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Word-recognition Performance on Two Types of Binaural Speech Tasks by Listeners with Normal Hearing and Listeners with Sensorineural Hearing Loss

Abstract:

Recognition performances on two types of binaural speech paradigms were studied [one in which information is combined (VIOECITO, Wilson et al., 1984) and one in which information competes (1-, 2-, and 3-dichotic digit pairs)] on 24 listeners with normal hearing (22.9 years) and 72 older listeners with sensorineural hearing loss (67.2 years). Performance on a word-in-noise task also was examined. Group and individual data on the three listening tasks will be presented.

Summary

This project examined word-recognition performances on two binaural word-recognition tasks by 24 listeners with normal hearing (22.9 years) and 72 older listeners with sensorineural hearing loss (67.2 years). First was temporal integration that involved presentation of the Vowel (segments) In One Ear and the Consonant (segments) In The Other (ear) with the temporal sequence of the word maintained (VIOECITO, Wilson et al., 1984). As a control, the VIOECITO also was administered monaurally. Second was the traditional free-recall dichotic-digit paradigm that involved 1-, 2-, and 3-pairs of digits. The Words-In-Noise (WIN) Test was administered to provide information about speech understanding in background noise (Wilson, 2003). For both subject groups, the materials were presented under earphones from CD at 70 dB HL.

Results

As expected the listeners with normal hearing performed at ceiling on the VIOECITO with means of 96.8% and 97.6% for the binaural and monaural VIOECITO conditions. Similarly, performance by the listeners with normal hearing on the dichotic digit materials was near or at ceiling but with a modest right-ear advantage evident. Mean performances 12 of the listeners on the digits presented to the left ear and right ear were (1) 1-pair--97.7% and 99.1%, respectively, (2) 2-pairs--92.6% and 97.2%, respectively, and (3) 3-pairs--88.1% and 92.3%, respectively, for the 3-pair digits. Defining an ear advantage on the dichotic paradigm as ± 2 tokens ($\pm 11.1\%$), a right-ear advantage (REA) was observed in three of the listeners for the 3-digit pairs with one of those listeners also having a REA for the 2-digit pairs. No left-ear advantages (LEA) were observed. Thus, both overall performance and the right-ear advantage increased as the stimulus pairs increased. Mean performance on the WIN was 2.6-dB S/N, which is well within the normal range of performances on the WIN (≤ 6 -dB S/N).

The listeners with hearing loss performed worse on both listening tasks when compared to the normal hearing listeners. The VIOECITO task revealed a means of 86.1% and 92.5% for the binaural and monaural listening conditions respectively. Mean performances on the dichotic digits when presented to the left and right ears were (1) 1-pair--82.1% and 92.2%, respectively, (2) 2-pairs--70.3% and 82.9%, respectively, and (3) 3-pairs--62.3% and 73.7%, respectively. Of the 72 participants, right-ear advantages (REA) for the 1-, 2-, and 3-digit pairs were observed in 56.9%, 66.7% and 66.7%, whereas left-ear advantages (LEA) were observed in 16.7%, 27.8%, and 30.6%. Those numbers were altered substantially when equal performance was defined as ± 2 tokens or differences $>11.1\%$. With this more conservative definition of ear advantage, 30.6%, 48.6%, and 51.4% of the 72 participants had a REA, 6.9%, 12.5% and 12.5% had LEAs, and 62.5%, 38.9%, and 36.1% had equal performances on the 1-, 2-, and 3-digit pairs. Mean performance on the WIN was 12.0-dB S/N with only one listener with hearing loss in the normal range (≤ 6 -dB S/N). These group performances on the three tasks will be expanded to include comparisons on the tasks by the individual participants with hearing loss.

References

Wilson, 2003

Wilson, Arcos, J., & Jones, H. (1984). Word Recognition with Segmented-Alternated CVC Words: A Preliminary Report on Listeners with Normal Hearing. *Journal of Speech and Hearing Research*, 27, 378-386.