Variability in Word Recognition by Adults with Cochlear Implants: The Role of Phonemic Awareness

Aaron Moberly, MD; Susan Nittrouer, PhD
The Ohio State University, Department of Otolaryngology – Head and Neck Surgery

Abstract

Objective: Cochlear implants (CIs) do not automatically restore speech perception for postlingually-deafened adults. Average word recognition remains at 60%, and enormous variability exists. Understanding speech requires storing speech in working memory using phonological codes, representations of the basic units of language. Hearing loss diminishes access to acoustic structure supporting these codes, and CIs may not completely restore this access. This investigation examined whether abilities to access and manipulate phonological representations ("phonemic awareness" skills) are degraded for CI users. Additionally, phonemic awareness was examined as a predictor of variability in a clinically-useful measure, word recognition in quiet.

Study Design: Thirty adults with CIs and 20 normal-hearing (NH) controls underwent testing.

Methods: Participants were assessed for word recognition in quiet, along with three phonemic awareness tasks: access to phonemic structure by selecting the word with the same starting (or ending) sound as a target word – Initial (or Final) Consonant Choice – ICC or FCC, and the ability to manipulate phonemes by repeating words’ phonemes backwards – Backwards Words – BW.

Results: Phonemic awareness scores were poorer for CI users than for NH controls for ICC (88% versus 98% correct, respectively) and FCC (67% versus 87%), whereas scores for BW were not significantly different (60% versus 70%). For CI users, ICC and FCC scores predicted approximately 20 and 40 percent of the variance in word recognition, respectively.

Conclusions: Phonemic awareness skills are degraded for adults with CIs and predict variability in word recognition. Findings suggest the need for efforts to restore phonemic awareness for CI users.

Questions

- Do adult CI users show poorer phonemic awareness than adults with normal hearing?
- Does phonemic awareness predict word recognition for adults with CIs?
- What demographic and audiologic factors predict phonemic awareness for adults with CIs?

Data analyses:

- Examination of group differences for test scores. Independent-samples t-tests to identify differences in mean scores for word recognition and phonemic awareness tasks between CI and NH groups.
- Initial Consonant Choice (ICC): Participant saw video clip of man’s face and heard him say target word. Required to repeat target word. After repeating, target and heard three word choices, and had to select which started with same sound as target.
- Final Consonant Choice (FCC): Similar to ICC task, except that participant was asked to select which word ended with same sound as target.
- Backwards Words (BW): Participant saw video and heard talker say a word and had to repeat it. Then asked to say the word with phonemes in reverse order.

Conclusions

- Sensitivity to phonemic structure is degraded for postlingually deafened adults with CIs, and longer duration of CI use does not automatically restore phonemic awareness.
- Phonemic sensitivity plays an important role in word recognition, at least under quiet conditions.
- Findings emphasize the need to improve phonemic sensitivity through implant processing and training programs that restore or enhance attention to the phonemic structure of spoken language.

References