**Specialized High-Level Processing of Speech and Music Revealed with EEG**

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While there are clear spatial differences in neural activity for speech and music (Norman-Haignere et al, 2015, Neuron, 88:1281-1296), the temporal responses are not well understood, and it is not clear if the temporal responses are unique for speech and music.  We hypothesized that neural responses measured with electroencephalography (EEG) may capture unique and discriminable responses to speech and music stimuli resulting from high-level processing.

Subjects listened to 30 different two-second-long sounds, including speech, music, and other environmental sounds.  Using linear discriminant analysis to classify the two-second EEG responses to each sound, we found that the speech and music sounds, in addition to impact sounds, produced higher classification accuracies than all other environmental sounds.  Separately, we repeated this experiment using model-matched versions of the speech, music, and impact sounds by resynthesizing the sounds using a model of low-level processing with identical spetrotemporal statistics to the originals (McDermott & Simoncelli, 2011, Neuron, 71:926-940). Model-matched impact sounds were classified identically to their original counterparts, showing that the EEG responses were dominated by the processing of low-level statistics.  In contrast, model-matched music and speech sounds were classified worse than the originals.  While classification of speech and music were best between 200-400 ms of the EEG response, music classification was significantly better than the classification of model-matched music sporadically throughout the two-second stimulus.

Our study demonstrates that EEG captures temporally unique responses to speech and music more strongly than other environmental sounds.  Furthermore, the unique responses are dominated by high-level processing in the brain.  These results highlight the importance of using naturalistic sounds when using EEG to study the neural processing of speech and music in humans.