# Overlooked Variables Regarding Hearing Aids and Dementia

BY RON LEAVITT

Potential cognitive benefits of hearing aid use are reported in the literature in four widely-publicized studies (Glick and Sharma, 2017, 2020; Lin et al, 2023; Sarant JZ et al, 2024). However, some of these studies have been criticized for their methodological limitations (Dawes, 2024; Sarant J et al, 2024). In their recent study, Sarant J et al (2024) addressed many of these methodological concerns and noted that use of randomized-controlled trials as a "gold standard" of proof may raise ethical concerns.

Clearly, issues associated with hearing loss, cognitive decline, and hearing aids have received much attention. By contrast, the parameters that yield these benefits have received much less consideration. In the studies noted above, all participants wore hearing aids programmed to a real-ear verified National Acoustic Laboratories' nonlinear fitting procedure, version 22nd edition (NAL NL-2) target as described by Keidser et al (2011), with a maximum deviation from target of + 5dB from 500 to 4000 Hz.

If one assumes throughout the United States all patients are receiving such verified real-ear fittings, the potential cognitive benefits may apply. However, this may not be the case nationally, as multiple studies document deviations from prescriptive targets (TABLE 1).

In pharmacological studies showing a significant therapeutic benefit, therapeutic dosage becomes a critical variable. Physicians hoping for similar therapeutic benefits must

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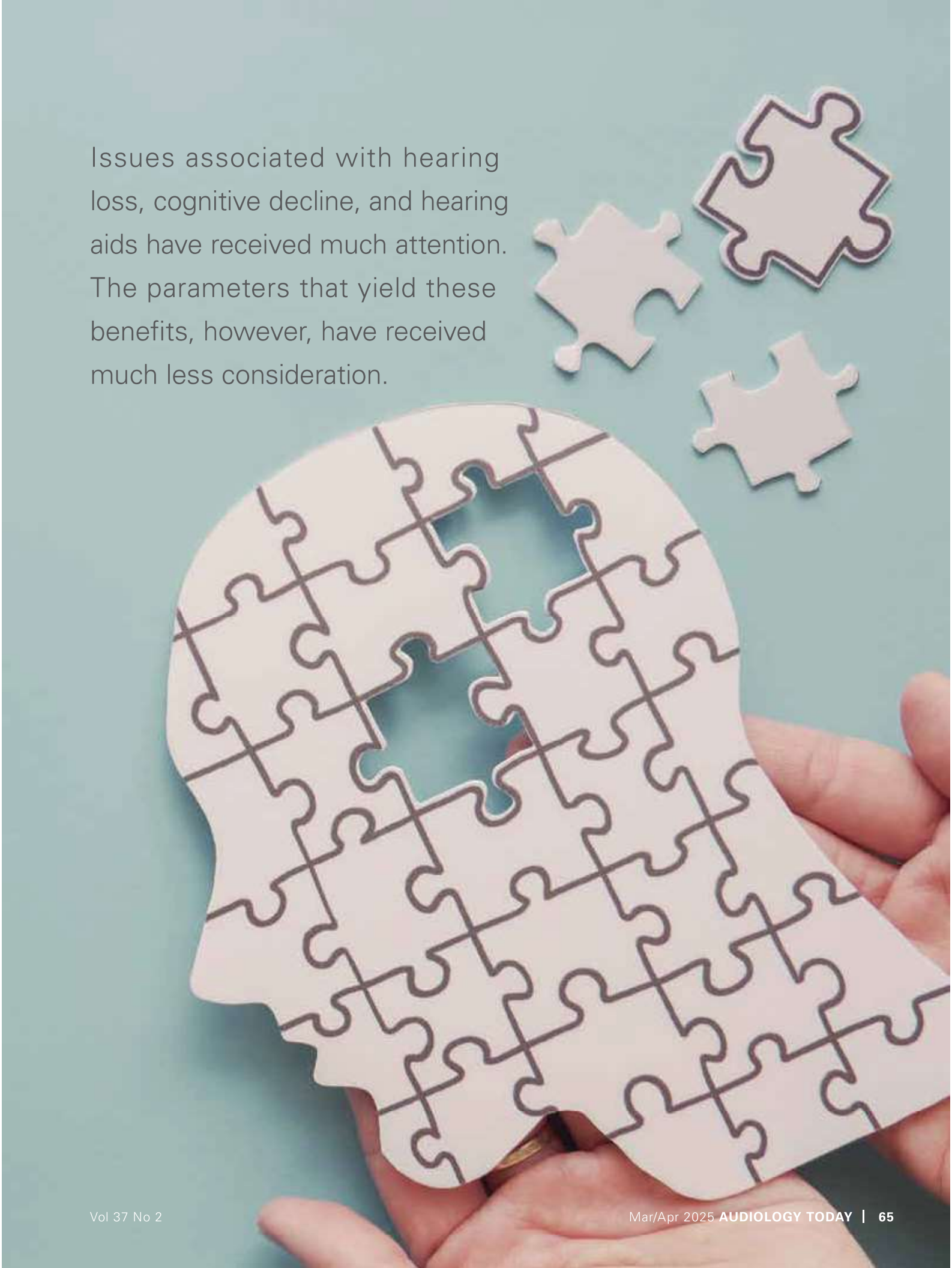
Issues associated with hearing loss, cognitive decline, and hearing aids have received much attention. The parameters that yield these benefits, however, have received much less consideration.



follow the reported dosage. Similarly, hearing-healthcare providers who expect to achieve the cognitive benefits demonstrated by the previous studies are obliged to follow the same dosage requirements (e.g., matching NAL NL-2 real-ear validated target on all patients).



Persons with hearing loss are not able to accurately judge if their hearing aids are programmed for optimum speech audibility.

Further, any assumption that persons with hearing loss might find their way to a real-ear validated target through hearing aid self-adjustment is mistaken. For example, a two-channel hearing aid with 10 choices in each channel would provide a self-fit individual with 1 chance in 100 of falling within the NAL NL-2 target at only one input level.

If, by contrast, an individual had access to contemporary hearing aids and associated hardware/software, and the software offered four channels for soft, medium loud, loud, and very loud levels, and only 10 choices were available in each channel, these individuals would have a 1 in 1016 likelihood of matching the NAL NL-2 target at all four levels.

For those who believe the manufacturer's "best-fit" software will solve the hearing aid programming problem, it has been shown that such software does not result in an approximation to an NAL target (Leavitt and Flexer, 2012; Abrams, et al, 2013; Sanders et al, 2015; Valente et al, 2018; Taylor and Mueller, 2023).

It has also been shown that persons with hearing loss are not able to accurately judge if their hearing aids are programmed for optimum speech audibility. Specifically, Humes et al (2017) reported 36 percent of highly educated adults with no cognitive deficits were willing to pay $1,800 per hearing aid for hearing aids that provided no improvement to their unaided listening abilities. In a follow-up study, this number was 37 percent (Humes et al, 2019). This

finding that nearly two-fifths of educated, individuals without dementia are willing to buy two non-amplifying, hearing aids totaling $3,600 should dissuade any belief that self-fit persons will consistently receive any aided benefit whatsoever.

A second overlooked variable in the studies by Glick and Sharma (2017, 2020) is that the cognitive resource reallocation and cognitive benefits reported were conferred only in individuals who met two criteria. First, all hearing aids were programmed to an NAL NL-2 verified target. Second, all subjects showed significant improvement in unaided versus bilaterally aided Quick Speech in Noise (QuickSIN) scores (Killion et al, 2004). However, the presentation level used for this QuickSIN test in both studies was 60 dB SPL, not the 70 dB HL value recommended by Killion et al for individuals with pure tone averages < 45 dB HL.

Any assumptions based on these four studies suggesting that wearing hearing aids, regardless of programing parameters or speech presentation levels, will provide a favorable cognitive benefit misrepresents the authors' findings. Cognitive protection is certainly not the case for those whose hearing aids are providing no benefit above the unaided response and possibly not for those receiving partial real-ear verified targets.

Until it can be shown that every hearing aid user is fit to a full NAL NL-2 real-ear verified target and that normal bilaterally aided QuickSIN scores have been obtained at a presentation level of 60 dB SPL, any statement of potential cognitive benefit must be questioned.

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*Ron Leavitt, AuD, obtained his bachelor's and master's degrees from University of Arizona and his AuD from Arizona School of Health Sciences. He is a recipient of the Larry Mauldin Award for Excellence in Teaching, winner of the AudioScan Challenge for best hearing-aid-validation procedure, and a recipient of the RayOVac Award for Best Audiologist in the Western United States.*

DISCLAIMER

*This article represents the author's views; it does not represent those of the Academy.*

**TABLE 1.** Summary of Hearing Aid Verification Studies

| AUTHORS (YEAR) | STUDY FINDINGS |
|---|---|
| Mueller and Picou (2010) | 35-37% hearing health-care providers used real-ear measures to verify prescriptive targets |
| McCreery et al. (2013) | 55% of hearing aids fit to school-age children did not meet +5 dB real-ear target criteria |
| Leavitt et al. (2017) | 2.3% of adult hearing-aid fittings from 24 facilities throughout Oregon met this + 5dB criteria |
| Holder et al. (2018) | 70.9 % of patients hearing aids did not meet real-ear verified NAL-NL2 target |
| Prentiss et al. (2020) | Less than 50% of surveyed audiologists observed hearing aid fittings that achieved real-ear targets |
| Sydlowski et al. (2021) | 81% of patients seeking cochlear implants had hearing aids that did not meet NAL targets. When their hearing aids were programmed to NAL NL-2 targets, 16% showed improved word recognition into a range no longer considered for implant candidacy. |

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