Title: Temporal Rate Discrimination Training Effects on Perception and Neural Encoding in Younger and Older Listeners

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Older adults have difficulty processing rapid temporal information, and this deficit may be a factor in their reported speech understanding difficulties. Hearing aids, the most commonly recommended treatment for hearing loss, can partially compensate for loss of audibility, but they do not address age-related deficits in temporal processing. Other approaches to manage age-related hearing deficits include auditory training. However, it is not yet known whether auditory training that targets temporal processing deficits can improve speech perception. This ongoing investigation is studying the extent to which training on temporal rate discrimination improves perception and neural encoding in young normal-hearing (YNH), older normal-hearing (ONH), and older hearing-impaired (OHI) listeners, with the eventual goal of determining if this training can generalize to improved speech understanding. It was hypothesized that this training would decrease age-related differences in temporal rate discrimination and in the spectral energy of auditory steady-state responses (ASSR).

Participants recruited in each of the three listener groups (YNH, ONH, OHI) were randomly assigned to an experimental or active control training group. The experimental group underwent nine sessions of training on temporal rate discrimination of band-limited pulse trains (center frequency: 4000 Hz; duration: 300 ms) presented monaurally to the right ear at two rates (100 and 300 pps). The active control group underwent nine sessions of training on detection of a 500-Hz tone presented in wideband noise (noise notch widths of 90, 120,150 Hz). At pre- and post-test sessions, both active control and experimental groups were tested on pulse-rate discrimination for rates of 100, 200, 300, and 400 pps and ASSRs were recorded to the same stimuli.

As hypothesized, training on pulse rate discrimination decreased age-related differences across both trained (100 and 300 pps) and untrained (200 and 400 pps) rates. However, the performance improvement is greater in the ONH compared to the OHI listeners. Preliminary analyses suggest that performance improvement was not observed in the active control group. Thus far, training has not increased spectral energy in the ASSRs to any pulse rate. Future analyses will examine factors that contribute to variability in improvement, and whether neural encoding at the pre-test session predicts capacity for perceptual learning. Generalization to other temporal processing tasks (i.e., gap detection, gap duration discrimination, and rhythm discrimination) and to speech recognition of sentences presented in time-compressed and reverberant conditions will also be assessed.

Funding: This research was supported by the National Institute on Aging of the National Institutes of Health under Award Number R01AG051603 (Gordon-Salant). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

The authors report no conflicts of interest.

Either poster or podium.

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