Automated Forced-Choice Word-Recognition Tests*  

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Introduction
Open set and closed set automated speech-recognition tests were constructed and evaluated with ten normal-hearing listeners and twenty listeners with sensorineural hearing loss. Speech-recognition thresholds were measured with CID W-1 recordings of spondaic words in a four-alternative forced-choice paradigm. Word presentation levels converged on the 50% point of the recognition-performance function (SRT). SRTs were compared to pure-tone averages obtained by automated audiometry. Word-recognition tests were conducted with recorded NJ-6 monosyllabic words (VA recordings, female talker) at five presentation levels using four alternative closed set and open-set responses.

Methods
Subjects:  
• One ear of 10 young adults with normal hearing  
• One ear of 20 adults with sensorineural hearing losses (see Figueur)  
• 10 males (18.70 yrs, mean=27.7 yrs, median=26.5 yrs)  
• 10 males (46-79 yrs, mean=62.8 yrs, median=64.5 yrs)  
• Normal tympanogram and otoscopy  

Average audiograms for each audiometric configuration of the 20 subjects (from Margolis & Saly, 2000).

Procedures:  
• Air and bone conduction pure-tone thresholds were obtained using the Automated Method for Testing Auditory Sensitivity (AMTAS).  
• Audiograms classified by AMPLAS (Margolis & Saly, 2007). (See figure above)  
• Speech Recognition Thresholds were measured with four-alternative closed-set responses. Subject chose one of four spondees shown on the touchscreen. Levels were changed adaptively to converge on 50% correct identification of recorded spondees (VA-W1 recordings, female talker).  
• Word-recognition tests (WRT) were conducted with recorded NJ-6 monosyllabic words (VA recordings, female talker) at five presentation levels using four-alternative closed-set and open-set responses (see table below). 100 words were presented at each level for open set and closed set conditions.  
• Presentation levels were referenced to the pure tone average (0.5, 1.0, 2.0 kHz) or average of best two if there was a 20 dB difference between any two of the three.  
• Open set responses were verbal responses scored by the tester.  
• Closed set responses were pointing responses to a matrix showing four alternative responses.  

Summary of Results
• Open set and closed set word recognition scores for normal hearing subjects are tightly distributed with maximum scores reaching 100% at the highest levels tested.  
• Open set and closed set scores for hearing-impaired subjects are widely distributed with maximum scores reaching 100% for a few subjects but with much lower maximum scores for most subjects.  
• Distributions of word-recognition scores obtained from clinic records are compressed with most scores near 100%, suggesting much better performance compared to open set and closed set scores obtained in this study.  
• Average open set and closed set word recognition scores were highly correlated (r = 0.88).  
• Maximum open set and closed set scores were poorly correlated with clinic scores.  
• Speech recognition thresholds obtained with a closed set response agreed well with the pure tone average.  
• 85% of differences between speech recognition thresholds and pure tone averages fell within a range of 0 dB ± 5 dB.

Conclusions
• Open set and closed set scores of hearing-impaired listeners obtained with female talker recordings indicate a higher degree of speech recognition difficulty than clinic scores obtained at a single level with a male talker.  
• The open set and closed set scores obtained in this study correlate poorly with clinical measures.  
• Closed set scores can be obtained efficiently in an automated forced-choice paradigm.  
• Speech recognition thresholds obtained with a closed set paradigm (Margolis & Saly, 2000) agreed well with the pure tone average.  
• 85% of the differences between speech recognition threshold and pure tone average fall within 10 dB range.

References
Margolis, R.H., Saly, G.S. Toward a standard description of hearing loss.  

* Corrections were made to this poster on 8 April 2016

This poster is available at http://audiology.oyuniversity.com/poster
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