Poster 1-005

LEARNING TO ASSOCIATE REWARD VALUES WITH CUES

Constanza de Dios, Geoffrey Potts
University of South Florida

Descriptors: Reward, Motivation, Exogenous Attention

The study measured the effects of value on exogenous and endogenous attention using event-related potentials (ERPs). Exogenous cues produce early perceptual representation in posterior cortex and thus elicit the P1 ERP, being larger to cued stimuli (cue validity effect). Endogenous targets require frontal evaluation of relevance and thus elicit the P2a, being larger to targets than nontargets (target effect). Although previous work has shown value-driven effects on attention depend on the stimulus feature where the value information is embedded, it is unknown when and how long these effects manifest throughout a task. To test this idea, we manipulated reward outcome (reward, nonreward, neutral), stimulus type (targets, distractors), and cue validity (valid, invalid, uncued) in a Posner cuing task. Correct keypresses to instructed targets or non-responses to distractors were given points if the imperative stimuli appeared in the location cued by reward, but given no points if they appeared in the nonreward cued-location. No reward was possible on neutral trials. Because value information was embedded in the cue, we predicted that reward would enhance the cue validity effect as indexed by the P1, but would not modulate the target effect in the P2a. In partial support of our hypothesis, the P1 showed enhanced cue validity only on reward trials, but this effect was only present during the early half of the task. Value did not modulate the target effect in the P2a. Together, the results suggest that reward was mapped to the cue early and in a rapid manner.

Poster 1-006

THE EFFECT OF ACUTE EXERCISE ON PUPILLOMETRIC INDICES OF LOCUS-COERULEUS ACTIVATION IN COLLEGE-AGED YOUNG ADULTS

Amanda McGowan, Madison Chandler, Jan Brascamp, Matthew Pontifex
Michigan State University

Descriptors: Inhibition, ERP, Pupillometry

Although the locus-coeruleus norepinephrine system has been hypothesized to underlie acute exercise induced enhancements in cognition — given its role in modulating alertness and attention; at present we have little understanding of the extent to which exercise induces changes in activation of the locus-coeruleus. To this end, pupillometric indices of both tonic (i.e., baseline) and phasic (i.e., task-evoked) locus-coeruleus activation were recorded concurrent with neuroelectric and behavioral measures in response to a flanker task. Assessments were performed in a sample of college-aged (M = 19.0 ± 1.1 years) young adults (n = 50; 27 female) prior to and following a single bout of moderate intensity aerobic exercise and an active control condition during two separate, counterbalanced sessions. Replicating previous findings, acute exercise resulted in faster and more accurate behavioral responses to an inhibitory control task as well as larger P3 amplitude (as an index of allocation of attentional resources), with no such modulations occurring in response to the active control condition. However, findings revealed no exercise-induced modulations in either baseline pupil size (as an index of tonic locus-coeruleus activation) or task-evoked pupillary reactivity (as an index of phasic locus-coeruleus activation). Such findings suggest that the locus-coeruleus is not modulated by exercise, reducing the extent to which it may be responsible for cognitive enhancements observed following exercise.

Poster 1-007

HEART RATE VARIABILITY DURING STRESS INDUCED COGNITIVE INHIBITION IN POST-STROKE APHASIA

Bijoyaa Mohapatra
New Mexico State University

Descriptors: Heart Rate Variability, Post-stroke Aphasia, Inhibition

This study investigated the changes in heart rate variability (HRV) during inhibitory processing in post-stroke aphasia. Ten post-stroke aphasic individuals, and 11 age-matched healthy controls participated in a non-randomized pretest-posttest study. All participants completed two computerized cognitive inhibitory tasks during which their HRV was recorded. The study phases were: 1) 10-minute baseline, 2) experimental continuous performance test (CPT)-X task, 3) 10-minute between tasks rest, 4) experimental continuous performance inhibition CPT-non-X task, and 5) 10-minute recovery. Both groups demonstrated significantly lower high frequency HRV and increased HR during CPT-non-X that poses greater inhibitory demands than CPT-X that poses lesser inhibitory demands. There was suppression of HRV during the tasks compared to baseline and recovery conditions in both groups confirming evidence for overall reduction in cardiac vagal activity. Aphasia group demonstrated prolonged HRV recovery compared to healthy controls suggesting that they require longer time to recover from stressful conditions. In conclusion, high HRV is linked to high-functional prefrontal inhibitory action that provides control over emotional states and cognitive responses, and low HRV is associated with decrease in inhibitory control in post-stroke aphasia.

Poster 1-008

INTRA AND INTER-HEMISPHERIC PHASE SYNCHRONIZATION DURING VISUO-SPATIAL ATTENTION DEPLOYMENT AND RETENTION IN VISUAL WORK MEMORY

Anne Monnier[1], Jean-Marc Lina[2], Roberto Dell'Acqua[3], Mattia Doro[3], Lesley Wu[4], Pierre Jolicoeur[5]
[1]Université de Montréal, CERNEC, [2]École de Technologies Supérieures, CEAMS, Université McGill, CRMM, [3]University of Padova, [4]Université de Montréal, [5]Université de Montréal, CERNEC, IUGM, BRAMS

Descriptors: N2pc and N2pb, synchronization, top-down processes

To deepen our understanding of the mechanisms of visuo-spatial attention and visual working memory, we recorded EEG from fifty observers completing a visual search task. Different numbers of color oddballs were shown in different locations (above/below, left/right visual fields, or vertical midline) among about 50 fillers. In the above/below task, one block of trials defined targets as oddballs above the midline and non-targets as below the midline; another block had the opposite pairings. In the odd/even task, targets were an even number of oddballs, and non-targets were an odd number of oddballs, in one block, and the opposite in another block. In the detection task, all oddballs were targets.Block order was counterbalanced across subjects. The amplitude of N2pc and N2pb increased significantly with the number of oddballs in all tasks. Importantly, this effect was significantly larger for targets than for non-targets in the localization and discrimination tasks, suggesting the effect of the number of oddballs depended on how attention was deployed. ICA was used to extract patterns of phase synchrony across brain areas for three frequency bands. Alpha synchrony increased within the hemisphere ipsilateral to targets during perceptual encoding (80-200 ms); gamma synchrony increased between occipital and parietal areas in the contralateral hemisphere during attentional processes (e.g. N2pc or N2pb) latency (200-300 ms); and beta synchrony increased between posterior and central contralateral electrodes during a latency reflecting visual working memory (400-500 ms).