Temporal Fine-Structure Coding and Lateralized Speech Perception in Normal-Hearing and Hearing-Impaired Listeners

This study investigated the relationship between speech perception performance in spatially complex, lateralized listening scenarios and temporal fine-structure (TFS) coding at low frequencies. Young normal-hearing (NH) and two groups of elderly hearing-impaired (HI) listeners with mild or moderate hearing loss above 1.5 kHz participated in the study. Speech reception thresholds (SRTs) were estimated in the presence of either speech-shaped noise, two-, four-, or eight-talker babble played reversed, or a nonreversed two-talker masker. Target audibility was ensured by applying individualized linear gains to the stimuli, which were presented over headphones. The target and masker streams were lateralized to the same or to opposite sides of the head by introducing 0.7-ms interaural time differences between the ears. TFS coding was assessed by measuring frequency discrimination thresholds and interaural phase difference thresholds at 250 Hz. NH listeners had clearly better SRTs than the HI listeners. However, when maskers were spatially separated from the target, the amount of SRT benefit due to binaural unmasking differed only slightly between the groups. Neither the frequency discrimination threshold nor the interaural phase difference threshold tasks showed a correlation with the SRTs or with the amount of masking release due to binaural unmasking, respectively. The results suggest that, although HI listeners with normal hearing thresholds below 1.5 kHz experienced difficulties with speech understanding in spatially complex environments, these limitations were unrelated to TFS coding abilities and were only weakly associated with a reduction in binaural-unmasking benefit for spatially separated competing sources.

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