AUTHOR BLOCK: R.O. GILMORE, D. A. Fared, M. G. Dexheimer, A. R. Seisler; Penn State Univ., UNIVERSITY PK, PA

The appearance and disappearance of visual forms defined by differential motion evokes distinctive EEG responses in school-age children

Differential motion patterns aid in the segmentation of visual figures from the background. Adults show evoked brain responses to time-varying motion-defined forms over posterior scalp regions (Fesi et al., 2011; 2014); in these participants, EEG amplitudes scale with the magnitude of direction differences between the figure and background. However, little is known about the development of brain responses to motion-defined forms in childhood. In this study, we measured steady-state visual evoked potential (SSVEP) responses in n=37 children (mean age: 6.4 years; 16 female). Participants passively viewed random dot kinematogram displays that depicted visual forms which differed in direction from uniform background motion by 5, 45, or 180 deg. Four 9x9 deg square-shaped figure regions emerged from and disappeared into the background at a rate of 1.2 Hz (F1). Figure and background regions were populated with white (39 cd/m^2) dots on a black (.065 cd/m^2) background at a density of 10%; dot positions were updated at 36 Hz (F2). Each condition was presented at two speeds (1.2 and 6.0 deg/s). EEG was collected at 432.43 Hz using a 128 channel EGI system and PowerDiva Video 3.4 software and submitted to a discrete Fourier transform. The complex domain (real and imaginary) components of each channel were analyzed using mixed-effects MANOVA, with direction difference and speed as fixed factors and participant as a random factor. We chose $p<.0005$ as our alpha level to reduce the likelihood of reporting false positives. Statistically significant effects for direction were found at 1F1, 2F1, and 3F1, and these showed a broad distribution across the scalp. No channels met criterion for the effect of speed at any harmonic. Many, but not all channels showed the scaling of amplitude by figure/background direction difference found in adults, an effect particularly pronounced at 3F1. Complex domain plots of the most reponsive channels at 2F1 and 3F1 showed consistent phase and amplitude profiles. These results show that the appearance and disappearance of visual forms defined by local motion differences engages a widespread network of brain regions in school-age children that is similar but not identical to adults.