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Control/Tracking Number: 2007-A-115800-SfN
Activity: Scientific Abstract
Current Date/Time: 5/15/2007 3:58:28 PM

EEG correlates of intentional ignoring.

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Abstract: The processing of behaviorally relevant stimuli often requires two sides of attention: attention to some stimuli, accompanied by ignoring of other stimuli. It is well known that attention alters neural processing, as shown by behavior and neural measures. However, the relationship of ongoing background activity to these changes, the time-courses of such effects, and the relationship between positive attentional mechanisms, and its inverse, ignoring, have not been fleshed out.
To address both sides of attention, we made coordinated experimental and EEG measurements in a recognition memory task with arrays of oriented bars. In one condition, subjects tried to remember just one array, while ignoring a later array. In another condition, subjects tried to remember both arrays. Subjects noted whether the remembered arrays matched a probe array. Before the stimuli, subjects were cued that a change in the array, if present, would occur in either the left or right hemifield.
The success or failure of ignoring can be assessed for individual subjects by examining the difference in recognition with memory load. On average, recognition was better and response times were faster when subjects reduced their memory load by ignoring one of the arrays. Using these behavioral measures of interference allows assessment of the effectiveness of ignoring for each subject without the need to explicitly ask the subject about the ignored stimulus.
Decreased visual attention in the ignoring condition was reflected in increased EEG power in the alpha band, and decreased power in the gamma band. In addition, event-related potentials show greater amplitude in the attended as opposed to the ignored condition. This convergence with previous results supports the idea that our manipulations altered the attentional system. We also examined how trial-to-trial behavioral differences affected neural response. Lateralization in EEG power in the alpha band during the remember condition predicts the hemifield to which the subject attends. In addition, although power in the high gamma band before the stimulus is presented did not predict the accuracy of a subject's response, we found that power in the same frequencies just after the stimulus is presented did predict accuracy.

This gives us a powerful tool to examine the neural correlates of trial-to-trial and condition-to-condition modulations in the effectiveness of ignoring behaviorally irrelevant stimuli.
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Theme and Topic (Complete): D.04.l. Visual cognition: Attention and search ; F.01.c. Attention
Keyword (Complete): attention ; EEG ; psychophysics ; behavior ; human
Presentation Preference (Complete): Poster Preferred
Support (Complete):
Support : Yes
Grant/Other Support: : NIH grants MH068404, MH55687 and MH61975

Linking Group (Complete): None selected
Special Requests (Complete):
Religious Conflict? : No Religious Conflict
Additional Conflict? : No

Status: Finalized