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

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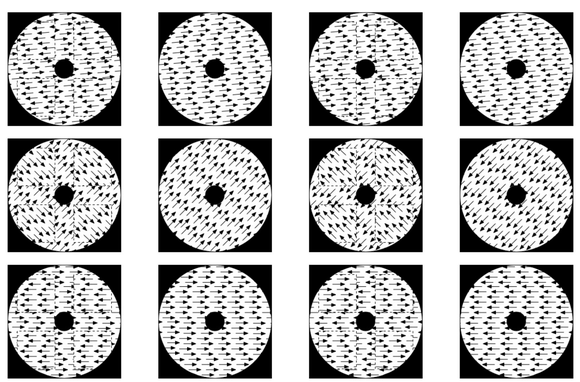
Motivation

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 [?],[?]; in these participants, EEG amplitudes scale with the magnitude of direction differences between the figure and background. 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 school-age participants and compared the resulting patterns to previous results of adults.

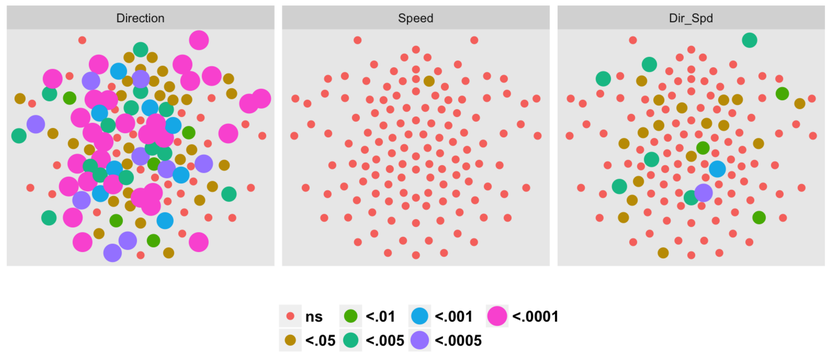
Method

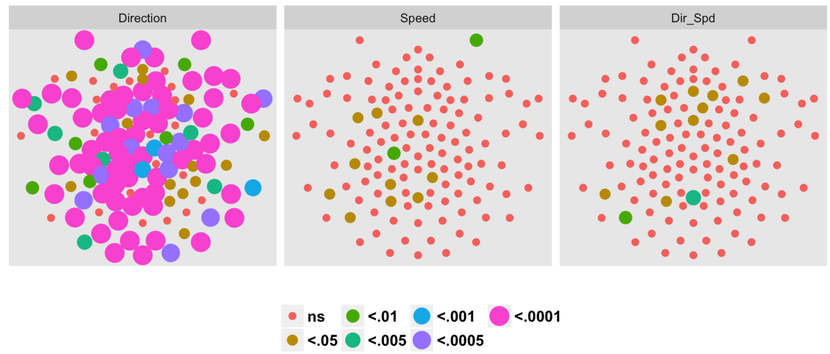
School-age observers (n=37; 4.3-9.0 years, *M*=6.4, 16 female) participated in this study. Participants passively viewed random dot kinematogram displays that depicted visual forms which differed in direction from uniform background motion by 5, 45, or 180 deg. Four 9x9 deg square-shaped figure regions 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). All patterns were displayed in an annular region 24/degree in outer and 4.8/degree inner diameter at the 60 cm viewing distance. 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.

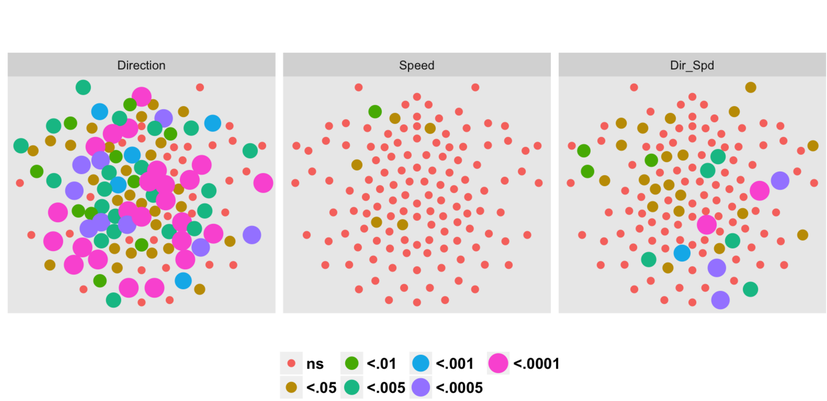
Displays



Results - Direction







Data Sharing

Movies of the displays, metadata about the participants, and raw data files are available at: `http://databrary.org/volume/144`.

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References

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