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Sustained visual attention studied with echoplanar functional MRI and parametric analysis.

EJ Modestino, GT Liu, A Miki, SM Doran, D Aleman, C Dobre, et al . *The Children's Hosp. of Phila., Hosp. of U. of PA, and the Scheie Eye Institute; U. of PA School of Med., Phila., PA.*

ejmodest@sas.upenn.edu

Purpose: In this pilot study, a functional MRI method for studying sustained visual attention with EPI and parametric analysis was developed. To our knowledge this has not been previously performed.

Methods: Five subjects (3 males, 2 females), ranging from 18 to 62 years and all right-handed, were tested. A 1.5 T Siemens MR scanner was used to obtain functional images, using a T2* weighted echoplanar image sequence with a FOV=240 mm x 240 mm, 64*64 matrix, 5 mm thick slices without interslice gaps, and TE=29 ms, 90 degree flip angle, TR=5.71 seconds. Each image set contained 28 axial slices, and 165 image sets were obtained over 15 mins., 43 secs. Using a video projector, visual stimuli generated by MacStim were displayed onto a ground-glass screen at the subjects' feet, which the subjects viewed with a mirror. A central fixation cross was provided. At random intervals between 2 to 10 seconds, the cross was replaced by a black dot, at which time the subjects were asked to press a button on a fiberoptic pushbutton pad. Latencies were recorded by MacStim. Then mean latencies during consecutive 5 image set epochs (28.57 seconds) were calculated. Motion correction, spatial smoothing, temporal smoothing, and spatial normalization of the data sets were performed using SPM96. A 2 condition parametric analysis was then used: the three epochs with the shortest mean latencies were contrasted with the three epochs with the longest mean latencies.

Results: Of the 5 subjects, only two showed statistically significant ($Z=4.62, 5.38$) prefrontal and cerebellar activation during the epochs with the shortest latencies.

Conclusions: EP fMRI and parametric analysis may in some instances localize the neural correlate of sustained visual attention. However, its low sensitivity may preclude consistent results between subjects. Alternative methodologies such as event related design can be considered.

Keywords: Attention; Visual; fMRI; Parametric