Infants benefit from implants with more frequency sounds

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A UT Dallas researcher studied how 6-month-olds distinguished between speech sounds. Through cochlear implant simulations, she found that infants process speech differently than older children and adults.

(Medical Xpress)—A new study from a UT Dallas researcher demonstrates the importance of considering developmental differences when creating programs for cochlear implants in infants.

Dr. Andrea Warner-Czyz, assistant professor in the School of Behavioral

and *Brain* Sciences, recently published the research in the *Journal of the Acoustical Society of America*.

"This is the first study to show that infants process degraded speech that simulates a cochlear implant differently than older children and adults, which begs for new signal processing strategies to optimize the sound delivered to the cochlear implant for these young infants," Warner-Czyz said.

Cochlear implants, which are surgically placed in the inner ear, provide the ability to hear for some people with severe to profound hearing loss. Because of technological and biological limitations, people with cochlear implants hear differently than those with normal hearing.

Think of a piano, which typically has 88 keys with each representing a note. The technology in a cochlear implant can't play every key, but instead breaks them into groups, or channels. For example, a cochlear implant with 22 channels would put four notes into each group. If any keys within a group are played, all four notes are activated. Although the general frequency can be heard, the fine detail of the individual notes is lost.

Two of the major components necessary for understanding speech are the rhythm and the frequencies of the sound. Timing remains fairly accurate in cochlear implants, but some frequencies disappear as they are grouped.

More than eight or nine channels do not necessarily improve the hearing of speech in adults. This study is one of the first to examine how this signal degradation affects hearing speech in infants.

Infants pay greater attention to new sounds, so researchers compared how long a group of 6-month-olds focused on a speech sound they were

familiarized with —"tea"'—to a new speech sound, "ta."

The infants spent more time paying attention to "ta," demonstrating they could hear the difference between the two. Researchers repeated the experiment with speech sounds that were altered to sound as if they had been processed by a 16- or 32-channel cochlear implant.

The infants responded to the sounds that imitated a 32-channel implant the same as when they heard the normal sounds. But the infants did not show a difference with the sounds that imitated a 16-channel implant.

"These results suggest that 6-month-old infants need less distortion and more frequency information than older children and adults to discriminate speech," Warner-Czyz said. "Infants are not just little versions of children or adults. They do not have the experience with listening or language to fill in the gaps, so they need more complete speech information to maximize their communication outcomes."

Clinicians need to consider these developmental differences when working with very young cochlear implant recipients, Warner-Czyz said.

More information: "Vowel discrimination by hearing infants as a function of number of spectral channels," Andrea D. Warner-Czyz. J. Acoust. Soc. Am. 135, 3017 (2014); dx.doi.org/10.1121/1.4870700

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