Speech detection and speech intelligibility measured binaurally in groups of listeners with, at most, "slight" hearing loss and who are partitioned on the basis of their absolute thresholds at 4 kHz

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Abstract

We have demonstrated repeatedly that listeners having absolute thresholds at 4 kHz exceeding 7.5 dB HL, but no more than "slight" hearing loss overall, exhibit deficits in binaural processing as compared to other listeners having hearing levels at 4 kHz $\leq$7.5 dB HL. The relatively poorer binaural performance included elevated: 1) thresholds of binaural signal detection; 2) interaural time-difference (ITD) thresholds; 3) interaural intensitive difference (IID) thresholds. Within a general cross-correlation-based model, the relatively poorer performance was explained by assuming that it stemmed from listeners in the $>$ 7.5 dB groups having higher levels of stimulus-dependent, additive internal noise, as compared to their counterparts in the $\leq$7.5 dB groups. The previous investigations employed procedures and stimuli intended to be "diagnostic" as to the nature of their degraded processing of interaural cues exhibited by listeners in the $>$ 7.5 dB groups. Consequently, the stimuli comprised pure-tone signals, Gaussian-noise maskers, and their counterparts "transposed" from low to high center frequencies. We sought to determine whether parallel results would obtain when the stimuli were masked tokens of speech. To do so, we studied both the detectability and intelligibility of speech that was masked by either flat-spectrum Gaussian noise or by speech-shaped noise (SSN). The targets and maskers were presented in both the NoSo and NoSπ stimulus configurations. We found no discernable differences, visually or statistically, between the two groups of listeners regardless of the type of task (intelligibility or detection of the speech), type of masker (flat-spectrum or SSN), or interaural configuration (NoSo or NoSπ). We found the data impressive for a number of reasons, not the least of which was that, never before, in over four decades of our studying binaural hearing, have we been able to convince ourselves that the null hypothesis was, indeed, provable. Proceeding undaunted, we re-measured thresholds of intelligibility while progressively and identically high-pass filtering the signals and maskers. Progressive elimination of the low-frequency information led to consistently poorer speech-intelligibility thresholds being obtained from the $>$ 7.5 dB HL group. The data and their implications will be discussed vis a vis their relevance to an understanding of binaural speech processing in the face of clinically-defined no more than "slight" hearing loss.

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