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Noisy classroom simulation aids comprehension in hearing-impaired children

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Children with hearing loss struggle to hear in noisy school classrooms, even with the help of hearing aids and other devices to amplify their teacher's voice. Training the brain to filter out background noise and thus understand spoken words could help the academic performance and quality of life for children who struggle to hear, but there's been little evidence that such noise training works in youngsters.

A new report showed about a 50 percent increase in speech comprehension in background noise when children with hearing impairments followed a three-week auditory training regimen. The effect was still evident when the children were tested three months after the training ended.

The findings are among the first to demonstrate that auditory training with noise can work in children. Other studies show that similar regimens help hearing-impaired adults.

The training involves repeated exposure to speech masked by noise, and is intended to teach the brain how to receive information and process it more efficiently. This could help hearing-impaired children who struggle to keep up in noisy classrooms.

"It's not a fair playing field with their normal-hearing peers," said Jessica Sullivan, lead author and a University of Washington assistant professor of speech and hearing sciences. "They have the best technology, but it's not enough – they still miss things."

People with normal hearing usually filter out background noise seamlessly. If a loud truck rumbles by, they can still understand a conversation because their brains work quickly to fill in sounds that they might have missed.

But people with hearing loss take in sound more slowly, and brain regions that process hearing aren't as adept at filling in muffled information.

In Sullivan's study, published in the January issue of the Journal of the Acoustical Society of America, hearing-impaired youngsters ages 6 to 17 attended seven one-hour sessions spread across three weeks. They listened to a series of sentences, such as "We saw two brown bears" or "Grandmother gave Bob red beans," masked by staticky background noise intended to simulate a clattering classroom scene.

During the sessions, Sullivan gradually made the regimen more demanding by ratcheting up the number of words in the sentences, the noise volume and the time between hearing the sentence and identifying what words were said. The children had to give correct answers 80 percent of the time before advancing to the next level of difficulty.

Three months after the training, the participants still showed improvements in word recognition over the noise.

Sullivan also found that auditory training with a crackling noise – called "interrupted" because white noise was interspersed with fleeting five- to 95-millisecond silences – increased hearing comprehension more than using continuous white noise. Children in the interrupted noise group showed about a 50 percent increase in speech intelligibility compared with their hearing at the beginning of the experiment.

"The maintenance of the improvement is a truly significant finding,"

Sullivan said. "It indicates that new hearing and listening strategies have been developed to detect speech despite noise."

The next step in the research is to see how the regimen works for other people, such as adults and cochlear-implant users, and to other types of noise, including real-world settings.

More information: asadl.org/jasa/resource/1/jasman/v133/i1/p495_s1

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