Medical Xpress

Mild-to-moderate hearing loss in children leads to changes in how brain processes sound

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Dr. Lorna Halliday . Credit: Cambridge University

Deafness in early childhood is known to lead to lasting changes in how sounds are processed in the brain, but new research published today in

eLife shows that even mild-to-moderate levels of hearing loss in young children can lead to similar changes.

Researchers say that the findings may have implications for how babies are screened for hearing loss and how mild-to-moderate hearing loss in children is managed by healthcare providers.

The structure and function of the auditory system, which processes sounds in the brain, develops throughout childhood in response to exposure to sounds. In profoundly deaf children, the auditory system undergoes a functional reorganisation, repurposing itself to respond more to visual stimuli, for example. However, until now relatively little was known about the effects of mild-to-moderate hearing loss during childhood.

A research team led by Dr. Lorna Halliday, now at the MRC Cognition and Brain Sciences Unit, University of Cambridge, used an electroencephalogram (EEG) technique to measure the brain responses of 46 children who had been diagnosed with permanent mild-to-moderate hearing loss while they were listening to sounds.

Dividing the children into two groups—younger children (8-12 years) and older children (12-16 years) - the team found that the younger children with hearing loss showed relatively typical brain responses—in other words, similar to those of children with normal hearing. However, the brain responses of older children with hearing loss were smaller than those of their normally hearing peers.

To confirm these findings, the researchers re-tested a subset of the group of younger children from the original study, six years later. In the follow-up study, the researchers confirmed that as the children with hearing loss grew older, their brain responses changed. Responses that were present when the children were younger had either disappeared or grown smaller

by the time the children were older. There was no evidence that the children's hearing loss had worsened over this time, suggesting instead that a functional reorganisation was occurring.

"We know that children's brains develop in response to exposure to sounds, so it should not be too surprising that even mild-to-moderate levels of hearing loss can lead to changes in the brain," says Dr. Axelle Calcus, lead author of the paper, from PSL University, Paris. "However, this does suggest that we need to identify these problems at an earlier stage than is currently the case."

"Current screening programmes for newborn babies are good at picking up moderate-to-profound levels of hearing loss, but not at detecting mild hearing loss. This means that children with mild hearing impairment might not be detected until later in childhood, if at all," says Dr. Lorna Halliday from the University of Cambridge.

"Children with hearing problems tend to do less well than their peers in terms of language development and academic performance. Detecting even mild degrees of hearing impairment earlier could lead to earlier intervention that would limit these brain changes, and improve children's chances of developing normal language."

More information: Axelle Calcus et al, Functional brain alterations following mild-to-moderate sensorineural hearing loss in children, *eLife* (2019). DOI: 10.7554/eLife.46965

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