

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

Rick O. Gilmore (rogilmore@psu.edu), Daved A. Fared, Michael G. Dexheimer, & Andrea R. Seisler
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MOTIVATION

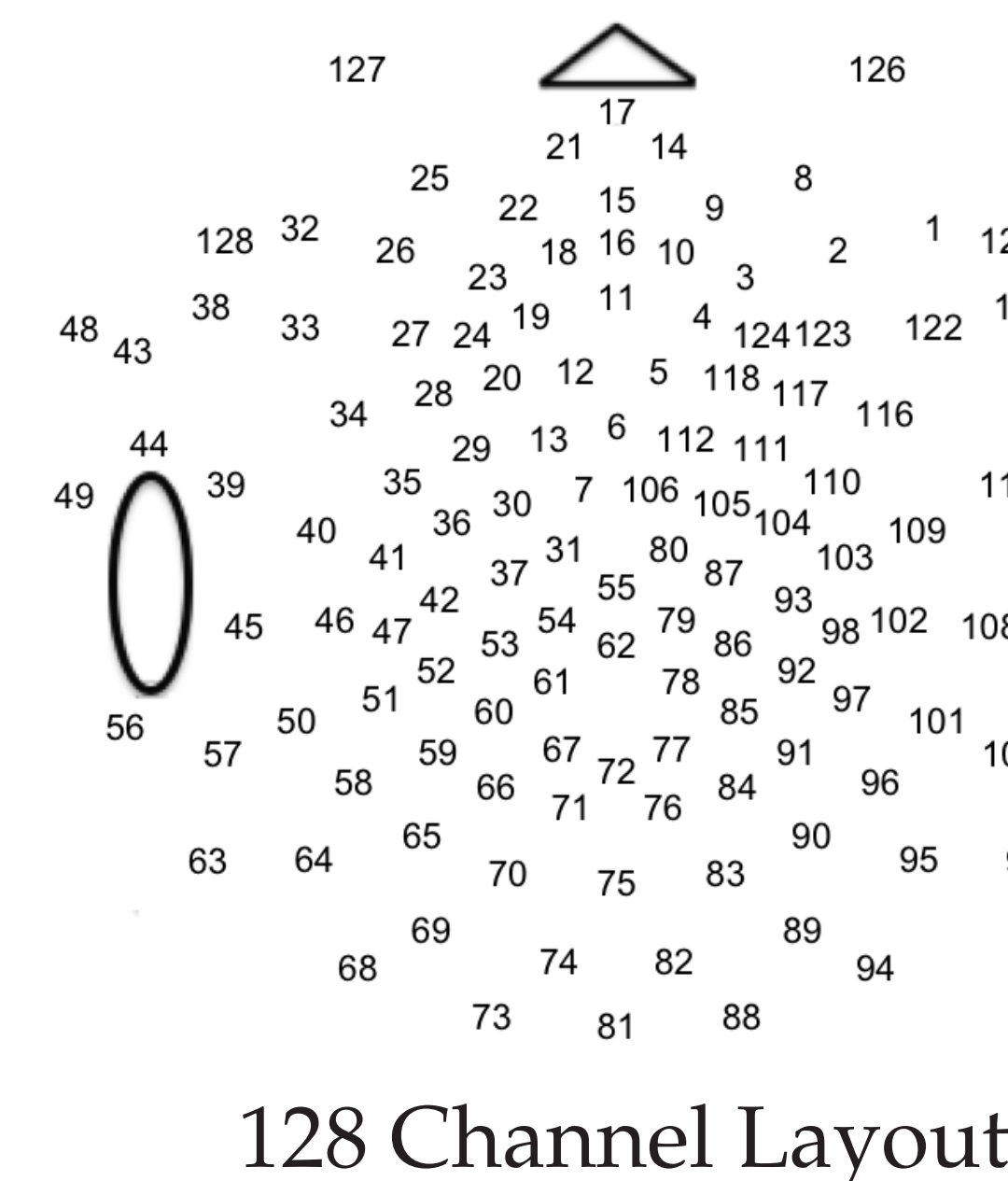
Differential motion patterns aid in the segmentation of visual figures from the background. Adults show evoked brain responses to time-varying motion-defined forms over posterior scalp regions [1],[2]; in these participants, EEG amplitudes scale with the magnitude of direction differences between the figure and background. Little is known about the development of brain responses to motion-defined forms in childhood [3]. 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° . Four 9×9 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 ($.065 \text{ cd/m}^2$) 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° in outer and 4.8° inner diameter at the 60 cm viewing distance.

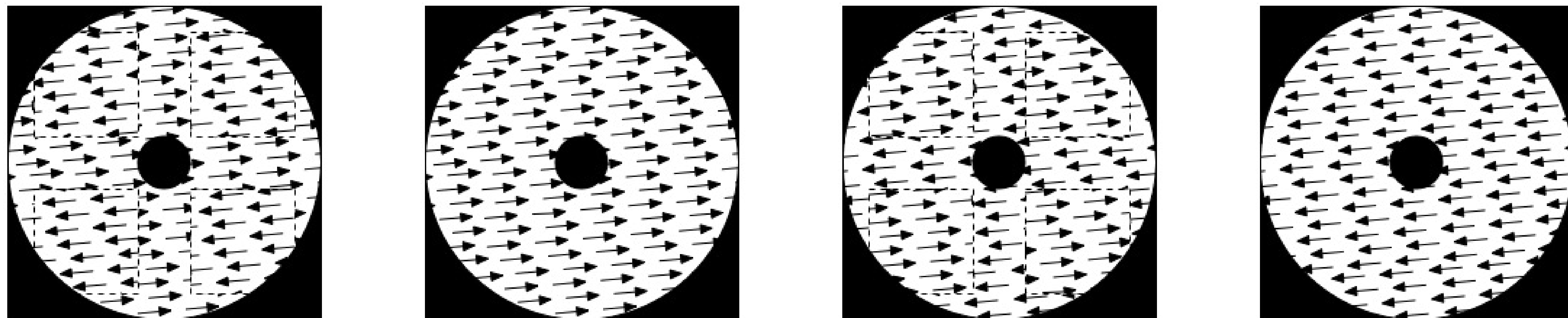
EEG was collected at 432.43 Hz using a 128 channel EGI system and PowerDiva Video 3.4 software and submitted to a discrete Fourier transform.

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.

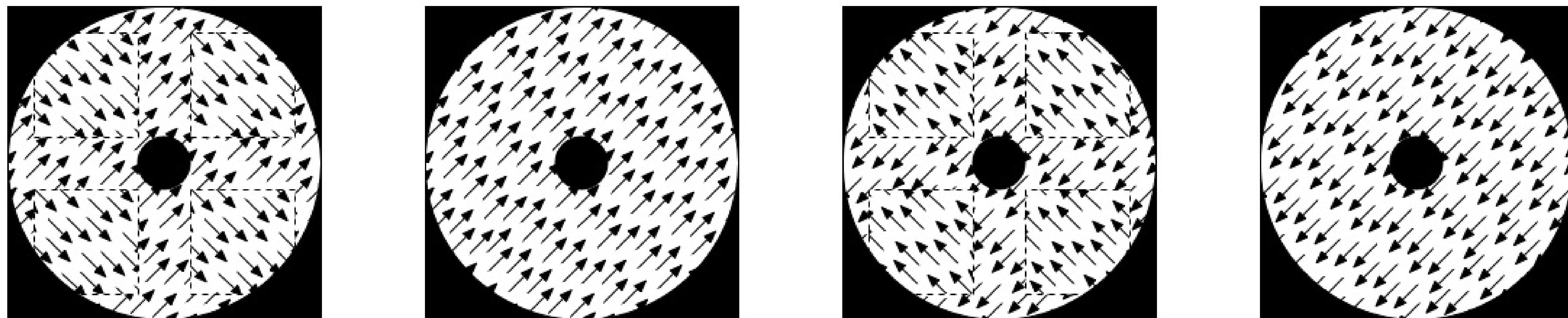


DISPLAYS

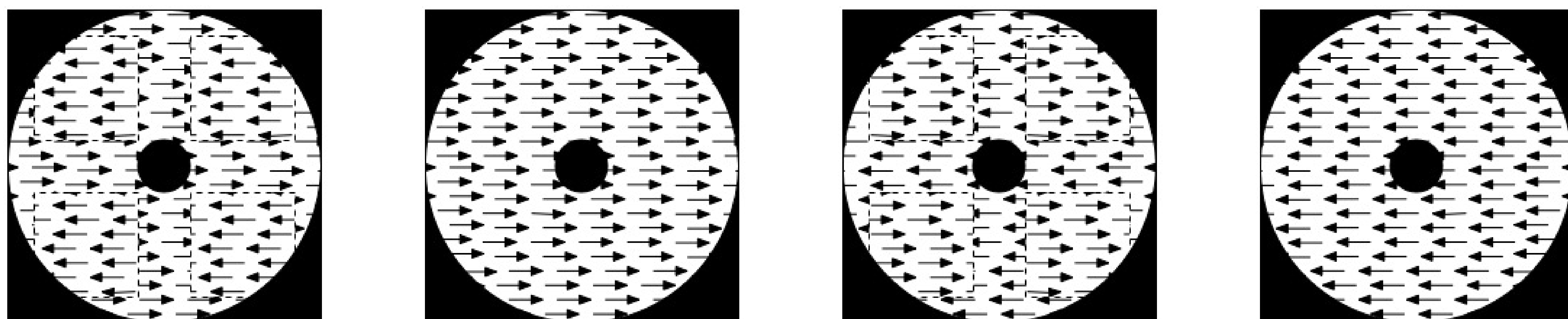
5 degree



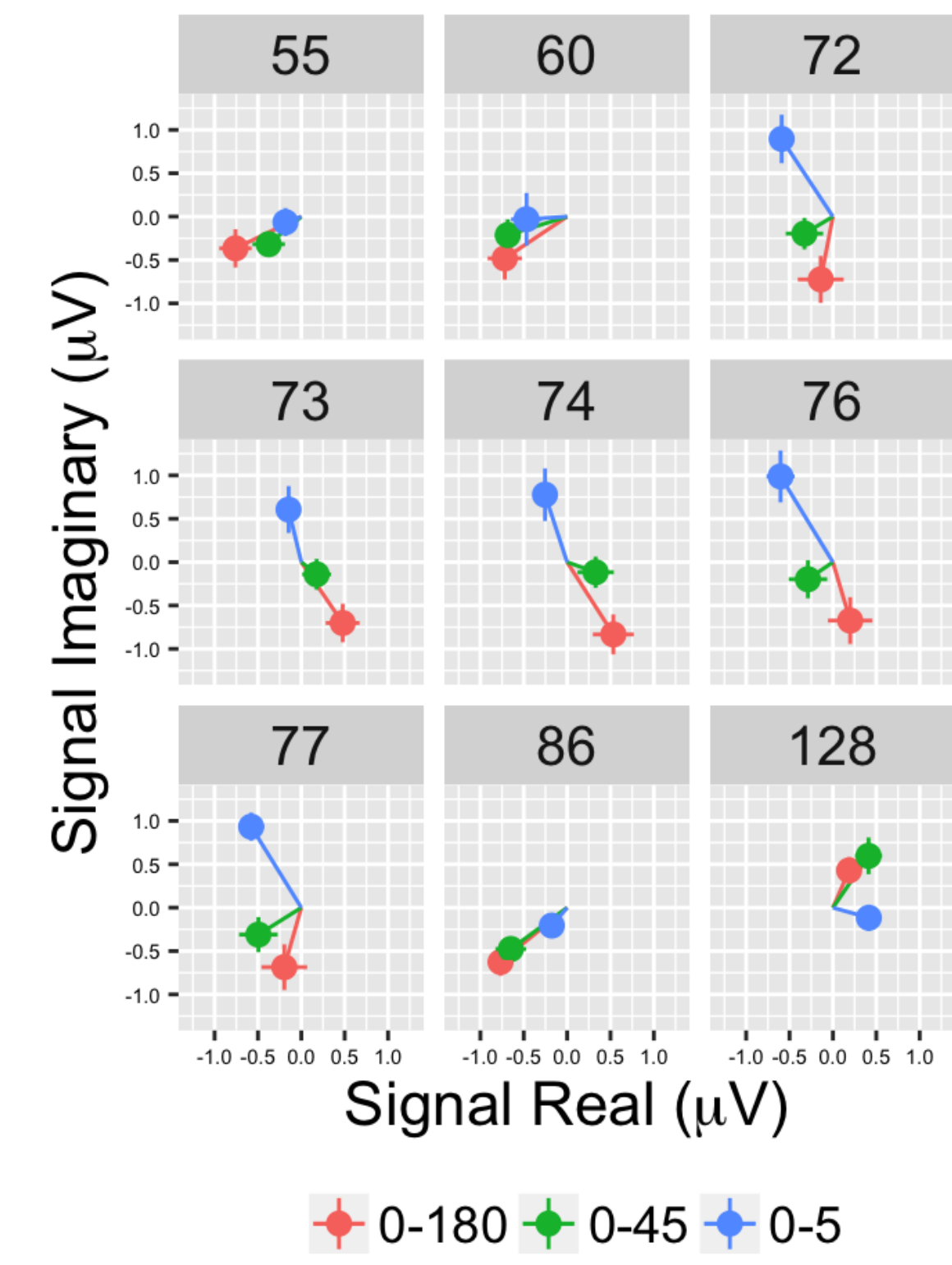
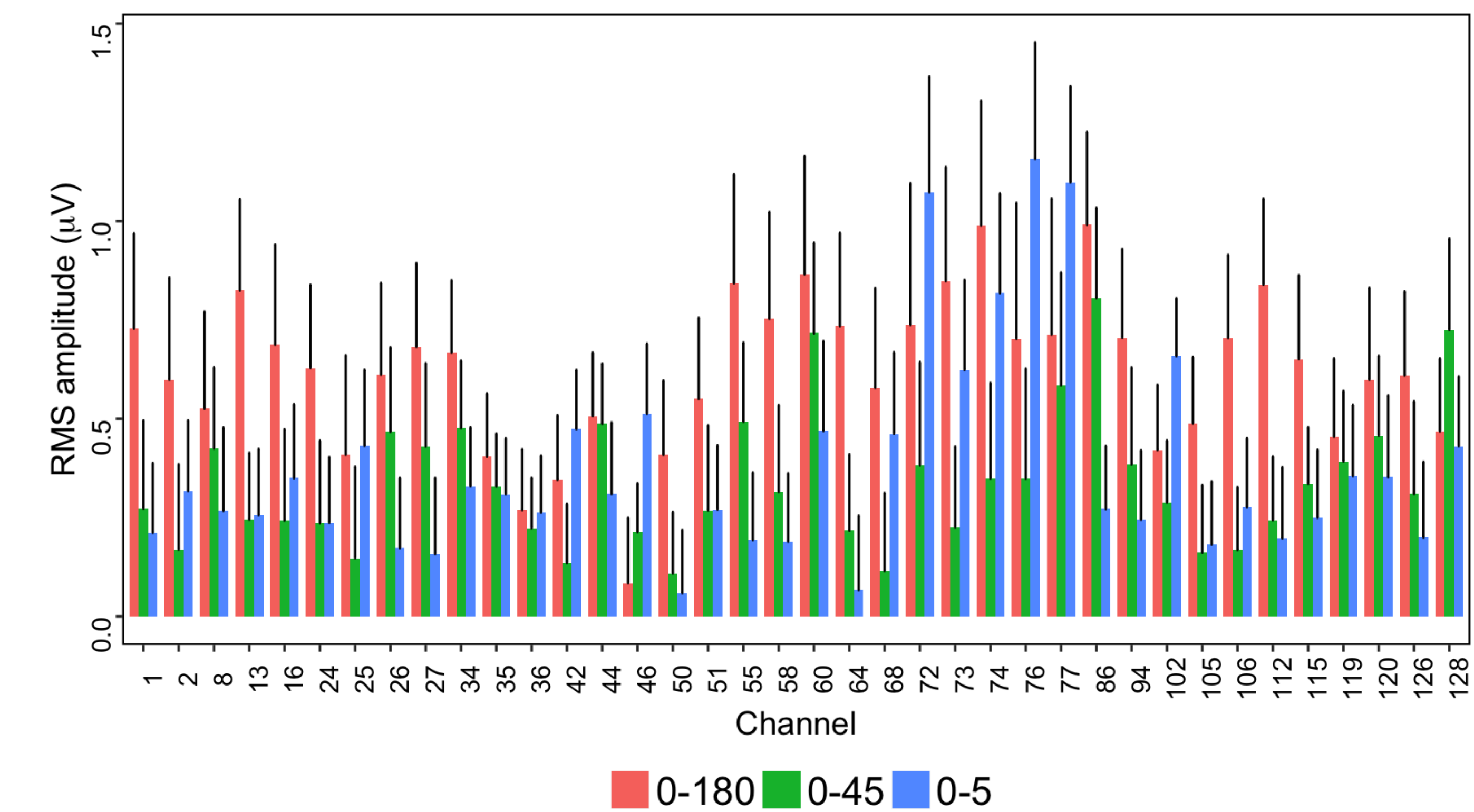
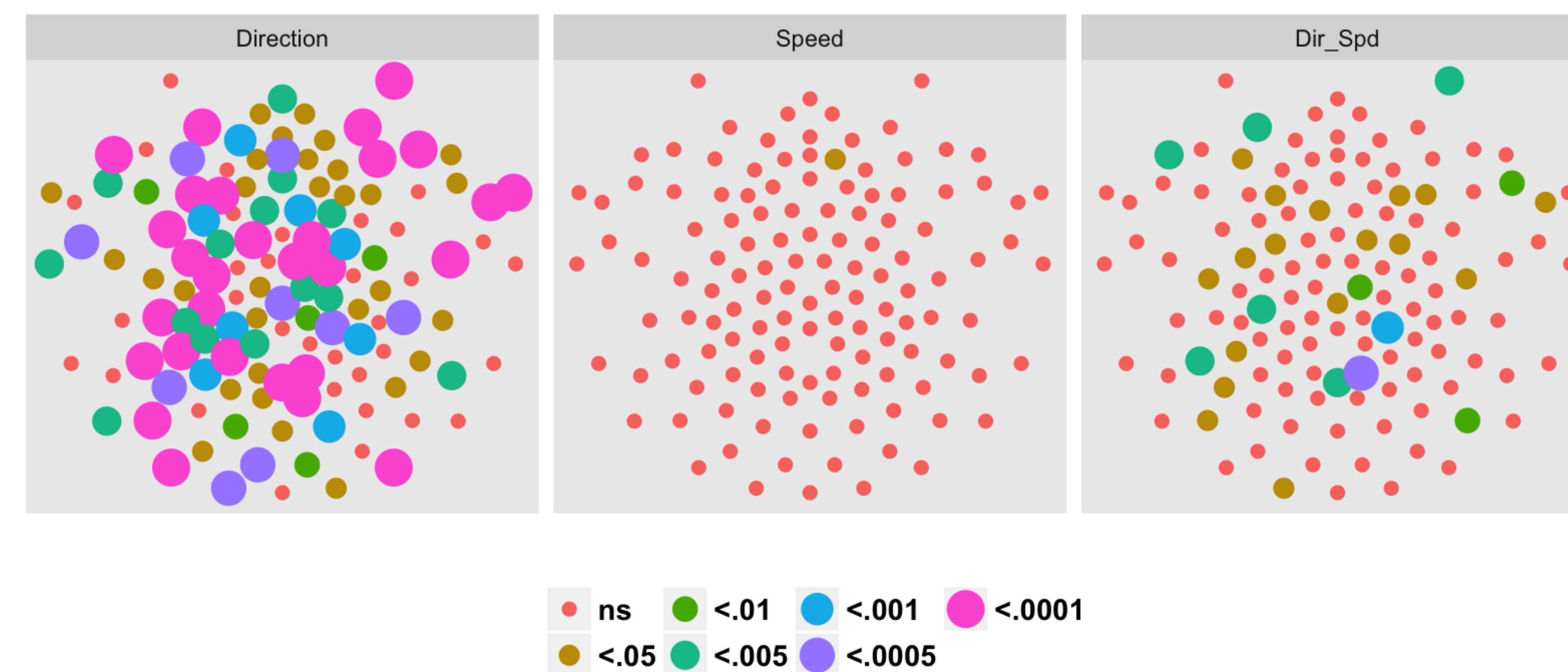
45 degree



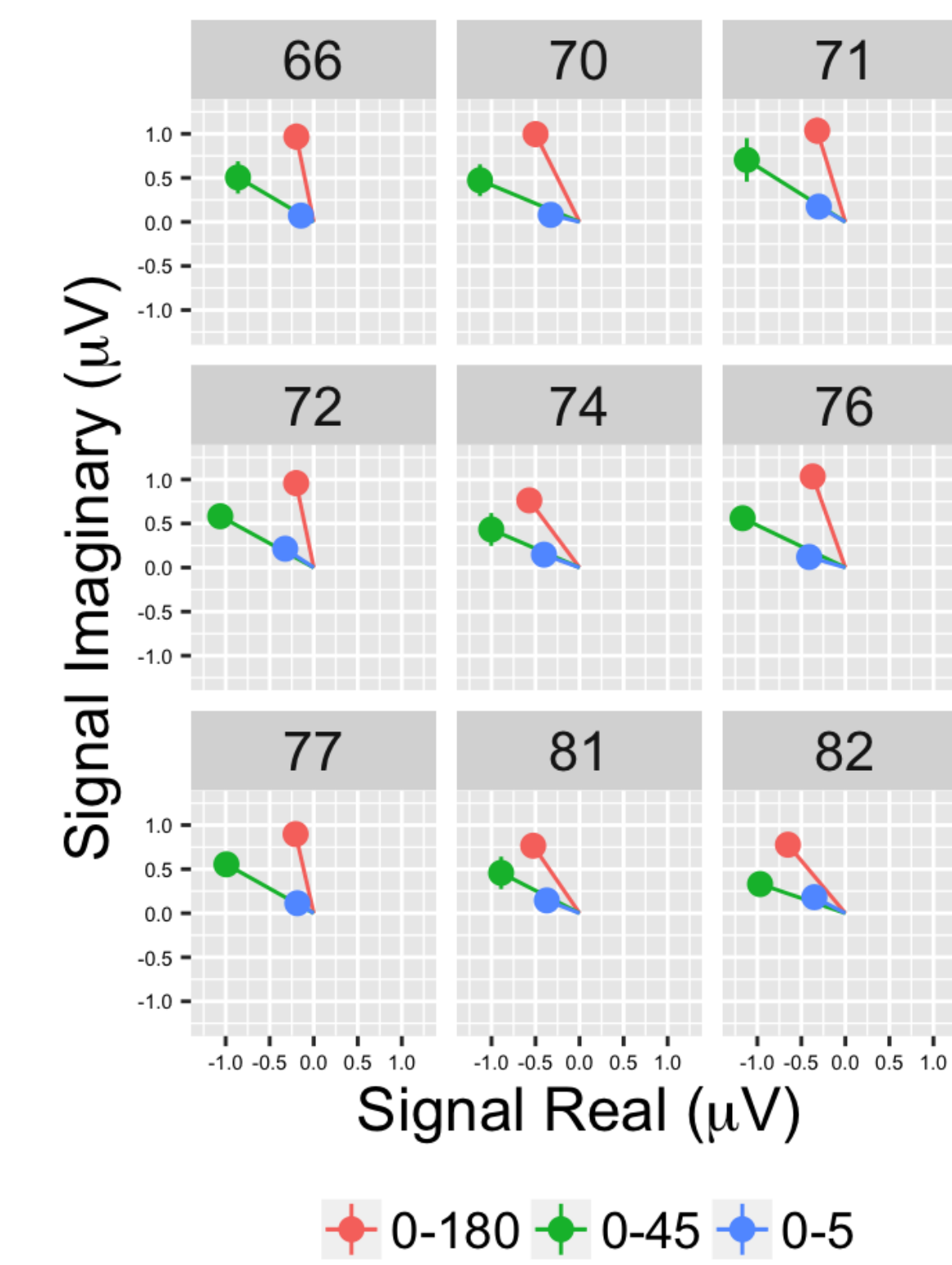
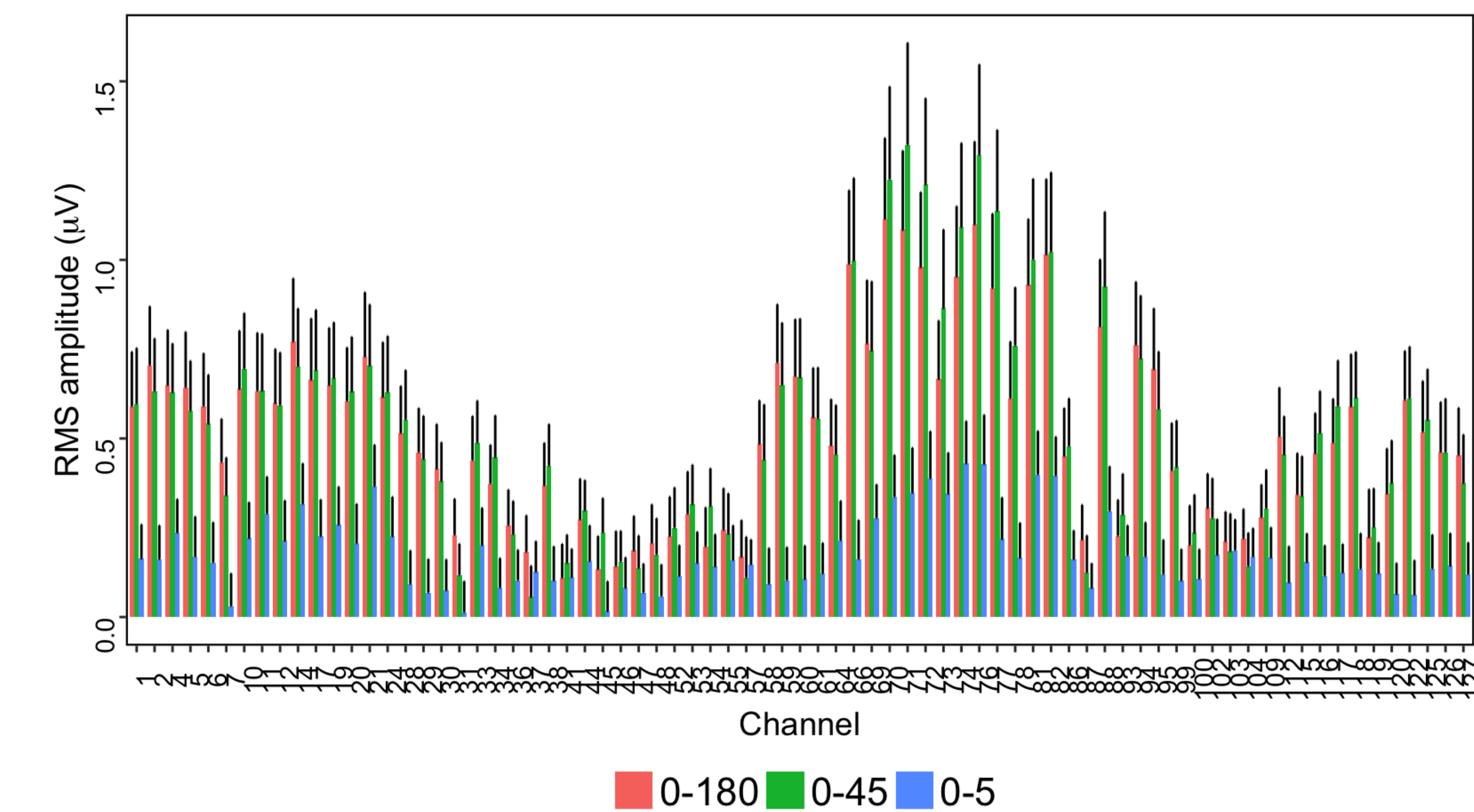
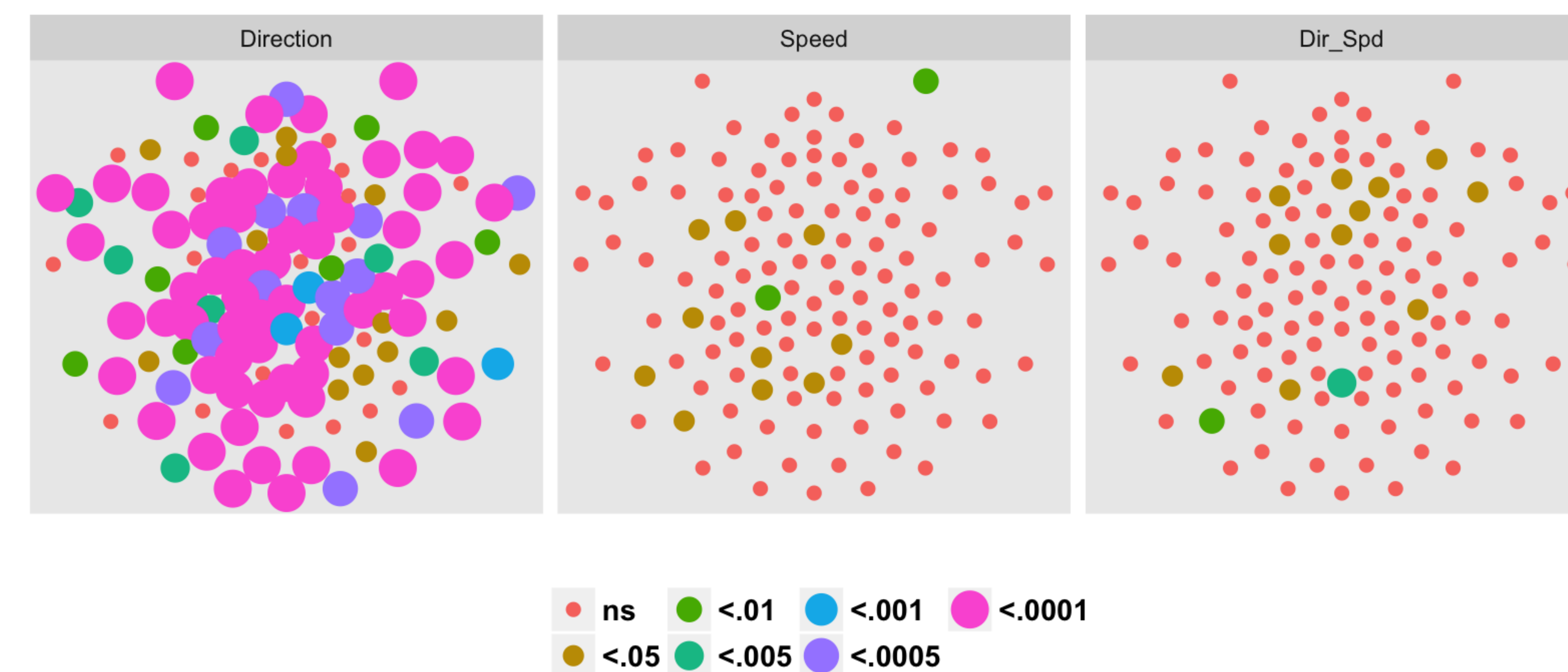
180 degree



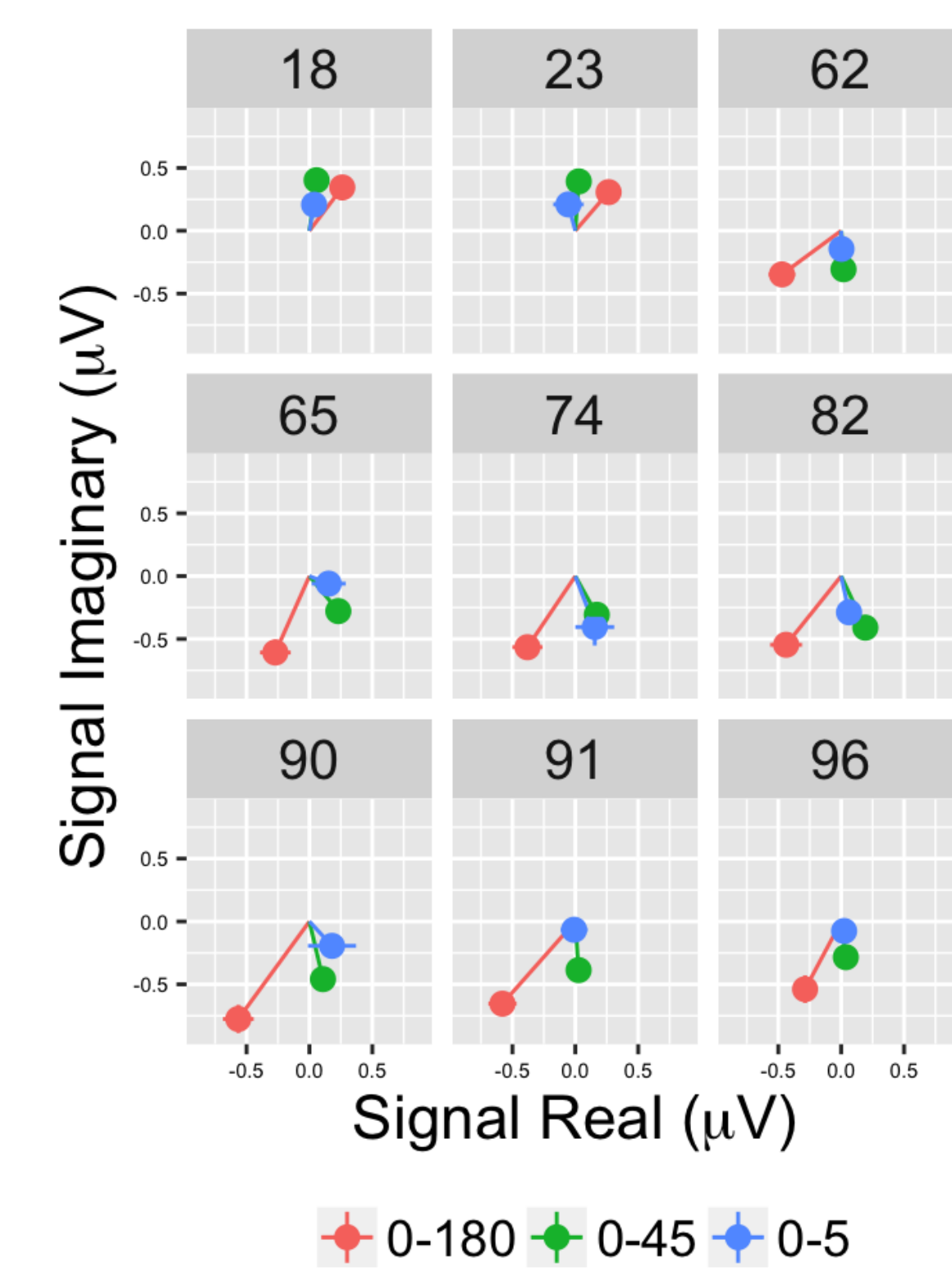
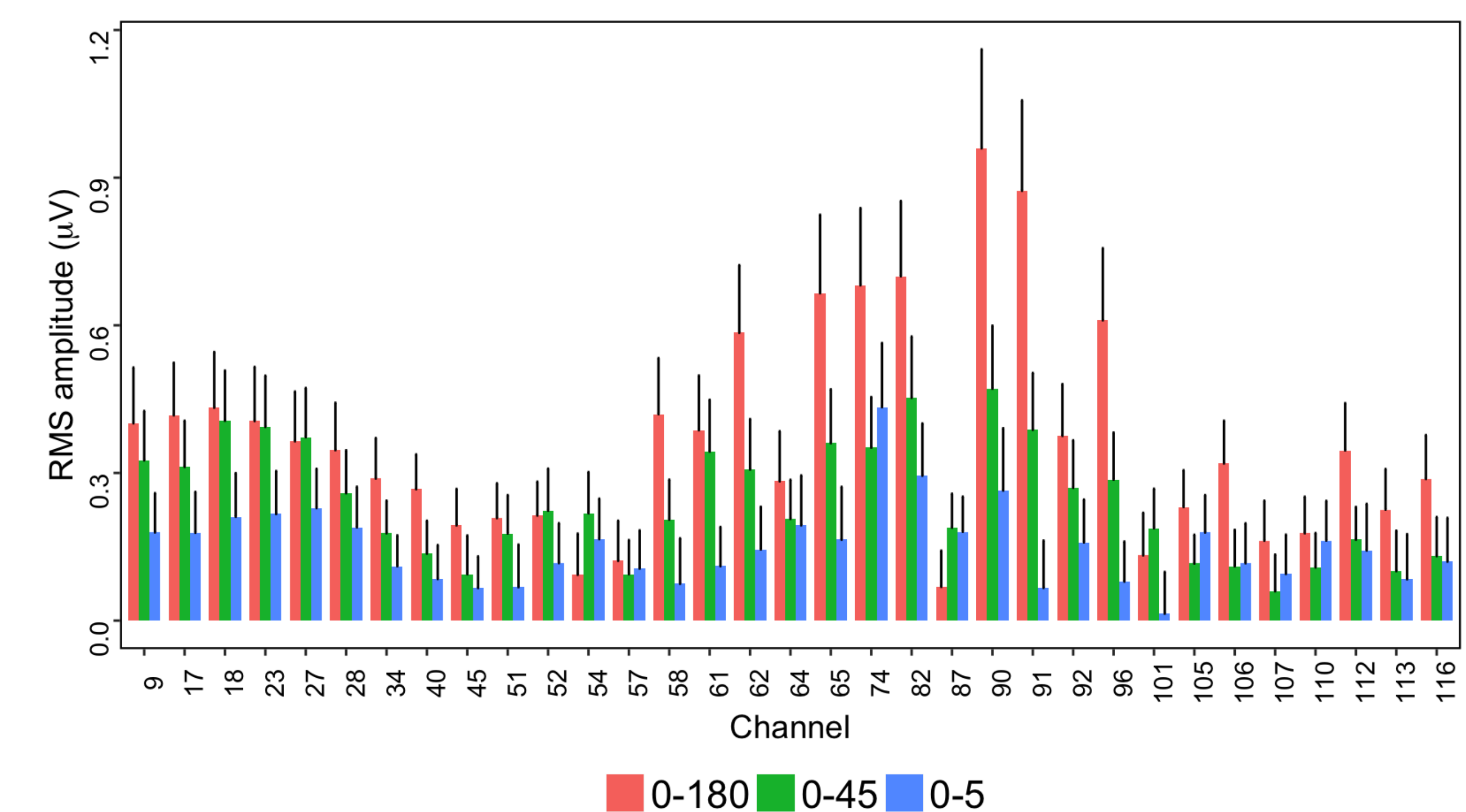
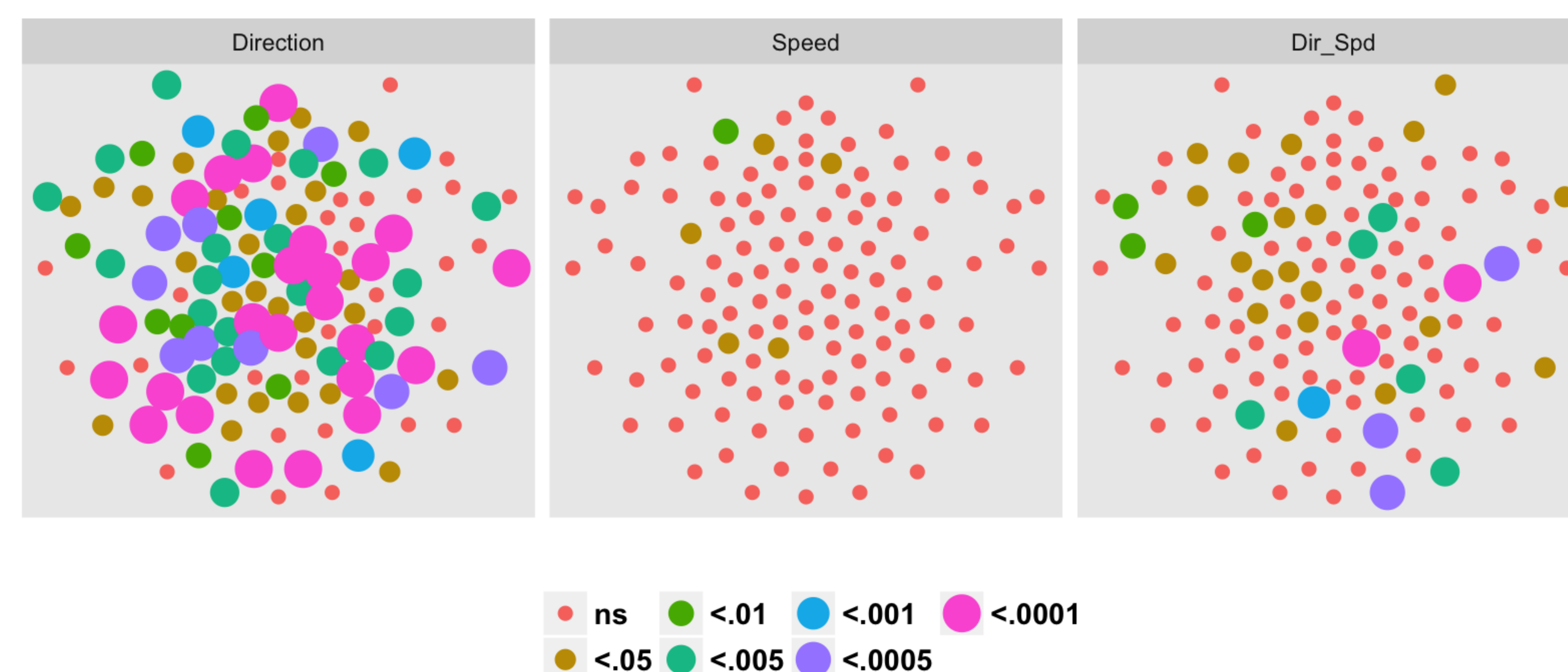
RESULTS - 1F1



RESULTS - 2F1



RESULTS - 3F1



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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