Synchronizing cochlear signals stimulates brain to 'hear' in stereo

May 8 2018

Using both ears to hear increases speech recognition and improves sound localization. Ruth Litovsky, at the University of Wisconsin-Madison, wants to bring this advantage to people who use cochlear implants. During the 175th ASA Meeting, Litovsky will present data showing a new technique that synchronizes the cochlear signals that stimulate the brain in a way that is similar to people who can hear normally. A child hears using synchronized binaural stimuli in Litovsky's lab. Credit: Ruth Litovsky

Using both ears to hear increases speech recognition and improves sound localization. In essence, it helps you to identify a friend's voice so you can follow her amusing anecdote over the din of a cocktail party. Ruth

Litovsky, a researcher at the University of Wisconsin-Madison, wants to bring this advantage to people who use cochlear implants.

"Twenty years ago, [the medical community] decided to give [deaf] people two implants, one in each ear, to see if it would improve their ability to hear better in noisy environments, so that children could integrate into classrooms and adults into the workplace more easily," Litovsky said. "I believe bilateral implantation has had a significant, positive impact on their quality of life, but they still struggle with noisy environments."

During the 175th Meeting of the Acoustical Society of America, being held May 7-11, 2018, in Minneapolis, Minnesota, Litovsky will present data showing a new technique that synchronizes the cochlear signals that stimulate the brain in a way that is similar to people who can hear normally.

"The first time I present a [deaf] child or adult with sounds that are truly coordinated, their face lights up as they experience that aha! moment where they truly hear stereo sound," Litovsky said. "The goal is to make this method work outside the lab, but it remains a challenge from an engineering point of view."

According to Litovsky, the brain acts like a little computer. It uses synchronized information to calculate the difference as sound waves arrive at each ear from different locations. These mental calculations help people locate sounds and separate speech from noise. Currently, individual cochlear implants send information to the brain independently, but the brain does not integrate the signals in an optimal way.

Cochlear implants do not restore the ear's ability to pick up soundwaves. Rather, these surgically implanted devices bypass the damaged inner ear and translate sound into electrical pulses that stimulate the auditory nerve. The Food and Drug Administration has approved the implants in children as young as one year of age.

Litovsky is committed to synchronizing auditory experiences especially for young children. The brain loses plasticity during development, so it is harder to learn to synchronize sounds later in life.

Now, the engineering setup for the technique is limited to the laboratory, but she hopes that researchers can eventually partner with implant manufacturers to make synchronous hearing a reality.

For Litovsky, being able to get to know deaf adults and children and seeing how their lives are improved by the implants makes all of these challenges worth the struggle.

Provided by Acoustical Society of America