CENTRAL AUDITORY PROCESSING in older adults: age and working memory

Not all elderly persons have specific hearing problems. But even for the older adults without these problems, their understanding of speech in noise deteriorates. Can this be explained by declining cognitive processing? Katrien Vermeire Ph.d. and her colleagues at Thomas More University College in Antwerp, searched for an explanation of this phenomenon.

"A shorter reading span indicates a worse working memory function in the elderly."

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Photos: Bureau Lorient Communicatie

"Central processing in older adults deteriorates. Working memory, with aspects like attention and inhibition decline", says Vermeire. “But this is countered by better language knowledge and better information retrieval from the context.” As working memory is a keyword, let’s get the definition straight. Vermeire refers to Alan Baddeley’s 1976 model for working memory. He defined it as the instrument for processing and saving in time of information during the execution of a complex task.

Vermeire: “Typically, with a small working memory, the processing demand of speech in noise exceeds the available working memory capacity. When processing uses up the available capacity, the saving function suffers: information is not remembered well. The actual auditory input does not match with what the episodic buffer thinks has been said. People with hearing loss, young or old, have a mismatch around this episodic buffer.”

Reading Span Test
But how is this with a general public of elderly, without specific hearing problems or hearing aids? How can their lesser understanding of speech in noise be explained, when their hearing capacity has only deteriorated moderately? Is it perhaps diminished working memory capacity? Vermeire: “To find the answer, we had to perform tests which exclude the influence of hearing capacity. And of course we had to find out how the verbal working memory in the older group performs in comparison with younger adults. We chose the Reading Span Test (RST) by Van den Noort, consisting of
a hundred sentences in Dutch. As is chooses a visual approach of the verbal working memory, it is possible to exclude all auditory influences.

The test was carried out with fourteen elderly, ranging in age from 60.4 to 82.7 years and an average of 74 years of age. The younger control group consisted of seven persons. Vermeire: "The younger group performed significantly better at understanding of speech in noise. The difference in hearing ability represents a normal age related hearing performance for both groups."

In the Reading Span Test the younger people were able to reproduce an average of 63 end words out of a hundred sentences, whereas the elderly only averaged 41. The spread ranged from 16 to 80. Fatigue was no factor, because test persons did not perform less well towards the end of the test.

Ethical issue

"We concluded that the working memory in younger adults is indeed better", Vermeire says. "Understanding of speech in elderly was, as expected, significantly worse. A shorter reading span indicates a worse working memory function in the elderly." So even without what is at present seen as 'hearing problems', the slightly diminished hearing in elderly already poses problems in understanding.

This leads to an intriguing question, which was indeed posed by Vermeire’s public: would timely fitting with hearing aids keep the elderly’s working memory in better shape? Vermeire: "There is more and more evidence for this, for instance from research by Frank Lin from Baltimore. This gives hope, but in my opinion, building a conclusive body of evidence poses some serious ethical questions. To find more conclusive answers to the question ‘can we stop/slow down the process of cognitive deterioration by early HA-fitting?’ they want to study two randomly selected groups: one group of older adults with a mild hearing loss who are fitted with a HA and a group who are not receiving a HA immediately. Then they want to compare the outcomes of the two groups. Nobody deserves to be in the control group."

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