, and younger-sedentary groups. The P3 was measured during a switch task, which consisted of two blocks of pure conditions (less than or greater than 5, odd-even digit), and two blocks of switch conditions (switching between pure conditions). Results indicated that physically active, compared to sedentary, participants exhibited increased P3 amplitude during both global (pure vs. switch) and local (switch vs. non-switch) comparisons. For the local comparison, older-active adults also had increased P3 amplitude at frontal sites compared to all other groups; and physically active, compared to sedentary, adults revealed increased amplitude to non-switch trials, an effect not found for switch trials. For P3 latency, physically active adults had faster P3 latencies in the parietal region compared to sedentary adults for both global and local comparisons. This effect was only found for the switch task in the global comparison. A trend was also observed for the local comparison such that physically active adults were faster than sedentary adults for the switch trials, and no group differences were found for the non-switch trials. The findings suggest that both age and physical activity affect underlying neuroelectric activation during tasks that require extensive executive control, and further suggest that physical activity may serve to increase efficiency of cognitive processing.

POSTURAL RESPONSES TO THE DEFENSIVE STARTLE REFLEX

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Descriptors: Startle, Motor Behavior, Posture

Postural responses to the defensive startle reflex were examined in 24 (12 female) undergraduates. Participants completed two blocked conditions (baseline, startle) consisting of four 40 s trials. During startle trials, participants received one auditory noise probe 4–8 s after trial onset. No probe was used during baseline trials. Postural responses were measured in the anterior-posterior (AP) and medial-lateral (ML) directions and the eye-blink reflex was measured over the left orbicularis oculi muscle. The initial postural response, which occurred within 500 ms after probe onset, indicated that participants exhibited an immediate anterior movement, followed by a posterior movement; an effect not found in the ML direction or in either direction for the baseline condition. A positive correlation was observed (r = .44, p < .02) between the eye-blink reflex and initial posterior movement, such that increased blink magnitude related to greater movement in the posterior direction. The sustained postural response also differentiated startle and baseline conditions, with the former eliciting posterior movement over the course of 10 s following startle onset. This sustained effect was not observed in the ML direction or in either direction for the baseline condition. These results suggest that a measurable postural response may be observed following an acoustic startle probe. This defensive response has two succinct components, the first being an initial AP movement to the startling noise, and the second being a posterior movement that may be associated with withdrawal behavior.
THE THOUGHT TRANSLATION DEVICE (TTD): APPROACH TO AN
AUDITORY BRAIN-COMPUTER COMMUNICATION SYSTEM

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Descriptors: Thought Translation Device, Biofeedback, communication

The Thought Translation Device (TTD) is a brain-computer-interface based on the self-regulation of slow cortical potentials (SCPs) and enables severely locked-in patients to communicate using their brain potentials. However, several locked-in patients are no longer able to focus their gaze on a computer screen. Therefore an extended version of the TTD provides all feedback information necessary for brain computer communication auditory. To evaluate the system a first study with 3*18 participants was carried out to test the performance of physiological regulation under three different feedback conditions: Visual, auditory or combined visual-auditory feedback of slow cortical potentials. The training consisted of three sessions with 1500 trials with a random assignment of required cortical positivity or negativity. The results show that physiological regulation of SCPs can be learned with auditory and combined auditory and visual feedback although the performance is significantly worse than with visual feedback alone. In a next step two auditory communication paradigms are presented: An auditory letter selection program that tells a patient the selectable letter sets by a computer’s voice as well as the resulting response. For less skilled patients a question answering system was developed presenting questions and answers can be obtained. The results of a first application to a completely paralyzed patient are presented.

THE CYCLIC VARIATION OF AROUSAL LEVEL IN THE
WAKEFULNESS- SLEEP TRANSITION: EVIDENCE FROM EEG
ALPHA ACTIVITY

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Descriptors: wakefulness-sleep transition, EEG alpha activity, arousal level

This study examined in detail a variation of arousal level reflected by EEG alpha activity (8–13 Hz) in the wakefulness-sleep transition. A total of 44 polysomnograms for 20 minutes after lights-off from 7 healthy participants (age 19–23 years) were analyzed. The EEG alpha activity was quantitatively evaluated using a percent time alpha and a mean frequency of EEG alpha that were calculated for every 5-s epoch. The percent time alpha is used to differentiate wakefulness from sleep in the international scoring system of sleep stage (Rechtschaffen and Kales, 1968, A Manual of Standardized Terminology, Techniques and Scoring System for Sleep Stages of Human Subjects). Two components were extracted from the temporal change in smoothed percent time alpha: a progressive decrease of the general level during descent into sleep and a cyclic repetition of sharp decrease and increase (rebound) with a mean interval of approximately 75s with a range from 45 to 100s. A strong negative correlation (r = -.70) between the percent time alpha and the alpha frequency was found during a limited period when the general level of percent time alpha decreases, although the cyclic variation was observed through the whole recording times. That is, the mean frequency becomes faster along with the cyclical decrease of percent time alpha and becomes slower along with the rebound. These results suggest that the arousal level in the wakefulness-sleep transition period does not necessarily have the monotonous tendency to fall to a lower level, but have the cyclic variations.

PARTICIPANT PERCEPTIONS SUPPORT THE RATIONALE OF THE
COMPARISON QUESTION TEST FOR THE
PSYCHOPHYSIOLOGICAL DETECTION OF DECEPTION

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Descriptors: polygraph, detection of deception, lie detection

One major criticism of the comparison question test (CQT), the most commonly used psychophysiological detection of deception technique, is that its underlying rationale is unreasonable. The CQT’s rationale predicts differential reactivity with the guilty showing larger responses to relevant than to comparison questions (R > C) and with the innocent showing the opposite pattern (C > R). The present study examined participant perceptions of CQT questions in the context of two laboratory mock crime experiments. Half of the 96 participants in Experiment 1 took money in a mock crime, and were then given a probable-lie CQT. Subsequently they gave ratings of the importance of, and their perceived physiological responses to, the questions of their CQT. As predicted by the rationale of the CQT, innocent participants’ perceptions of response were C > R and guilty participants’ perceptions of response were R > C. Guilt X Question Type Interaction, F(1,94) = 61.97, p < .001. However, the expected interaction was not found in ratings of question importance. Experiment 2, with 40 participants, half guilty of a mock crime of theft, used the directed-lie variant of the CQT and produced a similar pattern of results with a significant Guilt X Question Type interaction in perceived response, F(1,38) = 16.88, p < .001, but not for perceived importance. In both experiments, neither beliefs about the accuracy of the CQT, nor reported motivation for passing the CQT were associated with CQT outcome. These results fail to support critical positions on the CQT and are supportive of the CQT’s rationale.

EFFECTS OF IMAGINING FAVORABLE AND UNFAVORABLE
FOODS ON ACTIVITIES OF ELECTROGASTROGRAMS (EGG)

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Descriptors: EGG, imagining, food preference

This study investigated the effects of imagining favorable foods or unfavorable foods on activities of gastric motility recorded by electrogastrography (EGG). In this experiment, 40 participants were divided into two Groups with 20 participants each. Participants self-reported their food preferences through a 42 item survey. Group 1 was given positive food preferences and Group 2 was given negative food preferences. The participants in Group 1 imagined a list of favorable foods for 16 minutes. The participants in Group 2 imagined a list of unfavorable foods for 16 minutes. Participant’s EGG activities were continuously recorded for 16 minutes during both experimental and baseline periods. The power of EGG activity of 3 cycles per minutes (cpm) was calculated for statistical analysis. Results of this experiment indicated that the participants in Group 2 (those imagining eating unfavorable foods) had significantly lower ratios of EGG power at 3 cpm than in Group 1 (those imagining eating favorable foods) between the imagining and baseline periods, t(38) = 2.721, p > 0.01. In conclusion, imagining eating unfavorable foods significantly decreased normal EGG 3 cpm activities.
ANTISOCIAL PERSONALITY DISORDER AND ALCOHOL DEPENDENCE: N400 EFFECTS FROM A PRIMED AND UNPRIMED WORD PARADIGM

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Descriptions: antisocial personality, alcoholism, N400

Antisocial Personality Disorder (ASP) is one of the most common diagnoses co-occurring with alcoholism. Previous ERP studies have demonstrated cognitive processing deficits in both disorders. Among the findings are a deficit in N400 amplitude in alcoholics as well as prolonged N400 latency in alcoholics with comorbid ASP. The goal of the present study was to examine the effects of ASP and alcoholism on semantic processing using a word naming task. 327 adult subjects (155 M/172F; mean age 35.8 years) were assigned to one of 12 groups formed by the crossing of lifetime DSM-IV alcohol dependence (−/+), ASP (−/+), and gender. The task involved the presentation of primed, unprimed and non-word stimuli. Repeated measures analyses indicated larger N400 amplitude in ASP+ subjects across all stimulus types. No significant effects of alcohol dependence or gender were revealed. Consistent with previous work using this task, N400 amplitudes elicited by primed words were smaller than the N400 amplitude elicited by other stimuli. Analyses of N400 latency indicated a significant effect of stimulus type (longer latencies in response to the unprimed word), but no group differences. The larger N400 found in ASP+ subjects appears consistent with large negativities previously shown in subjects with psychopathy.

A COMPARISON OF CORDANCE AND TRADITIONAL EEG ASYMMETRY IN DEPRESSION

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Descriptors: EEG Asymmetry, Cordance, Major Depression

Cordance is a relatively new electroencephalographic measure that shows close correspondence with underlying cerebral perfusion (Leuchter et al., 1994). Cordance involves re-attribution of absolute power values from bipolar channels involving a particular electrode to that electrode. Whereas ample findings using conventional EEG have demonstrated a relationship between frontal brain asymmetry and emotion or psychopathology, comparatively little work has linked frontal EEG asymmetry to underlying brain systems. The present study was thus designed to compare alpha (8–13 Hz) asymmetry derived using Cordance with that of traditional EEG. Brain activity was monitored while 36 participants produced voluntary facial expressions that were grouped according to the approach/withdrawal motivational model of emotions. This model suggests that “approach” emotions (joy and anger) evoke relatively greater left frontal brain activity whereas “withdrawal” emotions (disgust, fear and sadness) evoke relatively greater right frontal brain activity. Asymmetry using Cordance was shown to be reliably measured during each emotional expression. Replicating findings with traditional EEG, withdrawal expressions produced a bilateral increase in frontal alpha. Lateralized effects were weaker with Cordance than in the traditional EEG. With traditional EEG, withdrawal faces produced significantly greater relative left frontal alpha, and a trend in the same direction was observed with Cordance. Correlations between traditional asymmetry and Cordance asymmetry are consistent with those observed when assessing resting trait asymmetry. The Cz-referenced traditional asymmetry scores show strong correlations with Cordance in all conditions whereas asymmetry scores from linked-mastoids data and average-referenced data show strong correlations only in the withdrawal condition. These findings suggest only a modest correspondence between traditional measures of EEG asymmetry and those derived from Cordance re-attributed power.

TREATMENT OF SPECIFIC PHOBIAS IN CHILDREN: EFFECT ON SALIVARY CORTISOL

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Descriptors: anxiety, phobias, cortisol

This study presents initial findings of a four-year multi-site NIH funded project to assess one-session treatment of specific phobias in children. 25 children with diagnosed specific phobias were assigned to either a one-session behavioral treatment (n = 19) or an education support group (n = 6). Salivary cortisol was obtained before and after a behavioral avoidance task (BAT) at four separate occasions: before treatment, immediately after treatment, at 6 months follow-up, and at 12 months follow-up. One-tailed paired t-tests for the one-session treatment showed significant declines in cortisol from pre- to post-treatment (t(18) = 2.11; p = .02 for cortisol measured before and t(18) = 2.36, p = .01 for cortisol measured 45 minutes after the BAT), that were generally maintained at 6 and 12 months follow-up. One-tailed paired t-tests for the education support group, however, were nonsignificant (all p’s > .05 at all time points), with means indicating either no change or nonsignificant increases in cortisol from pre- to post-treatment. Though n sizes were small, the direction of effects suggests differential treatment effects on cortisol, with decreases seen after one session treatment but either stable or increased cortisol after education support. If cortisol is viewed as an objective measure of stressor (phobic stimulus)-related anxiety, these findings provide initial support for the efficacy of one-session treatment of specific phobias in children.
COGNITIVE COPING STRATEGIES AND CARDIOVASCULAR RESPONSES IN AN AVERSIVE SITUATION: AN EXAMINATION WITH A DUAL TASK METHOD

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Descriptors: blood pressure, event-related potentials, attention

This study investigated the effect of the allocation of attentional resources on event-related potentials (ERPs) and cardiovascular responses during a dual task situation in which an avoidance task and a reward task were coupled. For the avoidance task, subjects were asked to avoid an aversive shock which was followed by a target (33%) tone by pressing a button. For the reward task, subjects were asked to detect the direction of an arrowhead presented on the display screen and were rewarded according to the speed of the reaction time. Subjects were divided into an avoidance group (n = 12) or a reward group (n = 10) according to whether they put the avoidance task ahead of the reward task, or not. The ERPs to non-target and target tone, ECG, and blood pressure were analyzed in the dual task situation. These results indicated that the amplitudes of N1 to non-target and of N2 to target were larger in the avoidance group than they were in the reward group, and that the avoidance group had higher blood pressure than did the reward group during the dual task performance. However, there were no differences in the mean R's of both tasks between the aversive and reward groups. The relationship between the cognitive coping strategy reflected by ERPs and cardiovascular responses will be discussed in terms of models of allocation of attentional resources.

SOCIAL DRINKING PATTERNS AND CEREBRAL BLOOD FLOW DURING WORKING MEMORY TASKS

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Descriptors: Working memory, alcohol, cerebral blood flow

A history of alcohol consumption has been related to slightly impaired cognitive performance. The present study investigated the effect of social drinking history on functional brain activity during spatial and verbal working memory tasks in 52 men and 35 women free from cerebrovascular disease. Participants were tested sober and grouped into two categories: men and 35 women free from cerebrovascular disease. Participants were tested on functional brain activity during spatial and verbal working memory tasks in 52 performance. The present study investigated the effect of social drinking history on cerebral blood flow (rCBF) during spatial and verbal working memory. Fifty-one, older (mean age = 61) subjects were examined with the radiotracer O-15. Stimuli and responses were consistent across tasks. A control task requiring detection of stimuli on the right or left was compared with static and dynamic memory load tasks. Static conditions designated 3 items (letters or spatial locations) as targets and all others as non-targets. Dynamic conditions designated the repetition of either letter or spatial location after a separation of two displays as a target and all other items non-targets. Index or third finger responses corresponded to targets and non-targets. Analyses compared working memory loads between spatial and verbal tasks. Both spatial and verbal working memory tasks elicited rCBF increases in dorsolateral prefrontal cortex, posterior parietal cortex, anterior cingulate, and cerebellum. An extensive area in left occipital and temporal regions and the motor cortex showed greater rCBF during verbal relative to spatial working memory. This and marginal results for spatial working memory suggested greater left localization for verbal representation and right for spatial. Prefrontal, parietal, and cerebellar areas were common to both types of working memory. Anterior and posterior areas seem related to attention and manipulation of representations by working memory, but verbal representations may be localized differently than spatial.

GREATER LEFT OCCIPITAL-TEMPORAL ACTIVATION, NOT PREFRONTAL ACTIVATION DISTINGUISHES VERBAL WORKING MEMORY FROM SPATIAL WORKING MEMORY

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Descriptors: Working memory, Spatial/Verbal Representation, rCBF

Is working memory for different representations localized differently? Positron emission tomography examined regional cerebral blood flow (rCBF) during spatial and verbal working memory. Fifty-seven, older (mean age = 61) subjects were examined with the radiotracer O-15. Stimuli and responses were consistent across tasks. A control task requiring detection of stimuli on the right or left was compared with static and dynamic memory load tasks. Static conditions designated 3 items (letters or spatial locations) as targets and all others as non-targets. Dynamic conditions designated the repetition of either letter or spatial location after a separation of two displays as a target and all other items non-targets. Index or third finger responses corresponded to targets and non-targets. Analyses compared working memory loads between spatial and verbal tasks. Both spatial and verbal working memory tasks elicited rCBF increases in dorsolateral prefrontal cortex, posterior parietal cortex, anterior cingulate, and cerebellum. An extensive area in left occipital and temporal regions and the motor cortex showed greater rCBF during verbal relative to spatial working memory. This and marginal results for spatial working memory suggested greater left localization for verbal representation and right for spatial. Prefrontal, parietal, and cerebellar areas were common to both types of working memory. Anterior and posterior areas seem related to attention and manipulation of representations by working memory, but verbal representations may be localized differently than spatial.

DEVELOPMENTAL CHANGE IN THE INHIBITION OF AN ACTIVATED RESPONSE: AN ERP INVESTIGATION OF THE STOP-SIGNAL TASK

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Descriptors: development, inhibition, ERP

This study investigated developmental change in the process of inhibition of an activated motor response using behavioral and ERP measures. A stop-signal task with a visual choice reaction-time task and auditory stop-signal was used to evoke the inhibition process. Sixty subjects participated; 20 subjects in each of the 8–12 year, 18–22 year and 30+ year age groups. ERPs were calculated to the visual choice stimuli and the auditory stop-signals. The accuracy of behavioral responses to the primary task increased with age between the 8–12 and 18–22 year groups. For the stop-task, inhibition accuracy did not differ between the age groups, while the speed of the inhibition process (the stop-signal reaction time, or SSRT) increased between the child and older-adult groups. ERP results showed that minor topographic changes with age were found for the visual N1, N2 and P3 components, with P3 latency reducing significantly between the child and young-adult groups. For components to the auditory stop-signal, N1 amplitude increased between 8–12 and 18–22 years and decreased in the 30+ group. N2 amplitude decreased with age between the child and older-adult group, especially in the frontal region. N2 and P3 latency reduced between the child and young-adult groups. The behavioral results suggest that while the inhibition process becomes faster, there is no improvement in accuracy with increasing age. Results for the frontally maximal N2 component suggest that the process indicating the need for inhibition becomes more efficient with age, using a more proficient and concise pattern of neural activation.
PROPORTIONAL SCALING OF GLOBAL BOLD SIGNAL MASKS
LIMBIC AROUSAL EFFECTS IN PASSIVE VIEWING OF
EMOTIONALLY AROUSING MATERIAL

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Descriptors: fMRI Global Scaling, Serial Visual Presentation, Emotional Arousal

Global variations of BOLD-fMRI signal are often considered as nuisance effects to be eliminated. However, in cases of strongly activated neural networks, applying global scaling might introduce unwanted biases (e.g. Aguirre et al. 1998). The present study explores if these concerns apply to emotional picture processing. Selective processing of affective pictures was explored in 21 subjects using BOLD-fMRI. Five groups of IAPS pictures (100 per group), varying in ratings of valence and emotional arousal were matched for physical parameters. Pictures were presented in 2 × 20 blocks of 12s, with presentation times of either 333ms (session A) or 1333ms (B). Picture category blocks were presented pseudo-randomly and session order was matched across subjects. Data were analyzed using SPM99 with (PGS) and without (NoPGS) proportional global scaling. The outcome of both analyses was very different. The NoPGS analysis reported well-known bilateral arousal dependent activations in occipital, parietal, frontal, limbic and brainstem areas. In contrast, the PGS analysis reveals only activations of the extended visual cortex while limbic activations were not significant. Furthermore, the PGS analysis revealed strongly pronounced deactivations in a variety of cortical areas surrounding cortical centers of activation while these deactivations appear negligible in the NoPGS analysis. Results suggest that proportional scaling might cause Type I and II errors in studies investigating emotional picture processing because of pronounced BOLD signal changes in extended neural networks. (Supported by the DFG)

AN EARLY POSTERIOR NEGATIVE EEG DIFFERENCE COMPONENT, MIRRroring FACilitated PROCESSING OF EMOTIONALLY AROUSING MATERIAL IN THE EXTENDED VISUAL CORTEX, IS ALMOST INDEPENDENT OF PRESENTATION RATE

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Descriptors: Rapid Serial Visual Presentation, Steady State Signal, Emotional Arousal

Presentation of emotionally arousing compared to neutral pictures generates a bilateral, negative ERP difference component over occipito-parietal areas. It arises with the P100, finds its maximum around 250 ms and is interpreted as facilitated motivated attention. Using 3 Hz and 5 Hz Rapid Serial Visual Presentation (RSVP) with alternating presentation of arousing and neutral pictures, we revealed this Early Posterior Negativity (EPN) as almost unaffected by presentation rate. Thus, in the 5 Hz condition, the maximum amplitude of the EPN, evoked by an arousing picture, appeared 50 ms after presentation of the following neutral stimulus. In this study we intended to investigate the temporal dynamics and limits of this linear superposition. Subjects viewed alternating high emotionally arousing pleasant and neutral pictures. Stimuli were matched for physical properties and presented at ten different rates between 1 and 20 Hz. All subjects generated the typical bilateral EPN with a maximum around 250ms. Superimposition of EPN and VEP components of the following pictures progressed linearly with increasing presentation rate. Thus, e.g. in the fastest 20 Hz video, the maximum EPN was found with onset of the fifth picture after presentation of the EPN evoking arousing stimulus. Synthetic linear superposition of the 1 Hz evoked potentials could - as a first approximation - predict all higher rate VEPs. As the Visual Steady State paradigm (VSS) can be considered as a special case of alternating RSVP, results have implications on the interpretation of steady state evoked potentials. (Supported by the DFG and Academy of Science, Heidelberg)

ENHANCED FEAR-NETWORK IN TORTURE SURVIVORS ACTIVATED BY RVSP OF AVERSIVE MATERIAL CAN BE MONITORED BY MAGNETIC SOURCE IMAGING

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Descriptors: MEG, fear, Rapid Serial Visual Presentation

Previous fMRI and EEG studies using Rapid Serial Visual Presentation (RSVP) demonstrated the discrimination of emotionally arousing from less affective stimuli. In EEG amplified processing of affective content appears predominately as an Early Posterior Negativity (EPN; P100–300 ms) over occipito-parietal areas. In fMRI this is reflected by an amplified BOLD signal correspondingly dominant in the extended visual cortex. A significant participation of bilateral frontal areas, with right hemisphere dominance for aversive material, could be demonstrated by fMRI. By means of whole-head MEG, the present study investigated cortical processing dynamics of emotional visual material in PTSD patients and controls using RSVP. Participants were 50 torture victims with a diagnosis of current PTSD (25 with co-morbid depression) and 25 control subjects. The magnetic counterpart of the EPN (EPN-M) was found in all subjects, patients and controls alike when viewing emotionally arousing compared to neutral material. In patients, however, the EPN-M was prolonged for arousing pictures regardless of valence and reduced in amplitude for pleasant material, indicating a lack of hedonic response in both groups of traumatized patients. Strongest group differences were found in the frontal lobes in response to aversive pictures. A bilateral frontal activation with distinct right hemispheric dominance was stronger in PTSD patients relative to controls. This confirms previous findings of a contribution of the frontal lobe activity to PTSD and affective disorders and can be viewed as an enhanced fear network activated by aversive material. (Supported by the DFG and the European Refugee Fund)

P300 STUDY OF THE VISUAL DISTRACTION EFFECT IN ADHD CHILDREN

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Descriptors: ADHD, P300, Visual distraction effect

In order to examine the visual distraction effect on children with attention-deficit/ hyperactivity disorder (ADHD), ERPs elicited by task irrelevant deviation were compared between groups of ADHD (n = 10) and of healthy control children (n = 19). Half of the stimuli were circles, and the other half were triangles. Most of them (42% each) were presented in blue color with the medium size (4 × 4 cm; viewing distance of about 1 m), and infrequently (4%) each were red colored with either larger (8 × 8 cm) or smaller size (2 × 2 cm). The participants were required to make a quick button press to the circle stimuli, regardless of the color and size. Although both groups showed the distraction effect in RT, i.e., longer RT for deviant than for the frequent stimuli, there was no group effect on the RT. Both groups elicited parietal dominant P300 ERP for all stimulus types. The analyses for the peak amplitude and latency showed that P300 was larger for target circles than for nontarget triangles, and larger for the deviant (especially...
for the large stimulus) than for the frequent stimulus. In addition, it was revealed that the ADHD children produced smaller and later P300 for deviant stimuli than the control children did. The results indicate that even when there are no behavioral differences, ERP can reveal the difference in the cognitive process of the ADHD: They allocate less resources to the task irrelevant deviation, behavioral differences, ERP can reveal the difference in the cognitive process of the control children did. The results indicate that even when there are no

Using rank correlations. As expected, stability was higher for subsequent sessions, decreasing as a function of time lag between recordings. Stability of GBA time course was high ($Rs > .56$) for both low and high GBA. In contrast, stability of topography (rank correlations between topographies representing different sessions) showed more pronounced differences between the two participants ($Rs > .67$ and $Rs > -.15$, respectively) and was higher for early evoked GBA (all $Rs > .48$).

**TEMPORAL STABILITY OF HIGH-FREQUENCY BRAIN OSCILLATIONS IN THE HUMAN EEG**

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Descriptors: High-Frequency Oscillations, Reliability, Dense-Array-EEG

Oscillatory activity in the human electroencephalogram (GBA) has been widely used as a dependent variable in psychophysiological research. Parts of this work have focused on gamma band activity (GBA), which can be measured as amplitude and coherence changes in the upper range of the temporal spectrum, typically above 20 Hz. The present study aimed at studying stability of GBA parameters within participants across multiple recording sessions. Two male students participated in 4 sessions spaced at 7 to 9 day intervals, respectively. They performed a feature-based attention task involving detection of checkerboards varying in color and size. EEG was recorded from 129 sensors. Data for attended non-targets were transformed into the frequency domain using Morlet-Wavelets. We examined two regions of the evolutionary spectrum typically used in studies of GBA, regarding their stability across recording sessions: (i) an evoked, early lower frequency gamma response and (ii) a late, induced higher GBA enhancement. Mean spectral power in these time-frequency ranges was evaluated using rank correlations. As expected, stability was higher for subsequent sessions, decreasing as a function of time lag between recordings. Stability of GBA time course was high ($Rs > .56$) for both low and high GBA. In contrast, stability of topography (rank correlations between topographies representing different sessions) showed more pronounced differences between the two participants ($Rs > .67$ and $Rs > -.15$, respectively) and was higher for early evoked GBA (all $Rs > .48$).

**AGE-RELATED REDUCTION OF MISMATCH NEGATIVITY EVOKED BY TIME-DEVIANT TONES**

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Descriptors: aging, time, temporal perception

In order to investigate age-related changes in pre-attentive processing of time information, mismatch negativity (MMN) waveforms evoked by deviation in the interstimulus interval of an ongoing acoustic stimulus train were compared

**ABNORMAL AFFECTIVE PICTURE PROCESSING IN CRIMINAL PSYCHOPATHS: EVIDENCE SUPPORTING THE PARALIMBIC DYSFUNCTION HYPOTHESIS**

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Descriptors: Emotion, Psychopathy, fMRI

Converging evidence from studies of event-related potentials (ERPs) and functional magnetic resonance imaging (fMRI) suggest that criminal psychopathy is associated with abnormalities in limbic and paralimbic brain regions during a variety of cognitive and affective tasks. These results have led to the hypothesis that the paralimbic system is dysfunctional in criminal psychopathy. In the affective realm, ERP and fMRI studies utilizing emotional lexical decision tasks, affective verbal memory and emotional word discrimination tasks reveal evidence supporting this hypothesis. However, these latter studies all employed linguistic stimuli raising the possibility that some or all of the observed abnormalities in criminal psychopaths may be related to primary difficulties in language processing. To address this issue, we designed an affective picture processing task which contained no explicit demands on linguistic processing. Participants were presented with alternating blocks of affective or neutral picture stimuli and were required to make a living/nonliving discrimination for each stimulus presented. We hypothesized that affective pictures, relative to neutral pictures, would elicit greater limbic and paralimbic hemodynamic activity in nonpsychopaths than in psychopaths. Consistent with predictions, psychopaths showed less affect related activity than nonpsychopaths in left amygdala, rostral and caudal anterior cingulate and posterior cingulate. These findings replicate and extend the results of affective processing studies employing linguistic stimuli and support the hypotheses that psychopathy is associated with a dysfunctional paralimbic system.
between young (18–60) and old (>60) adult groups. Participants were screened for neurological disease, dementia, use of cholinergic-agonists, and hearing loss exceeding 20 dB. A train of tones (adjusted for hearing threshold) with an interstimulus interval of 500 msec was randomly interrupted by deviant tones presented at an interval of 250 msec. MMN amplitude and latency elicited by this “temporal deviation” were measured from the largest negative peak between 100 and 200 msec post-stimulus, taken from the difference waveform (average deviant response minus average standard response. Fz referenced to nose, 0.1–30 Hz). MMN amplitude differed significantly between groups (p = .002). Young (N = 17): mean = 5.13 microvolts, SD = 2.94; Old (N = 21): mean = 2.63, SD = 1.49. We do not believe an observed difference in hearing sensitivity between groups affected MMN generation because tones were adjusted relative to hearing thresholds; no significant correlation was found between hearing loss and MMN amplitude within the old group, and amplitude reduction in the old group was not a general finding for other evoked potential components (e.g., early cortical wave Pa). These findings are thus consistent with an age-dependent reduction in pre-attentive sensitivity to acoustically-defined temporal intervals on the order of hundreds of milliseconds.

ASSOCIATION SPECIFIC PATTERNS OF CORTICAL ACTIVITY IN THE PROCESSING OF WORD MEANING?

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Descriptors: word processing, semantics, fMRI

Some studies on the neural correlates of word meaning report distinct neural activation patterns for words with visual versus motor associations. Words with visual associations have been reported to elicit more parieto-occipital activation patterns, whereas words with motor associations elicit more centrally distributed association patterns. Such distinct activation patterns are assumed to reflect the representation of word meaning in association-specific distributed neural networks. We tested this hypothesis in an fMRI experiment where 12 subjects had to attend to rapidly presented adjectives with either visual (color adjectives such as blue, green, red) or auditory (e.g., ‘squeaky’, ‘noisy’, ‘roaring’) associations. Words were matched for average word length and frequency and were rated by the subjects for typicality for the respective modality (visual/auditory) and for concreteness. Consistent with the hypothesis considerably increased activity for color adjectives compared to adjectives with auditory associations was found in occipito-parietal regions of the right hemisphere, particularly in the fusiform gyrus. However, for the reverse contrast only a very small patch of increased activation was found in the right insular cortex. While the results for the color adjectives are in line with the hypothesis of meaning representation through association specific distributed neural networks, this was not true for adjectives with auditory associations. The higher concreteness and typicality ratings for the color adjectives may partly account for this inconsistency.

SACCADIES TO AFFECTIVE PICTURES – HOW AROUSAL AND VALENCE AFFECT PRO- AND ANTISACCADE PARAMETERS

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Descriptors: emotion, attention, eye movements

A number of studies have demonstrated that emotional visual stimuli automatically draw the viewer’s attention. Here we investigate to what extent this effect can be seen in subjects’ eye movement performance. Affective pictures from the International Affective Picture System categories high arousing unpleasant, high arousing pleasant and neutral were presented in the periphery while subjects were fixating a central cross. Upon onset of the peripheral IAPS picture the fixation cross was extinguished and subjects had to either generate a saccade to the picture (prosaccade task) or inhibit the response and instead generate a saccade to the opposite visual field (antisaccade task). Stimulus onset asynchrony between onset of the peripheral affective picture and offset of the central fixation cross was varied, such that fixation offset either coincided with the onset of the peripheral target (no gap) or fixation offset preceded the onset of the peripheral target by 200 ms (gap). In the prosaccade task saccade amplitudes were reduced in the right visual field for unpleasant pictures regardless of fixation condition (gap-no gap). In the antisaccade task more antisaccade errors were generated towards pleasant presented than towards neutral and unpleasant pictures. However, this effect was restricted to the gap condition and to the left visual field. These results demonstrate an influence of emotion on saccade parameters both in pro- and in antisaccade tasks and indicate hemispheric asymmetries in emotional processing.

DIFFERENTIAL EFFECTS OF VIDEO GAME PLAY ON PAIN THRESHOLD AND TOLERANCE: COGNITIVE VS. ACTION GAMES

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Descriptors: pain perception, alertness

Past research indicates visual distractions can increase human pain tolerance. The present study assessed different types of video game distractions and personality characteristics on pain threshold, pain tolerance, pain ratings over time, and physiological measures. Participants (n = 30) engaged in three different conditions in a within-subjects design: mental video game, active video game, and a non-game baseline control. Participants experienced each condition 10 minutes prior to the pain administration (cold pressor test), and during subsequent pain testing. Physiological measures of oxygen saturation, pulse, and blood pressure were assessed prior to task, post task, and post-pain administration. Participants also completed questionnaires concerning competitiveness, aggressiveness, and video game playing habits. Results indicate that the active video game was successful in reducing pain ratings and increasing pain tolerance when compared to both the mental video game and baseline conditions. Personality characteristics of aggressiveness, competitiveness, and prior video game playing habits were not a significant factor in affecting pain measures. Thus, the present study indicates that active video game play is an effective adjunct to pain management, regardless of aggressive or competitive tendencies, or prior video game playing habits.

FUNCTIONAL MRI STUDY OF THE STIMULUS-PRECEDING NEGATIVITY (SPN)

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Descriptors: stimulus-preceding negativity, time-estimation, fMRI

The stimulus-preceding negativity (SPN) is the event-related potential (ERP) related to anticipation or expectancy. Many SPN studies employed a time estimation task to record the SPN. In the present study, we used whole-head fMRI to investigate the cortical activities during the time estimation task to
resolve the sources of the SPN. In the time estimation task of the present study, subjects \((n = 20)\) have to push a button 3 seconds after the onset of cue stimuli. Two seconds after the button push, a feedback (FB) stimulus was presented informing the subject whether the response was undershoot, correct, or overshoot. Subjects were presented with two experimental conditions: (a) true FB condition and (b) false FB condition. Under the true FB condition, FB stimuli were correctly presented based on subjects’ performance while FBs were randomly presented under the false FB condition. The experiment was conducted inside a 1.5-T GE scanner (echo planar imaging, 30 slices, 5 mm thickness, TR = 3 s, TE = 50 ms, flip angle = 90 degrees). Increased activations under the true FB condition were found in the left motor-related area (BA 4, BA 6), the thalamus, the right frontal lobe (BA 9, BA 10), the right parietal lobe (BA 40), and the posterior lobe of cerebellum. In contrast, under the false FB condition, only activations in the left hemisphere (BA 6, BA22) and the posterior lobe of cerebellum were found. These results suggest the involvement of the right hemisphere and thalamus in the SPN occurrence.

**VISUAL STEADY STATE POTENTIALS IN SCHIZOPHRENIA**

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Descriptors: Visual Evoked Potential, Steady State, Schizophrenia

The steady state visual evoked potential (SSVEP) is elicited by presenting a visual stimulus at a specific temporal frequency. SSVEPs have been shown to be abnormal in schizophrenia at low frequencies of stimulation (<12 Hz). The purpose of this study was to examine the SSVEP in schizophrenia at beta (12–28 Hz) and gamma frequencies (>28 Hz). SSVEPs at seven different frequencies of stimulation (4 Hz, 8 Hz, 17 Hz, 20 Hz, 23 Hz, 30 Hz and 40 Hz) were obtained from 15 subjects with schizophrenia and 38 healthy control subjects. Power at the stimulating frequency and signal to noise ratio (SNR) were used to quantify the SSVEP at each frequency. SNR provided a measure of SSVEP response in relation to the background activity. Both healthy control subjects and schizophrenia subjects showed lesser power but increased SNR at higher frequencies compared to lower frequencies. Schizophrenia subjects had lower power at beta and gamma frequencies compared to normal controls, but not at 4 and 8 Hz. Schizophrenia subjects also showed reduced SNR at all frequencies. These findings suggest that schizophrenia may involve an abnormality in visual neural network properties that oscillate to beta and gamma frequencies of stimulation. These findings are also consistent with psychophysiological and brain imaging evidence of disrupted visual processing in schizophrenia.

**CONFLICT, EMOTION REGULATION, AND PHYSIOLOGY**

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University of Quebec at Montreal

Descriptors: conflict, emotion regulation, ANS activation

Suppression of emotional reactions has been shown to lead either to an increase or decrease in physiological activation (internalizer – externalizer distinction versus facial feedback theory). The present study investigates the notion that suppression of negative affect during conflict that is voluntarily employed and endorsed by the individual leads to a reduction in ANS activity, whereas enforced suppression leads to an increase in ANS activity. For this, male-male and female-female dyads played a video game together, which was designed to create conflict. Participants played either with friends (no suppression), with friends while being explicitly instructed to suppress, or with strangers (implicit, endorsed suppression – emotional display rules guiding appropriate behavior generally forbid the expression of negative affect in the presence of strangers). Dependent measures were facial EMG to assess expressive behavior as well as skin conductance and heart rate variability as indices of sympathetic and parasympathetic activation respectively. A number of self-report measures were employed as manipulation checks. Preliminary data analyses confirm that participants were increasingly irritated during the game and that they attributed the cause of their irritation to the game partner. Further, participants who played with a stranger indicated the same level of withdrawal of nonverbal behavior than participants who were explicitly instructed to suppress. Interactive effects of condition and participant gender on physiological activation will be discussed.

**AGE-RELATED EFFECTS IN TASK SWITCHING IN A SPATIAL STROOP TASK**

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Beckman Institute for Advanced Science and Technology, University of Illinois at Urbana-Champaign

Descriptors: optical imaging, task switching, aging

We investigated the possibility of using non-invasive optical measures of neuronal function (the “event-related optical signal,” or EROS) to evaluate the time course of age-related differences in task switching. EROS has been shown to exhibit good temporal and spatial resolution and as such allows for the analysis of the timing of activation of brain regions. Groups of young (YA) and old (OA) adults were run in a spatial Stroop task with a task switch component. Each trial started with a cue followed 2 s later by an imperative stimulus. The cue indicated whether, for a particular trial, the relevant dimension was position or meaning. This generated conditions in which the task was switching or not with respect to the previous trial. ERS data were recorded simultaneously to EROS data collection. Behavioral results indicated that OA showed greater reaction time costs for switch trials. The ERO results suggest that, while both groups showed a switch-related positivity about 500ms after the cue, this effect was sustained longer for the OA. P3 amplitude effects were evident at Pz for the YA whereas they spread across other electrode sites in the OA. EROS results indicated that the YA and OA exhibited lateralized brain activity (left when switching to the meaning task, and right when switching to the position task). However, the OA lateralize later than the YA do. Additionally, OA showed bilateral activation after lateralized activation. These results provide further insight into possible age-related differences in the time course of neural circuitry.

**PROCESSING RADIO PUBLIC SERVICE ANNOUNCEMENTS: AROUSING CONTENT, PRODUCTION PACING, AND COLLEGE STUDENTS**

Seungjo Lee, James R. Angelini, Nancy Schwartz, & Annie Lang

Indiana University

Descriptors: radio, attention, arousal

This study examined the effects of production pacing and arousing content on college students’ physiological, cognitive, and emotional responses to radio substance abuse public service announcements (PSAs). 96 undergraduates listened to 24 PSAs which varied by Arousing Content and Production Pacing. While listening, HR and SC were measured. After each message, subjects used the Self Assessment Mannequin (SAM) to report their emotional responses. After listening to all the messages, subjects completed a forced-choice, four-alternative,
THE EFFECT OF PLACEBO-INDUCED EXPECTATIONS ON GASTRIC TACHYARRHYTHMIA AND VECTIO-NINDUCED NAUSEA

Max E. Levine & Robert M. Stern
The Pennsylvania State University

Descriptors: electrogastrography (EGG), placebo, expectation

The purpose of this study was to examine the effects of manipulating an individual's expectations through the administration of placebo treatments on the development of gastric tachyarrhythmia, nausea, and other symptoms of motion sickness provoked by a rotating optokinetic drum. Positive-Expectancy Group participants were given two placebo pills they were led to believe would protect them against the development of nausea and motion sickness. Negative-Expectancy Group participants were given the same two pills, but were led to believe they were meant to combat specifically the dizziness associated with motion sickness, and that there was a tendency for them to make the nausea of motion sickness slightly worse. Placebo-Control Group participants were told the pills were indeed placebos that would have no effect whatsoever. Subjective symptoms of motion sickness (SSMS) and electrogastrograms (EGGs) were collected during a 6 min baseline period and a subsequent 16 min drum rotation period. SSMS scores were significantly lower for Negative-Expectancy Group participants than for either Positive-Expectancy or Placebo-Control Group participants. Gastric tachyarrhythmia, the abnormal stomach activity that frequently accompanies nausea, during drum rotation was significantly lower among Negative-Expectancy Group participants than among either Positive-Expectancy or Placebo-Control Group participants. The results of this study suggest that being told symptoms of nausea might be made worse by an ingested pill led to a reduction in the severity of nausea that later developed.

EEG COHERENCE BETWEEN PREFRONTAL, MIDFRONTAL AND PARIELTAL CORTEX IMMEDIATELY PRIOR TO CORRECT AND INCORRECT DECISION-MAKING RESPONSES

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Descriptors: decision-making, theta, coherence

EEG theta coherence provides a statistical measurement of synchronization that increases with demand during working memory tasks, evidenced by long-range coherence between the prefrontal/mid-frontal and parietal regions (e.g., Sarnthein et al., 1998). We compared EEG 5–7 Hz theta coherence 1 sec prior to making decisions in a 2 1/2 hr multimedia, computer-based, decision-making task designed to evaluate general history and humanities knowledge at college level. Participants were 4 young right-handed, healthy adults. Continuous EEG was recorded from 29 sites referenced to mastoid. After artifacting and epoching with Scan 4.2, all trials were spline-fit to 512 points and Global Field Power was generated. Mid-frontal to mid-parietal sites were significantly more coherent prior to inaccurate than accurate responses (respectively, .444, .417; F = 23.94, p = .02) within the first 100 trials. In the left hemisphere, Fp1-P3 coherence was significantly higher prior to inaccurate than accurate responses (respectively, .138, .120; F = 9.17, p = .05), whereas in the right hemisphere there was no difference (respectively, .155, .146; F = .23). Coherence was significantly higher for midfrontal-parietal than prefrontal-parietal connections. Coherence for other frequency bands, both interhemispheric and within hemisphere, will be presented. Our results suggest that complex decision-making involves synchronization between prefrontal/frontal and posterior association cortex by theta brain activity and is moderated by task demand.

HABITUATION OF SKIN CONDUCTANCE RESPONSES DURING POLYGRAPH EXAMINATIONS: A GROWTH CURVE ANALYSIS

Elizabeth Lockette, Paul C. Bernhardt, Sean D. Kristjansson, Andrea Webb, & John C. Kircher
University of Utah

Descriptors: Growth curves, habituation

Growth curve analysis was used to test if skin conductance responses (SCRs) habituate during polygraph examinations, if the SCRs of truthful and deceptive subjects habituate at different rates, and if differential rates of habituation can be used to improve the accuracy of computer diagnoses of truth and deception. SC data were obtained from 84 adults who had been recruited from the general community. Half of the participants committed a mock theft of $20 from a secretary's purse and half were innocent. All participants were given a probable- lie comparison question test, and all were offered $50 to convince the polygraph examiner of their innocence. 93% of innocent and 88% of guilty participants were correctly classified based on traditional computer analysis of mean within-subject differences in responses to comparison and relevant questions. Growth curve analysis revealed that innocent subjects' SCRs to comparison questions habituated more rapidly than did their responses to relevant questions. Conversely, guilty subjects' responses to relevant questions habituated more rapidly than did their responses to comparison questions. Despite significant and substantive differences between the groups in rates of habituation, resulting growth parameter estimates did not significantly improve the accuracy of computer decisions. However, alternative models of growth or analyses of other physiological measures might improve the accuracy of computer decisions.

EMOTIONAL AROUSAL AND NOVELTY: EFFECTS OF WITHIN-SESSION REPETITION ON ERPS AND SKIN CONDUCTANCE

Andreas Loew, Margaret M. Bradley, Ashley R. Keller, & Peter J. Lang
University of Florida

Descriptors: emotion, event-related potentials, habituation

Emotionally arousing pictures (pleasant or unpleasant) prompt larger skin conductance response (SCR) than neutral pictures. The late positive potential (LPP) of the ERP during picture viewing also covaries with emotional arousal,
with a larger potential when viewing emotional, compared to neutral, pictures. We investigated the contribution of novelty to modulation of both the LPP and SCR changes by repeatedly presenting the same pictures within a single experimental session. Subjects (n = 25) viewed 12 different pictures (4 erotic; 4 neutral; 2 threat, 2 mutilation). Each picture was presented for 4 s and repeated six times in a temporally randomized presentation, with a varying 10-14 s intertrial interval. Emotionally arousing pictures prompted a larger LPP, 300 to 600 ms after picture onset. Emotional pictures prompted greater positivity than neutral pictures regardless of repetition, with significant differences observed throughout the session. LPP was lower overall on the first picture presentation, compared to later presentations, possibly due to an added contribution for recognition memory. SCR differentiation between emotional and neutral pictures was only obtained during the initial presentation of the pictures. SCRs habituated quickly and did not discriminate between emotional and neutral pictures after initial presentations. The data suggest that the brain continues to register emotional significance for familiar stimuli whereas SCRs are more sensitive to novelty. ERP measures of emotional arousal may be preferred when repeatedly presenting identical stimuli.

THE LATE POSITIVE POTENTIAL AND AFFECT: SKIN RESPONDERS AND NON-RESPONDERS
Andreas Loew, Margaret M. Bradley, & Peter J. Lang
University of Florida

Descriptors: emotion, event-related, potentials, skin conductance response

Electrodermal activity reflects activity within the sympathetic axis of the autonomous nervous system and has repeatedly been demonstrated to covary with emotional arousal during picture viewing. The magnitude of the late positive potential (LPP; 300-700 ms) of the ERP also covaries with emotional arousal. Although both measures are indices of emotional arousal, a significant number of people produce few measurable skin conductance responses in the laboratory. In the current study, we investigated modulation of the LPP by affect for skin conductance responders and non-responders. Participants viewed pleasant (24), neutral (24), and unpleasant (24) pictures while the LPP and skin conductance were recorded. Skin non-responders were defined as those who responded less than ten percent of trials. Repeating previous results, both the late positive potential and skin conductance change were significantly greater when viewing emotionally arousing, compared to neutral, pictures when averaged across all participants. More importantly, both responders and non-responders discriminated affective from neutral pictures in the LPP, showing significantly more positivity when viewing emotionally arousing, compared to neutral, pictures. The main difference between the two groups was reduced overall positivity in the LPP for non-responders. These data suggest that the evoked potential more consistently discriminates emotionally arousing stimuli over subjects, and thus may be a preferred measure, particularly for research with small subject samples.

NEUROBIOLOGICAL INVESTIGATION OF SELF-CARE BEHAVIOR
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Descriptors: movement, stroke, fMRI

Stroke can cause severe, long-lasting motor deficits, impacting activities of daily living like dressing and grooming. Effective rehabilitation can improve such skills, however no current rehabilitation strategy is based on knowledge of the neurobiology of recovery after stroke. Such knowledge would allow physicians to tailor rehabilitation to the specific pattern of damage for each patient. Our aim is to develop a paradigm for studying self-care motor tasks using functional Magnetic Resonance Imaging (fMRI). We used fMRI to record the BOLD response in eight normal adult volunteers performing two self-care tasks (buttoning and zipping) and three control tasks (right, left, and bimanual finger tapping). Subjects alternated 30 s of rest with 30 s of repetitive task performance in 3.5 min. blocks. During each block, we collected 70 scans, each consisting of 28 5 mm thick T2* axial images (GE 1.5T; TR/TE = 3000/40 ms, 64 × 64 mm matrix). Single fixed-effects analyses were done for each task using SPM4 (p < .001). Each task elicited a similar pattern of activation, including bilateral sensorimotor cortex and cerebellum. In spite of the presence of large upper-arm movements, the self-care tasks induced only slightly more head movement than the control tasks, as assessed during analysis. Our results demonstrate that behaviors relevant to self-care can be studied using fMRI, and that these highly practiced, over learned behaviors produce patterns of activation that are similar to simple finger tapping. (Supported by the American Heart Association (023025SN))

THE RELIABILITY AND CONSISTENCY OF THE EVENT-RELATED OPTICAL SIGNAL: EFFECTS OF SPATIAL ALIGNMENT AND LOW-PASS FILTERING
Kathy A. Low, Edward L. Maclin, Monica Fabiani, & Gabriele Gratton
Beckman Institute, University of Illinois at Urbana – Champaign

Descriptors: EROS, reliability

The goal of this study was to assess the reliability (across sessions) and consistency (across subjects) of the event-related optical signal (EROS). EROS, a brain imaging technique that relies on frequency-domain measurements of changes in the optical properties of brain tissue, has been shown to be sensitive to changes in several localized cortical areas. The reliability and consistency of EROS, however, has not yet been formally assessed. Therefore, we ran 8 participants through two identical sessions of a passive auditory oddball experiment during which we recorded optical and electrical activity. Optical recording channels were spatially aligned by co-registering digitized fiber locations with a structural magnetic resonance image for each subject separately, and then Talairach transforming the co-registered data to permit alignment across subjects. We also filtered the data at two different levels (4 vs. 10 Hz low-pass) to look at the influence of higher frequencies on the estimates of reliability. Spatial alignment improved both the reliability and consistency estimates of EROS. The event-related potential (ERP) waveforms were more reliable than the corresponding EROS waveforms, but EROS reliability was greatly improved by filtering at 4 Hz. The consistency of the waveforms across subjects tended to be higher for EROS compared to ERP measures. These data suggest that spatial alignment and low-pass filtering can greatly improve the reliability and consistency of EROS, and that these estimates are comparable to that of simultaneously recorded ERPs.

THE EVENT RELATED OPTICAL RESPONSE TO ELECTRICAL STIMULATION OF THE MEDIAN NERVE
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Descriptors: EROS, somatosensory

The Event Related Optical Response (EROS) uses variations in the time it takes for infrared light to propagate through neural tissue to study changes in neuronal optical properties in response to stimuli and endogeneous events. EROS

Kathy A. Low, Edward L. Maclin, Monica Fabiani, & Gabriele Gratton
Beckman Institute, University of Illinois at Urbana – Champaign

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responses to electrical stimulation of the median nerve at one, five and eight Hz were collected from 80 channels in eight subjects. Optical recording channels were spatially aligned by co-registering the digitized fiber locations with a structural magnetic resonance image (MRI) for each subject separately, and then the co-registered data sets were Talairach transformed to permit alignment across subjects. After alignment, data from channels underlying voxels of a surface projection were combined to produce maps of means and t statistics. Waveforms associated with voxels within an a priori region of interest (ROI), over somatosensory cortex based on a review of the literature, were compared across stimulus and control conditions. Significant effects were found in the ROI for all three stimulus conditions within 50 ms following the stimulus. A split-half analysis of the five and eight Hz conditions demonstrated the replicability of the responses. This represents the first reported EROS measurement of somatosensory cortical activity.

HOW MANY MORE "BUTTERFLIES" ARE TRAPPED IN PASSIVE BODIES?

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Descriptors: MMN, N400, Clinical assessment

In December 1995, at the age of 43, Jean-Dominique Bauby suffered a sudden and severe stroke in the brain stem and emerged from a coma several weeks later to find himself in a rare condition called “locked-in syndrome”. He related his situation in a poignant book “The Diving Bell and the Butterfly” (1997). Although his mind (the “butterfly”) was intact, he was in face of extreme physical disability (the “diving bell”), able to move only his left eyelid, which dictated his experience. We have recently tested four patients with severe brain damage as a result of trauma, stroke or drug ingestion. By all traditional standards, these patients were beyond the reach of standard assessment tools and were, accordingly, judged to be without cognitive function. However, evaluation of all four of these patients revealed clear mismatch negativity responses indicative of at least the rudiments of attentional function. Further, N400 activity related to semantic comprehension was observed for all the patients in response to the terminal word of highly contextually constrained sentences. The presence of this N400 activity provides strong evidence that these patients were capable of speech processing. These results advocate the use of ERPs for routine clinical practice in the case of non-communicative patient populations.

EVENT-RELATED BRAIN POTENTIALS ELICITED BY PERFORMANCE FEEDBACK IN A TIME-ESTIMATION TASK

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Descriptors: error processing, feedback, error-related negativity

Recent theories have associated the Error-related negativity (ERN/Ne) with the arrival of an error signal in the anterior cingulate cortex (Holroyd & Coles, 2002, Psych Rev, 4, 679–709). This error signal is generated when negative events occur, particularly when they are unexpected, and the anterior cingulate uses the error signal to select among appropriate courses of action. We evaluated these ideas by replicating and extending previous studies of the feedback ERN in which subjects receive feedback after making a time-production judgment. In three different conditions, subjects received (a) correct or incorrect feedback, (b) correct, incorrect-slow, or incorrect-fast feedback, and (c) the same as condition (b), but with the graded incorrect feedback as a function of the degree of error. Correct responses were associated with a gain of 6 cents; incorrect responses, with a loss of 6 cents in conditions (a) and (b), and a loss of 2, 6 or 10 cents in condition (c). Behavioral data indicated that subjects adjusted their time-estimation as a function of feedback: following incorrect feedback in condition (b), they shortened or lengthened their judgments, and in condition (c) the amount of adjustment was related to the amount of loss. An ERN following negative feedback was present in all three conditions, being largest in the first condition (cf. Milten et al., 1997, J Cogn Neurosci, 9, 788–798; Lemke et al., unpublished data). However, in condition (c) ERN amplitude was not related to the amount of loss signified by the feedback. These results are discussed in terms of the Holroyd-Coles model.

A TEST OF FUNCTIONAL ORIGINS OF THE ERROR-RELATED NEGATIVITY

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Descriptors: error-related negativity (ERN), response conflict, error detection

There are two primary hypotheses concerning the functional origins of the error-related negativity (ERN): the error detection account and the response conflict account. In this study we tested which account could better explain various characteristics of the ERN by manipulating the degree of response conflict and comparing correct responses that follow partial errors and complete (uncorrected) errors. We used three stimulus- response compatibility tasks, referred to here as the arrow task (AR), the arrow Simon task (AS), and the arrow-orientation task (AO). In AR, colored arrows (red or green) pointing up or down were presented centrally. In AS, colored arrows were presented above or below fixation. In AO white arrows (pointing up or down) were presented above or below fixation. For both AR and AS, the participants were instructed to respond to the color of the arrow stimulus, but not to the pointing orientation by briskly lifting the corresponding right or left middle finger. For AO, they were instructed to respond to the pointing direction of the white arrow stimulus (up or down), but not to the location (above or below). As predicted, the premotor RT, RT, and error rate indicated that the conflict became stronger in the following order: AO > AS > AR. The ERN amplitudes for these tasks also showed the same relationship (AO > AS > AR), which is compatible with both accounts. However, the ERN was much larger for complete errors (with no EMG evidence of response competition) than for partial errors (with EMG evidence of response competition), supporting the error-detection account.

HABITUATION OF THE CARDIAC DEFENSE RESPONSE IS MODULATED BY HEART RATE VARIABILITY

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Descriptors: Cardiac defense, heart rate variability, habituation

The cardiac defense response (CDR) is a multi-phasic heart rate response to an intense or aversive stimulus. The response itself is composed of a series of alternating heart rate accelerations and decelerations that endures for approximately 80 seconds after the stimulus. Many characteristics of this response have been examined including cognitive, attentional, and emotional modulation. In addition, the autonomic underpinnings of the response have been investigated with the first two components being associated with greater...
parasympathetic modulation than the latter two components. The response typically habituates very quickly (usually after one trial). Importantly, considerable individual differences exist. For example, gender differences in the CDR have been documented. In the present study we examined another potential source of individual differences namely resting heart rate variability (HRV). The cardiac time series was recorded for two minutes at rest and during each of three presentations of an intense auditory stimulus. Resting HRV was indexed by the mean squared successive differences (MSD) and the phasic cardiac responses to the intense stimulus over the 80 succeeding seconds grouped into 10 medians. A HRV quartile by trial (1–3) by median (1–10) repeated measures ANOVA was performed. A three-way interaction was found (Roy’s largest Root = 0.63, p = 0.003). Subsequent analysis showed that the highest HRV quartile habituated after the first trial whereas the lowest HRV quartile failed to habituate after three trials. These results replicate and extend our previous findings that persons with low HRV may be hypervigilant and fail to habituate to novel neutral stimuli.

**ERROR-MONITORING ERPS, AGING, AND HEART-RATE VARIABILITY**

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Brock University

Descriptors: ERN, aging, heart rate variability

The goal of this study was to examine age-related changes in error monitoring as these relate to electrophysiological and cardiac measures associated with attentional control. Midline ERPs and heart signals were recorded as older and younger adults performed an Eriksen flanker task and a more demanding source memory task that is acutely sensitive to age-related cognitive decline. Behaviorally, on both tasks older adults responded more slowly and made more errors, confirming that the attentional demands of the tasks were greater for them. Electrophysiologically, error-related components of the ERP (ERN/Ne and Pe) were shallower in older than in younger adults, suggesting a less robust neural response to the commission or monitoring of errors. Cardiac response as indexed by resting vagal tone (VT) was reduced in the older adults, indicating the general decline in the variability of beat-to-beat interval. Controlling for age, we found that VT was correlated with both components of the ERP error-monitoring response (ERN and Pe) but only within the more cognitively demanding and age-sensitive source monitoring task. As well, higher baseline VT was marginally associated with a lower source error rate, but only for older adults. Thus, autonomic control of heart rate variability is associated with both behavioral and electrophysiological indices of error monitoring. These relationships are most evident when the demands on the system are greatest, as when older adults are called upon to do a complex source monitoring task.

**EFFECTS OF AUDITORY BILATERAL STIMULI TO THE HIGH DISCOMFORT MEMORY**

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Descriptors: bilateral stimulus, P3, SUDS

This study examined the effects of auditory bilateral stimuli on information processing about high discomfort memory. Participants (n = 67) were asked to recall one uncomfortable memory and a person’s name that was associated with the uncomfortable experience. They evaluated degree of discomfort about the memory with Subjective Units of Distress Scale (SUDS). Subjects whose SUDS were more than 6 (n = 27) were assigned to High-SUDS group, and subjects whose SUDS were less than 4 (n = 10) were assigned to Low-SUDS group. For recording ERP, the person’s name associated with the uncomfortable memory (relevant stimuli) and four other unrelated names (irrelevant stimuli) were randomly presented on a CRT. Auditory bilateral stimuli were a isopresented via headphones. In this experiment ERP and SUDS were recorded before and after presentation of auditory bilateral stimuli. In the High-SUDS group, P3 amplitudes elicited to the relevant stimuli and SUDS were significantly reduced after presentation of auditory bilateral stimuli. No differences were found in the Low-SUDS group. These results suggested that auditory bilateral stimuli affected information processing of high discomfort memory so that P3 amplitudes elicited to stimuli related to such a memory were reduced.

**PHYSIOLOGICAL SOOTHING: RELATIONS WITH POSITIVE AFFECT AND AGE**

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Descriptors: physiological soothing, positive emotion, age

One function of positive emotions is “undoing” states of physiological arousal produced by negative emotions (Fredrickson & Levenson, 1998). We explored this relation during conflictive marital interactions, hypothesizing that periods of physiological soothing (i.e., transitions between arousal and calm) would be associated with positive affect. Autonomic and somatic responses were measured continuously from 63 middle-aged and 58 older married couples during a 15-minute discussion of a conflictive marital issue. Soothing epochs were operationalized as 10-second periods where at least three of six physiological channels were at least one standard deviation away from baseline (in the aroused direction) immediately followed by a 10-second period during which no physiological channels met this criterion. Affective behavior during the conversation was coded using the Specific Affect Coding system and collapsed into positive, negative, or neutral categories. For each soothing epoch for each spouse, we determined the category of the concomitant affect. Results indicated that rates of positive affect were significantly higher during soothing epochs than during non-soothing periods. Interestingly, this finding of greater positive affect during soothing epochs was stronger for older couples than for middle-aged couples. These results underscore the important role that positive emotions play in restoring physiological equilibrium, an important aspect of emotion regulation. Our age-related findings are consistent with previous research emphasizing the increasingly important role that positive emotion plays in the lives of the elderly.

**CREATING AN IMAGE OF ONESELF AS MOTHER: THE LINK BETWEEN PSYCHOLOGICAL PREPAREDNESS, ATTACHMENT REPRESENTATION AND PHYSIOLOGICAL RESPONSE**

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Descriptors: attachment, motherhood, electrodermal response

The transition to motherhood is a profound change in a woman’s life and often brings a great deal of stress. This study hypothesizes that one factor affecting the level of stress associated with this transition is a woman’s psychological preparedness for motherhood. The sample consisted of 60 women (mean age 32.6) in their third trimester of pregnancy. Participants completed the Adult Attachment Interview (AAI), during which physiological data were continuously
NEGATIVE AFFECT AND ERROR-RELATED PHYSIOLOGY
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Descriptors: ERN/Ne, Pe, Anxiety, Emotion, Response monitoring

Both error-related negativity (ERN/Ne) and positivity (Pe) are components of an ERP complex associated with monitoring action and detecting error. A previous study from our laboratory demonstrated that autonomic measures such as skin conductance (SC) and heart rate (HR) may also be part of this process. Although the ERN has been shown to be modulated by a variety of affective characteristics, these differences have not yet been investigated in the context of error-related SC or HR responses. In the present study, college students were assigned to one of three groups based on their scores on the Positive and Negative Affect Scale (PANAS): 1) high NA/high PA (anxious), 2) high NA/low PA (depressed), and 3) low NA, high/PA (happy). Midline EEG, HR and SC were recorded while subjects performed a Stroop-like reaction time task. Results indicated that while all groups showed the characteristic ERN-Pe complex, the ERN was generally enhanced in high-NA subjects while Pe was enhanced in the happy subjects. Likewise, both SC and HR were sensitive to performance errors and, although the between-group differences on these measures were not significant, larger error-related SC and HR responses appeared to characterize subjects high in NA. As in our previous study, SC was related to Pe and Pe predicted post-error RT slowing.

FEAR, ANXIETY, AND PHYSIOLOGY: PATTERNS OF EMOTIONAL MODULATION
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University of Florida

Descriptors: emotion, anxiety, imagery

Emotional reactivity during narrative imagery was investigated in anxiety patients with primary diagnoses of specific phobia (n = 31), social phobia (n = 35), and panic disorder without agoraphobia (n = 27), and in an age-matched, non-anxious control group (n = 41). Imagery was cued by auditory scripts with either pleasant, neutral, or unpleasant/fearful content. Psychophysiological measures included the startle probe reflex, heart rate, skin conductance, and facial electromyography. Participants were generally more reactive to emotional than to neutral imagery on all measures, although within-group reactivity varied over contents. Thus, although controls, specific, and social phobics showed a similar differentiation among emotional and neutral scripts, differences across imagery content conditions for panic patients were unreliable for most measures, including skin conductance, corragator, and the startle probe reflex. Furthermore, specific phobics showed the largest heart rate and corragator responses to fearful scenes, significantly greater than the reactions of panic patients—social phobics falling between these groups. Overall, the data suggest that both normal controls and patients with circumscribed fear are physiologically more reactive and show more differentiated emotional processing than patients with less cue-specific, generalized anxiety.

THE ROLE OF ANXIETY SENSITIVITY IN THE DEVELOPMENT OF ANTICIPATORY ANXIETY INDUCED BY A THREATENING EXPERIMENTAL CONTEXT
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University of Greifswald

Descriptors: anticipatory anxiety, anxiety sensitivity

The present study examined the usability of an anticipation of hyperventilation procedure to induce an anxiety state. As a comparison an anticipation of shock condition was applied. It was tested whether any of the two procedures can specifically discriminate between participants with high vs. low anxiety sensitivity. A student sample of 10 subjects high and 10 subjects low in anxiety sensitivity was recruited for the study. During consecutive parts of the experiment threat (anticipation of hyperventilation or threat of shock) and safe phases (anticipation of relaxed breathing or no-shock condition) were signalled by 4 different colored slides lasting for 3 minutes. Startle reflex response (orbicularis oculi EMG), heart rate, skin conductance level, respiration rate, end-tidal CO2, and subjective ratings of DSM-IV panic attack symptoms were recorded. Throughout the experiment highly anxiety sensitive subjects reported an increased number and level of anxiety symptoms. Moreover, these participants showed increased startle responses and autonomic activation. As expected, threat conditions evoked a further potentiation of startle response and autonomic arousal in both groups. However, the anticipation of breathing manipulations lead to greater increases in responding specifically in the high anxiety sensitivity group. The results imply that the anticipation of hyperventilation is an adequate procedure to induce anticipatory anxiety. It also shows the potential of the anticipation of hyperventilation procedure to discriminate between groups differing in anxiety sensitivity.

DEPRESSION AND AUTONOMIC AND VASCULAR RESPONSES TO AFFECTIVE STIMULI AMONG OLDER AFRICAN-AMERICAN ADULTS
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Descriptors: cardiovascular reactivity, depression, African-Americans

Past research suggests hypertension in African-Americans is partly a product of chronically elevated vascular responses (CVR) to mental and emotional stress. Poor emotion recognition has been linked with negative psychological factors. The present study assessed the role of depression in emotion recognition and CVR. Participants were 106 African-Americans (51 males, 55 females; aged 21–92) who are part of the Healthy Aging In Nationally Diverse Longitudinal Samples Study (HANDLS). Participants completed the CESD depression scale and then evaluated emotional expressions in faces and sentences (PAT). The PAT tasks were preceded by a five-minute baseline and followed by a five-minute recovery period. Heart rate and blood pressure (BP) were obtained continuously using a Portapres beat-to-beat BP monitor. Measures of log-transformed high frequency heart rate variability (HF-HRV) and alpha index (AI) were computed.
to assess vagal response and baroreceptor sensitivity (a combination of vagal and alpha-adrenergic factors). BP, total peripheral resistance (TPR), and HF-HRV scores increased significantly from PAT tasks to recovery. During recovery, low PAT scores were linked with higher vascular resistance (TPR), AI, and HF-HRV scores. High depression scores were linked with poorer performance identifying emotions, higher TPR and HF-HRV scores from baseline to recovery, and reduced HR-HRV in younger persons. These results suggest that in African-Americans depression is associated with one of the vascular components to hypertension in the context of emotion processing.

THE DETECTION OF DECEPTION USING EVENT-RELATED POTENTIALS IN A HIGHLY REALISTIC MOCK-CRIME SCENARIO

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Descriptors: ERPs, Deception Detection, Bayesian Analysis, Bootstrapping

Memory evaluations utilizing ERP's have demonstrated high sensitivity and specificity, leading some proponents to suggest they may prove useful in forensic or homeland security contexts. Most studies, however, employed simple list-learning tasks or inquired about benign demographics, rather than assessing the utility of ERP procedures in conditions emulating forensic work. Moreover, few studies have assessed the potential vulnerability of ERP's to countermeasures (CM's). The present study assessed participants for guilty-knowledge following a highly realistic mock-crime scenario. In addition to standard innocent and guilty groups, three groups employed different CM's during the ERP evaluation. Two approaches to individual classification were used, a Bayesian combination of ERP features, and a Bootstrapping of cross correlations between waveforms. Both analyses produced surprisingly low rates of classification accuracy for guilty subjects. Standard guilty participants were only detected 47 % (Bayes) or 27% (Boot) of the time, and CM's further lowered this rate of detection. Innocent participants were falsely accused only 6% (Bayes) and 0% (Boot) of the time, but bootstrapping left a majority of innocent subjects unclassified. These results highlight that: 1) Innocent individuals are adequately protected in this guilty-knowledge procedure; 2) Even the recent and salient knowledge of facts from a realistic mock crime does not ensure guilty individuals will be correctly classified; 3) ERP procedures may be vulnerable to specific countermeasures.

PARAMETRIC ANALYSIS OF THE RECOGNITION POTENTIAL AND MEANING RECOGNITION POTENTIAL

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Descriptors: Recognition Potential, PCA, laterality, ERP

Event-related brain potentials (ERPs) were used to examine the roles of expectancy and meaning manipulations in visual word recognition by visually presenting English sentences, one word at a time, to 33 native English speakers. Two conditions used sentences that ended with: (1) words of moderate to high cloze probability (e.g., “New York is a very busy city”) and (2) anomalous words (e.g., “Most cats see well at court”). Sentences also differed according to ratings for expectancy, meaning, weirdness, and overall sense. Data were collected by a 128-channel system in order to improve source localization, particularly for the right-lateralized N2. The data were collapsed over subjects to produce a single waveform for each of the 150 sentences. These item-averaged data were then analyzed using parametric PCA to reveal correlations to parameters of interest. Consistent with a previous study (Dien et al., 2003), but with a new stimulus set, a left-lateralized N2 (RP) was found to correlate with expectancy ratings, while a right-lateralized N2 (MRP) was found to correlate with overall sense.

EFFECTS OF EXOGENOUS CORTISOL ON AMPLITUDE OF THE STARTLE REFLEX

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Descriptors: startle, cortisol

This study investigated a possible link between amplitude of the acoustic startle reflex and cortisol levels by replicating a prior study which showed that administration of 20 mg hydrocortisone administration attenuates startle reflex amplitude (Buchanan, Brechtel, Sollers, & Lovatto, 2001). Participants in this study were 16 male veterans between the ages of 38 and 62. Cortisol levels were manipulated within-subjects via administration of 20 mg hydrocortisone and placebo over two sessions held on separate days. Each session involved administration of hydrocortisone or placebo followed by assessment of acoustic startle reflex amplitude and salivary cortisol 0, 30, 60, 90, and 120 and minutes later. Each startle assessment consisted of presentation of ten 105dB 50 ms bursts of white noise at intervals averaging 30 seconds during a 5 minute period. Results showed that hydrocortisone produced a 20-fold increase in level of salivary cortisol relative to placebo. Startle responses habituated over the course of the procedure and were larger during the first than second assessment session, but there were no significant differences in blink amplitude between the hydrocortisone and placebo conditions. Possible reasons for the failure to replicate the suppression of startle by hydrocortisone in this study will be discussed.

ERN RESPONSES TO ERRORS ISSUED BY ONESELF AND TO ERRORS OBSERVED IN OTHERS

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Descriptors: error processing, error-related negativity

Recent studies showed that a negative going component, i.e., the error-related negativity (ERN), is present in motor-related ERPs when a subject's actual behavior violates his/her action plan. Here, we tested whether an ERN is also present when a subject is observing behavioral errors issued by another individual. 16 healthy and paid subjects were exposed: a) to the Berstein et al. (1995) paradigm mapping four letters onto four keys and requesting subjects to press the correct key as soon as a letter was presented on the screen; b) same subjects had to count key-pressing errors of another individual exposed remotely in relation to the subject to the same task as in condition a; c) subjects had to give feedback to the remote individual by pressing a key whenever the remote person issued an error. For 16 new subjects, the same displays as group one during c) were used but subjects now were instructed e) that the video displays depict random spatial patterns of letters and rectangles. Analysis of ERPs of condition a) replicated earlier findings of large ERNs during error trials. Dipole analysis revealed ERN sources to be localized in the anterior cingulate cortex (ACC). ERP-data of conditions b) to e) also indicated ERN-like activities with its major sources in the ACC. ERN amplitudes were significantly delayed when the remote person issued erroneous key-responses or when the predefined pattern of letter/rectangle association was violated. Results will be discussed in terms of the Holroyd-Coles model on the ERN and within the framework of mirror neurons.
FACE-SPECIFIC N170 COMPONENT IS MODULATED BY FACIAL EXPRESSIONAL CHANGE

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Descriptors: facial expression, facial change, N170

In this study, we investigated the event-related brain potentials (ERPs) to facial expressional change. Facial changes were created by immediate, successive presentation of two different faces. Expressional faces (smiling or angry) were preceded by either (1) a neutral face of the same person, (2) the same expression of a different person, or (3) the neutral face of a different person, which generated different types of facial change, i.e., expression change, individual change, or both, respectively. The first and the second stimuli elicited prominent face-specific N170 components over posterior temporal sites. For the first stimuli, there were no differences in N170 among smiling, angry, and neutral faces. For the second stimuli, although there were no significant differences among change types for angry faces, smiling faces elicited larger N170 when preceded by the same person’s neutral face than by a different person’s smiling/neutral face. This effect is due to facial change and not the physical features of the stimuli, because the N170 elicited by physically identical stimuli was modulated by change types. Also, it is not possible that this effect results from the physical differences between the first and the second stimuli, because the largest N170 was not elicited by expressional and individual changes, but by expressional change only. These findings suggest that the N170 is sensitive to change into a smiling expression from a neutral expression, and that this N170 modulation may reflect the extraction of expressional change information at the structural encoding process, at least for change into a smile.

ACTIVITY MODULATION IN FRONTO-PARIETAL NETWORKS IN MOTIVATED ATTENTION OF EMOTION

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Descriptors: emotion, attention, cortical networks

In the present study we presented high (pleasant and unpleasant) and low (neutral) arousing emotional pictures in a steady-state visual evoked field paradigm using magnetoencephalography. Applying a minimum norm estimation (MNE) technique we determined the origin and the strength of the evoked neuromagnetic field. Besides subjective ratings, we obtained heart rate change latency. These data suggest that the rare valence events are automatically evaluated, even when this manipulation is unrelated to the subjects’ task.

THE EFFECT OF IRRELEVANT NOISE ON SEMANTIC PROCESSING

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Descriptors: n400, speech processing and noise, attention

Typically our listening environment is filled with irrelevant auditory information. Yet, we can often comprehend the spoken message and maintain conversation with little distraction by the irrelevant extraneous noise present. However, the ease of comprehending speech when embedded in competing noise is not shared by all populations (e.g., learning-disabled adults, Chermak et al., Ear and Hearing, 1989; reading impaired children, Brady et al., J Exp Child Psych, 1983). Currently, little is known about how the brain is able to process the relevant information while inhibiting the response to irrelevant stimuli. Thus, we examined how the underlying neural networks that index semantic processing, using the N400 response, are affected by a competing irrelevant noise distractor in adults. Sentential stimuli were presented in quiet and noisy listening conditions. The sentences varied according to the phonemic and semantic appropriateness of the terminal word. The signal-to-noise ratio (SNR) was decreased in a series of steps to examine how the brain will respond under various unfavorable listening situations. A multitalker babble was chosen as the noise distracter. Data revealed that even at a relatively easy signal-to-noise ratio the underlying neural mechanisms that index semantic processing begin to account for the noise present. More research is needed to determine how the brain’s processing changes with the introduction of noise and what implications this may have for language development.

EVENT-RELATED POTENTIALS REFLECT AUTOMATIC EVALUATIVE PROCESSING DURING A GRAMMATICAL CLASSIFICATION TASK

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Descriptors: Automatic evaluative processing, affect, stimulus valence

Event-related potentials (ERPs) were used to examine automatic evaluative processing in a modified oddball task featuring a grammatical classification task. Subjects viewed series of 6 words and were asked to indicate whether each word was a noun or an adjective. Word stimuli in each series varied in probability of occurrence in both their grammatical classification (noun vs. adjective) as well as their valence (positive vs. negative). The series were constructed to allow for comparisons to be made between rare grammatical events as well as rare valence events. As expected, rare grammatical occurrences elicited a large P300 component maximal over Centro-Parietal electrode locations. Rare valence events (a high valence negative word embedded in a series of high valence positive words), elicited large component differences between 250–400 ms, when compared to frequent valence events. These components differed from the P300 to rare grammatical events in morphology and scalp-distribution as well as latency. These data suggest that the rare valence events are automatically evaluated, even when this manipulation is unrelated to the subjects’ task.
THE ERROR-RELATED NEGATIVITY IS AFFECTED BY THE SUBJECTIVE SIGNIFICANCE OF THE ERROR

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Descriptors: Error-related negativity, Error detection, Error estimation

The error-related negativity (ERN) is a component of the ERP, appears selectively on erroneous behavior, and it is considered to correlate with error detection. This research investigated how the ERN reflects the processes of error detection and subjective error estimation. The degree of mismatch between error and correct response and of subjective significance of the error were manipulated, which were defined by the error type (different hand or different finger) and whether the errors were penalized or not. In a four-choice reaction time task, four types of stimuli ("O" or "C" with red or blue color) were presented in random order with equal probability. On each trial, participants had to respond with the middle or index finger of the left or right hand assigned to each stimulus. In a hand-penalty condition, only hand errors were penalized, and in a finger-penalty condition, only finger errors were penalized. The EMG-locked ERPs were derived from correct trials and four error categories according to the error types (hand or finger) and the penalization (penalized or not). The mean amplitude (100–250 ms after the EMG onset) of the ERN was larger in penalized than in non-penalized error trials, and larger in hand error than in finger error trials. These results indicate that the ERN amplitude reflects not only the magnitude of the mismatch between correct and actual response but also the subjective error estimation, which suggest that the subjective significance of the error have an influence on error detection.

ELECTROPHYSIOLOGICAL MEASURES OF NONCONSCIOUS MEMORY FOR WORDS

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Descriptors: Memory, priming, ERPs

We used an attentional manipulation to disentangle conscious from nonconscious memory. Words appeared at fixation for 105 ms, while simultaneously a yellow cross appeared 7 ms from fixation in 1 of the 4 quadrants, followed by a mask that disrupted word and cross processing. In different blocks, subjects counted syllables in the word ("full attention") or decided whether the horizontal or vertical element of the cross was slightly longer ("diverted attention"). At test, subjects viewed words and pseudowords and on each trial made a lexical decision, which, for words only, was followed by a recognition decision. ERPs to recognized words from the focused-attention condition included enhanced centro-parietal positivity from 400–800 ms relative to ERPs to new words. This effect was interpreted as an ERP correlate of conscious memory for the well-recognized full-attention words, as in multiple prior studies. In contrast, diverted-attention words were recognized at chance levels, and nonconscious memory was observed in the form of a speeded lexical decision (12 ms faster than for new words). ERPs for these words included frontal negativity (400–800 ms) and occipital positivity (600–800 ms), interpreted as ERP correlates of nonconscious memory. Similar results were found when the two types of study trials were mixed instead of blocked in a second experiment. Priming effects were again found for nonrecognized words from the diverted-attention condition (22 ms faster than for new words). These findings attest to the different neural events responsible for these two types of memory.

THE INFLUENCE OF ENCODING PROCESSES AND AGE ON THE FALSE MEMORY EFFECT FOR PICTURES

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Descriptors: Aging, False Memory, Pictures

Previous studies indicate that cognitive aging is associated with increased susceptibility to various kinds of false recollections. However, the decrease in performance compared to young adults may depend on the encoding task used. To examine this issue, 24 young and 8 elderly adults (ERPs also recorded) participated in a false memory task. Pictures from 34 different semantic categories, containing either perceptually similar or perceptually dissimilar line drawings, were used. In the encoding phase one group was required to assign pictures to a specific category (Category Group), whereas the other indicated whether they liked the picture or not (Item Group). In line with the results of a prior study that used a similar design with words, false alarms to lure items (new pictures from studied categories) were relatively higher for the Category Group than for the Item Group in both age groups. For young adults, hit rates and correct rejections to new and lure items were higher in the Category Group than in the Item Group. However, categorical encoding increased correct rejections to new items for the elderly, while hit rates and correct rejections to lure items were similar for both encoding groups in this age group. Preliminary ERP-results for the elderly revealed episodic memory effects in both encoding groups, which occurred later in time for the Item Group. Additionally, larger positives at frontal locations in the Category Group are consistent with the claim that a strategy focusing upon semantic information helps elderly subjects to increase performance.
THE PHONOLOGICAL MISMATCH NEGATIVITY REFLECTS PRE-LEXICAL PROCESSING DURING SPoken WORD RECOGNITION REGARDLESS OF THE POSITION OF PHONEME MISMATCH

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Descriptors: phonological mismatch negativity, phonology, ERP

The phonological mismatch negativity (PMN) is proposed to reflect the analysis of acoustic input merging with pre-lexical phonological expectations. However, in previous investigations only the phonological expectedness of the initial phoneme has been manipulated. In the present study, the position of phonological mismatch was manipulated during a phoneme deletion task. Event-related brain potentials were recorded as participants were instructed to omit the initial phoneme from a nonword ("brep", without the /b/) after which they heard a correct (rep, ret, tid) or incorrect (dep, ret, tid) response. The place of phoneme mismatch occurred at either the initial position (dep, tid), or the final position (ret). Results indicate that the PMN (peaking at 270 ms) was largest to incorrect items, but differentiated between items that mismatched at the initial position versus those that mismatched at the final position. Results suggest that the PMN reflects serial matching of acoustic input with pre-lexical expectations formed by the experimental context. Furthermore, the elicitation of the PMN in a task that minimizes lexical and semantic influences is unequivocal evidence that the PMN is a neural manifestation of pre-lexical phonological processing.

EVENT-RELATED POTENTIALS ASSOCIATED WITH SELF-INITIATED STIMULUS PROCESSING

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Descriptors: intentional action, oddball task, P3

To examine the difference between self-initiated and externally induced stimulus processing, event-related potentials (ERPs) were recorded for the stimuli triggered by voluntary action and for the same stimuli presented automatically without action. Sixteen university students performed auditory and visual oddball tasks in two conditions that differed in the way of initiating stimuli. In the self condition, participants were asked to press a computer mouse button at a pace of once per 1–2 s. Each click triggered one of the two stimuli (frequent standard and rare target) immediately after the microswitch closure. In the auto condition, the same stimuli were presented automatically with the same interstimulus intervals as those produced in the self condition. Participants were instructed to respond to the target stimuli by pressing a space key on the keyboard. To remove the effect of movement-related brain potentials, difference waveforms were calculated by subtracting the ERPs to the standard stimuli from the ERPs to the target stimuli. The amplitude of the P3 wave was larger in the self condition than in the auto condition particularly at central sites. This effect was observed in both auditory and visual tasks. These findings are consistent with a previous study (Nittono, H., & Ulisperger, P. 2000. NeuroReport, 11, 1861–1864) and suggest that cortical processes underlying the P3a component are highly activated in self-initiated stimulus processing.

MASKING ELICITS EMOTION EXPERIENCES IN THE ABSENCE OF DISCRIMINATORY PHYSIOLOGY

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Descriptors: Emotion, Visual masking, Meditation

Recent theories propose that subtle emotion states guide decision-making when insufficient rational guides exist. Yet little is known about the nature of emotion experience when cognitive information is limited. Studies employing a “masking” paradigm to disrupt the awareness of an emotional stimulus offer some evidence that emotional arousal can be activated preattentively, particularly for aversive, fear-relevant stimuli. We assessed whether subjects can also discriminate the valence of a feeling state elicited by a masked emotional stimulus. 16 long-term meditators and 18 non-meditators viewed a series of pictures with pleasant, neutral, and unpleasant emotional content, both masked and non-masked, and reported on experienced emotional valence and arousal, while measures of skin conductance (SCR), facial EMG, and heart rate (HR) were simultaneously recorded. Masked emotional pictures did not elicit discriminatory SCR or EMG responses. HR discriminated among masked pictures by arousal, but not by valence. Despite minimal physiologic discrimination, both groups discriminated among stimuli in their self-reported arousal. Contrary to hypotheses, only non-meditators successfully discriminated among pictures in their reports of experienced valence. Discrimination between unpleasant and neutral stimuli was superior to that between pleasant and neutral stimuli on both dimensions. This discrimination of feeling states was not related to heartbeat detection ability, cardiac vagal tone, or degree of self-reported attention to emotional states.

AGE-DEPENDENT CHANGES IN BEHAVIORAL AND ELECTROPHYSIOLOGICAL MEASURES OF SENSORY GATING

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Descriptors: P50, aging, sensory inhibition

Aging is associated with changes in exogenous attention switching and distractibility. We attempted to document variation in behavioral items associated with “sensory gating” across three age groups (18–29, 30–59, 60+), and further to identify putative neural mechanisms by measuring specific evoked potential components. Eighty-nine individuals without neurological disease reported the greatest difficulty. The same participants underwent auditory information when multiple distracter sound sources are present. The oldest group for three items, all of which related to experiencing difficulty processing acoustic information when multiple distracter sound sources are present. The oldest group reported the greatest difficulty. The same participants underwent auditory evoked potential recordings while watching silent movies for 30 min. Activity evoked by paired-clicks (intensity adjusted for hearing threshold; 0.5 s inter-click interval) was recorded from Cz referenced to right mastoid. Amplitude, latency and response suppression (“gating”) of components Pa, P1 and N1 were measured. We found a significant increase in Pa amplitude with advancing age (F = 7.54, p = 0.001), consistent with sensory disinhibition from prefrontal control (Knight et al., 1989). An observed significant decrease in N1 suppression (F = 5.23, p = 0.007) suggests a change in gating efficiency at auditory cortex. Failure to demonstrate an age-effect for P1 gating (F = 0.18, p = 0.84) is consistent with previous reports (Rasco et al., 2000), and suggests preserved subcortical stimulus filtering.
IMAGING THE ORBITOFRONTAL CORTEX

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Descriptors: emotion, orbitofrontal cortex, fMRI

Over a hundred years ago, a railroad worker named Phineas Gage exhibited impaired decision-making and personality changes following an accident that severely damaged his orbitofrontal cortex. More recently, the OFC has been implicated in the processing of reward and punishment (O’Doherty et al., 2001); performance on a gambling task (Bechara et al., 1997); and reasoning about social exchanges (Stone et al., 2002). Clearly, the orbitofrontal cortex is of great interest to social neuroscientists. Unfortunately, the OFC is plagued by susceptibility artifact in fMRI studies, resulting in significant signal loss in the region of interest. In the current study, fMRI collection parameters were manipulated to evaluate their effects on signal loss in the OFC. Data were collected on a GE 3T Signa imager using multiple acquisition sequences (EPI, forward and reverse spiral), slice thicknesses (5 mm, 3.5 mm), and orientations (axial, coronal, sagittal). Results indicated that signal loss was minimized by collecting images in the sagittal plane, contrary to popular use of coronal slices to maximize coverage of the OFC. For all three acquisition sequences, 3.5 mm slices suffered less signal loss than 5 mm slices. The reverse spiral sequence produced the least amount of signal loss. However, these parameters produce a decrease in the signal-to-noise ratio, suggesting the use of a combined reverse-forward sequence to take advantage of the better SNR of the forward spiral and the maximal coverage of the reverse spiral. Functional data will be presented to support this conclusion.

DEPRESSED MOOD, INDEX FINGER FORCE AND MOTOR CORTEX STIMULATION: A TRANSCRANIAL MAGNETIC STIMULATION (TMS) STUDY

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Descriptors: transcranial magnetic stimulation, depressed mood

Transcranial Magnetic Stimulation (TMS) is a technique being used increasingly in the neurosciences and psychiatry as a way of selectively inhibiting or exciting underlying cortical tissues. The present study utilized TMS of the motor cortex to better understand basic motor processes associated with depressed symptoms independent of cognitive requirements or diagnostic category. The participants were chosen from an undergraduate student population based on scores from the Beck Depression Inventory (BDI). In order to assess the integrity of the basic motor-evoked potentials (MEPs) in forearm EMG, the motor cortex was used to initiate MEPs in forearm EMG and force production measured in the right (dominant) index finger. While participants were at rest, the group with more depressive symptoms showed less force response in the index finger following stimulations at 140% of their motor threshold compared with the group endorsing less depressive symptoms (p < .05). A negative correlation between the force response in the index finger at baseline (rest) following stimulation and the BDI indicated that depressed mood symptom elevations were associated with less response to stimulations (r = –.61, p < .05). The results argue for a greater importance placed on the relationship between depressive mood symptoms and basic motor processes. Future research is necessary to assess relationships in clinical populations between mood and motor function indexed by TMS and to measure the functional significance of group differences.

VARIABILITY IN THE N400 REFLECTS AUTOMATICITY OF SEMANTIC PRIMING IN A SECOND LANGUAGE

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Descriptors: ERP, bilingualism, semantic priming, language acquisition, N400

We investigated individual differences in second language (L2) proficiency by looking at the automaticity of semantic priming using behavioral and event-related brain potentials (ERPs). Fifteen first language (L1) English speakers varying in L2 French proficiency made living/non-living judgments to visually presented English and French nouns in lists blocked by language. Sixty critical words were each presented twice, once preceded by a strong semantic associate (e.g., ADULT, CHILD; primed) and once preceded by an unrelated word (e.g., SON, CAT; unprimed). Behavioral response time (RT) variability was measured using the coefficient of variation (CV), which was computed for each participant by dividing the standard deviation of RTs by the mean RT. Participants performed faster in L1 than in L2 and with lower CVs. The lower CVs indicated greater automaticity in L1 than L2. ERPs revealed that only less proficient bilinguals showed N400 priming effects and only in their L1. CVs of the N400 amplitude were computed for parietal electrode sites. The CV elicited on primed trials in L1 was significantly greater than that elicited by L1 unprimed trials or the L2 CVs. Furthermore, the L2-specific primed N400 CV at Pz significantly predicted L2 behavioral proficiency and correlated with the corresponding behavioral CV, indicating that variability in N400 amplitude (i.e., its CV) reflects automaticity of semantic processing. It is suggested that automaticity in semantic access as a consequence of language training is related to language proficiency.

AUDITORY STEADY STATE ERP DEFICITS IN BIPOLAR DISORDER

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Descriptors: Auditory ERPS, steady state, bipolar disorder

Patients with schizophrenia show disruption of auditory steady state activity at gamma range frequencies, consistent with abnormal neural synchronization. We tested whether these steady state deficits also occurred in patients with bipolar disorder. Nineteen patients with bipolar disorder during a manic or mixed episode and 32 non-psychiatric control subjects were evaluated. The patients were not receiving mood stabilizers or anti-psychotic medication at the time of testing. Click trains (500 ms duration) presented at 20, 30, 40 and 50 Hz were used to evoke steady state ERPs. After averaging trials, a Fast Fourier Transform was used to evaluate EEG power at the frequency of stimulation for each click rate, and the log (10) of the power value at each rate was used in statistical analysis. Signal to noise ratio was calculated for the 40 Hz response. Patients with bipolar disorder showed deficits in power at all frequencies of stimulation. The presence of psychotic symptoms was associated with greater reduction in 20 Hz power. Signal to noise ratio at 40 Hz was decreased in patients as well. These results indicate that auditory steady state deficits are apparent in bipolar disorder during the manic or mixed phase of the illness. The steady state potential is probably generated in the primary auditory cortex and is thought to depend on GABAergic inhibitory drive on glutamatergic neurons, suggesting that these systems may be affected during acute episodes.
THE DIPOLE MODELING OF THE STIMULUS-PRECEDING NEGATIVITY BASED ON FMRI RESULTS

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Descriptors: stimulus-preceding negativity, dipole modeling, fMRI

The purpose of the present study is to investigate sources of the stimulus-preceding negativity (SPN) using dipole modeling based on FMRI results. In the present study 20 participants performed a time estimation task. Participants had to push a button when they thought the instructed time (6s, 8s, 10s) had elapsed. A visual feedback (FB) stimulus informing about their timing performance was presented 3 s after pushing the button. The EEG was averaged from -2500 ms to +4500 ms of the pushing of the button and the SPN was obtained preceding the FB stimulus. The dipole fitting procedure performed under fixed location and free orientation conditions was as follows. First, seven dipoles were located in the brain region from the results of the fMRI measurement performed in separate experiments. Then three dipoles located at the motor related area (BA4, BA6) in the left hemisphere and at left cerebellum were fitted with the interval of 2500 ms preceding the pushing of the button. Second, the rest of four dipoles located at right hemisphere (BA9, BA10, BA40, and thalamus) were fitted one by one with the interval between the pushing of the button and the FB stimulus, and then these four dipoles were fitted again simultaneously. The results showed that the dipole at the thalamus had a more prominent source potential compared to other dipoles. This result supports the gating theory in which the thalamus plays the role of routing the cortex and opens a sensory gate for incoming stimuli when the stimulus occurrence can be anticipated.

CONTEXT MODULATES SKIN CONDUCTANCE RESPONSE TO UNPLEASANT VISUAL STIMULI

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Descriptors: skin conductance response, text priming, unpleasant pictures

We studied the skin conductance response (SCR) to very unpleasant pictures, viewed in two priming contexts designed to either reinforce or attenuate the known strong reactions elicited by them. Two blocks of IAPS pictures (24 each) were presented, unpleasant (multilabeled bodies) and neutral (objects). The participants (94 male students) were divided into two groups, attenuating and reinforcing that read different descriptive texts prior to viewing. Before the unpleasant block, the attenuating group read a text about make-up experts simulating wounds and mutilation for the movies; the reinforcing group read a text about the worldwide problem of human violence. Both groups read a text about tool fabrication before the neutral picture block. Participants' negative and positive trait-affects were evaluated with the PANAS. In the reinforcing group, there was a general increase inSCRs during unpleasant pictures, relative to neutral. In the attenuating group, subjects that scored above the average on the positive affect scale (Hi-PA) and those below the average on the negative scale (Lo-NA) showed a reduction in SCR to unpleasant pictures. The Lo-PA and the Hi-NA participants, in spite of the text, did react with higher strength to unpleasant pictures. Overall, the data suggest that Hi-PA and Lo-NA participants are reactive to textual priming aimed to decrease the negative impact of the pictures, while the other participants seem less responsive to efforts at attenuating affect. We concluded that trait and contextual factors interact in determining the SCR to threatening stimuli.

DISSOCIATING RULE-BASED AND SIMILARITY-BASED MECHANISMS DURING LANGUAGE ACQUISITION

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Descriptors: learning, fMRI, hippocampus

Recent studies have begun to describe the brain mechanisms subserving human learning. According to one important view on learning individuals either learn item-specific information on the basis of superficial similarity to some exemplar or learn by abstracting a representation of the underlying rules. It has been argued that learning mechanisms based on superficial similarity may well explain learning, even learning of simple artificial grammar systems (AG). However, the acquisition of abstract or rule-based knowledge in more complex AG paradigms cannot be explained by relying solely on similarity-based mechanisms. Here, we used functional magnetic resonance imaging to examine in detail the contribution of both mechanisms to AG learning by assessing learning-related changes in hemodynamic activity during AG learning. During scanning, participants with profound knowledge of an AG perceived a slightly modified version. For one group the superficial similarity was changed by introducing a new word order without changing the underlying rules. For the other half the new word order implied also a new grammatical rule. Only this latter condition led to a significant decrease in grammaticality judgment immediately after the change with subsequent learning of the new rule. Changes in superficial features of an AG modulated activation in the left anterior hippocampus whereas the inferior portion of the left precentral gyrus (BA6 adjacent to BA44) was selectively engaged following abstract rule change. These results point to a differentiation between similarity-based learning and rule-abstraction during AG learning with similarity-based learning playing a non-obligatory role during the initial phase and rule-based abstraction during a later phase.

THE EFFECT OF UNCERTAINTY IN ERROR MONITORING: AN ERP INVESTIGATION

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Descriptors: ERN, uncertainty, error monitoring

We conducted a series of experiments to address the effect of uncertainty for error monitoring and the ability of the error detection hypothesis to account for the presence of Correct-Related Negativity (CRN). In study one, 18 healthy young participants completed letter discrimination tasks during single and dual attention conditions designed to manipulate response certainty. In the second study, the same participants completed easy and difficult tone discrimination tasks designed to influence stimulus certainty. In the third study, task difficulty was manipulated in such a way to produce different error rates without altering certainty. Results from studies 1 and 2 indicate that error and correct responses are processed more similarly when uncertainty is present (i.e., ERN = CRN). Furthermore, uncertainty was associated with attenuation of the ERN and enhancement of the CRN, consistent with an error detection hypothesis. The findings from study three also clearly indicate that task difficulty alone does not influence the ERN or the likelihood of a CRN component. Taken together, our results offer support for the error detection account of the ERN and also establish the role of uncertainty in predicting the CRN, as first postulated by Scheffers and Coles.
ELECTROPHYSIOLOGICAL MEASURES OF ATTENTION FOLLOWING ILLUSORY LINE MOTION

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Descriptors: illusory motion, visual attention, P1

When a line is presented instantaneously adjacent to some cued location of the visual field, observers will perceive motion as if the line were propagating out of that location. Thus, motion is perceived in the absence of any true motion. This effect has been termed illusory line motion (ILM). In this study we examined the interaction between ILM and the focus of visuospatial attention. Attention tends to follow objects as they move through visual space. We wondered whether the illusion of motion produced by ILM would be sufficient to draw attention to the end of the line towards which motion is perceived. An alternative possibility is that attention “spreads out” over the extent of the line (Hamm & Klein, 2002, Perception & Psychophysics, 64, 279–91). We evaluated these possibilities by measuring the effect of ILM on the amplitudes of the P1 and N1 VEP components elicited by probes flashed at either end of the line. ILM was induced by presenting a line connecting two squares. One of the squares flashed briefly immediately prior to the presentation of the line. This caused the line to appear to propagate out from the cued (flashed) square towards the uncued square. After a 400–600 ms ISI, a checkerboard probe was flashed at the location of one of the squares. Preliminary results suggest that P1 and N1 amplitudes for probes at the 400–600 ms ISI, a checkerboard probe was flashed at the location of one of the squares. Preliminary results suggest that P1 and N1 amplitudes for probes at the uncued end (at the beginning of the motion) are greater than those for probes at the cued end (at the beginning of the motion). This is consistent with our conjecture that the focus of visuospatial attention would follow the illusory motion.

SEX AND VIOLENCE: EFFECTS OF SUSTAINED OR INTERMIXED PRESENTATION

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Descriptors: emotion, picture content, skin conductance, ERP

Emotionally arousing pictures of erotica and mutilations prompt large electrophysiological responses as well as heightened positivity of ERPs measured over the vertex (compared to neutral picture, 400–700 ms). In this study, we assessed these responses when people sequentially viewed pictures from the same affective category. We asked whether viewing one disfigured body after another, for example, leads to increased (sensitization) or decreased (habituation) defensive activation. Skin conductance and 128-sensor ERPs were measured during each of 8 12 s picture presentations and 12 s interpicture intervals. For one group (n = 20), erotic and mutilation pictures were presented intermixed with other contents; for another group (n = 20), participants viewed all of the erotic or mutilation pictures in a continuous series. For both groups, skin conductance responses and late positive potentials were larger when viewing erotica and mutilation, compared to neutral, pictures. Affective modulation of the late positive potential was generally quite similar, regardless of whether pictures were intermixed or presented sequentially. Mode of picture viewing affected skin conductance responses: When viewing erotic pictures in a continuous series, skin conductance responses decreased significantly, compared to erotic pictures intermixed with other contents. On the other hand, pictures of mutilations elicited similar, large responses under both conditions— in a series or intermixed— suggesting that autonomic reactions to aversive stimuli may be uniquely resistant to habituation.

THE EFFECTS OF MOOD ON ORIENTING EDRS AND ON ATTENTIONAL BIAS TOWARD EMOTIONAL STIMULI

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Descriptors: pre-attentive bias, threat, EDRs

The effects of mood on pre-attentive biases toward pictures varying along valence and arousal dimensions were investigated. 37 undergraduates performed a probe detection task (Bradley, et al., 1998; Cognition and Emotion, 737–753) after negative or positive mood was induced via two different pieces of music. RTs, self-reported mood as measured by the BMIS and changes in electrophysiological activity were measured. Five types of pictures were used (positive-low arousal; positive-high arousal; negative-low arousal; negative-high arousal and neutral) to examine the specificity of pre-attentive bias. A measure of attentional bias was derived from manual RTs to probes. MANOVAs results on the BMIS scales showed that participants in the negative mood induction group significantly reported more feelings of anxiety. Participants in the positive mood induction group reported more feelings of contentment. MANOVAs results on RT data showed a significant Group by Valence interaction, F (1,35) = 5.56, p = .024. Participants in the anxiety group showed avoidance toward negative high arousal pictures and vigilance toward the negative-low arousal pictures, p = .041. In contrast, participants in the contentment group showed vigilance toward all emotional pictures. MANOVAs results on EDRs data showed a significant Group by Valence interaction, F (1,35) = 8.94, p = .005. Participants in the anxiety group showed larger EDRs when showing avoidance on negative pictures while participants in the contentment group showed larger EDRs when showing vigilance toward positive pictures.

INFLUENCE OF ACUTE ALCOHOL INTOXICATION ON ATTENTION CONTROL

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Descriptors: alcohol intoxication, attention, ERPs

Many researchers have proposed alcohol-induced impairments of specific cognitive processes to account for the diverse effects of acute intoxication on behavior. Attention-allocation theory (Steele & Josephs, 1990) suggests that alcohol restricts the focus of attention to only the most salient cues in the environment. The present experiments examined this theory within the framework of two cognitive paradigms across spatial and temporal domains. In both experiments, participants were randomly assigned to placebo, medium dose (0.04 g/kg), or high dose (0.08 g/kg) alcohol groups. Study 1 examined alcohol’s effect on spatial attention capacity using a modified flanker task. Alcohol was expected to reduce the influence of flankers due to a restricted focus of attention. Neither behavioral nor P300 results supported this prediction. In the second study, participants completed an auditory discrimination task to equiprobable high and low tones. In this paradigm, the amplitude of P300 reflects the weight of previously presented stimuli still remaining in one’s attention span (i.e., working memory). Alcohol produced a shift in this weighting from 2-back to 1-back, suggesting a reduced focus of temporal attention resulting from alcohol intoxication, consistent with attention-allocation theory. The discrepancy between the two studies may result from the fact that the spatial attention task involves a conflict condition that requires inhibition of inappropriate responses, which may be impaired by alcohol as proposed by Fillmore and Vogel-Sprott (1999, 2000).
DO POSITIVE AND NEGATIVE SOMATIC MARKERS PRECEDE GOOD AND BAD CHOICES BEFORE EXPLICIT KNOWLEDGE IS AVAILABLE?
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Descriptors: decision-making, somatic markers

Recent evidence suggests that somatic markers mediate decision-making processes by signalling potential rewards and punishments before conscious knowledge is available (Bechara et al. 2000, Cerebral Cortex, 295–307). The present study investigated whether anticipatory electrodermal responses to good and bad choices modulate advantageously in a gambling task before explicit knowledge about the rules of the task is available. Forty-six undergraduates performed a computerized version of the gambling task while participants’ preferences toward the four decks of cards, their knowledge of the rules of the task (yes/no) and whether they could describe them as well as changes in electrodermal activity were measured. Participants were a-posteriori divided in two groups based on their knowledge of the rules by trial 100. Results of MANOVAs showed that trial 50, participants in the "knowledge group" had made more advantageous choices (p = .043) and they had developed clear preferences toward the advantageous decks (p<.005). Anticipatory EDRs before making a choice varied significantly throughout the task between the two groups, F (4, 39) = 2.40, p = .05. Between trials 21 and 41, participants in the “knowledge group” showed larger anticipatory EDRs before choosing disadvantageously as well as before choosing advantageously. The present results support the notion that positive and negative somatic markers modulate decision making by helping developing preferences before explicit knowledge is available.

FEARING THE BLUE CRY: CROSSMODAL CLASSICAL CONDITIONING OF ‘MOTIVATED ATTENTION’

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Descriptors: ERP, Conditioning, Crossmodal

In previous EEG studies we specified a negative ERP difference component over occipito-parietal areas when viewing both pleasant and aversive emotionally arousing compared to neutral pictures. This Early Posterior Negativity (EPN) arises with the P100, finds its maximum around 250ms and is interpreted as mirroring motivated attention. Investigating short-term plasticity of motivated attention we used event-related potentials and crossmodal classical conditioning with affective sounds (IADS) as UCS and unicolored video screens as CS. Three different colors were presented and paired with three affective groups of stereo sounds (pleasant, neutral, unpleasant) while subjects were performing a demanding distracting task. Stimuli were matched for brightness/loudness and color-sound combinations were permuted across subjects. Before and after the “learning-sequence, colors were presented without sounds at a 3Hz-rate. Comparing “pre-” and “post- learning” ERPs, a typical EPN was observed in the post-treatment condition for colors paired with unpleasant as well as pleasant sounds, though most pronounced for the aversive stimuli. Corresponding to the sound rating gender differences, female subjects showed larger EPNs in reaction to the 'unpleasant' color than males did. The results indicate that motivated attention networks can be tuned within a few trials. Moreover, conditioned EPN responses to plain stimuli prove this component as independent of physical stimulus parameters, especially semantic complexity.

STRESS AND STRAIN ON A ROLLER COASTER

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Descriptors: stress, leisure time, monitoring

Research has often neglected objective assessment of stress and strain during leisure time activities. This psychophysiological study focuses on stress in an amusement park and during driving. Forty-two male students were assessed for nearly 24 hours with the Freiburg Monitoring System (FMS). The system allows the acquisition of all relevant strain components in everyday life. Physiological, behavioral and subjective data are recorded. Total workload is assessed by heat rate, physical load by accelerative sensors, and emotional workload by “additional heart rate” (AHR). Behavior is assessed by accelerative sensors and reports. Subjective judgments are recorded four times an hour. Subjects equipped with the system drove to an amusement park, and then rode a roller coaster, a big swing boat, a float and were elevated onto a 75 m tower. Additionally, usual leisure and study time and the night were considered. Visiting the amusement park was exceptionally strenuous. In particular, heart rate and AHR were highest on the swing boat and the roller coaster. Driving a car was strenuous compared to other daily activities, with city-traffic being more strenuous than the highway. Subjectively reported assessments did not reflect objective body reactions. These results indicate that comprehensive monitoring of physiological, behavioral and subjective measures are necessary to detect sources of stress during leisure time.

BLINK-FREE DATA: ARE WE THROWING A BABY OUT WITH THE BATHWATER?

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Descriptors: Blinking, reaction time, preadolescents

Much effort is made to eliminate the field potential influences associated with eye-blinks on brain potentials with the implicit assumption that blinks are sources of artifact without behavioral effects other than a brief interruption of vision. To explore the possibility that there may be more to blink-associated data than meets the eye, covariations of blinks and reaction time measures were examined in 40 healthy children (8-11 yrs, old; IQ>80; 24 females) performing an attentional task. Subjects were tested in the morning while continuing overnight fasting. Measures of sleep (overnight actigraphy) and blood glucose (finger stick) were also obtained. Blinks were recorded (vertical EOG) while subjects performed a Continuous Performance Task (300 letters: 2 s duration; 1/2.2 s) pressing a button to target letters (X after A; 17% random occurrence). Recordings were digitized for off-line blink determination (>150 μV, >150 ms). Data were analyzed using ANOVA with post-hoc t-tests. Subjects were well-rested (~8.5 hrs of sleep) and morning blood glucose levels were normal. Reaction times were ~80 ms faster in the presence of blinks (p<.001) and blinks protected against a time on task slowing in reaction time present on blink-free trials [target trials during the 1st vs 2nd 150 trials: with blinks (ns); without blinks (p<.005)]. These findings suggest that blink-free data may provide an inaccurate representation of behavioral and physiological status. (Supported by USDA CRIS 6251-51000-002-03S)
THE EFFECTS OF TASK DIFFICULTY ON ATTENTIONAL MODULATION OF PREPULSE INHIBITION

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Descriptors: attention, prepulse inhibition, startle

The purpose of the current study was to examine the effects of task difficulty on attentional modulation of prepulse inhibition (PPI) in order to investigate whether the processing demands of a prepulse impact PPI. College student participants were asked to perform two versions of a tone-counting task in alternating trial blocks. In each version, participants were required to count the number of tones of one pitch while ignoring tones of a different pitch. In the Easy-Task blocks, the tones consisted of 800 Hz and 1200 Hz tones. In the Difficult-Task blocks, the tones consisted of 950 Hz and 1050 Hz tones. In each task condition, a subset of the tones served as prepulses for a startle-eliciting noise burst at lead intervals of 60 and 120 ms. The question of interest was whether the additional attention required by the more difficult tone discrimination task would impact the attentional modulation of prepulse inhibition. Results revealed comparable tone-counting performance in the two conditions. In additional, significant attentional modulation of PPI for the 120 ms lead interval in the Easy-Task Blocks, with greater PPI produced by the attended than the ignored prepulses. In the Difficult-Task Blocks, a significantly smaller attentional modulation effect was observed. However, for attended and ignored prepulses, PPI was greater in the Difficult-Task Blocks than the Easy-Task Blocks. These results provide further evidence that PPI, and attentional modulation of PPI, is sensitive to the attentional demands of the prepulse.

FACIAL SKIN SURFACE TEMPERATURE CHANGES DURING A CONCEALED INFORMATION TEST

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Descriptors: skin surface temperature, infrared thermography, concealed information

When individuals commit a crime, they often show involuntary physiological responses to remembered details of that crime. This phenomenon is the basis for the Concealed Information Test, in which rarely occurring crime-related details are embedded in a series of more frequently occurring crime-irrelevant items while respiratory, cardiovascular, and electrodermal responses are recorded. We investigated the feasibility of using facial skin surface temperature (SST) measures recorded using high definition thermographic images to predict deception during a Concealed Information Test. Participants were randomly assigned to nondeceptive (n = 10) or deceptive (n = 5) treatment groups. Participants in the deceptive group completed a mock-crime involving a simulated murder. A focal plane array thermal imaging radiometer was used to monitor SST while crime-relevant and crime-irrelevant items were verbally presented to each participant. Statistical analyses, focused on the facial region above the eyebrows, showed significant differences between deceptive and nondeceptive groups. Deceptive participants’ SST responses to the relevant item were larger than the responses of nondeceptive participants prior to the onset of their verbal responses. However, during the latter part of the response interval, deceptive participants’ SST responses to the relevant item dropped to a level below those of nondeceptive participants. These results suggest that thermal image analysis can be effective in discriminating deceptive and nondeceptive individuals during a Concealed Information Test.

PHYSIOLOGICAL AND ATTENTIONAL RESPONSES ELICITED BY DISTALLY AND PROXIMALLY PERCEIVED STIMULI IN SPIDER PHOBIA

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Descriptors: spider phobia, attentional allocation, startle response

There is evidence to suggest that anxiety gives way to fear with increasing threat cue proximity, with this change being characterized by distinct behaviors. These behavioral changes include differences in the attention allocated towards, and the physiological responses elicited by, the approaching threat stimulus. In Study 1 a modified visual probe task assessed the attentional allocation to distally and proximally perceived stimuli in high and low spider fearful participants. Attentional bias was assessed using response times to visual probes appearing after paired pictures of the spider and control stimuli. Results indicated that participants with a high fear of spiders showed a significant attentional bias for the distally perceived spiders, with no bias in low fear participants. High fear participants also demonstrated a tendency to avoid proximally perceived spiders. In Study 2, eye blink startle magnitudes to auditory probes and skin conductance responses were recorded whilst high and low spider fearful participants viewed single presentations of proximally and distally perceived spider and control stimuli. The results demonstrated a potentiated startle response to the proximally perceived spiders and increased SCR to both proximally and distally perceived spider pictures in the high fear group. These results are discussed in terms of vigilance and defensive/avoidant patterns of response to aversive stimuli as their proximity increases.

THE IMPACT OF EMOTIONAL INTENSITY OF NEWS FOOTAGE AND COMMUNICATIVE POTENCY OF THE PRESIDENT ON ATTENTION TO SOUND BITES

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Descriptors: Television News, Sept. 11th Coverage, Emotional Responses

When creating TV news stories about traumatic events, a common practice is to select images representative of the news and follow them with a presidential response. This action-reaction sequence occurred repeatedly during coverage of the attacks on the World Trade Center (WTC)–footage of the attack followed by a sound bite from President Bush. This study examined the interaction of image intensity and leader potency on viewer attention. Specifically, it tested whether the emotional intensity of the crisis footage interacts with the communicative potency of President Bush to impact the attention paid to the presidential response. A 2 x 2 x 4 mixed design experiment was conducted using intensity of WTC video (high/low) and the potency of Bush’s responses (high/low) as within-subject variables and four orders of presentation acting as levels of the between-subjects factor. Forty participants viewed the stimulus materials while having their heart rate, skin conductance, and corrugator activity recorded. SAM ratings were also collected after each action-reaction sequence. Results show that, as predicted, subjects evidenced significantly more SCRs, higher SAM arousal, and lower heart rate in response to high intensity footage of the attacks than low intensity. The potency of Bush’s responses did not significantly affect SCRs, however. Cardiac analysis shows lower heart rate during potent Bush statements and during those following high intensity WTC footage. There were no significant interactions in analyses of heart rate levels during the presidential sound bites.
THE EFFECTS OF INCREASING COMMERCIAL BREAKS ON ATTENTION, AROUSAL, ATTITUDES, AND MEMORY FOR INFORMATION IN RADIO ADS

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Descriptors: radio, audio processing, SCR

Radio professionals must balance commercial presentation with programming content to please listeners and clients. Industry wisdom maintains listeners hate to have music interrupted and that longer sets of music improve ratings. This results in long commercial breaks often containing as many as 10 ads in a single pod. Selling commercials in such long breaks is difficult due to perceptions of listener fatigue and tune-out. It is argued that even if tune-out is controlled, attention and memory for commercials presented in one long break suffers compared to that for commercials presented in several shorter pods. In order to test this, a between-subjects experiment was conducted with two versions of a simulated radio broadcast containing 8 songs and nine commercials. One version presented 4 songs followed by a single break containing all 9 commercials and then the remaining songs. The other contained breaks of 3 commercials after songs 2, 5, and 7. The experiment was conducted at two locations, with 178 participants listening to the stimulus, completing a distraction task, and answering memory and attitude measures. Some participants (n = 65) listened individually with cardiac and skin conductance activity measured during presentation. As predicted, results show increased skin conductance and lower cardiac activity during ads presented in shorter pods. Self-report data show more irritation and disruption reported in the multiple-pod condition, as well as higher estimation of the number of ads presented. Also as predicted, memory was better in the multiple-pod condition.

IMPULSIVITY, STIMULUS EVALUATION, AND BEHAVIOR MONITORING

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Descriptors: impulsive personality, ERN, P3b

Impulsivity is a personality characteristic associated with several mental disorders, including substance abuse. Impulsive subjects may evaluate stimuli differently than non-impulsive subjects, i.e. they may be more sensitive to rewarding than punishing stimuli. Impulsive subjects may also monitor their behavior differently than non-impulsive subjects, i.e. they may be less sensitive to signals that their behaviors are not consistent with current goals. We tested these hypotheses using event-related potentials from a flanker task with a critical central stimulus letter flanked by two distracting letters on each side. Correct responses to potentially rewarding stimuli (letter T) resulted in monetary rewards; incorrect responses to potentially punishing stimuli (letter N) resulted in monetary punishment. Twenty Rice University undergraduates participated and were placed into high and low impulsive groups by a median split on score on the Barratt Impulsivity Scale. The stimulus-locked anterior P2 (P2a) and centroparietal P3 (P3b) served as indices of stimulus evaluation while the response-locked error-related negativity (ERN) was the index of action monitoring. The groups did not differ on P2a or P3b, but there was a Group × Stimulus × Response trend (p = .08) in the ERN, indicating that the low impulsive subjects had a larger ERN when they made errors to punishing stimuli (the condition in which a punishment would be delivered). This suggests that low-impulsive subjects are more sensitive to delivered punishment, based on behavior monitoring, than high-impulsive subjects.

PSYCHOPHYSIOLOGICAL REACTIVITY IN INSTRUMENTAL AND REACTIVE VIOLENT OFFENDERS

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Descriptors: reactive vs. instrumental violence, specific picture contents, eyelid reflex and electrodermal activity

Psychophysiological reactivity in a prison sample of 33 instrumental offenders (at least one cold, predatory, goal-directed aggression), 14 reactive offenders (hot, impulsive, expressive aggressions), and 23 non-violent offenders was studied. Eyeblink reflexes to noise probes (50-ms, 105 dB) occurring 300, 800 or 3800 ms after picture onset, SCR, corrugator and zygomatic activity were recorded during affective picture perception. Stimuli were 32 pleasant (erotic couples, female nudes, thrill, babies), 8 neutral (objects), and 32 unpleasant (suffering, threat to self, aggression, mutilation) slides from the IAPS, 6 s presented. Overall SCRs were higher for pleasant and unpleasant pictures, compared with neutral (quadratic trend F[1,132] = 17.45, p < .0002), and corrugator activity was larger for unpleasant compared with pleasant pictures (linear trend F[1,130] = 41.33, p < .0002). Group differences were found on startle and zygomatic measures. Non-violent and instrumental offenders' startle potentials were potentiated during threat to self pictures already at 300-ms, and inhibited during erotic couples at 800-ms, whereas reactive offenders did not. Non-violent and instrumental offenders' zygomatic activity was larger for pleasant compared with unpleasant pictures; reactive offenders did not differentiate among affective categories. Our findings suggest that reactive offenders can be reliably distinguished from instrumental ones in terms of startle and zygomatic reactivity patterns, but not when using electrodermal or corrugator measures.

THE ROLE OF ATTENTION AND AFFECTIVE RESPONSE TO SEXUAL CUES IN THE EXPERIENCE OF SEXUAL DESIRE AND SEXUAL AROUSAL

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Descriptors: Sexuality, Emotion, Attention

Using startle response modulation and a dot detection task, this pilot study evaluated early affective and attention mechanisms in sexual desire. Consistent with Barlow’s model of sexual functioning, we predicted that individuals with higher levels of sexual desire would display (1) a more strongly attenuated startle response to sexual pictures as compared to nonsexual pictures, and (2) slower dot detection of targets following neutral pictures when a sexual picture was present. Dot detection and startle tasks were counterbalanced and presented to 11 women and 16 men. Four picture classes were presented in the startle task: sexual, nonsexual pleasant, neutral, and unpleasant. Eyeblink amplitude differed according to picture class (F(3,24) = 8.09, G-G < .001). Further analysis indicated that only the difference between sexual and neutral pictures was significant (F[1,25] = 14.6, G-G < .001). A main effect of picture pair in the dot detection task (F[1,25] = 5.486, G-G < .05) indicated an increased reaction time to probed, nonsexual stimuli when a sexual stimulus was present, suggesting that sexual pictures captured more attention that nonsexual pictures. ‘Solitary sexual desire’ (measured by the Sexual Desire Inventory) correlated with difference scores indicating greater attention to sexual slides in those with higher desire (r = .50, p<.01). No significant correlations were found between startle responses and the SDI. In conclusion, these preliminary findings suggest that levels of sexual desire may be related to early attention, but not emotional, processing of sexual cues.
INSULIN SENSITIVITY OF CORTICAL MAGNETIC FIELDS MEASURED BY MAGNETOENCEPHALOGRAPHY (MEG) IN HUMANS

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Descriptors: MEG, insulin, memory

In type 2 diabetes insulin resistance of peripheral tissues is well established. However, the effect of insulin on cortical activity is not known in detail. There are reports suggesting insulin related effects on cortical EEG recordings and cognitive and behavioral measures. To investigate this effect we used MEG recordings during a memory task combined with auditory stimulation to determine the correlation between behavioral and cortical parameters. Ten normal weight subjects (m/f: 5/5, age 25 ± 1y, BMI 19.9 ± 0.6) participated in a placebo-controlled study. During the study, subjects had to perform the Sternberg task (ST) requiring memorization of strings. Simultaneously the auditory mismatch negativity (MMN) was recorded with a whole-head MEG system. The MEG recordings were performed on 2 different days separated by 1 week. Each session included 3 stages of insulin (I) (baseline, 0.25 and 1 mU/kg/min, each stage over 90 min) or saline infusion (P). At the end of each stage MEG was recorded. Differences in weight control were evaluated using a visual analogue scale (VAS). A significant reduction of the reaction time during the ST was observed during insulin infusion (p < 0.05). The MMN was enhanced during insulin and reduced during placebo (condition p < 0.02, interaction p < 0.05). The reaction time and the MMN showed a significant negative correlation (p < 0.05). The change of MMN over time significantly correlated with the VAS-score for difficulties in weight control (p < 0.05 in I and P). Peripherally administered insulin showed cognitive, behavioral and cortical effects in lean normal subjects. The cortical response may be an effective predictor of cortical insulin sensitivity. The relationships among cortical parameters, eating behavior, weight control, and peripheral insulin sensitivity appear worthwhile studying in the future.

IMPROVED DETECTION OF MAGNETIC FETAL BRAIN RESPONSES BY COMBINATION OF PHYSIOLOGICAL AND ANATOMICAL MEASUREMENTS

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Descriptors: MEG, fetal brain activity, brain development

Superconducting quantum interference detectors (SQUIDs) are capable of recording magnetic fields generated from the fetal brain in utero. However, the interpretation of the recorded signals is often very difficult, because the fetal brain signals are mixed with interfering sources like maternal and fetal heart signals. A possible approach to improve the interpretation of fetal magnetoencephalographic (fMEG) recordings is by including fetal anatomical information. fMEG systems: 1) On the SARA (SQUID array for reproductive assessment) system, the physiological recordings were performed with three localizer coils attached to specific points of the maternal body. The SARA system includes 151 primary sensors measuring the magnetic fields generated in the maternal abdomen. The position of the localizer coils were recorded before and after the physiological measurement. 2) A 3D US was combined with a magnetic localizer. This localizer consisted of three coils attached to the same point of the maternal body used during the physiological recording. The physiological data were then analyzed with the inclusion of the anatomical information of the fetal head (location, diameter). The anatomical information made it possible to determine the origin of the fMEG. The origin was in accordance with the fetal head position. In addition the anatomical information makes it possible to correct for disturbances introduced by the procedures to eliminate maternal and fetal heart signals. This combination allows us to prove that the recorded signals are really generated in the fetal brain. Also this procedure would help in developing new analysis approaches, which can increase the detection rate of fetal brain responses.

EEG ALPHA ASYMMETRY IN POSTTRAUMATIC STRESS DISORDER (PTSD) AFTER ROAD TRAFFIC ACCIDENT

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Descriptors: PTSD, EEG alpha, asymmetry

In this study, EEG alpha asymmetry was measured to investigate the role of frontal and parietal activation asymmetries in posttraumatic stress disorder (PTSD). Since patients with PTSD are characterized by negative emotions and avoidance behavior, we expected them to show greater right than left frontal hemisphere activation (EEG alpha decrease). We recorded spontaneous EEG in 36 road traffic accident survivors (24 with PTSD or subsyndromal PTSD and 12 without PTSD) during the following conditions: resting baseline and confronta- tion with trauma-related and non-trauma-related emotional visual stimuli. Data analysis of the data revealed no significant differences in frontal (F3/F4) activation patterns between the PTSD and Non-PTSD participants. However a group by stimulus type interaction was observed for the parietal (P3/P4) activation-asymmetry to neutral and trauma-relevant stimuli. Healthy accident survivors showed a relative right parietal alpha decrease mainly during confrontation with the trauma-relevant stimulus, whereas PTSD patients showed
to both conditions a more general increase in right parietal activation. Since right posterior regions are thought to be involved in the regulation of emotional arousal, our results suggest, that healthy accident survivors respond more "normally" to threatening situations by increasing situational emotional arousal. (Supported by the Deutsche Forschungsgemeinschaft (KA1476/3-1))

BARORECEPTOR SENSITIVITY AND EFFECTIVENESS VARIATES DIFFERENTIALLY IN FUNCTION OF COGNITIVE-ATTENTIONAL DEMAND

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Descriptors: baroreceptor and effectiveness, cognitive-attentional demand

Recently a new index of baroreceptor function, the baroreceptor effectiveness index (BEI) has been proposed based on the spontaneous sequence method. BEI quantifies the number of times the baroreflex is effective in driving the sinus node as aratio between the number of systolic blood pressure (SBP) sequences followed by reflex changes in heart period and the total number of SBP sequences. In this study we examined the modulation of BEI and baroreceptor sensitivity (BRS) by different cognitive-attentional demands. Seventy three students performed three tasks: mental arithmetic, memory and visual attention. Results indicate that BRS reliably decreases during mental arithmetic and increases slightly during visual attention. BEI increases during the visual attention task. A strong effect was observed in the slope and overall pressure change of the SBP sequences, decreasing both features during tasks with respect to baseline periods. The effect found in BEI cannot be explicated at a physiological level by concomitant changes in the features of sequences. The modulation of BRS and BEI by cognitive demands are in accordance with the Lacey’s intake/rejection theory. These results suggest that the information provided by the BEI index is not redundant with that provided by BRS. Specifically, it is suggested that BRS is most sensitive to internal cognitive elaboration conditions (mental arithmetic task), while BEI is most sensitive to external attentional conditions (visual attention task).

VENTILATION-CORRECTION OF RESPIRATORY SINUS ARRHYTHMIA: THE SENSITIVITY OF THE RESPIRATORY MODULATION OF VAGAL OUTFLOW IS STABLE ACROSS TIME

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Descriptors: Respiratory sinus arrhythmia, vagal tone, respiration

Respiratory sinus arrhythmia (RSA) is strongly dependent on respiratory cycle duration (Ttot) and tidal volume (VT). This can greatly impair its potential as an index of cardiac vagal tone. We have proposed a correction-procedure of the peak-valley RSA (Ritz et al. Psychophysiology 38; 2001, 858–862) that requires baseline calibration of RSA by paced breathing. Participants breathe at four different respiration rates (8–18 breaths/min) for 3 min each. During the main experiment, the participants are then allowed to breathe spontaneously. For off-line correction of RSA, RSA is normalized by VT for each breath of the paced breathing baseline, and the within-individual regression of RSA/VT upon Ttot is calculated. For each breath of a given Ttot during the main experiment, RSA/VT predicted by this regression equation is subtracted from the observed RSA/VT. This index represents the change in vagal tone from paced breathing baseline. While the intercept of the regression equation varies within individuals with changes in vagal tone, the slope is thought to represent the sensitivity of the respiratory modulation of vagal outflow as a stable characteristic of the
individual. To test the long-term stability of the slope parameter we performed paced breathing trials with 25 participants (12 healthy participants, 13 asthma patients) twice 10 months apart. The slope of RSA/Vt upon Ttot was relatively stable (r(t = .65) for the whole group and for subgroups of participants. Thus, the slope parameter can be used for a reliable estimation of respiratory modulation of RSA.

PHYSIOLOGICAL COSTS OF RESPONSE-FOCUSED AFFECT MODULATION

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Descriptors: emotion, regulation, physiology

Emotion regulation plays a vital role in intra- and interpersonal functioning. This experiment was designed to explore the affective, behavioral, and physiological responses of response-focused affect modulation. Participants (N = 44) were asked to watch either a neutral or a disgust-eliciting film. Those randomly selected to watch the disgusted-eliciting film were asked to watch naturally, or to exaggerate or suppress their behavioral reaction to the film clip. Physiological recordings – including skin conductance level (SCL), interbeat interval (IBI), pre-ejection period (PEP), and high frequency (HF) power spectrum of heart rate variability (HRV) – were recorded prior to, during, and after mood induction. As expected, exaggerators were rated as showing increased arousal and negativity relative to persons in the natural-watch and suppress conditions. The primary physiological finding was that suppression was associated with significantly greater elevations of sympathetic arousal at the myocardium (i.e., decreased PEP) relative to mere exposure to the neutral or disgust-eliciting film. Exaggeration did not significantly differ from neutral and natural-watch conditions on PEP reactivity. SCL increases were significantly lower for the neutral movie condition, suggesting that elevation in SCL occurred as a result of negative affective experience. Last, the exaggerate condition was associated with significantly reduced IBI, suggesting that “heart rate follows behavior”. Results generally support and extend previous research on response-focused emotion regulation strategies.

EFFECTS OF VIEWING EMOTIONAL PHOTOGRAPHS ON ACTIVITIES OF GASTRIC MOTILITY

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Descriptors: EGG, emotion, photographs

This study investigated the effects of viewing photographs with negative emotional components on activities of gastric motility recorded by electrogastrography (EGG). Thirty-two subjects were randomly divided into two groups of 16 subjects each. The subjects in Group One viewed a set of photographs with a negative emotional nature for 16 minutes. The subjects in Group Two viewed a set of photographs of a peaceful nature for 16 minutes. Subjects sat in a chair for a 16 minute baseline prior to the 16 minute experimental period. EGG activities were recorded continuously throughout the baseline and experimental periods. The power of EGG activity of 3 cycles per minutes (cpm) was calculated for statistical analysis. The results indicated that the subjects in Group One (viewing photographs of a peaceful nature) had significantly higher ratios of EGG power than those in Group Two (viewing photographs of a negative emotional nature) between the viewing and baseline periods (t = 2.142, df = 30, p < 0.04). In conclusion, viewing photographs of peaceful scenes significantly increased gastric motility indexed by enhanced amplitude of EGG waves at 3 cpm.

FOCAL CONCENTRATION OF EEG-Delta ACTIVITY INDICATES FUNCTIONAL IMPAIRMENT AND RECOVERY IN APHASIC PATIENTS

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Descriptors: aphasia, EEG- delta band, recovery, post-stroke

Focally generated slow waves are mostly produced by neural networks that have been deafferented from major input sources and thus indicate dysfunctional brain areas. For instance, focal slow wave activity is readily localized in the vicinity of brain lesions by magnetic source imaging. The present study examined slow waves in the EEG of 11 aphasic patients (1 female, 9 males, mean age 54.1 yrs; 1–3 months after left-hemispheric cortical and/or subcortical ischemia or hemorrhage) and 10 healthy controls (4 females, 6 males, mean age 43.3 yrs). Aphasics showed considerably larger mean amplitudes in the 1–4 Hz band over the left hemisphere compared to controls. EGG-recordings were repeated every 4 months across a 2 year period. Over the first 11 months post-stroke left-hemispheric delta-amplitude and its overall power measured by equivalent dipole modeling per hemisphere decreased significantly (while dipole location remained stable) and in parallel with the recovery of language functions (assessed by the Aachen Aphasia Test). No further changes occurred during the following period (12–24 mo after stroke). Results suggest a functional significance of focal slow wave activity indicating dysfunction in structurally affected brain areas. Focal slow activity, determined from the EEG, may be used to evaluate the course of recovery. Spontaneous recovery (restitution) appears during the 1st year and levels out after this period. (Research was supported by the Deutsche Forschungsgemeinschaft (FOR348))

EMOTIONAL EATING: PSYCHOPHYSIOLOGICAL MECHANISMS OF FOOR CRAVING

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Descriptors: Cardiac defense, heart rate variability, food craving

Modulation of defensive reflexes and heart rate variability are considered two psychophysiological indices of emotional regulation. Food craving, on the other hand, is considered a motivational state involved in eating disorders, such as bulimia and purgative anorexia. The underlying mechanisms of food craving are, however, poorly understood with competing explanatory models: the incentive-appetitive model, the homeostatic-aversive model, and the approach-avoidance conflict model. In this study, we used the two psychophysiological indices of emotional regulation to examine the underlying mechanisms of food craving in women with high risk of developing eating disorders. 48 women with high scores in the BITE questionnaire were randomly divided into two groups: a 6-hours deprived group and a non deprived group. Participants underwent a psychophysiological test to assess heart rate variability during a 5-min rest period, followed by several trials to assess modulation of the cardiac defense response by viewing food pictures and non-food (pleasant, neutral or unpleasant) pictures, selected from the IAPS. Cardiac defense was elicited by an intense white noise of 105 dB, 500 ms duration, and instantaneous rise time. Results show a significant inverse relationship between heart rate variability and cardiac defense: participants with low heart rate variability produced the greatest cardiac defense response, this effect being maximized in the deprived group. These results suggest a poor emotional regulation as the main psychophysiological mechanism underlying food craving.
NON-CONTACT ASSESSMENT OF FACIAL MYOGRAPHIC ACTIVITY USING LASER DOPPLER VIBROMETRY

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Descriptors: Facial expression, non-contact sensing, emotion

Current methods for assessing facial muscle activity are constrained by the difficulties inherent in observational and automated scoring of video recordings of visible expressions, and by the obtrusiveness of the electrodes used for EMG recording. Here we describe a novel method for recording facial activity, based on the technique of Laser Doppler Vibrometry (LDV). LDV is a technically mature method for sensing surface vibration, remotely and in the absence of physical contact, which is widely used in engineering and manufacturing. The basis for LDV sensing of myographic activity lies in the translational vibration patterns that accompany contraction, usually sensed with microphones or surface accelerometers. LDV records obtained from cheek and forehead muscle groups under posed expressions (guided by the Facial Action Coding System, Ekman and Friesen, 1978) showed the same differential pattern of responding as the EMG, and were graded in amplitude depending on the force of the gesture. The LDV sensing of myographic activity lies in the translational vibration patterns that accompany contraction, usually sensed with microphones or surface accelerometers. LDV records obtained from cheek and forehead muscle groups under posed expressions (guided by the Facial Action Coding System, Ekman and Friesen, 1978) showed the same differential pattern of responding as the EMG, and were graded in amplitude depending on the force of the gesture. The LDV method may provide a powerful technique for measuring facial expressions (including micro-expressions), which have attracted considerable interest in the assessment of affect and credibility. Supported by DoDPI grant DASW01-03-0002.

STUDYING FUNCTIONAL CONNECTIVITY IN THE BRAIN WITH CROSS-CORRELATIONAL ANALYSIS OF OPTICAL IMAGING DATA

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Descriptors: optical imaging, functional connectivity, task switching

A new non-invasive brain imaging technique, optical imaging, was used to study age-related differences in frontal lobe activity during task switching in a spatial Stroop task. The good temporal and spatial resolution of optical imaging was exploited to investigate the spread of the activity, as well as the associations (functional connectivity), between cortical regions. We considered a regularly spaced grid that covers the cortical area of interest (frontal and prefrontal zones) on the brain surface projected onto a plane. The time series associated with each pair of locations on the grid were cross-correlated at different lags, ranging from 0 to 240 ms. The number of positive cross-correlations was largest at lags 0 and 240 ms, while negative cross-correlations peaked at lag 144 ms. Similar autocorrelation patterns were observed in young and old adults, presumably resulting from a neural oscillatory activity. Cross-correlations between distant locations reflect synchronous activity in different cortical areas, perhaps reflecting excitatory or inhibitory connections. Connectivity patterns varied as a function of age. Old adults showed a significantly smaller number of negative correlations at 0 lag (which suggests lack of inhibitory processes), and almost no (positive or negative) cross-correlations at longer lags. The latter may reflect a lack of long-term coherence between cortical areas. Analyses of lagged cross-correlations between different brain areas illustrate the application of optical imaging as a tool for investigating functional connectivity in the human brain.

EFFECTS OF NON-CONSCIOUSLY PROCESSED EMOTIONAL PICTURES ON SUBJECTIVE REACTIVITY

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Descriptors: emotion, unconsciousness

Research on emotional modulation of defensive reflexes in humans typically use intense and instantaneous noise for its elicitation. Recent studies using masked emotional pictures have shown that the defensive reflexes (cardiac defense and startle) can be preattentively modulated. Two of these studies have also examined the subjective reactivity to the noise eliciting the reflexes. In study one 42 female spider phobics were randomly assigned to conscious (24 S) or non-conscious (18 S) presentation of pictures of spiders or flowers paired with a 500 millisecond noise. In the second study 24 female small animal (spider or snake) phobics were exposed to phobic, neutral and pleasant foreground pictures presented either consciously (12 S) or non-consciously (12 S) paired with a 1000 millisecond noise. The results in the first study showed that the probe was evaluated as more unpleasant when presented with the phobic picture than when presented with the non-phobic picture for both conscious and non conscious groups. The results in the second study showed that the noises presented with the phobic and pleasant slides were evaluated as more intense and unpleasant than the noises presented with the neutral slides. These findings are consistent with the notion that subjects can obtain autonomic feedback to which they have non-conscious access from non-consciously processed threat stimuli.

SAME BRAIN, DIFFERENT DAY: AFFECTIVE CONSISTENCY IN FMRI AND EEG

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Descriptors: emotion, fMRI, EEG

Understanding the neural circuitry involved in affective picture perception requires spatially and temporally sensitive measures of functional activity. The late positive potential of the picture-onset ERP shows reliable modulation by emotional arousal; a similar pattern of arousal modulation is found for BOLD fMRI signal change in visual cortex. In the current dataset, both 256-channel EEG and 3T fMRI were recorded while 18 subjects viewed a series of 60 pleasant, neutral, and unpleasant pictures, balanced for brightness, contrast, spatial frequency, and complexity, and including a central fixation point. Initially subjects viewed the picture series while 3T fMRI data were collected in 2 prescriptions covering visual cortex and anterior subcortical areas; a second identical session collected EEG and peripheral physiological data in a simulated MR scanner. Results demonstrate greater BOLD signal change during arousing compared to neutral picture perception in lateral occipital, medial parietal, and fusiform visual cortex, frontal eye fields, caudate, and amygdala. The LPP was also modulated by picture arousal. Interestingly, although collected on separate days, a strong, positive correlation was found between LPP positivity and BOLD signal change in fusiform gyrus and medial parietal cortex, suggesting that these distinct measures gauge the same neural sensitivity to emotional stimuli.
ATTENUATION OF AUDITORY ERPS TO STIMULUS REPETITION: REFRACTORINESS VS. INHIBITION

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Descriptors: N1, auditory sensory memory

Stimulus repetition results in the attenuation of event-related neural responses. In particular, the auditory N1 decreases in amplitude with stimulation rate. However, there have also been reports of N1 enhancement with rapid stimulation (SOAs < 400 ms). We examined the N1 to trains of four tones presented at 2.5, 3.33, 5, and 10 Hz. Instead of a dependence on the stimulation rate, the N1 amplitudes were determined by the latency of the response from the onset of the train. N1 amplitudes were largest to the first tone, decreased to the response to tones 400 ms after train onset, and were relatively stable thereafter. These results cannot be explained by a mechanism of neural refractoriness and suggest that N1 attenuation to repeated sounds is due to some type of inhibitory process. The few hundred ms prior to full response attenuation may reflect a period of auditory integration for similar stimuli, which may be critical in defining auditory events and separating them from the rest of the acoustic environment. Such an inhibitory mechanism may be critical for perceptual and sensory memory processes.

AUDITORY ERPS REFLECT TEMPORAL INTEGRATION AND TEMPORAL RATE SENSITIVITY

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Descriptors: MMN, auditory sensory memory

Like other sensory systems, the auditory system is particularly sensitive to change. The mismatch negativity (MMN) reflects the outcome of a preattentive neural change-detection process. The MMN reflects the degree of deviance in auditory stimuli. It is also sensitive to more elaborate stimulus properties, such as context and convergence of features. We examined the MMN to manipulations of the intervals between identical tones. Trains of four tones with stimulus onset asynchronies (SOAs) of 100, 200, 300, or 400 ms were followed by a fifth tone preceded either by the same SOA or one of the three other SOAs. The logarithm of the deviant/standard interval ratio predicted the relative amplitude of the mismatch response. This pattern held for both short and long deviants. In addition, when the deviant interval was 100 ms, the response was qualitatively different from the typical MMN. This suggests a differential processing of deviants that unexpectedly occur within the temporal window of integration. These findings are important for understanding the operation of auditory sensory memory.

NEURAL CORRELATES OF AUDITORY SENSORY MEMORY AND AUTOMATIC CHANGE DETECTION

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Descriptors: MMN, fMRI, sensory memory

An auditory ERP component, the mismatch negativity (MMN), reflects automatic change detection and its prerequisite, sensory memory. This study examined the neural correlates of automatic change detection using BOLD fMRI and two rates of presentation previously shown to induce either a large or no MMN. A boxcar block design was employed in two functional scans, each performed twice. A block consisting of 1000-Hz standards (S) alternated with one consisting of 1000-Hz standards and 2000-Hz infrequent deviants (S+D). Presentation rate was either 150 or 2400 ms. Fourteen participants were instructed to ignore all auditory stimulation and concentrate on a film (no audio) by reading subtitles. Data analysis used SPM99 and random effects analysis. Cluster statistics (p < .05, corrected) were employed at a height threshold of p < .001. At the short ISI, there was a significant BOLD response in the right superior temporal gyrus (STG), the left insula, and the left STG (including parts of primary auditory cortex). There were no suprathreshold clusters at the long rate, with S+D blocks inducing no greater activity than S blocks. A comparison between the two rates showed the short rate to evoke significantly greater right STG activity, supporting the hypothesis that sensory memory is involved in automatic change detection.

TIME-DEPENDENT RESPONSES OF HEART RATE VARIABILITY TO POSTURAL CHANGE

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Descriptors: heart rate variability, spectral analysis, cardiac autonomic activity

Spectral analysis of heart rate variability (HRV) has been utilized in assessing cardiac autonomic response to behavioral tasks. Because the analysis provides averaged features over the entire length of a time series, the dynamic aspect of HRV, for example, time-dependent change is difficult to assess. The present study examined time-dependent responses of the low-frequency (LF) and high-frequency (HF) component of HRV to postural change. ECG and respiration in 10 students were recorded during a 5-min supine period followed by a 5-min standing period with paced breathing at 0.25 Hz. After spectral analysis by Fourier transform was performed on R-R interval data in each period, the time-dependent changes in the amplitudes of LF and HF component were assessed by inverted Fourier transform. The HF amplitudes decreased throughout the standing period (p < .01), although the LF amplitude showed no significant change in both the supine and standing periods. The LF:HF ratio during the standing period was higher than in the supine period (p < .01). Additionally, there was an increase in the LF:HF ratio of nearly 60 sec at the beginning of standing period and a subsequent decrease in that to the initial LF:HF ratio’s level of the standing period. In the standing period, significant correlation coefficients between LF and HF amplitudes were observed in 7 subjects (r = .17 – r = .58). These results suggest that the continuous assessment of HRV may provide detailed information about dynamic responses or harmonic fluctuations of cardiac autonomic activity to postural change.
AFFECTIVE PICTURE PROCESSING IN PTSD AND SCHIZOPHRENIA: A MEG STUDY

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Descriptors: affective picture processing, emotion, magnetoencephalography

Viewing affective pictures elicits emotional reactions in self-report, autonomic and somatic measures. Brain imaging shows that this selective attention to emotional picture content is accompanied by widespread activation in the human cortex. By means of whole-head MEG, the present study aimed 1) at assessing group processing differences when affective information is presented to torture victims, schizophrenics and healthy participants and 2) at elucidating which brain areas contribute to the processes and which neural basis underlies the experience and the expression of fear. MEG recordings were obtained from 13 schizophrenia inpatients, 12 torture victims with current symptoms of PTSD and 10 healthy controls during affective picture viewing. Picture-evoked magnetic fields showed significant differences between the two groups of patients and the control group. Patients with PTSD exhibited a different magnetocortical activation when compared with healthy controls and schizophrenic patients and displayed enhanced responses to emotionally charged and trauma-related stimuli. Schizophrenic patients with distinctive affect disturbances showed a stronger activation pattern to neutral pictures. Healthy participants exhibited a generally early activation which was stronger to emotionally arousing (pleasant and unpleasant) pictures that it was to neutral ones. The excessive vigilance seen in patients with PTSD may be associated with increased demands on brain areas involved in visuospatial processing, including prefrontal and parietal cortex which underlie the symptoms of PTSD.

AUTONOMIC RESPONSES IN ADULTS TO EMOTION REGULATION TASKS

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Descriptors: adult temperament, emotion regulation, heart rate variability

Emotion regulation (ER) influences the experience, expression, and nature of emotions. Research on affect regulation has focused on infants and young children. In contrast, there are few studies of ER in adults despite the crucial role such skills play in adaptive psychological and social functioning, and the salience of impaired affect regulation in psychopathologies such as anxiety and depression. Physiological aspects of adult affect regulation were examined using two dimensions derived from the Adult Temperament Questionnaire (ATQ): negative affect (NA) and effortful control (EC). Four experimental groups were created from 24 males and 53 females who were recruited based upon their screening ATQ scores: high NA/high EC, low NA/low EC, high NA/low EC, low NA/high EC. The electrocardiogram and impedance cardiogram were recorded during rest and stressors tasks that were selected to evoke differences in emotion regulation. A significant EC X NA X task interaction for heart rate (HR) (p = .04), and similar marginal interaction for high frequency ECG spectral power (HF) (p = .06), was found, with lower resting HR in the low EC/low NA and high EC/high NA groups and higher resting HF power in the low EC/low NA group. EC subscale inhibitory control was predictive of higher resting HF for females (R^2 = .99), and the Extraversion subscale sociability was a significant predictor of pre-ejection period during the stressor tasks (R^2 = .08), with low sociability linked with stronger sympathetic response. Regulatory skills appear to be linked with individual differences in temperament.

DIMINISHED ERROR-RELATED NEGATIVITY IN 10-YEAR-OLD CHILDREN WITH POOR SOCIAL BEHAVIORS

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Descriptors: ERN, sociability, children

The error-related negativity (ERN) is a fronto-centrally distributed negative deflection in the ERP component following error responses and reflects activity of a general response checking mechanism. Adult research has demonstrated that the ERN is influenced by affect, socialization, compulsiveness, impulsivity and the amount of investment individuals have in a task. For example, Dikman and Allen (2000) found that low-socialized adults had smaller ERNs on punishment trials compared with high-socialized adults. Little research has been directed toward the ERN in children and in relationship to behavior. We studied the ERN in relation to children’s aggressive and poor social behaviors using items from the self-report psychoticism scale of the Junior Eysenck Personality Questionnaire-Revised. ERPs were recorded from 38 10-year-old children from midline scalp sites during a visual flanker task. We examined the ERN on error trials. We found that, whereas aggressive behavior was unrelated to the ERN, children who reported poor social behaviors exhibited smaller ERNs at FCz compared with children who reported no poor social behaviors. One interpretation is that children with poor social behaviors are less concerned about performance on the task. The present study lends support to previous research demonstrating that the ERN component may be influenced by social behavior and/or the extent to which subjects care about making a mistake. This study also extends these findings to children within the normal range of social behaviors.

WHAT DOES BLOOD PRESSURE TELL ABOUT GENDER-RELATED DIFFERENCES IN EMOTIONAL REACTIVITY TO VISUAL STIMULI?

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Descriptors: gender differences, blood pressure, emotion

In prior research on autonomic responding to emotional pictures, blood pressure measures have often been neglected. Indeed, blood pressure is an important indicator of cardiovascular reactivity, especially when gender-related differences are considered. The current study was aimed at investigating the effects of gender on the magnitude and patterning of blood pressure responses to pleasant and unpleasant, high arousal visual stimuli. Systolic and diastolic blood pressure (SBP and DBP), as well as heart rate (HR) and skin conductance (SCR) emotional responses were investigated during picture viewing in 21 female and 25 male students. Highly and equally arousing contents were selected from the International Affective Picture System, including 2 pleasant (erotic couples and human bodies) and 2 unpleasant (threat and blood) categories. Each picture was presented for 6s. No gender differences were found for SCR, with subjects showing the largest changes to erotic stimuli. A main effect of gender was found in HR changes, with women showing overall greater decreases than men. However, for both men and women the largest cardiac decelerations were elicited when viewing blood stimuli. Irrespective of gender, significant increases in both SBP and DBP were obtained for erotic stimuli. Moreover, erotic pictures specifically induced greater reactivity in men than in women. It is concluded that gender is an effective moderator of BP responses to erotic stimuli during picture viewing. These results are consistent with previous research showing that men are specifically more aroused by erotic visual stimuli compared with women.
Three experiments were conducted to investigate the effects of mental countermeasure against the detection of deception using P3. In each experiment, college students were divided into two groups: a countermeasure (CM) group, in which subjects were instructed to count backwards by sevens during the experiment as a mental countermeasure, and a non-countermeasure (NCM) group. Relevant stimuli were words that were interpolated into a sentence (Experiment 1), photographs of people's faces (Experiment 2), and words that were embedded in a sentence (Experiment 3). In Experiment 1 there were no differences in P3 amplitudes between CM and NCM groups. In Experiment 3, there were no differences in P3 amplitudes between CM and NCM groups. However in both experiments 2 and 3, P3 amplitudes elicited to relevant stimuli were larger than those to irrelevant stimuli in both CM and NCM groups. Thirteen of 15 subjects in the CM group and 14 of 15 subjects in the NCM group (Experiment 1), 15 of 16 subjects in the CM group and 11 of 14 subjects in the NCM group (Experiment 2) and 13 of 14 subjects in the CM group and all subjects in the NCM group (Experiment 3) were correctly detected. There were no differences in correct detection rate between CM and NCM groups, in each experiment. These findings indicate that mental countermeasure can reduce P3 amplitude but do no harm to correct detection rate.

Descriptors: detection of deception, countermeasure, P3

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COACTIVATION OF CARDIAC PARASYMPATHETIC AND SYMPATHETIC NERVOUS SYSTEM DURING HYPOGLYCEMIA

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Descriptors: heart rate, metabolism, autonomic nervous system

Despite sympathetic cardiac activation, hypoglycemia has little effect on heart rate (HR) in healthy persons. This pattern suggests parasympathetic coactivation. Hypoglycemic (2.7 mmol/l) and normoglycemic (4.7 mmol/l) hyperinsulinemic clamp studies were performed on 15 healthy adult subjects twice in a crossover design. There was a 485% plasma epinephrine increase during hypoglycemia. The 45% shortening of pre-ejection period demonstrated sympathetic cardiac activation. Increased parasympathetic activity was observed through increased HR variability as indexed by the root mean square of successive differences of interbeat intervals. HR did not change. The study demonstrates hypoglycemia stress-induced coactivation of both autonomic nervous system branches at the cardiovascular level. Parasympathetic mechanisms are involved in controlling HR change during hypoglycemia, and in healthy humans, hypoglycemia-induced sympathetic tachycardia may be obviated by countervailing parasympathetic mechanisms.

Descriptors: heart rate, metabolism, autonomic nervous system

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STIMULUS AUGMENTATION AND RESISTANCE TO STARTLE HABITUATION IN ADULT CHILDREN OF ALCOHOLICS

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Descriptors: stimulus augmenting, alcoholism risk, startle EMG

Compared to persons with no family history of alcoholism, adult children of alcoholics (ACOA) display reduced information processing due to hyperarousal of primary orienting and attention mechanisms. This results in an overestimation of and an over response to stimulus salience. The present study examined whether these processes are so powerful as to resist or block habituation. Fifty-two healthy, matched, nonalcoholic volunteers aged 22-45 years, served as participants. One group of 26 participants were ACOAs and the other 26 participants were not ACOAs (NACOAs). Attention operations were evaluated using skin conductance (SC) and eye-blink electromyographic (EMG) activity recorded during a standard acoustic startle paradigm presented during two sessions, one week apart. During each session subjects received an initial presentation of one 720 msec duration 114 dB(A) stimulus followed by five 40 msec presentations each of 90, 96, 102, 108, and 114 dB(A) stimuli with intertrial intervals randomized between 9-15 sec. Startle eye-blink EMG was sampled for 300 msec following each stimulus presentation, while SC was sampled for 5000 msec post-stimulus. Compared to NACOAs, ACOAs displayed significantly elevated startle EMG and significantly reduced SC orienting responses to all stimuli intensities. Trial by trial and session by session analysis showed virtually no EMG and SC habituation in the ACOAs. Across trials and sessions, NACOA subjects displayed the expected significant habituation to the startle stimuli. Overall, the results support the presence attention and encoding differences between ACOAs and NACOA subjects. The stimulus augmentation of the ACOAs appears so robust that it blocks paradigmatic manipulations designed to enhance habituation.

Descriptors: detection of deception, countermeasure, P3

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COACTIVATION OF CARDIAC PARASYMPATHETIC AND SYMPATHETIC NERVOUS SYSTEM DURING HYPOGLYCEMIA

Hartmut Schachinger1, Johannes Port2, Stuart Brody1,3, Lilly Linder1, Peter R. Huber1, Daniel Cox4, & Ulrich Keller1

1University Hospital, Basel, Switzerland; 2University of Stuttgart, 3University of East Asia, 4Hiroshima Shudo University

Descriptors: heart rate, metabolism, autonomic nervous system

Despite sympathetic cardiac activation, hypoglycemia has little effect on heart rate (HR) in healthy persons. This pattern suggests parasympathetic coactivation. Hypoglycemic (2.7 mmol/l) and normoglycemic (4.7 mmol/l) hyperinsulinemic clamp studies were performed on 15 healthy adult subjects twice in a crossover design. There was a 485% plasma epinephrine increase during hypoglycemia. The 45% shortening of pre-ejection period demonstrated sympathetic cardiac activation. Increased parasympathetic activity was observed through increased HR variability as indexed by the root mean square of successive differences of interbeat intervals. HR did not change. The study demonstrates hypoglycemia stress-induced coactivation of both autonomic nervous system branches at the cardiovascular level. Parasympathetic mechanisms are involved in controlling HR change during hypoglycemia, and in healthy humans, hypoglycemia-induced sympathetic tachycardia may be obviated by countervailing parasympathetic mechanisms.

Descriptors: heart rate, metabolism, autonomic nervous system

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CONFIGURAL PROCESSING IN FACE ENCODING: AN EVENT-RELATED BRAIN POTENTIAL STUDY

Marten K. Scheffers, Austin Nichols, Rachael Fares, & B. Michelle Peruche

Florida State University

Descriptors: face perception, N170, event-related potentials

Theories of face perception postulate that spatial-relational (i.e. configural) information plays a key role in the identification of persons. The contribution of configural and by-parts processing was investigated with event-related potentials (ERP) in an identity matching task. Twenty participants decided whether two sequentially presented face pictures depicted the same or a different person. Faces were cropped so as not to show hair, ears, and chin line. There were three picture types: intact, noise (blurring of detail should increase the dependence on configural processing), fragmented (expected to enhance the dependence on by-parts processing). Both an upright and inverted presentation condition were used. ERPs to the first face picture elicited a large P1 (about 135 ms) and N1 (about 195 ms) at electrode sites PO7 and PO8 with right hemisphere dominance. ERPs for noise and fragmented faces were compared to the ERPs for the intact faces. The results suggest that noise added to the face picture reduced the N1 amplitude, whereas fragmentation of the face only slightly increased the N1 amplitude. Inverted faces relative to upright faces elicited an increased N1 (PO7) for intact faces and a reduced N1 (PO8) for noise and fragmented faces. The implications of these findings for theories of face perception and the neural basis of face processing will be discussed.

Descriptors: face perception, N170, event-related potentials

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COACTIVATION OF CARDIAC PARASYMPATHETIC AND SYMPATHETIC NERVOUS SYSTEM DURING HYPOGLYCEMIA

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Descriptors: face perception, N170, event-related potentials

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EXAGGERATING EMOTIONS: PHYSIOLOGICAL CORRELATES AND COGNITIVE CONSEQUENCES

Brandon J. Schmeichel, Heath A. Demaree, & Jennifer L. Robinson
Case Western Reserve University

Descriptors: emotion, regulation, cognition

Emotion exaggeration has been an understudied affect regulation strategy. The present research explored the physiological correlates and cognitive consequences of exaggerating positive and negative affect. Participants viewed either a disgust- or amusement-eliciting film clip and were instructed either to react naturally or to exaggerate their emotional response. Participants who exaggerated their emotions showed increased heart rate and increased sympathovagal reactivity relative to participants who were not instructed to exaggerate their emotions. Exaggerating emotions also led to poorer performance on subsequent tests of verbal and figural fluency (left- and right-frontal tasks, respectively). The adverse effect of emotion exaggeration on subsequent cognition was most evident in the negative affect condition. Cognitive performance after emotion exaggeration supported predictions derived from the limited resource model of self-regulation (Muraven & Baumeister, 2000). Further, cognitive deficits were not mediated by the increased heart rate and increased sympathovagal reactivity associated with emotion exaggeration.

WE CAN WORK IT OUT: RELATIONAL PRONOUNS, PHYSIOLOGY AND BEHAVIOR IN MARITAL CONFLICT

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Descriptors: Marriage, language, physiology

This study examined the relationship that certain categories of words spoken during marital conflict have with concomitant physiological and emotional responses and with marital satisfaction. Seventy nine middle-aged (40–50 years old) and 73 elderly (60–70 years old) couples engaged in a 15 minute conflict conversation during which physiology, emotional behavior, and subjective emotional experience were continuously measured. Verbatim transcripts were coded into three lexical categories that reflect different degrees of “togetherness”: (a) We-words: pronouns that focus on the couple; (b) Me-words: pronouns that focus on the self; and (c) You-words: pronouns that focus on the other spouse. Analyses revealed that greater use of We-words predicted slower heart rates, more positive emotional behavior, and more positive self-report of emotion. Greater use of Me-words predicted faster heart rates, more negative emotional behavior, and lower marital satisfaction. Greater use of You-words predicted more negative emotional behavior and lower marital satisfaction. We conclude that: (a) greater use of words that imply togetherness (We-words) are associated with more emotionally positive and more physiologically calm interactions, and (b) greater use of words that imply separateness (Me-words, You-words) are associated with more emotionally negative and more physiologically aroused interactions and with less satisfied marriages.

DO INCENTIVES INFLUENCE THE FLANKER-COMPATIBILITY-EFFECT?

Jan Seifert, Johannes Hewig, Ewald Naumann, Dirk Hagemann, & Dieter Bartussek
Universität Trier

Descriptors: Flanker task, emotional regulation of attention

The relationship between attentional and motivational processes is an increasing matter of research. It is a crucial topic for understanding “healthy” human information processing as well as it’s clinical aspects (e.g. anxiety or ADHD). The aim of the present study was to find a suitable paradigm to explore interactions of this kind. Event-related potentials (ERPs) were recorded from 24 Ss (aged 20–28 yrs) in a reaction time task. This task combined a standard paradigm of attention research - the Eriksen-or Flanker-task - with a motivational manipulation. A discriminative stimulus at the beginning of each trial specified positive, negative or no reinforcement in order to elicit three different motivational states: approach, (active) avoidance and a non-reinforced neutral state. A choice reaction task followed. Flanking distractors indicated a response, which was identical, neutral or opposite to the appropriate response. A first analysis indicated that the manipulation of motivation and attentional selection were successful. However preliminary analyses suggest, that for reaction times to the imperative stimulus the motivational and attentional main effects were significant, but their interaction was not. Amplitudes of event-related potentials (N2, P3) following the imperative stimulus again showed both main effects but no interaction. Our preliminary data suggest that the flanker-compatibility-task cannot shed light on the mutual influence of attention and motivation. (Supported by Deutsche Forschungsgemeinschaft, grant HA3044/2-1)

THE P300 AS A TYPING TOOL: TESTS OF BRAIN COMPUTER INTERFACE WITH AN ALS PATIENT

Eric Sellers1, Gerwin Schalk2, & Emanuel Donchin1
1Department of Psychology, University of South Florida, 2Wadsworth Center, New York State Dept. of Health and SUNY- Albany

Descriptors: Brain-Computer Interface, P300, Assistive Devices

Farwell and Donchin (Electroenceph. Clin. Neurophys. 1988, 70, 510–523) described a P300 based Brain Computer Interface (BCI) that may provide locked-in patients with a means of communication. The subject is presented with letters and symbols, organized in a 6 by 6 matrix. Every 125 msec either a row, or a column, of the matrix is intensified for 100 msec. The subject focuses attention on the cell containing the character to be communicated. When intensified, the row and column containing the attended character elicit a P300, while the other 10 rows and columns do not. Thus, a computer can identify the character the subject has selected by detecting which row and column elicited a P300. Donchin, E., Spencer, K. M., & Wijesinghe, R (IEEE Trans. Rehab. Engineering, 2000,8, 174–179) reported successful communication at a rate of up to 8 characters/minute with 80% accuracy. We report here the first attempts to evaluate the use of the P300 based BCI by a patient suffering from ALS. The tests were conducted at the home of the patient, a 64 year old male who at the time of testing retained the ability to move his eyes horizontally. The patient was tested for several hours over 4 days. In general, the target stimuli did elic it a P300 from the patient, and on occasion the computer successfully identified correctly both the row and the column. However, many difficulties were encountered in this environment. We will discuss the technical, and the operational, problems that arise when an ALS patient attempts to use the BCI, and various solutions we developed for these problems. The solutions were tested with able bodied subjects.
NEGATIVE SLOW WAVE DURING ENCODING OF EMOTIONAL STIMULI IN A FREE RECALL TASK

Avgusta Shestyuk, Brooks King-Casas, & Patricia Deldin
Harvard University

Descriptors: Slow Wave, Emotion, Memory

Whereas initial categorization and encoding of emotional information indexed by the late positive ERP component (LPC) has been widely demonstrated, neural correlates of the sustained processing of emotional stimuli that are thought to contribute to subsequent recall of information remain largely unknown. This study investigated negative slow wave (SW) components of the ERP to determine whether they may index encoding processing of emotional stimuli related to subsequent memory performance. EEG data were collected from 9 sites during the encoding phase of a free recall paradigm from 15 participants. Stimuli comprised 30 neutral, 30 self-relevant positive and 30 self-relevant negative words, presented in five blocks of 18. Remembered words, as compared with forgotten, elicited greater amplitudes of the LPC and the late SW (1850–3500 ms). Additionally, SW but not LPC amplitudes were greater for emotional relative to neutral words. Finally, there was an increase in SW-indexed processing of negative relative to positive words frontally, and increased processing of positive relative to negative words parieta!. These data suggest that SW components index sustained encoding processes that are essential for successful memorization of information and may contribute to preferential memory for emotional stimuli.

MULTIPLE LEVELS OF LETTER REPRESENTATION EXAMINED THROUGH THE ENCODING-RELATED LATERALIZATION METHOD

Eunsam Shin, Monica Fabiani, & Gabriele Gratton
University of Illinois at Urbana-Champaign

Descriptors: Encoding-related lateralizations; event-related brain potentials; visual memory

We investigated different levels of letter representation using the encoding-related lateralization (ERL) method. This method isolates ERP activity related to visual memory by examining the relationship between the lateralization of the brain response elicited by a centrally presented probe and the hemifield of study presentation of the same stimulus. Earlier studies indicate that there may be multiple forms of ERL activity (e.g., Gratton et al, 1998, Psychophysiology, 35, 348–351). Here we used a memory search task in which the memory set (2 or 4, half on each side of fixation) was always presented in upper case, and the test stimulus was presented foveally in upper or lower case. The data indicate multiple levels of ERL activity: (1) An ERL peaking at 180 ms latency, restricted to the P7/P8 electrode, occurring when the test stimulus case matched the memory set stimulus (independently of set-size), which may depend on a physical representation of the stimulus acquired through a parallel process; (2) a diffuse activity of opposite polarity peaking at 300 ms and independent of case and set-size, suggesting that by this latency a symbolic form of representation is achieved; (3) a posterior long-latency ERL sensitive to both case and set-size, perhaps reflecting the emergence of a form of physical representation in which different letters are joined in a single object, consistent with a feature conjunction level of analysis. These data indicate that the ERL can be used to examine the progressive extraction and analysis of stimulus features.

ELECTROPHYSIOLOGICAL EVIDENCE FOR TEMPORAL OVERLAP BETWEEN MEMORY SCANNING AND MOTOR PREPARATION

Eunsam Shin, Monica Fabiani, & Gabriele Gratton
University of Illinois at Urbana-Champaign

Descriptors: Memory search; the lateralized-readiness potential (LRP); serial vs. parallel processing

Although evidence from the Lateralized Readiness Potential, or LRP, indicates that partial information may in some cases be transmitted to the response system before processing is completed, a question remains about whether this phenomenon is general, and also extends to each individual sub-process. Heil et al. (1999, Psychological Research, 62, 289–299) found no evidence of transmission of partial information in a memory search task. We therefore ran a similar study, in which factors were chosen to affect selectively particular information processing stages: Letter-case, memory set size (2 and 4), and a choice/go-no-go procedure were chosen to tap different information processing stages (i.e., encoding, scanning, motor preparation). The case of the test stimulus determined the hand to use. The membership of the test stimulus in the memory set determined whether a response should be made or not. Although behavioral data showed additive effects on RT, the LRP data suggested that the hand information provided by the letter-case was transmitted to the motor response system irrespective of the completion of the memory scanning process. Thus, in contrast with the Heil et al. study, the LRP data supported a continuous model of information processing. This difference may be due to a greater stress on speed in our study. However, the response-related LRP's for set sizes 2 and 4 were identical, suggesting that partial information acquired during memory comparison cannot be transmitted to the response system. This suggests that memory comparison operates as a discrete module.

WHY PEOPLE CHANGE: DOES PHYSIOLOGY PREDICT CHANNEL CHANGING BEHAVIOR?

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Descriptors: television, channel changing, attention

Understanding why people change television channels has long been a goal of programmers, researchers, and advertisers. Most research in this area has used self-report methods (surveys and diaries) which rely on viewers’ conscious recollection of past events. In this study, we looked at how a viewer’s mental effort (e.g. heart rate) and physiological arousal (SC) during viewing were related to changing the channel. We asked if there is a discernable physiological pattern associated with a channel changing behavior. Two groups of subjects (college students and older viewers) viewed on a four station system with different local television newcasts on all four channels. Participants were encouraged to change channels any time they wanted to (as they would at home) using a remote control device. Heart rate and skin conductance were continuously recorded. Results show HR increases steadily in the 10 seconds prior to a channel change and then decreases in the 10 seconds following a channel change. The reverse pattern was found for tonic SC which decreases steadily in the 10 seconds prior to a channel change and then increases following the change. We also measured the viewers’ recognition memory before and after the change and found, as with heart rate, that recognition is decreasing preceding a change and then increases following the change. Older viewers showed less improvement in memory following the channel change. Thus, attention, arousal, and encoding all decrease in the seconds preceding a channel change, and increase in the seconds which follow the channel change.
DISTRIBUTED NEURONAL NETWORKS FOR SEMANTIC INFORMATION: MISMATCH NEGATIVITY TO ACTION WORDS

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Medical Research Council, Cognition and Brain Sciences Unit, Cambridge, U.K.

Descriptors: word processing, cortical memory traces, MMN

Mismatch negativity (MMN), an index of experience-dependent memory traces, was used to investigate the processing of action-related words in the human brain. Responses to auditory presented movement-related English words were recorded in non-attend odd-ball paradigm using a high-density EEG set-up. MMN was calculated using responses to the same words presented as standard and deviant stimuli in different sessions to avoid contamination from phonetic-acoustic differences. The topography of the mismatch negativity to action words showed unusual centro-posterior distribution of the responses suggesting that activity was at least in part generated posterior to usually observed frontal MMNs. Moreover, responses to hand-related word stimulus ('pick') had a more spread-out lateral distribution, whereas leg-related stimulus ('kick') elicited a more focal dorsal negativity. These differences, remarkably reminiscent of sensorimotor cortex topography, were confirmed by source analysis (minimum-norm current estimates), which also suggested differentially distributed activation for the two stimuli. We suggest that these results indicate activation of distributed neuronal assemblies which function as category-specific memory traces for words and may involve sensorimotor cortical structures for encoding action words.

AN ERP STUDY OF WORKING MEMORY DEFICITS IN SYSTEMIC LUPUS ERYTHEMATOSUS

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State University of New York at Buffalo

Descriptors: P3, working memory, go/no-go

Up to 70% of patients with Systemic Lupus Erythematosus (SLE) have deficits in cognitive functioning, and these deficits are associated mainly with processing speed and working memory (WM). We hypothesized that the P3 component of the ERP, recorded during a verbal and spatial WM task (V-WM; S-WM), would reflect these deficits in SLE, and that P3 measures would be related to performance on the paced auditory serial addition test (PASAT), which places high demand on processing speed and WM. Participants were 16 SLE patients and 16 controls. ERPs were recorded to the encoding, maintenance, and match (Go), or no match (NoGo) stimuli of the WM tasks. For S-WM, controls had greater P3 amplitude than SLE patients at the parietal site (Pz) for Go and NoGo, but not for the encoding or maintenance stimuli. At the frontal site (Fz), SLE patients had greater P3 amplitude than controls for the encoding and maintenance stimuli, but not for Go or NoGo. These findings were not present for V-WM. The P3 measures for the S-WM task were then compared between SLE patients divided into high and low PASAT performance groups. The high PASAT group had greater P3 amplitude at Pz for Go and NoGo and lower P3 amplitude at Fz for encoding and maintenance compared to the low PASAT group. The findings suggest that the P3 amplitude differences between SLE and controls are dependent on the different cognitive elements of the WM task and on the electrode sites. Further, the P3 relationships with PASAT performance provide evidence that the ERP is sensitive to processing speed and WM deficits in SLE.

SUSTAINED PROCESSING ON THE STROOP TASK IN DEPRESSION

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University of Pittsburgh, School of Medicine

Descriptors: Stroop, pupil dilation, fMRI

Depressed individuals frequently display disruptions in selective attention, but the time course and specificity of these difficulties are not well understood. To address these questions, 15 healthy and 16 unmedicated depressed adults completed a Stroop task (12 s ISI); pupil dilation was recorded as a measure of cognitive load. Both groups took longer to name the color for incongruent than congruent trials. Pupil dilation was also higher for incongruent trials than for congruent trials across groups suggesting that pupil dilation reflected cognitive load on the task. Depressed individuals displayed decreased pupil dilation in the seconds following stimuli relative to controls. Computational neural network modeling suggested the observed effects were consistent with disruptions in dorso-lateral prefrontal cortex function leading to decreased cognitive control. A subset of the same individuals retook the task during concurrent measurement of pupil dilation and fMRI (3 Tesla, TR = 1.5 s, TE = 26 ms, FOV = 24 mm, 34.32 mm slices, reverse spiral pulse sequence). Patterns of pupil dilation were similar in and out of the magnet. Regression analyses suggested that while prefrontal activity was marginally decreased in depressed participants pupil dilation better reflected subgenual anterior cingulate activity in these individuals. Together these data suggest that disruptions in selective attention in depression could involve decreased task engagement and more engagement of structures associated with emotional processing.

DIFFERENCES IN PUPIL DILATION ASSOCIATED WITH EMOTION REGULATION IN DEPRESSED AND NEVER-DEPRESSED INDIVIDUALS

Greg J. Siegle, Christine Larson, Lisa Farnace, Howard Aizenstein, Bruce Smith, & Michael E. Thase
University of Pittsburgh

Descriptors: emotion, pupil dilation, depression

Dysregulated emotional reactivity is a hallmark of depression. It is unclear whether depressed individuals put in less effort at emotion regulation or put in the same effort but are less successful than healthy individuals. To address this question, we used pupil dilation to gauge cognitive load on tasks that could regulate emotional engagement. Seven depressed and seven never-depressed participants alternately considered the personal relevance of affective words (5 s) followed by one of four strategies (10–15 s): 1) maintain considering the word’s personal relevance, 2) rephrase how the word is not relevant to them, 3) a prefrontal distracting task (digit sorting), or 4) another distracting task (visual search). As expected, depressed individuals displayed marginally sustained pupil dilation following affective words. The groups displayed increased dilation to distraction tasks relative to maintenance or reappraisal, and similar dilation to maintenance. Depressed individuals had higher and more sustained pupil dilation during reappraisal and decreased dilation to distracting tasks compared to controls. Depressed individuals’ increased dilation during reappraisal suggested that they put in at least as much effort as controls during reappraisal. Their decreased dilation to the distracting tasks is consistent with either multiple problems in emotion regulation or decreased cognitive load for more demanding tasks. Further studies involving fMRI can help to distinguish between these hypotheses.
THE INFLUENCE OF CHRONIC SERTRALINE ADMINISTRATION ON THE LOUDNESS DEPENDENCE OF THE AUDITORY EVOKED POTENTIAL IN HEALTHY SUBJECTS

Julian G. Simmons1,2, Nicholas B. Allen1,2, Gregor Berger2, & Pradeep J. Nathan3
1 University of Melbourne, 2 ORYGEN Research Centre, 3 Swinburne University

Descriptors: LDAEP (Loudness Dependence of the Auditory Evoked Potential), Serotonin, SSRIs (Selective Serotonin Reuptake Inhibitors)

The loudness dependence of the auditory evoked potential (LDAEP) has been proposed as an indicator of central serotonergic activity, such that strong LDAEP reflects low serotonergic function. In order to assess this technique in a study examining the role of serotonin in affective processing, 33 healthy participants (21 female) with no current or lifetime history of psychiatric illness were administered sertraline (a Selective Serotonin Reuptake Inhibitor; SSRI) or a placebo for 21 days in a double blind experiment. On day 21 the LDAEP was assessed in all participants. Five hundred tones were presented in a pseudo-randomized order with an equal number of tones of differing intensities (60, 70, 80, 90 and 100 dB SPL) across five blocks. The magnitude of the N1/P2 peak was assessed at each of the tone intensities at each of 9 scalp sites. The LDAEP was obtained at each site for each participant by calculating the slope of the linear equation obtained by least squares regression of the N1/P2 amplitude on the logarithm of tone intensity. The LDAEP effect was observed, with its magnitude found to be greatest at Cz. Furthermore, the magnitude of the LDAEP at Cz was significantly lower for the group administered sertraline compared to those receiving a placebo. This indicates that the augmentation of serotonergic function induced by chronic SSRI administration results in a reduction in the LDAEP in healthy subjects, consistent with predictions. This finding supports the use of the LDAEP as a non-invasive measure of brain serotonergic activity.

INCREASED P300 AMPLITUDE FOR AFFECTIVE CATEGORIZATION IN CANNABIS USERS: RELATIONSHIP TO POSITIVE SYNDROME SCHIZOTYPY

Patrick D. Skosnik1, Sohee Park2, Laura Dobbs, & Wendi Gardner3
1 Indiana University, 2 Vanderbilt University, 3 Northwestern University

Descriptors: Cannabis, Affective/Visual ERP, Schizophrenia

The relationship between the behavioral and psychopharmacological effects of cannabis and the positive syndrome of schizophrenia (SZ) has lead to an endocannabinoid hypothesis of psychosis. However, it is unclear whether there is also an association between cannabis use and the negative syndrome of SZ, particularly in relation to affective blunting. The present study examined whether cannabis use is associated with schizotypy, and utilized event-related potentials (ERP) to assess affective categorization of positive and negative trait words. It was found that cannabis users demonstrated increased P300 amplitude for negative trait words and scored higher on the schizotypal personality questionnaire (SPQ) subscales of the positive syndrome. Additionally, cannabis users scored lower on negative SPQ subscales, and a positive correlation was observed between the amount of self-reported cannabis use and positive syndrome scores. These data provide evidence that cannabis use is not associated with a dysregulation in affect processing or negative syndrome schizotypy, thus limiting an endocannabinoid model of SZ to the positive syndrome.

EXPOSURE UNDERLIES THE BENEFICIAL EFFECTS OF WRITTEN DISCLOSURE

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Temple University

Descriptors: cortisol reactivity, emotional disclosure, exposure

Little attention has been paid to understanding why Pennebaker’s written disclosure paradigm results in health benefits. To address the question of whether written disclosure is more effective when an individual writes about the same event across all three writing sessions, the present study randomly assigned individuals to either write about the same traumatic experience at each session, about a different traumatic experience at each session, or about a neutral topic. All participants completed measures of physical health and PTSD before the first writing session and at follow-up. Writing sessions took place on three consecutive days, for 20 minutes each session. At each writing session, subjective and objective (salivary cortisol) measures of emotional responding were collected. Results indicated that both disclosure conditions show significant improvements in psychological and physical health at follow-up compared to control participants. However, repeat disclosure participants showed significantly greater improvement compared to those who wrote about different traumatic experiences. For self-reported emotion, a significant reduction of negative affect occurred from the first to the last writing session for the repeat disclosure group only. Cortisol reactivity data revealed a similar pattern of findings. Cortisol reactivity during the first session was significantly related to improvement at follow-up for the repeat disclosure group only. These findings provide support for the hypothesis that exposure underlies the efficacy of the written disclosure paradigm.

TOWARD THE DEVELOPMENT OF A REAL-TIME, PSYCHOPHYSIOLOGICALLY-BASED AFFECT RECOGNIZER

Craig A. Smith, Leslie D. Kirby, Nilanjan Sarkar, & Pramila Rani
Vanderbilt University

Descriptors: affect recognition, peripheral physiology, pattern recognition

We describe recent progress toward developing a psychophysiological-based “affect recognizer” capable of differentiating identifying, in real time, the occurrence of several distinct affective states, including interest/engagement, boredom/fatigue, anxiety, and frustration. Using peripheral psychophysiological data (including parameters of cardiovascular functioning, electrodermal activity, and facial muscle activity in the brow and cheek regions), derived from a variety of cognitive problem-solving tasks designed to produce systematic variability in affective state (e.g., math problem-solving and anagram tasks in which difficulty was systematically manipulated), and by applying advanced signal processing and pattern-recognition techniques, we demonstrate the feasibility of developing such a recognizer using a person-centered, context-specific approach. In our initial study, we were able to find stable correlations (p < .01) within participants between specific parameters of physiology and emotional states of anxiety and engagement. Within individuals the patterns of correlation were somewhat different for the two states. However, the patterns observed for a given state, as expected, differed somewhat from person to person, further exemplifying the importance of employing a person-centered approach. Potential applications of this type of affect recognizer are considered.
AGING AND EMOTIONAL REACTIVITY: AFFECTIVE PICTURE PROCESSING IN OLDER AND YOUNGER ADULTS

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Descriptors: Emotion, Aging, Startle

Emotional reactivity to affective pictures was compared for 33 older (60–71 yrs) and 34 younger (18–23 yrs) healthy adults. Participants viewed 45 pictures (15 pleasant, 15 neutral, 15 unpleasant) for 6 s each and a 107 dB startle probe accompanied 36 pictures between 2–4 s after picture onset. The startle reflex, corrugator EMG, heart rate, and self-report measures of valence and arousal were collected. Self-report findings indicated that older adults reported an overall increase in pleasure and arousal compared to younger adults. The startle reflex also revealed an age effect such that older adults exhibited an increased startle response compared to younger adults. Further, this effect interacted with picture valence since older adults had greater potentiation for unpleasant pictures compared to younger adults. Older adults also exhibited decreased corrugator activity and less heart rate deceleration (D1) compared to younger adults. These results suggest that despite older adults’ reporting increased pleasure and arousal to affective pictures, they respond with decreased emotional reactivity along expressive physiological (corrugator) and ANS (heart rate) measures. Startle reflex findings suggest that older, compared to younger, adults may have a decreased ability to inhibit irrelevant stimuli during affective picture processing. Further, older, relative to younger, adults also exhibit greater startle reactivity to unpleasant material, which is consistent with their increased arousal ratings. Overall, findings indicated that the aging process affects emotional reactivity.

RAPID SERIAL PRESENTATION OF AFFECTIVE PICTURES ELICITS EMOTIONAL REACTIONS

J. Carson Smith, Andreas Löw, Margaret M. Bradley, & Peter J. Lang
University of Florida

Descriptors: facial EMG, mood, rapid picture presentation

Rapid presentation of a stream of pictures results in the conceptual masking of individual exemplars and a decay in recognition memory. Evoked-potentials indicate, nevertheless, that emotionally arousing pictures are discriminated from less affective images. The present experiment examines if emotion-related cortical, autonomic and somatic responses are manifest during, and persist after, rapid presentation of a picture stream. Maintenance of affective responding both during and after rapid picture presentation would confirm that emotional reactions are elicited. Blocks of all pleasant, all neutral, or all unpleasant pictures were presented at rates of 3 pictures per second (333 ms each; 60 pictures) and 7 pictures per second (142 ms each; 150 pictures). Each picture block lasted 20 s and was followed by a 30 s inter-block interval. Probe startle magnitude, corrugator muscle activation, and skin conductance responses were larger when viewing unpleasant compared to pleasant picture blocks, regardless of presentation rate. Furthermore, affective modulation of startle and corrugator activity persisted during the 30 s after picture presentation (although responses were smaller during the inter-block intervals). Zygomatic activity showed a larger response during pleasant pictures, but only at the faster, 7 Hz, rate. Overall, these findings suggest that despite conceptual masking, pleasant and unpleasant mood states are evoked by rapidly presented picture stimuli.

THE INFLUENCE OF PHYSICAL ACTIVITY AND NEGATIVE AFFECT ON THE STARTLE RESPONSE DURING AFFECTIVE PICTURE VIEWING

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Descriptors: facial EMG, mood, fast picture presentation

This study examined if being physically active influences emotional reactivity in those with and without increased negative affect. Depressed individuals have been shown to exhibit blunted physiological responses to pleasant emotional stimuli, while other research shows that physical activity reduces the risk of the future development of depression, and is an effective treatment for clinical depression. Thus, two hypotheses were tested: either habitual physical activity promotes normal affective reactivity in individuals with high negative affect, or high negative affect dominates affective disposition and affective reactivity to emotional pictures, regardless of physical activity habits. Four groups, who varied in negative affect and physical activity history, were tested. Participants viewed separate 4.5 minute consecutively presented series of all pleasant, all neutral, and all unpleasant pictures (36 per series), followed by a 3-min inter-series interval. Participants with high negative affect did not show normal appetitive attenuation of the acoustic startle response across the pleasant picture block, and non-physically active participants did not show significant aversive potentiation of the startle response during the unpleasant picture block. Taken together, these data indicate that those with negative affect do not respond appropriately to pleasant stimuli, and that normal levels of physical activity are related to normal reactivity to emotional stimuli.

HEART RATE CHANGES DURING ODORANT ADMINISTRATION: PROMOTION OF "COOL-DOWN" AND RECOVERY IN COLLEGE ATHLETES

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Descriptors: odorant administration, athletic performance

An often under-addressed aspect of athletic training, and even casual exercise, is the proper amount of time for "cool-down" and recovery. However, when an ample recovery period is not available, the likelihood of injury and overtraining increases while athletic performance decreases. Previous research has shown that odorants can affect one’s mood, motivation, and task performance. Moreover, peppermint odor is linked to enhanced athletic performance, while jasmine odor is a proven sleep aid. These unique odorant characteristics led to their inclusion within the present experiment in an attempt to determine whether jasmine and peppermint odors can enhance athletic recovery. In a within-subjects design, twenty athletes performed a modified version of the Bruce Stress Test Protocol on a treadmill for 15 minutes and then completed push-ups until exhaustion. Following 10 minutes of "cool-down" stretching in a peppermint, jasmine, or no-odor condition, physiological data were recorded and the participant completed questionnaires related to workload demands and mood. In addition, level of vigor was rated over the following twelve hours. Both jasmine and peppermint odors significantly reduced athletes’ heart rate following the “cool-down” period compared to the non-odorized control condition. Such a finding supports the hypothesis that odorants may have a substantial role in naturally and safely expediting recovery from physical exertion.
RIGHT ANTERIOR TEMPORAL LOBE LOSS PREDICTS DEFICITS IN EMOTIONAL COMPREHENSION: NEW STIMULI AND POSSIBLE MEDIATORS

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Descriptors: emotional comprehension, right temporal lobe

Neuronal loss in the right anterior temporal lobe in frontotemporal lobar dementia (FTLD) patients has been associated with reduced ability to identify emotion in static stimuli (e.g., photographs of faces; Perry et al., 2001, Neurocase, 7, 145–160). In the present study, we examined whether these deficits extend to more dynamic emotional stimuli (films) and are associated with differences in ANS response to the films. FTLD patients were shown five short films in which the primary character experienced either happiness, sadness, disgust, fear or sexual arousal. During the films, ANS activity was measured, and afterwards patients were asked to identify the primary emotion experienced by the main character. To quantify neuronal loss, region of interest analyses were conducted on patients’ structural MRI scans to determine bilateral volumes (frontal, anterior temporal, amygdala). Neuronal loss in the right anterior temporal lobe was associated with decreased accuracy in identifying the emotion experienced by the main character. This finding still held when controlling for loss in other brain regions (bilateral frontal, left anterior temporal, bilateral amygdala). Neuronal loss in the right anterior lobe was not associated with any alterations in the ANS responses to the film. These findings support the important role the right temporal lobe plays in emotional comprehension and suggest that this relationship is not mediated by differences in the emotional impact of the films (as indexed by ANS responding).

CONSIDERATION OF TEMPERAMENT AND GENDER IN THE INTERPRETATION OF PHYSIOLOGIC DATA

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Descriptors: Developmental, Temperament, Gender

The present study investigates the relation of gender and temperament to several physiological variables in preadolescent children. Categories of children were most accurately described by distinct profiles of physiological measures. Previous longitudinal studies have explored the interaction between early temperamental characteristics and later physiology. Yet, few have used multiple physiological measures over several time periods and evaluated the findings in light of both gender and temperament. In the current study, subjects were part of a longitudinal sample originally classified at 4 months old as behaviorally high or low and followed through childhood and adolescence. The study emphasizes the importance of considering individual variables, including gender and temperament, in the interpretation of psychophysiological variables.

PSYCHOPHYSIOLOGICAL REACTIVITY AND RISK ASSESSMENT IN VICTIMS OF SEXUAL ASSAULT

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Descriptors: sexual assault, risk recognition, autonomic reactivity

Research has found that, compared to individuals without a history of sexual victimization, those who have been previously victimized are at greater risk for future victimization (Arata, 2002, Clinical Psychology: Research and Practice, Vol 9, 135–164). To explain this phenomenon (known as sexual revictimization), some researchers have focused on possible deficits in risk recognition on the part of the victim. The purpose of the present study was to examine the physiological correlates of risk recognition in a college female sample of victims and nonvictims of unwanted sexual acts. 35 victims of adolescent or adult sexual assault and 35 nonvictims listened to an audiotaped analogue of a date rape interaction and were asked to indicate when the man had “gone too far” by pushing a button on a keypad. Heart rate and skin conductance were recorded for two minutes prior to the onset of the tape (baseline), during the 6-minute presentation of the interaction, and for two minutes immediately following the end of the tape (recovery). Results indicate that victims of sexual assaults are slower to indicate that the man has “gone too far”, and, compared to nonvictims, experience less heart rate acceleration and skin conductance reactivity during certain segments of the tape that are most arousing. These results suggest that victims of sexual assault may be more vulnerable to subsequent victimization due, at least in part, to an inhibition of physiological signals that are critically important in activating the defensive system.

THE MEDIAN FOREPERIOD EFFECT OF HEART RATE DECELERATION

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Descriptors: Heart rate, Reaction time, Variable Foreperiod

This study examined anticipatory human heart rate deceleration in two reaction time tasks. Result from van der Molen, Somsen and Orlebeke (1987) indicated that anticipatory heart rate deceleration in a variable foreperiod (FP) reaction time (RT) task tends to continue until the median FP duration; the FPs between 6, 9 and 12 sec showed anticipatory HR deceleration that continued for 9 sec. This finding raises several questions. Do subjects implicitly learn the time intervals in a variable FP? Is anticipatory heart rate deceleration connected to the timing of the FP? 25 subjects participated in one of two RT conditions, one with variable FPs of 4, 6, 8, 10, and 12 sec presented with equal probability and one with 19 non-aging FPs between 4 and 12.5 sec. It was hypothesized that (1) in the variable FP RT task the subject’s heart rate deceleration would continue for 8 sec; (2) in randomized FP conditions, the probability that the stimulus will occur increases, hence, RT will be faster with longer FPs; (3) In the non-aging condition RTs will not increase with FP length; (4) The median FP effect will not occur in the non-aging condition. The results showed regular increase in RT with FP length in the variable condition and not in the non-aging condition. In the variable condition heart rate continued to decelerate for 7 sec. In the non-aging conditions HR deceleration also occurred, but showed a more variable pattern.
MMN ELICITED BY CHANGES IN SOUND LOCATION IS MODERATED BY LOCATION AND PROBABILITY OF THE OCCASIONAL STIMULUS

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Descriptors: MMN, Sound Localization

There is considerable variability in the literature with regard to the latency (reported peaks between 100 and 200 ms) and distribution of mismatch negativity (MMN) elicited by occasional changes in the location of a stimulus. There are also no previous studies of how MMN is affected by the actual locations of the standard and deviant stimuli, or of how deviant probability affects MMN. In Experiment 1, we systematically examined how event-related potentials elicited by an occasional change in location of a short pure tone are affected by probability and deviant stimulus location. Difference waves showed an early MMN peaking between 100 and 140 ms after stimulus onset. Lower-probability deviants and larger changes in stimulus location elicited larger peaks. In addition, occasional stimuli from different locations within the same hemifield elicited patterns of activity consistent with different underlying generators, possibly reflecting the presence of cortical spatial maps. In Experiment 2, we investigated whether there was a contribution of N1 to the components observed in Experiment 1. When we presented stimuli from 5 equally probable locations, we found that in contrast with the oddball design used in Experiment 1, there were no significant peaks in the difference waves. We conclude that although occasional changes in the location of a pure tone elicit earlier peaks than MMN reported for other types of deviation, the topographical distribution and behavior of the elicited electrical activity are consistent with an underlying mismatch-like process.

P3 AMPLITUDE AS AN INDEX OF SEVERITY IN IMPULSIVE AGGRESSIVE BEHAVIOR

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Descriptors: Aggression, Event-Related Potentials, Impulsiveness

Previous work has suggested that small P3 amplitude may serve as a marker for a dimension of psychiatric disorders associated with disinhibited behavior. For example, reduced P3 amplitude has been demonstrated in individuals with alcohol and substance use disorders, externalizing childhood behavior problems, antisocial personality disorder and impulsive aggressive (IA) behavior. The present study extended this notion by investigating the usefulness of P3 amplitude as an index of aggression severity in IA individuals. Participants were self-referred individuals seeking treatment for aggression control problems. All participants completed a battery of personality measures and a standard auditory oddball task. P3 amplitude and latency to target stimuli were obtained at midline electrode sites. Participants were then assigned to a two-week single-blind placebo-baseline period in which they received daily administration of a placebo prior to beginning six weeks of anticonvulsant administration. An aggression criterion of two IA outbursts during the placebo-baseline was necessary for continuation in the larger study. Analysis of the ERP and placebo-baseline behavioral data indicated that IA individuals who met the aggression criterion (i.e., those with a greater severity of IA behavior) exhibited significantly lower P3 amplitude than those who did not meet the criterion. These results support the hypothesis that P3 amplitude, as an index of disinhibitory psychopathology, may be used in the assessment of disorder severity.

FACILITORY EFFECTS OF AWARENESS ON DIFFERENTIAL DELAY FEAR CONDITIONING

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Descriptors: conditioning, awareness, startle

To assess the role of awareness in fear conditioning, a differential fear conditioning paradigm was combined with an awareness manipulation. Participants were instructed to either 1) figure out what predicted the shock, or 2) count the number of stimuli occurring in a row. A post-experiment assessment revealed that manipulation 1 was associated with high awareness (HA) of the CS+/shock relationship, while manipulation 2 was associated with low levels of awareness (LA). Habituation (16 pres.), acquisition (16 pres.; 100% CS+/shock contingency), and extinction (28 pres.; 2 of 1st 6 CS+ trials shocked) phases used two visual stimuli: a triangle and a circle. Startle reflexes revealed significant CS+/− differences in both acquisition and extinction. However, there were also significant CS+/− × awareness group interactions during these phases. In acquisition, neither group showed discrimination between CSs in block 1, but there were significant CS+/− × awareness interactions in blocks 2 and 3, indicating that the HA group showed CS discrimination, but the LA group did not. There was no CS+/− × awareness interaction in block 4, indicating that both awareness groups showed CS discrimination late in acquisition. During extinction, the HA group maintained CS discrimination, while the LA group did not. For SCR, the HA group showed CS+/CS− differentiation during acquisition and extinction, whereas no significant differentiation was evident in the LA group. Hence, awareness appears to modulate the time course and strength of fear conditioning.

THE RELATIONSHIP OF WORKING MEMORY, ANXIETY AND SCHIZOTYPAL SYMPTOM MEASURES TO P50 SUPPRESSION

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Descriptors: P50, schizotypy, social phobia

This study was designed to assess associations between P50 suppression and associated autonomic measures with neuropsychological and symptom measures. The electrodermal, heart rate, and N100 response, and P50 suppression of schizotypals (n = 12), controls (n = 12) and social phobics (n = 12) was recorded at Cz during two 66-trial tasks, baseline and a social math stressor. Measures of schizotypal symptoms, state/ttrait anxiety, self-reported social behavior and working memory also were collected. With all groups combined (n = 32 for working memory measures), significant positive one-tailed associations were found between stressor click 2 and stressor P50 ratio with schizotypal symptoms, state and trait anxiety and stressor EDA levels. Stressor click 2 amplitude also positively correlated with social distress and negatively correlated with social attainment. Unexpectedly, several measures of intact working memory correlated with impaired stressor suppression. The stressor P50 ratio and click 2 amplitude correlated negatively with the difference between Trails A and B, stressor P50 ratio had a one-tailed association with WAIS III picture arrangement (sequencing), and stressor P50 click 1 amplitude correlated negatively with WAIS III digits backward. Although symptom measures showed the expected relationship to impaired gating across groups, offering corroborative support for biological parallels between schizotypy and schizophrenia, measures of working memory showed an unexpected relationship to gating under stressor but not baseline conditions.
RELATIONSHIP BETWEEN BLOOD PRESSURE AND COGNITIVE PERFORMANCE

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Descriptors: blood pressure; hypertension; cognition

This study examined the relationship between blood pressure and cognitive performance in adults recruited through the third National Health and Nutrition Examination Survey conducted in the U.S. from 1988-94. After application of exclusion criteria (e.g., history of stroke, medication use, acute use of alcohol prior to testing), the sample consisted of 1338 women and 1389 men who completed computerized tests of 1) visuomotor reaction time (i.e., visual reaction time), 2) complex psychomotor speed (i.e., symbol digit substitution), and 3) verbal learning (i.e., serial digit learning). Mean age of the sample was 35.7 years (SD 10.5, range 20–59), and included 38% Caucasians, 38% African Americans, 21% Mexican Americans, and 3% Other. Hierarchical regression analyses were conducted for each cognitive test. Age, race, education, and sex were entered as control variables on the first step. Systolic blood pressure was then entered on step two. Finally, an age by systolic blood pressure interaction was entered as a predictor on step three. Results indicated that the control variables were significant predictors of performance on all three cognitive tests. Further, for the analysis predicting performance on the serial digit learning test, systolic blood pressure was a significant predictor on step 2 (R-square change = .02, Beta = .22, F = 7.34, p<.01) and the age by systolic blood pressure interaction was a significant predictor on Step 3 (R-square change = .002, Beta = -.46, F = 6.04, p<.05). No variables were entered on steps 2 or 3 for the analyses of visual reaction or symbol digit substitution. These findings indicated that higher systolic blood pressure levels predicted poorer performance on a simple test of verbal learning, and that this effect was most pronounced in younger adults.

EEG GAMMA RELATES TO CLARITY OF THINKING AND SOURCE MONITORING ERPS AFTER MILD HEAD INJURY

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Descriptors: Gamma, mild head injury, cognitive complaint

Persistent cognitive complaints are often reported by individuals with mild head injury (MHI) but such complaints are difficult to quantify. We compared 22 individuals with MHI (loss of consciousness <30 minutes) with 13 age- and education-matched controls to determine whether a disruption in high frequency EEG activity (gamma) would be associated with self-reported reductions in the clarity of thinking. Gamma activity was elicited during a perceptual identification task and ERPs were collected during a source memory task in which participants attempted to discriminate previously studied items from familiar but non-target lures. Those with MHI were more likely than Controls to mistakenly identify nontarget lures as having come from the study list. They also produced higher amplitude ERP positivities to the nontarget lures even when these were correctly rejected. Thus, in contrast to controls, they seemed less able to withdraw attention from the nontarget material. For those MHI participants (N = 7) who reported non-normative levels of cognitive complaint, reductions in gamma activity in the 30–100 Hz range was associated with reduced clarity in thinking. Moreover, the decline in gamma band activation predicted the size of the lure-related positivity elicited in the MHI group during the source monitoring task. Thus, reduced cortical activation was associated with both reduced clarity in thinking and with impairment in the ability to inhibit a neural response to nontarget information in MHI individuals with self-reported cognitive complaint.

IDENTIFICATION AND SEPARATION OF REFERENCE-FREE SPECTRAL EEG COMPONENTS: COMBINING CURRENT SOURCE DENSITY (CSD) AND FREQUENCY PRINCIPAL COMPONENTS ANALYSIS (FPCA)

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Descriptors: EEG methodology, surface Laplacian, frequency PCA

The interpretability of quantitative EEG is severely limited by two crucial choices: definition of appropriate frequency bands and recording reference. Both the spectral properties of the EEG and their associated topographies, as well as those of artifacts, can vary considerably for any given subject and/or paradigm, based on these choices. Some researchers have acknowledged these problems by simultaneously analyzing various reference schemes, or by more loosely defining frequency bands to match data properties (e.g., varying alpha ranges to capture a peak). Problems are exacerbated when power spectra are computed (e.g., information is lost by nonlinear transformation, hemispheric asymmetries may invert, etc). In contrast, a surface Laplacian (CSD) is a data transformation with known correspondence to neuronal generators. CSDs concisely reflect the true topographic variation of the EEG signal, ignore volume-conducted activity, and are identical for any reference scheme (e.g., linked ears/mastoids, nose, average, etc). A FPCA provides a concise summary of EEG spectra that conforms to the data, rather than to rigid, unrelated frequency bands. Combining these advantages, amplitude spectra were computed from CSD epochs (eyes open/ closed 30-channel resting EEG of 72 subjects), and summarized using an unrestricted, Varimax-rotated, covariance-based PCA. Multiple, psychophysiologically meaningful alpha factors with distinct topographies were clearly separable from eye and muscle artifacts, providing a more relevant topographic description of the spectral structure of these data.

AN ERP STUDY OF VISUAL SELECTIVE INFORMATION PROCESSING IN CHILDREN WITH ADHD

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Descriptors: ADHD, visual selective attention, ERP

The aim of this study was to investigate visual selective information processing in children with attention-deficit/hyperactivity disorder (ADHD). ERPs were recorded from children with ADHD and healthy control children during a two-dimensional selection task. Participants were required to make a quick button press to the target stimulus, defined by a particular combination of color (red or blue) and form (circle or square), in the sequence of four types of stimuli (red circle, red square, blue circle, and blue square) presented every 1,200 ms in random order with equal probability. No difference in RT for the target was found between ADHD and control group. The target stimulus elicited a parietal P300 in both groups. There was no group effect on P300 peak latency, whereas P300 peak amplitude was smaller for the ADHD than for the control group. Color attention effect was obtained as a central negativity (200–400 ms) in the difference wave, obtained by subtracting ERPs to color-irrelevant nontarget stimuli from those to color-relevant nontarget stimuli, and this color effect was delayed for the ADHD group. The results of RT and P300 latency indicate that the processing of the target is not delayed in ADHD children. In contrast, the delayed color attention effect shows that the ADHD children required more time to classify the nontarget stimuli as not a target, and this additional resource requirement for nontarget processing may cause the smaller target P300.
SWALLOWING AND AFFECT: EVIDENCE FOR A VALENCE MODULATION OF SPONTANEOUS SWALLOWING RATES

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Descriptors: Emotion, swallowing rate, affective pictures

It has been observed that spontaneous swallowing rates are dependent on the affective state. However, previous studies using experimental emotion induction have failed to distinguish between valence and arousal effects. We analyzed rates of swallowing in participants who viewed slides from the International Affective Picture System (IAPS) preselected for inducing positive, negative, and neutral affective states. Three series of 12 pictures of homogeneous affect were presented, with each picture presented for 20 s and an interstimulus interval of 25 s. During the picture series participants breathed through a tube for measurements of respiration and respiratory resistance by forced oscillations. Swallowing was readily detected in the resistance signal by brief rapid increases caused by closure of the glottis. Following the three series, participants rated valence, arousal, and interest of the individual picture, and voluntary viewing time was recorded. Ratings of affect and viewing time confirmed earlier findings with IAPS material. Cumulative swallowing rates throughout the picture series increased in a monotonic fashion from positive to neutral to negative pictures. Differences were not significant for presentation periods alone. We conclude that swallowing rates vary with the valence of the affective state, and that induction of tonic mood states is needed to demonstrate this effect. The use of a mouthpiece may have facilitated spontaneous swallowing in our experiment. Affect-induced swallowing may be an important biobehavioral factor in gastrointestinal disorders.

DEVELOPMENT OF MISMATCH NEGATIVITY BETWEEN 2 AND 6 MONTHS OF AGE IN A GAP DETECTION TASK

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Descriptors: MMN, temporal processing, infant development

We examined the development of mismatch negativity (MMN) evoked responses to occasional silent gaps in 2000 Hz tone pips in infants between 2 and 6 months of age. At 2 months of age, only a large positive slow wave was apparent, and its amplitude increased significantly in response to the deviant gap stimuli. At 3 months of age, most infants showed the same pattern as the 2-month-olds; however, 4 of the 13 infants (31%) showed a negativity in the difference wave (deviants - standards) around 200 ms after stimulus onset, resembling adult MMN. At 4 months, more than half of the infants showed the negativity (11/19 or 58%). By 6 months, most of the infants showed the negativity. Thus, evoked responses to the occasional presence of a silent gap in tone pip stimuli change dramatically between 2 and 6 months of age with the younger infants showing an increased positivity and the older infants an increased negativity to the deviant stimuli. We speculate that this dramatic change is associated with the layer-specific anatomical development that is seen across this age range. Specifically, increases in synaptic density reach a maximum in auditory cortex around 3 months of age (Huttonlocher & Dubbolkar, 1997, J. Comp. Neurol., 387: 167–178). Furthermore, neurons outside layer I are immature before about 4 months of age, at which time neurons in deeper layers (VI, V, VI) become mature (Moore, 2002, J. Assoc. Res. Otolaryngol., 2: 297–311). Thus, we hypothesize that the emergence of MMN between 2 and 6 months of age is associated with the maturation of deeper cortical layers.

ATТЕNTIONAL CONTROL AND FACIAL EMOTION PROCESSING IN PHYSICALLY ABUSED CHILDREN: ASSOCIATION WITH CHILD DISTRESS

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Descriptors: Selective attention, ERP, face processing

Recent research suggests that maltreated children are biased in their processing of anger and/or threat related information. Yet, few studies to date have attempted to isolate the mental processes involved in processing threat related material that may differ in maltreated and typically developing children and confer risk for psychopathology. This poster will present the results of an orienting paradigm aimed at isolating attentional subprocesses that may underlie perceptual biases. Angry, happy, and neutral adult faces cued right or left peripheral locations at which a target could subsequently appear. Reaction time and event-related potential indicators of selective attention (P1, N1, and P3b) were compared on trials with coincident faces and targets (valid trials) and trials with non-coincident faces and targets (invalid trials). We examined the relative effects of maltreatment histories and internalizing symptomatology on children’s attentional performance. Results indicated that, as predicted, abused children were slower than controls and expanded more neural resources in disengaging from angry faces, but not from happy faces. This effect was not moderated by child internalizing symptoms. However, abused children with clinically significant internalizing symptoms were also slower than controls in disengaging from neutral faces. Implications of this finding for the development of hostile attribution bias and risk for psychopathology will be discussed.

LONG-TERM EFFECTS OF TRANSCENDENTAL MEDITATION PRACTICE ARE SEEN IN ACTIVITY, NOT DURING MEDITATION

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Descriptors: meditation effects, EEG coherence, development

Cross-sectional studies of EEG patterns in short and long-term Transcendental Meditation (TM) subjects report similar broad-band frontal EEG coherence estimates during TM practice, but significantly different coherence estimates during eyes-open computer tasks (Travis et al, 2002, Biological Psychology, 293–319). Cross-sectional studies are confounded by initial group differences. The current longitudinal study investigated frontal EEG coherence in 13 subjects (average age 20 yrs) at baseline and at one, three, six and 12 months after learning TM. EEG was recorded during two-stimuli reaction-time tasks—two numbers 1.5 apart. Subjects pressed a left or right-hand button to indicate which was larger. EEG was also recorded during eyes-closed (baseline) and TM practice (subsequent months). Results: Frontal EEG coherence was significantly higher after 1 month TM practice compared to eyes-closed baseline (MANOVA Wilk’s Lambda F(1,12 = 7.7, p = .017). There were no significant frontal EEG coherence differences between one, three, six or 12 months TM practice (MANOVA Wilk’s Lambda, F(3,10 = 1.65, p = .24). Also, frontal EEG coherence during RT tasks increased across the five periods (significant linear trend, F(1,12 = 11.1, p = .006). Discussion: Individuals appear to quickly master TM practice (in as little as a month), and that long-term TM effects are seen during eyes-open tasks after the practice. Early efficacy of TM practice combined with progressive changes in brain dynamics during tasks may be key criteria to compare TM with other types of meditation practice.
ERP STUDY OF THE GAP EFFECT FOR HAND MOVEMENT: SPATIAL RELATION BETWEEN TARGET AND RESPONSE

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Descriptors: gap effect, ERP, reaction time

The gap effect refers to the fact that reaction time (RT) is reduced if a fixation point (FP) disappears before a target onset. This study investigated how the spatial relation between target and response influence the gap effect for hand movement. ERPs were recorded during four response tasks that were designed according to the response hand (related/unrelated to the target side) and orientation (related/unrelated to the target side). Participants grasped handles in each hand, and were required to move the handles to the orientation according to the task. The FP was followed by a target presented to the right or left of FP. The FP was removed 200 ms prior to target onset in the gap condition, or remained on in the overlap condition. Clear gap effect was obtained from every condition. In the overlap condition, hand-related tasks shortened RT. Similar effect occurred in the gap trial, and further RT facilitation occurred in the both hand- and orientation-related task. The onset latencies of readiness potentials showed similar tendencies as the RT. In contrast, visual evoked potentials derived from the target peaked earlier in the gap than in the overlap condition, but there were no differences among the tasks in each condition. The results indicate that the ipsilateral hand movement increases the gap effect, furthermore the orientation-related movement with ipsilateral hand produces much more effect. Moreover, the results suggest that the gap effect is attributed to additional processes activated with FP offset and spatially related movement, which accelerate motor preparation.

THE ACTIVATING EFFECT OF ERRORS IN HIGH AND LOW SOCIALIZED STUDENTS

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Descriptors: ERN, Time-frequency, Wavelet, Socialization, Psychopathy

Participants scoring extremely low or high on the socialization scale of the California Psychological Inventory participated in a forced-choice visual discrimination task under conditions of monetary reward or aversive acoustic punishment. Previously in this sample, the error-related negativity (ERN) proved differentially sensitive to errors under the two conditions for each group, such that low-socialized participants produced smaller ERNs during the punishment task than during the reward task, whereas high-socialized participants produced similar ERNs in both conditions. The present investigation examined the time-frequency characteristics of errors under these conditions, focusing on high-frequency (20–55 Hz) spectral power computed by a wavelet-based time-frequency analysis on individual response-locked epochs. Overall, error trials produced substantially greater high-frequency power than correct trials, although this was especially pronounced for the low-socialized subjects when making errors that resulted in loss of reward, and it was relatively absent in high-socialized subjects in this condition. Like the previous ERN analyses, these results provide further support for the role of sensitivity to rewards and of avoidance-learning deficits in low socialized individuals, and, by extension, psychopathy.

THE SURPRISINGLY MINOR INFLUENCE OF PROCESSING OBJECTIVES ON SOCIAL CATEGORY-RELATED ERPS

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Descriptors: P300, social cognition, social categorization

Both implicit and explicit social categorization have been shown to influence ERPs related to attention (N100, P100, N200) and working memory (P300). However, it is unclear how relevant these effects are to situations in which one is not explicitly engaged in category-based processing. Since tasks that require processing of target features other than social category attenuate implicit category-based judgments and almost completely reduce category-based amygdala activation, it has been proposed that non-categorical processing completely inhibits social categorization. Two studies were conducted to determine the extent to which implicit social categorical processing occurs despite explicit non-categorical processing. Study one involved an explicit motive for target individuation, requiring extraversion judgements of targets that varied in terms of both race and gender. Racial category membership significantly affected the amplitude of both exogenous and endogenous attentional components, while gender only significantly affected the N200. In addition, both racial and gender category membership affected the amplitude of the P300. In study two, to examine if completely non-social tasks would inhibit social categorization, participants completed either a non-social feature based or a non-social individuating task. Target stimuli varied in terms of race. With the exception of the N100, which showed no evidence of responsiveness to social category, the results of study two were identical to study one, indicating that non-social tasks do not inhibit social categorization.

THERE IS NO LRP ERROR DIP DURING THE SIMON EFFECT WHEN SUBJECTS AREN'T AWARE OF STIMULUS LOCATION

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Descriptors: ERP, LRP, Simon

In the Simon effect, reaction times (RT) are faster and response accuracy is greater when stimulus and response share spatial locations (compatible trials) than when they do not (incompatible trials), even though stimulus location is task irrelevant. Under these conditions, the lateralized readiness potential (LRP) demonstrates a brief activation of the incorrect response on incompatible trials. Here we investigated whether the incorrect response is activated under dichoptic stimulus presentation in which participants are unaware of the stimulated eye. Two square frames, one presented to each eye, were continuously visible and fused. The monocular stimulus was a red or blue patch presented in the center of one of the two squares. From the subjects’ point of view all stimuli were in the center of the fused square. RT was faster (p < .001) and accuracy greater (p < .01) on compatible (e.g., left eye stimulated - left hand reaction) than on incompatible trials. The stimulus-locked LRP onset latency was earlier on compatible than on incompatible trials without signs of incorrect response activation. No differences in P300 or earlier ERP components were found. We conclude that this paradigm differs qualitatively from the conventional Simon task, and that awareness of stimulus location may be a prerequisite for incorrect response activation on incompatible trials.
JUSTICE AND FORGIVENESS: PSYCHOPHYSIOLOGICAL EFFECTS FOR VICTIMS

Charlotte vanOyen Witvliet, Lindsey Root, Amy Sato, & Thomas Ludwig
Hope College

Descriptors: Justice, Forgiveness, Emotion

This study assessed the psychophysiological effects of justice and forgiveness. Participants (27 male and 30 female college students) imagined a scenario placing them as the victim of a home burglary with six justice-forgiveness outcomes in a 3 Justice (Punitive, Restorative, No Justice) by 2 Forgiveness (Granted, Not Granted) repeated measures design. Each participant imagined all six conditions two times, with condition orders counterbalanced across participants. The 16s imagery trials were separated by relaxation periods of 16–32s. Justice main effects typically indicated increasingly positive and decreasingly negative self-reports across the no-justice to punitive justice to restorative justice conditions. Main effects of Forgiveness showed that granting versus not granting forgiveness to the perpetrator yielded more positive feelings, perceived control, gratitude, and empathy, and less fear, anger, and arousal. Granting forgiveness also was associated with significantly lower heart rate and brow muscle tension (corrugator EMG) levels. Physiology was generally less responsive to Justice than to Forgiveness. However, a Justice X Forgiveness interaction occurred for SCLs: levels were significantly higher in the restorative-justice-only condition or the forgiveness-plus-punitive-justice condition and SCLs in these last two conditions did not differ from each other. The data suggest that for victims, restorative justice and granting forgiveness may yield the strongest emotional benefits.

AVERSIVE QUALITY OF SOUNDS: ROLE OF INFRASONIC COMPONENTS

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Descriptors: stress, infrasound, resonance

We previously found that unrecognizable, synthetic sounds were more aversive than recognizable, environmental sounds. Unrecognizable, synthetic sounds were rated as highly unpleasant, produced sympathetic reactivity, and elicited escape behaviors. To intensify the aversiveness of these sounds, infrasound frequencies were added. We believe that infrasound components could amplify a sound’s effect on the body when their frequencies correspond to body resonant frequencies. In this study, human reactions to sounds with and without infrasound components were compared. Subjects were sequentially exposed to 9 synthetic, unpleasant and unrecognizable sounds at 82 dB (A). Four sounds consisted of audible frequencies only. Five other sounds were created by low frequency range corresponds to human body natural (resonant) frequencies, particularly electrical brain activity. Escape behavior response (termination of sound and its latency) and heart rate reaction (HR) were assessed for each sound. We found that audible sounds with infrasound components elicited significantly more frequent escape reactions and stronger sympathetic HR reactions then sounds without low frequency components. Sound termination latency was significantly shorter for sounds with infrasound components. We suggest that the stressfulness of audible sound is primarily a function of low frequency modulation coincidental with body resonance frequencies. (Research supported by funding from the Department of Defense to RJS.)
DEFENSIVE HOSTILITY AND CARdioVASCuLAR REACTIVITY TO ACTIVE AND PASSIVE STRESSORS IN COLLEGE-AGED MALES

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Virginia Polytechnic Institute & State University

Descriptors: defensive hostility, reactivity

The autonomic characteristics of hostility and defensiveness were assessed in 55 male undergraduates selected on the basis of median splits from the composite Cook Medley Hostility Scale (Chost) and Marlowe Crowne Social Desirability Scale (MC) to create 4 groups: 15 High Defensive Hostile (DH; high MC, high Chost), 16 Low Defensive Hostile (LH; low MC, high Chost), 16 High Defensive Low Hostile (DL; high MC, low Chost) and 8 Low Defensive/Hostile (LL; low MC, low Chost). All subjects engaged in the following 3-minute tasks while the electrocardiogram, impedance cardiogram, and blood pressure (BP) were recorded: baseline, video game (VG), recovery, baseline 2, hand cold pressor (CP) and recovery 2. Cardiovascular (CV) response patterns in DH subjects were predicted to show enhanced reactivity in comparison to other groups. ANOVAs were conducted on baseline and change scores (task - baseline) for the following variables: Heart rate (HR), systolic and diastolic blood pressure (SBP, DBP), pre-ejection period (PEP), and high and low frequency ECG spectral power (HFP, LFP). Group effects were observed for HR reactivity, F(3,51) = 3.98, p = .013 and HFP reactivity, F(3,51) = 6.64, p = .001. DH's showed enhanced HR reactivity to CP in comparison to LH's, t(29) = 3.084, p = .004. Surprisingly, LH's showed more HFP in response to both tasks than LL's. These data suggest that DH's are more reactive to passive stressors than LH's. Future studies may include interpersonal provocation as a means to evoke construct relevant aspects of defensiveness that contribute to CV reactivity.

CLOSURE ON ACCOUNT OF PREDICTION VERSUS POSTDICTION: AN ERP ANALYSIS

Gopakumar Venugopalan, & Asghar Iran-Nejad
The University of Alabama

Descriptors: ERP

“The most straightforward way of testing the notion that P3s are evoked by unexpected stimuli is to present unexpected stimuli,” (Verleger, 1988, p. 349). In this study ERPs were used to examine closure on account of post-diction and prediction. Thirty healthy adult participants were first assigned to a classic GO/NO GO – called Task One. The targets and non-targets were presented in a pseudo-random order, and subjects clicked the mouse for targets. In Task Two the subjects were divided into two groups and shown gestalt-like visual stimuli (magic eye pictures) using Inquisit®. The subjects in Group 1 (N = 15) were told what image they were to expect, while subjects of Group 2 (N = 15) were not told what to expect. The subjects clicked the mouse when they perceived the image, whereupon the program advanced to the next stimulus. The data was gathered using an elastic cap (Electro-cap®) with tin electrodes, following the 10–20 International System, with the earlobes as references which was attached to a Neuroscan 24®. Preliminary analysis support the notion that closure on account of post diction is significantly different from closure due to prediction, with significant between group and within-group differences. The subject in the “magic eye” conditions indicated their attainment of closure by pressing a button, though actual perception was verbally elicited. There is some threat to the validity of the study since the ERP was not time locked- in the classic sense—but correlated post hoc based on the verbal reports of the subject. Though the study supports the notion that an insight or spontaneous closure is different from a mere schema or context updating subroutine, further analysis would warrant investigations of gamma band activity, the P3a versus P3b, and the effect of task difficulty.

NEURAL MECHANISMS OF DECEPTION AND RESPONSE CONGRUITY IN A VISUAL TWO-STIMULUS PARADIGM INVOLVING AUTOBIOGRAPHICAL INFORMATION

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University of South Carolina

Descriptors: Deception, ERP, Response-Congruity

The influence of deception and response congruity on high-density event-related potentials (HD-ERPs) was studied in 46 college-aged participants. Participants viewed questions involving personal information such as their names and dates of birth. They were randomly prompted by stimulus color to respond truthfully or deceptively, by agreeing or disagreeing with a second prompt consisting of the word “True” or “False.” HD-ERPs were analyzed with temporal principal components analysis. Unlike previous studies using the two-stimulus paradigm with deception (Stelmack, 1994; Vendemia & Buzan, 2001), only one waveform was associated with deception. This early positive component had a strongly anterior distribution similar to the early component identified by Vendemia & Buzan, and appeared to be associated with early attention processes.

P300 ABNORMALITIES IN BIPOLAR DISORDER AND SCHIZOPHRENIA

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Descriptors: Auditory ERPS, bipolar disorder, schizophrenia

Auditory P300 latency prolongation or amplitude reduction have been reported in studies of bipolar disorder patients and in schizophrenia. The purpose of this study was to test whether auditory ERP components elicited during an oddball task could differentiate between these two disorders. ERPs were elicited during an auditory discrimination task in which a subject pressed a key to infrequent (p = .15) 1500 Hz tones interspersed amid a series of 1000 Hz tones. Thirteen patients with manic or mixed bipolar disorder (BP), twelve patients with schizophrenia (SZ), and 24 control subjects were evaluated. None of the subjects had a history of alcohol or substance abuse. The amplitude and latency N100 and P200 were measured from averages to non-target tones, and N200 and P300 were measured from averages to target tones. N100, P200 and N200 amplitudes were reduced in SZ patients, but not BP patients. Both BP and SZ patients showed reduced P300 amplitude. P300 latency was prolonged in the SZ group, but not the BP group. Schizophrenia, but not bipolar disorder, is associated with amplitude reduction in early ERP components, suggestive of abnormal sensory processing. Both groups showed reductions in P500 amplitude, which may indicate disturbances of the superior temporal gyrus or inferior parietal lobe. Prolonged P300 latency suggests slowing of processing speed in SZ, but not BP patients.
EMOTIONS BEHIND GLASS-AFFECTIVE PICTURES AND RESPIRATORY RESISTANCE
Andreas von Leupoldt & Bernhard Dahme
University of Hamburg

Descriptors: asthma, emotion, bodyplethysmography

We examined the influence of emotions on asthmatic airway obstructions by using whole body plethysmography to control airways reactivity. Three IAPS picture series were presented with video glasses to induce positive, neutral and negative emotional states in 32 asthmatic and 32 nonasthmatic persons while seated in a body plethysmograph. Airway resistance (Raw), specific airway resistance (sRaw), thoracic gas volume (TGV) and mood were recorded directly after each presentation, sRaw additionally before and after each series. Heart rate (HR) and skin conductance level (SCL) were measured continuously. Based on subjects’ mood ratings the targeted affective and neutral states were successfully induced without differences between both groups. Significant increases of Raw and sRaw were observed during and after positive and negative affective stimulation, compared to neutral stimulation in asthmatic subjects and also, but to a smaller degree in nonasthmatic controls. No effect was found for mood induction on TGV in both groups. HR showed a valence modulation with increasing rates from negative to neutral to positive series, whereas considered together with SCL an expected autonomic pattern underlying the increases of Raw and sRaw could not be observed. The findings show that the experience of positive and negative emotions provoked by viewing affective picture series can cause airway obstructions in asthmatic subjects and also, but less strongly in nonasthmatic controls. Thus, the results correspond with prior findings using forced oscillation technique to measure airways reactivity.

EGG RESPONSES OF GI RESPONDERS AND NON-GI RESPONDERS TO FOOD AND STRESS
Jiangyue Wang & Robert M. Stern
Pennsylvania State University

Descriptors: EGG, mental stress, viewing food image

The purpose of this study was to examine the effects of food image and mental stress on gastric myoelectric activity recorded by electrogastrography (EGG) in individuals with or without epigastric distress symptoms under normal daily stress. 80 subjects were divided into two groups, a gastrointestinal (GI) – responder group, a non- GI- responder group, on the basis of their scores on a stress reactivity questionnaire. Baseline measurement was taken for 6 minutes. Half of the subjects watched a TV program about food for 6 minutes first. After a 6 minutes break, subjects were given a stressful arithmetic task for the following 6 minutes. This period was followed by a 6-minute recovery period. The other half of the subjects experienced the mental stress first, and then the food image viewing task. During both experimental and baseline periods, EGG activity of the participants was continuously recorded. The power of the EGG activity of 3 cycles per minutes (cpm) was calculated. EGG activity was compared between the food image and stressful task. The results indicated that food images increased normal 3cpm gastric activity, and the stressful task decreased normal 3cpm gastric activity significantly, (F [1,163] = 9.689, p<0.01). For those subjects who experienced the stress task first, the non GI- responders showed significantly less EGG 3 cpm activity while viewing the food than the GI- responders, (F [1,41] = 5.496, p<0.05). In conclusion, EGG responses are sensitive to both the stimulus situation and subject individual differences.

AN EARLY LOCUS OF GARNER INTERFERENCE BETWEEN INTEGRAL DIMENSIONS ATTRIBUTED TO A FAILURE OF INHIBITORY PROCESS
Huijun Wang & Robert D. Melara
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Descriptors: selective attention, Garner interference, inhibition

To investigate Garner interference between the integral dimensions of pitch and loudness, ten participants performed pitch discrimination tasks in a filtering paradigm while their behavioral performance and scalp event- related potentials (ERPs) were recorded. Both target and distractor tones were presented binaurally, with targets at 78 dB and distractors at 75 dB. Variation along distractor channel across conditions ranged from zero (Baseline) to 78 Hz (Easy filtering), to 136 Hz (Medium filtering), to 191 Hz (difficult filtering). When variation in the distractor channel was increased, participants were slower, less accurate, and less sensitive in their target detection. Distractor variation affected ERP components in the distractor channel as manifested by significantly increased N1 responses. Distraction also caused a delay in P3 responses to targets. This study suggests that the primary source of Garner interference between integral dimensions (pitch and loudness) is a breakdown in distractor inhibitory processing which causes targets to be less salient in working memory and more difficult to be identified. Attentional disruption begins with the N1 component, representing a perceptual stage of processing.

EVENT-RELATED POTENTIALS AS AN INDEX OF THE CONCEPTUAL SIMILARITY BETWEEN WORDS AND PICTURES
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Stony Brook University

Descriptors: Conceptual similarity, P300

Event-related potentials (ERPs) were used to examine the neural correlates of processing stimuli that are conceptually related to (but perceptually distinct from) a target stimulus. The P300 component was examined in 10 participants during a multi-stimulus oddball paradigm composed of both pictorial and word items. The stimuli consisted of pictures of five simple objects adapted from the Boston Naming Task and their five corresponding names. All stimuli were presented with equal probability (p = .10). Participants were instructed to keep a mental count of the appearance of the target, which was the word “globe”. As expected, the target stimulus elicited a large P300 component. The conceptually related non-target (the picture of the globe) also elicited a P300 component that was similar in amplitude to the target-related P300. Both the target and the conceptually related non-target were associated with significantly greater P300 amplitudes than unrelated non-target pictures and words. These data suggest that P300 amplitude is a good index of conceptual similarity between stimuli.
EFFECTS OF DECEPTION ON TONIC AUTONOMIC AROUSAL
Andrea Webb, Paul Bernhardt, Sean Kristjansson, & John Kircher
University of Utah

Descriptors: Deception, tonic arousal

This study tested if measures of tonic arousal are related the amplitude of responses during probable-lie and directed lie polygraph tests and if tonic levels of electrodermal and cardiovascular activity can be used to improve polygraph test accuracy. Subjects (N = 336) were interrogated about their participation in a mock crime. Half were guilty and half were innocent. Half of the innocent and half of the guilty subjects received a probable-lie test. The remaining subjects received a directed lie test. All subjects were offered a $50 bonus to appear truthful. Skin conductance (SC) and resistance (SR) were obtained from SC recordings. Systolic and diastolic blood pressures (BP) were obtained from a Finapres BP monitor. Heart period was obtained from the electrocardiogram. Number of nonspecific SC responses and SC level were positively related to phasic reactivity. High tonic levels of SR were associated with small SR responses. High BP levels were positively related to phasic response magnitude. High resting heart rates were associated with small cardiac decelerations. None of the tonic measures improved the accuracy of polygraph outcomes. Tonic arousal accounted for less than 2% of the variance in the guilt/innocence criterion when used in combination with standard measures of differential reactivity to predict group membership. The results suggest that the use of absolute measures of electrodermal and cardiovascular activity would do little to improve the accuracy of computer algorithms for diagnosing truth and deception.

ANTEROIOR CINGULATE ACTIVATION ASSOCIATED WITH CONCEPTUAL AND RESPONSE LEVEL INTERFERENCE
Robert West, Ritvij Bowry, & Celine McConville
University of Notre Dame

Descriptors: counting Stroop task, anterior cingulated

Evidence from studies using fMRI and PET has led to the proposal that the anterior cingulate cortex (ACC) is activated by response, but not conceptual or semantic, level conflict. We explored this hypothesis in two experiments using the counting Stroop task and event-related brain potentials. The task included five types of trials (congruent, neutral, incongruent-response, incongruent-conceptual, incongruent-high). In the task individuals were required to identify the identity and number of the digits did not match (e.g., 222); for incongruent-response trials the identity and number of the digits did not match (e.g., 222); for incongruent-conceptual trials the identity of the digits was not in the response set (e.g., 555); for incongruent-high trials two incongruent digits were presented (e.g., 13). All incongruent conditions elicited a N450 and conflict sustained potential. Consistent with previous research, dipole analysis revealed that the neural generators of the N450 were well fit by a pair of sources in medial (ACC) and anterior frontal cortex. These findings indicate that the ACC is activated by both response and conceptual level conflict. The failure to observe cingulate activation in previous imaging studies may have resulted from aspects of task design or data integrity.

CARDIOVASCULAR REACTIVITY TO VISUAL ILLUSIONS
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Descriptors: Attention, Illusions, Mental Arithmetic

Eighty college students (40 male) performed a serial-subtraction mental arithmetic (MA) task and one of four visual perception tasks. Two variables were factorially manipulated for the visual task: whether stimuli contained a perceptual illusion or not, and whether a question cueing the illusion was present or absent. For example, either the question “Which line is longer?” or no question was placed below the Müller-Lyer illusion or below a similar figure with the arrowheads straightened to remove the illusion. MA and a visual task were presented in balanced order with 1 min between tasks. Each task contained three 20 s stimuli presented successively. Cardiovascular task data were calculated relative to a 1 min pre-task baseline. MA elicited a significant decrease in heart period (HP), attributed to reciprocally-coupled sympathetic activation (shorter pre-ejection period, PEP) and vagal inhibition (suppressed respiratory sinus arrhythmia, RSA) mode of cardiac control. The illusion, but not the question, factor changed HP in the visual tasks. HP significantly shortened when illusions were present but significantly lengthened when they were absent. These bi-directional HP changes are best explained by a co-inhibition mode of cardiac control with sympathetic (significantly longer PEP) and vagal (suppressed RSA) inhibition. We observed changes in both sympathetic and vagal inhibition consistent with shortened HP for illusions (smaller PEP increase with greater RSA suppression) and lengthened HP without illusions (larger PEP increase with smaller RSA suppression).

ATTENTION AND EMOTION IN PROCESSING AFFECTIVE FACIAL IMAGES IN SCHIZOTYPAL VERSUS SOCIALLY PHOBIC INDIVIDUALS
Patricia White, Lorraine Stewart, Asako Kanazawa, & Cindy Yee
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Descriptors: P50, schizotypy, social phobia

This study examines facial processing of angry, happy and neutral faces in two populations with symptoms of social anxiety. Schizotypal (SZ, N = 12) and socially phobic (SP, N = 12) subjects were compared to normal controls (NC, N = 12) in six counter-balanced 150-trial tasks with three type of stimuli: context (60%), target (20%) and non-target (20%) stimuli. N100, P200 and P300 components were measured at midline sites in response to target and non-target stimuli, with target stimuli requiring a button press response. Stimuli included the same emotional facial images in all six tasks with target stimuli identified by emotion (happy, angry, neutral; angry context, neutral/happy context) or feature detection instructions (closed mouth, one task with stimuli inverted and the other task with upright images). Results extend previous literature by demonstrating P200 sensitivity to affective versus neutral contexts, N100 sensitivity to emotional valence, and reaction time, and N100 and P300 sensitivity to stimulus orientation. SP produced enhanced N100 amplitude to neutral targets in angry versus happy contexts, but male SZ had delayed P200 response to affective faces, consistent with impaired affective discrimination. Across targets and non-targets, SP had larger P300 to angry faces and SZ had reduced P300 to happy faces. SP and SZ self-reported similar levels of impaired social function and social anxiety on standard surveys, but this research suggests the groups differ in the information processing of facial emotion.
NOVEL PARAMETERS OF AUTONOMIC AND CARDIOVASCULAR FUNCTION OBTAINED WITH A MOBILE MENTAL STRESS TESTING LABORATORY IN A GENERAL CLINICAL RESEARCH CENTER

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Stanford University and VA Palo Alto Health Care System

Descriptors: mental stress, RSA, PEP

Examining mental stress reactivity in clinical populations can elucidate pathophysiological processes and allostatic load adjustments. An integration of mental stress testing into the hospital setting would be desirable. We developed an advanced mental stress testing laboratory contained in an instrument rack that is fully mobile within the General Clinical Research Center at the Stanford Hospital. The 60 × 30 × 24 inch size rack contains two PCs with one set of peripherals (switched), an A/D board, electrocardiograph, impedance cardiograph, capnograph, Finapres, two respiratory pneumographs, arm blood pressure monitor, video camera, and VCR. One PC provides VITC code and synchronization signals for integration of video data with physiological data recorded on the other PC. Baseline autonomic data is collected during spontaneous and paced breathing tasks. Stress testing follows a modified Trier Social Stress Test protocol. Computed parameters include heart rate, systolic/diastolic blood pressure, pre-ejection period, left-ventricular ejection time, stroke volume, cardiac output, Heather Index, total peripheral resistance, aortic characteristic impedance, arterial compliance, ETPCO2, respiratory rate, and tidal volume. Spectral analyses provide HF, LF and VLF heart period variability, transfer function RSA (adjusted for respiratory confounds), cardiorespiratory coherence and phase, baroreflex sensitivity, and Mayer-wave activity. We conclude that a comprehensive psychophysiological assessment of autonomic and cardiovascular function within a hospital setting is feasible.

THE INFLUENCE OF ATTENTIONAL RESOURCES ON P50 SUPPRESSION IN RECENT-ONSET SCHIZOPHRENIA

Terrance J. Williams, Cindy M. Yee, Keith H. Nuechterlein, & Marilyn Kesler-West
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Descriptors: Schizophrenia, P50, Sensory Gating

Sensory gating, as measured with the P50 suppression paradigm, has been found to be disrupted in individuals with schizophrenia and has been linked conceptually to attentional deficits (e.g., Freedman et al., 1987, Schizophrenia Bulletin, 669–678). This study was designed to examine the extent to which deficits in P50 suppression might be related to a failure to appropriately allocate attentional resources or a limited availability of attentional resources. Experiment 1 served as the P50 baseline condition during which event-related potentials (ERPs) were collected while recent-onset schizophrenia patients and normal comparison subjects were presented with pairs of clicks. Experiment 2 included two choice reaction time tasks that selectively directed subjects’ attention to either Click 1 or Click 2 of the paired clicks. ERPs were collected concurrently. Preliminary analyses suggest that directing attention to Click 1 may normalize P50 suppression in schizophrenia patients, while directing attention to Click 2 has no significant effect on suppression. Experiment 3 manipulated the availability of cognitive resources by including an n-back task with three different memory load conditions (0-, 1-, 2-back), presented concurrently with paired clicks. Initial results indicate that P50 suppression among schizophrenia patients is further disrupted during the n-back task, regardless of memory load. Taken together, these results suggest that the P50 suppression deficit may be related both to a failure in the allocation and in the availability of attentional resources.

A COMPARISON OF THE FINAPRES AND IMPEDANCE CARDIOGRAPHY FOR NON-INVASIVE ESTIMATION OF CARDIAC OUTPUT DURING MENTAL STRESS

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Stanford University and VA Palo Alto Health Care System

Descriptors: cardiovascular system, cardiac output, mental stress, biomedical signal processing

The Finapres is a non-invasive device that measures calibrated blood pressure continuously in the finger. This allows not only computation of beat-by-beat systolic and diastolic blood pressure, but also of stroke volume and cardiac output using the Modelflow method for arterial pulse contour analysis. This cardiac output estimate has been validated against invasive measurement (e.g., Gratz et al., 1992), as has the more commonly used cardiac output estimation by impedance cardiography. An advantage of the Finapres against the impedance cardiograph is that it simultaneously measures mean blood pressure for systolic and diastolic blood pressure, but also of stroke volume and cardiac output assessment with these two methods in 42 young healthy participants during baseline and a variety of mental stressors. Cardiac output values during the stress tasks were expressed as change scores from baseline. Pearson correlations between Finapres and impedance cardiography derived cardiac output reactivity scores were in the order of 0.1 to 0.3 and not statistically significant. Correlations between raw scores were similarly low. We conclude that the Modelflow method applied to the Finapres arterial pressure waveform provides cardiac output estimates that are divergent from those based on impedance cardiography. The two methods apparently have unique sources of measurement error that make a comparison of results from studies using one or the other difficult.

BACKWARD MASKING: A COMPARISON OF DIFFERENT METHODS

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Karolinska Institute

Descriptors: backward masking, display technology, consciousness

When a target picture is shown briefly and followed immediately by another (masking) picture, people report that they are conscious only of the masking but not the target picture. Although backward masking is a promising tool to study nonconscious mental processes, it is technically demanding. Whereas studies have traditionally used cathode-ray tube (CRT) monitors or mechanical shutters together with slide projectors, it is unclear if displays based on liquid crystal (LCD) and thin-film transistor (TFT) technology are possible alternatives. Because all methods may not be equally suited for masking due to differences in technology, this study compared different methods of presenting pictures at short durations. Changes in luminance were measured with psychophysiological recording equipment together with a photodiode. Target pictures were presented at various durations and for each presentation, initial latency, rise time, observed duration, and relative maximum luminance were measured. When methods were compared in their accuracy in presenting pictures at short durations, presentation parameters showed poor accuracy for LCD and TFT but not for shutter and CRT. These findings do not recommend the use of LCD or TFT displays in backward masking studies. However, because our results may not generally apply to all displays, we advise researchers to validate the presentation parameters of their display. Our procedure may be useful for that purpose.
FUNCTIONAL CEREBRAL ASYMMETRY AS A FUNCTION OF HOSTILITY

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Descriptors: Hostility, fluency, cardiovascular

The influence of hostility on the lateralized tasks of cardiovascular regulation, verbal fluency and nonverbal fluency was assessed. Twenty-four subjects divided into two groups, high- and low-hostile men underwent physiological measurements of SBP, DBP, and HR before and after verbal (Controlled Oral Word Association Test) and figural fluency (Ruff Figural Fluency Test) tasks, which were used as stressors. It was expected that high-hostile men would produce results indicative of differential right hemisphere activation when compared with low-hostile men. In addition, it was predicted that high-hostile men would display a weakness in both the performance on the right-frontal nonverbal fluency task and in their ability to maintain relative cardiovascular stability subsequent to the presentation of that stressor. As predicted, high-hostile men produced more perseverative errors than did low hostile men on this task. Further, subsequent to administration of the nonverbal fluency task, high-hostile men produced a reliable increase in blood pressure when compared to baseline and to low-hostile men. This is a successful replication of a previous experiment using a more refined methodology. Results were obtained with an n-size 50% smaller than the previous experiment (It is argued that the increase in power is a consequence of screening for depression). Results are discussed within the context of the functional cerebral systems of emotion and arousal. Implications for further research are explored.

FMRI ANALYSIS OF FORM AND MOTION PERCEPTION IN SCHIZOPHRENIA

Marcia Wilt, Mario Dzemidzic, Andrew Bismark, Yang Wang, Brian O’Donnell, & Anantha Shekhar
Indiana University, Indiana University School of Medicine

Descriptors: visual psychophysics, psychopathology

Visual psychophysical tasks were adapted to a block design fMRI study to assess motion and form perception. Seven unmedicated schizophrenic patients and 9 healthy controls were tested. During form tasks, subjects determined the letter (D or U) that appeared in noise (control was noise alone). In motion tasks, subjects reported the direction of coherent motion (left or right) in a moving dot pattern (control was stationary dots). Noise in both conditions was modulated with responses to maintain 71% response accuracy. Behavioral data confirmed that patients required significantly less noise than controls to perform either task; however, deficits for motion were significantly worse than form. Since the patients received a stronger (less noisy, more coherent) visual stimulus, their BOLD activation in visual areas was expected to be higher than controls. Instead, we found significantly lower activation in ventral and dorsal visual areas with form and motion stimuli, respectively, indicating reduced signal-to-noise capacity in schizophrenia.

DISSERTATION TO VISUAL MENTAL IMAGERY ACTIVATES THE CONTRALATERAL OCCIPITAL REGION: EVIDENCE FROM EEG ALPHA OSCILLATION

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Hokkaido University, Sapporo Medical University

Descriptors: mental imagery, spatial attention, alpha power

The purpose of this study is to reveal how spatial attention to mental imagery affects brain activation reflected by EEG alpha power variation. EEGs were recorded from twenty-six scalp sites, while twelve students ran two conditions with their eyes closed. In the control condition, the participants were asked only to hear auditory stimuli. After the control condition, they memorized two sets of three random shapes printed on the left, center, and right side of each card. In imagery condition, the participants were required to visualize the card indicated by the first auditory stimulus, and attend to the location, indicated by the second auditory stimulus, in the imagery card. At the end of each trial, they drew the shape at the attended location. EEGs were analyzed during each 1024-ms-epoch from 1024 ms before (pre) to 5120 ms after (post-1 to post-5) the onset of the second stimulus. After fast Fourier transform (FFT) analysis, median alpha (7.8–12.7 Hz) powers were computed and log transformed to normalize the power (dB = 10 log (condition/rest)) for each epoch. Alpha attenuation was observed at the contralateral occipital sites to the attended side in the post-2 epoch during the imagery condition relative to the control condition. Provided the alpha attenuation reflects increment of the neural activity, the results indicate that spatial attention increases neural activation on the contralateral occipital region to the attended side. This finding suggests that the mechanism of spatial attention in visual imagery is similar to that in visual perception.

DIFFERENTIAL CONDITIONING OF FEAR TO INGROUP AND OUTGROUP FACES

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Descriptors: prejudice, aversive conditioning, startle eyelink

We examined whether White participants would show more rapid acquisition and slower extinction of a fear response to Blacks as compared to Whites because of negative cultural stereotypes about Blacks. To this end, we used an aversive conditioning paradigm in which Black and White faces were either paired with aversive electric shock or not. To assess learning patterns, fear-potentiated startle eyelink responses were used. Participants first viewed pictures of Black and White faces without shock (habituation). Next, either Black or White faces were paired with shock (acquisition). Finally, participants viewed the faces without shock (extinction). Results indicated that during habituation, there were no differences in the magnitude of participants’ startle responses while viewing Black faces vs. White faces. During acquisition, participants showed evidence of learning the fear response, and the magnitude of the fear response did not differ for Black and White faces paired with shock. During extinction, however, differences emerged. Participants shocked to Black faces during acquisition showed a heightened startle response to Black faces as compared to White faces. In contrast, participants shocked to White faces during acquisition showed no differences in the magnitude of startle responses to Black and White faces. These processes may contribute to the maintenance and perpetuation of outgroup stereotypes and prejudice. Further investigation will examine how these response patterns may be moderated by individual differences in prejudice.
EFFECTS OF CHEWING GUM FLAVOR ON MEASURES OF MEMORY, REACTION TIME, AND HAND/EYE COORDINATION

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While limited research has addressed the effects of chewing gum on cognitive performance, the established connections exhibit promise. Wilkinson, Scholey, and Wesnes (2002) found that chewing gum improves episodic and working memory, and Onozuka, et al. (1999) established that reduced mastication in rats impaired spatial memory and led to the degeneration of hippocampal neurons. Other studies have concluded that chewing gum flavor, in addition to the process of mastication, activates different neuronal populations in the brain, differentially stimulating brain activity (Morinushi, Masumoto, Kawasaki, & Takigawa, 2000; Yagy, et al., 1998). The present study assessed the effects of both mastication and chewing gum flavor on measures of memory, attention, reaction time, problem solving, and response variability. In a within-subjects design, 31 participants completed an assortment of cognitive tasks on a computer-based program (Impact®) under five chewing gum conditions (no gum, flavorless gum, peppermint gum, cinnamon gum, and cherry gum). Participants chewed the gum (or sat quietly during the no gum control condition) for five minutes prior to testing. A one between (gender), two-within (cognitive task, gum) ANOVA produced trends indicating cinnamon gum leads to better visual recognition memory and attentional processes, and improves both working memory and visual-motor response speed. Another trend indicated flavored gums, in comparison to non-flavored gum and no gum conditions, enhanced working memory and visual-motor response speed. A significant gum × task interaction revealed that gum flavor, particularly cinnamon and peppermint, produced the greatest variation among delayed visual recognition memory scores. Implications are particularly salient in regard to providing a non-pharmacological adjunct for memory enhancement.