Title: Determinants of Word Recognition Speed in Older Adults

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Objectives: A hallmark of aging is difficulty understanding speech spoken rapidly or in noisy or reverberant conditions. This problem is common even among older adults who do not have hearing loss. However, it is aggravated by hearing impairment, and among those so impaired, is not corrected through hearing aid use. The goal of this research is to better understand the processes that limit speech understanding in the elderly. Objectives are to determine the extent to which (1) aging slows word recognition speed in noise; (2) those psychophysical measures of temporal processing impacted by aging are associated with word recognition speed; (3) neural processing of brief stimuli can predict behavioral sensitivity to the temporal properties of those same brief stimuli.

Research Plan: Experiments examine relationships between perceptual and physiological measures of temporal processing and the processing time needed by older adults to accurately, confidently recognize speech. Subjects' performance will be evaluated for a time-gated word recognition task, in which recognition is measured in noise as a function of the portion of the word presented. Discrimination of silent intervals and envelope modulation will be used to obtain information about temporal fine structure and envelope processing because it is not yet clear which of these abilities would be most important for rapid recognition of words. Compound action potentials (CAPs) and auditory brainstem responses (ABRs) recorded in forward and simultaneous masking paradigms will be used to determine the levels of early neural processing that contribute to temporal processing abilities. Mixed-effects general linear modeling will be used to relate psychophysical and physiological temporal processing to word recognition speed. An otoacoustic emission (SFOAE) based estimate of cochlear function and a reading based estimate of cognitive processing speed will be covariates in the model.

Methods: Participants will range in age and hearing ability. Subjects will achieve a passing score on the Mini Mental Status Examination in order to rule out effects on behavioral measures of a major cognitive deficit. Subjects will also have a normal 226-Hz tympanogram and no clinically significant air-bone gaps. Procedures will include pure-tone audiometric assessment, physiological assessment (tympanometry, electrophysiological recording of auditory nerve CAP, ABR, and SFOAE testing), psychophysical assessment (silent interval discrimination), cognitive assessment (a test of working memory and sequencing and a reading based cognitive processing speed) and speech perception assessment (word recognition speed). Subjects will be screened for depression and attention disorder.

Findings: This is a new study, thus there are no findings to report. Results are expected to lead to approaches to clinically distinguish among functional and structural stages at which older auditory systems can be impaired, which would require substantially different remediation strategies. Results are also expected to allow us to test current theories of temporal processing.