University of Maryland

Neuroscience and Cognitive Science Seminar

Hierarchical auditory neural processing underlying speech perception at the cocktail party

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Recognizing speech in competing noise is a challenge for everyday communication as most natural listening environments (e.g., classrooms, restaurants) contain acoustic interference(s). Speech-in-noise (SIN) processing is thought to rely on either (i) the recruitment of higher-order brain mechanisms which compensate for poorer speech representations in auditory-sensory areas (feedforward model) or (ii) a progressive backward search to lower-levels with more optimal signal-to-noise ratio (SNR) (feedback model). In a series of neuroimaging studies, we are examining how the central auditory system codes, transforms, and ultimately renders our perception of the complex soundscape. Applying state of the art distributed source analysis to neuroelectric recordings of human brain activity allows us to assess the relative contributions of linguistic and auditory brain regions to SIN processing. Our results reveal a complex SIN network including left inferior frontal (e.g., Broca's) and the auditory cortices whose relative contributions and laterality are strongly modulated by speech SNR. At the behavioral level, we find that SIN skills are predicted by neural coding within inferior frontal gyrus (IFG), but not primary auditory cortex (A1) per se, indicating higher-order speech representations are critical for successful SIN analysis (i.e., feedforward model). Contrastively, our cross-linguistic studies reveal the opposite in nonnative speakers (A1 > IFG; feedback model), indicating an identical SIN network is differentially engaged depending on language experience.

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10:15am, Room 1103 Bioscience Research Building

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