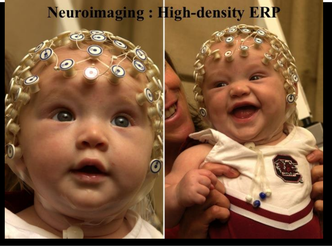

Cortical Source Analysis of Infant Spatial Cueing

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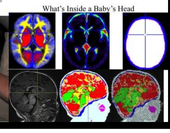


Background

Infants covertly move attention around in space without moving fixation. This is shown in the "spatial cueing" procedure in which a cue indicates the side of an upcoming target or is contralateral to the target ("valid" and "invalid"). Brain activity in this task may be measured by ERPs occuring in response to cued or uncued targets. This study found that the cortical sources of these ERP components occurred in the lateral occipital cortex and the fusiform gyrus differentially for the experimental conditions.

Methods

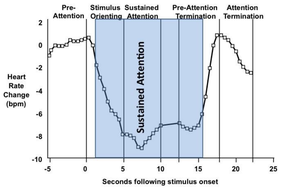
Participants:

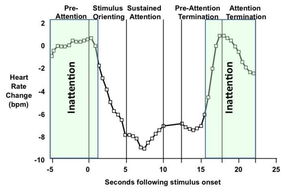
Infants at either 14- or 20-weeks of age were tested.

Stimuli and Procedure:

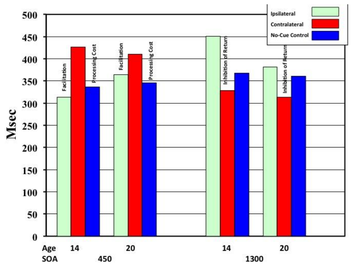
An interesting visual stimulus was presented on a large monitor. A small cue was placed in the periphery for 150 ms, then no stimulus in the periphery and no central stimulus, followed by a target in the same location as the cue (valid trial) or opposite location (invalid trial). Some trials had the cue only (cued-control) and some had the target only (neutral). The SOA between cue and target was 350 or 1350 ms. EOG was used for reaction time, attention was defined with HR, and EEG was recorded with 128 channel system.

Heart Rate and Attention

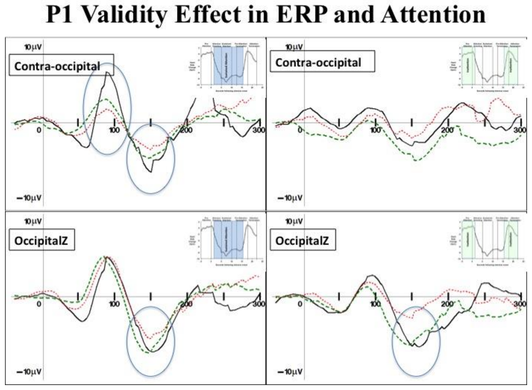


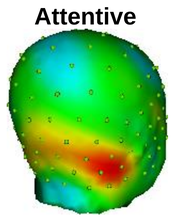


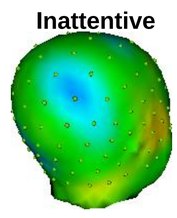
Reaction Time



Event Related Potentials

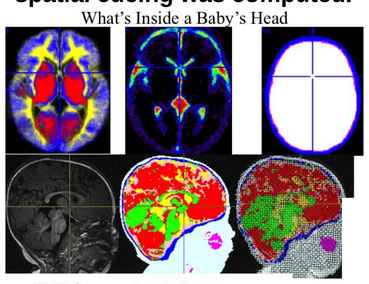


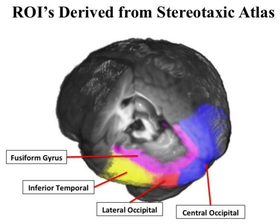




Cortical Source Analysis

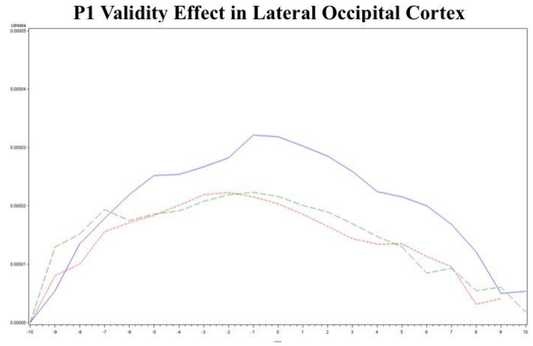
Cortical source analysis of the ERP was done. Individual participants were given a structural MRI, the materials inside the head were identified, and a realistic wireframe model was made. This was done for ~70 infants. This "library" of infant models was used to select a model from an infant with the same size a participant in the study. Second, the "forward model" and "inverse model" were constructed Third, a current density reconstruction (sLORETA) was done with the participants' ERPs using this model. Finally, average current density in ROI's hypothesized to be involved in spatial cueing was computed.

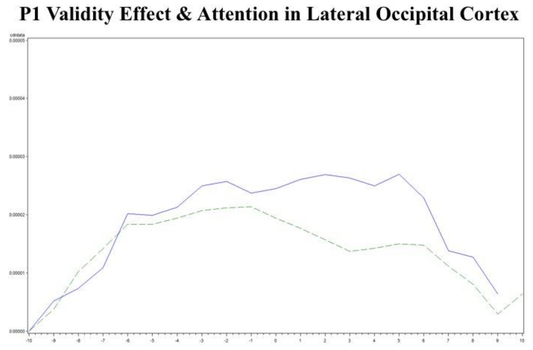


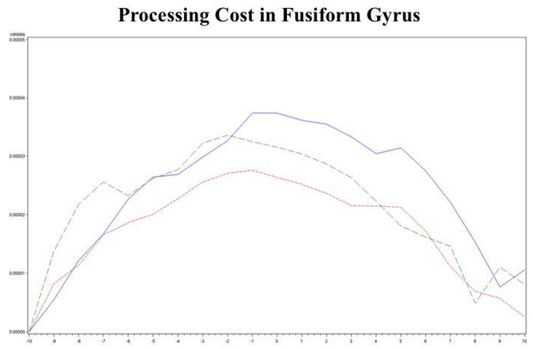


CDR at Peak of P1 (msec)

The current density can be computed on each ERP sample. The CDR at the peak of the P1 showed that the validity effect and the attention-validity effect occurred primarily in the inferior-occipital ROI, ie., "lateral occipital cortex". The processing cost effect in P1/N1 occurred primarily in the fusiform gyrus

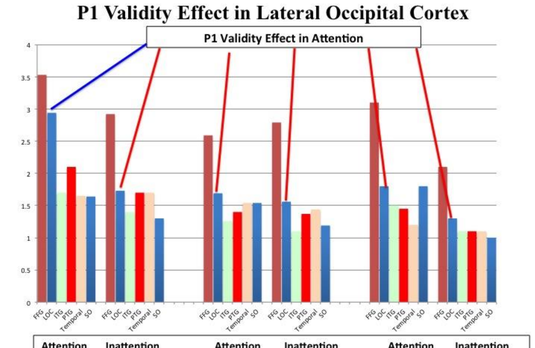


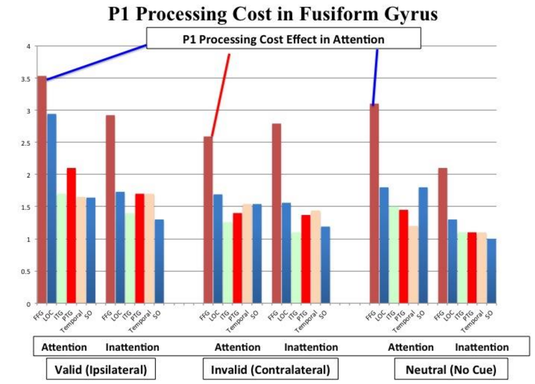


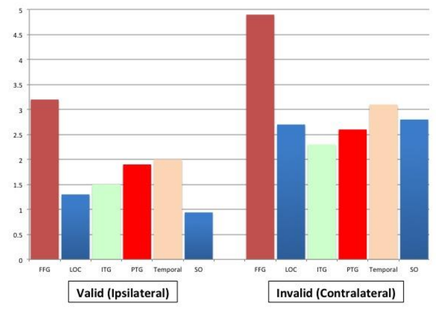


ROI Effects

The current density for the ROI's is the average current density per voxel. The P1 validity effect occurred in the lateral occipital cortes. The P1/N1 processing cost occurred in the fusiform gyus. The inihibiton of return, found in the long SOA trials, occurred as a overall decrease in current density across a wide range of ROI's.







Sponsored by NIH HD R37 18942