

physiological evidence for processing of task-irrelevant faces, even under high perceptual load which usually prevents distractor processing.

F5

ATTENTIONAL MODULATION OF STIMULUS APPEARANCE: ERP EVIDENCE FOR A POSTPERCEPTUAL PROCESS

*Michael Niedeggen*¹; ¹Experimental Psychology and Neuropsychology, Free University Berlin, Germany – Numerous psychophysical studies indicated that a transient visuospatial shift of attention induced by a salient peripheral cue increases the apparent contrast of a target stimulus. Here, a similar cuing paradigm was used to examine the effect of covert attention on the appearance of visual motion coherence: A short sequence of coherence (100 ms) was embedded in two dynamic random dot kinematograms (RDK) presented left and right of a fixation. Subjects had to decide which RDK was apparently defined by a higher level of coherence. The target was preceded by a short reduction in luminance in one RDK serving as a cue (SOA: 100 ms). Psychophysical data revealed that the apparent motion coherence was reduced by an invalid cue (higher coherence in the contralateral RDK), and attenuated by a valid one (higher coherence in the ipsilateral RDK). A corresponding modulation of the event-related brain potentials (ERPs) was obtained in the range of a late cognitive component (P300), but not within the negativity associated with sensory motion processing (N200). Here, invalid cues were found to prolong the time course of sensory processing. The results indicate that reflexive attention does not necessarily enhance a visual signal, and that the corresponding shift in stimulus appearance reflects the activation of a postperceptual process.

F6

A LOWER LOADED HEMISPHERE AIDS IRRELEVANT PROCESSING

*Ritsuko Nishimura*¹, *Kazuhiro Yoshizaki*¹, *Kimiko Kato*¹, *Takeshi Hattai*²; ¹Aichi Shukutoku University, ²Nagoya University – Our study aimed to investigate whether or not a distractor was processed in the hemisphere which is loaded with the lower perceptual load. This question was motivated by the assumption that each hemisphere has an independent resource. Right-handed 16 participants were asked to discriminate a target letter in briefly presented five task-relevant letters, while ignoring a distractor presented in the periphery outside the task-relevant letters. We manipulated perceptual load of the target (high-load or low-load), presentation mode between a target and a distractor (within- or across-field), and compatibility of a target and a distractor (compatible or incompatible). In the high-load condition, a target and three non-target letters were presented in either left (LVF) or right visual-field (RVF) and a non-target letter was presented in the opposite visual-field. In the low-load condition, a target was presented in either LVF or RVF and four non-target letters were presented in the opposite visual-field. In the within-field condition, the target and the distractor were presented in the same visual-field. By contrast, in the across-field condition, they were presented in the divided visual-fields. Results showed that in the low-load condition the compatibility effect was larger in the within-field condition than in the across-field condition. On the contrary in the high-load condition, the compatibility effect was larger in the across-field than in the within-field condition. These results suggested that the distractor was processed in the hemisphere which was loaded with lower perceptual load, irrespective of the presentation mode.

F7

TEMPORAL EXPECTANCY INFLUENCES ORIENTING IN TIME BUT NOT THE TIME COURSE OF ORIENTING IN SPACE

*Nathan Parks*¹, *Paul Corballis*¹; ¹Georgia Tech – It has long been known that attention may be oriented to regions of visual space. More recently, it has been proposed that attention may also be directed to instants in time. That is, an endogenous cue of attention may carry information regarding the temporal validity of an upcoming target. In the case of both spatial and temporal orienting, endogenous cues must be informative and the cue-target validity of these cues must be learned. We wondered whether the time course of spatial orienting is learned and is dependent on the tempo-

ral validity of endogenous spatial cues. We examined interactions between temporal orienting and the time course of spatial attention by biasing cue-target stimulus onset asynchrony (SOA) in an endogenous spatial attention paradigm. Subjects (N=72) performed an endogenous spatial cuing task (75% validity) with cue-target SOAs 100, 200, 300, 400, 500, 600, or 700 ms. The temporal validity of spatial cues was manipulated between groups by weighting the occurrence of one SOA over the others. In the three groups (N=24), the validity of 100, 400, or 700 ms was manipulated by weighting the corresponding SOA to occur 40% of the time versus the 10% occurrence of each remaining SOA. Simple reaction time data were examined for interactions between spatial and temporal orienting. There were significant within-subjects effects of spatial orienting and significant between-subjects effects of temporal orienting, but no interaction between the two. Results are consistent with the idea that spatial and temporal orienting operate via separable mechanisms.

F8

BEHAVIORAL AND ELECTROPHYSIOLOGICAL LINKS BETWEEN DRD4 AND ATTENTION ORIENTING IN CHILDREN

*Koraly Perez-Edgar*¹, *Nathan Fox*², *Louis Schmidt*³; ¹George Mason University, ²University of Maryland, College Park, ³McMaster University – Numerous studies have shown that the D4 dopamine receptors (DRD4s) play important roles in attentional and motivational processes. With children, much of the focus has been on Attention-Deficit/Hyperactivity Disorder (ADHD). Less work has focused on the role of DRD4 in normal development. In the current study, we examined the links between DRD4 allelic status and performance in a standard measure of attention orienting, the Posner cued-attention paradigm, in 7-year-old children. Building on previous work, the Posner task was modified to include a baseline, affect-neutral, condition and a second condition completed in an emotionally-charged environment. The impact of this manipulation on attention orienting was examined using behavioral (RT) and psychophysiological (ERP) measures. The children with the long-allele (LA) were significantly slower in the task than their peers in the short-allele (SA) group, $F(1, 47)=8.57$, $p<.01$. The LA group was particularly slow when presented with invalidly cued trials, $F(1, 47)=6.59$, $p=.01$, across both neutral and affective conditions. For the N1 component, children in the SA group showed the expected validity effect, which increased from the neutral to affective Posner condition. However, the LA group displayed a decrease in the validity effect across conditions, $F(1, 43)=4.85$, $p=.03$. For N2, the LA group had smaller peak amplitudes and failed to show the validity effect in the affective task, $F(1, 43)=7.61$, $p=.01$. The data indicate that children with the long allele have greater difficulty with basic attention-orienting processes, perhaps contributing to the link between DRD4 and attention problems, including ADHD.

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MENTAL IMAGERY AND VISUAL PERCEPTION OF THE MENTAL NUMBER LINE

Lorenzo Pia^{1,2}, *Alessia Folegatti*¹, *Marco Neppi-Mòdona*^{1,2}, *Luigi Cremasco*³, *Lucia Spinazzola*^{1,4}, *Patrizia Gindri*⁵; ¹University of Turin, ²Neuroscience Institute of Turin (NIT), ³University of Turin, ⁴Fondazione Don Carlo e Centro Santa Maria ai Colli, Turin, ⁵Hospital Company S. Antonio Abate, Gallarate, ⁵San Camillo Hospital, Turin – It has been suggested a relationship between spatial thinking and number representation, such that numbers are represented along a continuous, left-to-right mental number line with smaller quantities located to the left of larger ones. Some evidence comes from the joint deficits of space and numbers processing in left-neglect patients. These patients, when required to indicate which number is halfway between two orally presented numbers that define a numerical interval, may displace the midpoint progressively rightwards as the interval grows. This raises the question of whether shifting attention within a mental representation produces a corresponding attentional shift in the visual field, and vice-versa. To address this question, we selected 10 neglect patients with the aforementioned pattern of numerical error. The same numerical intervals were then employed in a “numerical-endpoint task” that consisted of two conditions: 1) Marking

the midpoint of the empty space enclosed between two numerical extremes; 2) Same as 1), but now patients were asked to mark the midpoint by writing down the number that is numerically halfway between the two numerical extremes. The results indicate that the size of numerical intervals equally influenced the rightward numerical bias in the number bisection and in the “numerical-endpoint” tasks. The same was not true for spatial bias (defined as the position of the bisector number): in this case no modulation by the size of the numerical interval was present. These results suggest that attention shift across internal spatial representation and external space might be underpinned by (at least some) different mechanisms.

F10

THE INFLUENCE OF REWARD AND PUNISHMENT ON ATTENTION: EVIDENCE USING ERPS

Nikki Pratt¹, Dennis Molfese¹; ¹University of Louisville – Event-related potentials (ERPs) investigated the influence of motivation and expectation on the neural processes involved in selective visual attention. The research design was adapted from Derryberry & Reed’s (1994) paradigm. Cues preceded target location in peripheral boxes that contained positive or negative incentives. Points were awarded for a fast response in the positive incentive box and subtracted for a slow response in the negative incentive box. The electrophysiological recordings utilized a 256-hydrocel electrode net to investigate valid and invalid targets in positive and negative boxes. The current analysis examined the ERP to targets with cues predicting target location in 80% of the trials. Preliminary results indicated that the P1 in the occipitotemporal region generated a larger response to trials with congruent cue and target locations. This was enhanced for targets that appeared in the negative incentive box. The N1 in the occipitotemporal region generated a larger response to incongruent cue and target locations. Specifically, a greater N1 response occurred to invalid targets in the negative incentive box. A cue presented in the positive incentive box followed by a target in the negative incentive box generated the largest N1. The results suggest that early selective attention in the occipital cortex is influenced by motivation as well as target validity.

F11

THE RIGHT TIME AND THE LEFT TIME: SPATIAL ASSOCIATIONS OF ENDOGENOUS TEMPORAL CUES AFFECT TARGET DETECTION IN RIGHT BRAIN-DAMAGED PATIENTS

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from invalidly cued locations persists for endogenous cues that elicit spatial mental representations.

F12

ATTENTION PLAYS A ROLE IN SUBITIZING: AN INATTENTIONAL BLINDNESS STUDY

Henry Railo^{1,2}, Mika Koivisto^{1,2}, Antti Revonsuo^{1,2,3}, Minna M. Hannula^{1,4}; ¹University of Turku, Finland, ²Centre for Cognitive Neuroscience, University of Turku, Finland, ³School of Humanities and Informatics, University of Skövde, Sweden, ⁴Sackler Institute for Developmental Psychobiology, Weill Medical College of Cornell University – Subitizing refers to the effortless process of enumerating small numbers of items. Whether subitizing rests purely on parallel pre-attentive processes, or, is actually an attention demanding process, has been debated previously. Previous studies that have examined the attentional requirements of subitizing have based their conclusions on conditions where the participants have explicitly attended on the task of enumeration and attention has been focused on the item location. Enumeration latencies have also been shown to increase already in the subitizing range, suggesting that some serial, attentional components may be involved. The present study is the first that directly contrasts the pre-attentive and the attentive models of subitizing. We used inattentional blindness paradigm to test whether enumeration is possible when the effects of attention are minimized by presenting the items unexpectedly while the participants were focusing on another task. Divided- and full-attention conditions were also included. The results showed that only numbers one and two could be enumerated under inattention, that is, when the effects of attention were minimized. Moreover, freeing attentional resources in the divided- and full-attention conditions increased the enumeration accuracies considerably, including for number two. Thus, the results suggest that even for enumerating small numbers, the attentional demands increase as the number of objects increases.

F13

EVENT-RELATED POTENTIAL INDICES OF ASYMMETRIES IN ATTENTIONAL GRADIENTS

John C. Richiardi¹, William Bush¹, Lisa D. Sanders¹, Kyle Cave¹; ¹University of Massachusetts, Amherst – Previous evidence suggests that if the possible locations of stimulus presentation are delineated, spatial attention affects processing in a graded manner. Specifically, stimuli presented close to cued regions elicit larger visual evoked potentials (VEPs) than those presented farther away. However, both position in the visual field and allocation of attention may contribute to the observed gradients. These relative contributions can be distinguished by comparing responses on physically identical trials when attention is directed to locations at various distances from the stimuli. In the current study, participants attended to one of 12 squares arranged in a circle around fixation. Letters appeared individually, each in one of the squares; 80% were O’s (standards) and 20% were X’s (deviants). Participants pressed a button when an X appeared at the attended location. VEPs elicited by standards showed evidence of asymmetric attentional gradients. Specifically, the largest amplitude N1s were observed when participants attended to the location where a standard was presented. Responses were also larger to standards when attention was directly above the stimulus compared to when it was directly below. However, all of these conditions resulted in larger amplitude N1s than when participants were attending to more distant locations. These results confirm that attention can be applied to visual processing in a spatial gradient and reveal its asymmetric distribution.

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DEFICITS IN EARLY DETECTION AND DISCRIMINATION PROCESSES OF ATTENTION DURING NICOTINE ABSTINENCE

Anthony Rissling¹, Dana Smith¹, Irene Yang¹, Michael Dawson¹, Anne Schell², Keith Nuechterlein³; ¹University of Southern California, ²Occidental College, ³University of California Los Angeles – Impaired performance during continuous performance tasks (CPTs) has been reliably reported in smokers following nicotine abstinence when compared to nicotine intake. However, the specific processes of attention that account