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When hearing loss masquerades as cognitive decline

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When hearing loss masquerades as cognitive decline

Audibility and processing effort can bias cognitive-test performance

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Audibility and processing effort can bias cognitive-test performance

In recent years, dementia research has increasingly focused on age-related hearing loss and its association with accelerated cognitive decline and contribution to dementia risk.¹

In this issue, Parker *et al*² (**pp 172-6**) investigated whether pure-tone audiometric thresholds (an indicator of peripheral hearing status) predict biomarkers of dementia-associated cerebral pathologies and cognitive performance in the preclinical older population. Hearing thresholds were indeed negatively associated with scores on the Mini-Mental-State Examination (MMSE), a widely used screen for cognitive impairment. However, the authors noticed that this relationship was no longer significant when the auditory-based repetition item of the MMSE (“*No ifs, ands, or buts.*”) was excluded from the analysis.

From an audiological point of view, this finding is not surprising. Sibilant consonants, such as the plural marker “s” in the English version of the repetition item, are characterized by high-frequency acoustic energy. Age-related hearing loss, which affects a large proportion of the general older population, manifests itself mainly in that frequency range. Consequently, those participants in the study of Parker *et al*² with larger hearing losses struggled to hear the word-final sounds, and incompletely and thus (according to the MMSE scoring rules) incorrectly repeated the item.

Clearly, interpreting this failure as a sign of cognitive pathology would be absurd, but few are the neuropsychological or cognitive tests that caution against a possible audibility bias in the older test population, and that include procedures to ensure that test stimuli are correctly perceived.

To complicate matters further, even in the case of good audibility, age-related supra-threshold auditory processing deficits that are not reflected in the audiogram³ distort auditory information. As a result, cognitive effort is required for the processing of the test stimuli, thereby reducing the remaining cognitive resources available for the execution of the cognitive task itself⁴ (e.g. memorizing a list of items, as used in many dementia screens). This effortfulness hypothesis of cognitive performance is consistent with results from a recent study simulating age-related hearing loss in young normal-hearing participants with no cognitive impairment. Despite test stimuli being fully intelligible, auditory short-term and working memory were significantly affected compared to when no hearing-loss simulation was used.⁵

In summary, Parker *et al.*'s² serendipitous observation is a timely illustrative reminder that age-related auditory deficits negatively impact test performance, potentially resulting in the mis- or overdiagnosis of cognitive decline. Crucially, the reduction in audibility, which can be compensated for by increasing the presentation level of the test stimuli (e.g. via the use of hearing aids), represents only one aspect of the challenges older people face when taking cognitive tests. In addition, increased processing effort associated with hearing loss and advanced age hampers cognitive-test performance.^{4,5} It is currently unclear how this could be mitigated.

To conclude, given the ubiquitous nature of hearing loss in the elderly who also constitute the target population for dementia diagnosis and research, clinicians and researchers need to carefully choose their cognitive tests to minimize the impact of hearing impairment on the assessment of cognitive functioning.

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