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The Times They are A Changing

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My Letter to the Editor which follows was prompted by Dr. Pichora-Fuller's excellent, evidence-based, in-depth discussion of communication surrounding the retracted academic paper appearing in the *Lancet Public Health* titled: "Retraction of a Publication Error Reporting That Hearing Aid Use Modified Dementia Risk (Pichora-Fuller, 2024) which appeared in Volume 11, Issue 1 of the *Canadian Audiologist*. Kudos to Dr. Pichora-Fuller, a scientist's scientist and a clinical researcher's paragon. Her scholarly piece and the conclusion to "keep questioning results that seem too good to be true" should resonate for each of us.

To recap, *The Lancet Public Health*, published a paper titled "Association between hearing aid use and all-cause and cause-specific dementia: an analysis of the UK Biobank cohort." In their report, Jiang, Mishraa, Shrestha, et al., (2023) concluded that:

"in people with hearing loss, hearing aid use is associated with a risk of dementia of a similar level to that of people without hearing loss." They further proposed that "up to 8% of dementia cases could be prevented with proper hearing loss management"

The paper received high praise and attracted international attention given the global public health challenges and costs posed by dementia, a group of cognitive and social symptoms for which there remains NO cure. Fast forward to the lab of Jure Mur, a postdoctoral student at the University of Edinburgh in Scotland. Mur attempted to replicate the findings of Jiang and colleagues but could not produce matching results. Assuming a coding error and in the interest of scientific integrity, Mur emailed the authors several times regarding the discrepancies. Frustrated and confused by the lack of a response, Mur submitted a comment article to the Lancet editors who declined to publish his comments after much prodding (Retraction Watch, 2024). Following a protracted exchange, the *Lancet Public Health* agreed to retract the article in December 2023. The compelling argument made by Mur was that, in contrast to the conclusions of Jiang and colleagues, that hearing aid use corresponds to a lower rate of dementia, Mur and colleagues found that among people with hearing loss, the dementia rate was higher for those using hearing aids! The latter outcome perplexed many audiologists but to me it seemed plausible.

Before I address a possible explanation for the discrepant conclusions/findings reached by Mur, I feel it incumbent on me to underscore how serious a decision it is when a scientific journal issues a retraction and how serious it is that the retracted paper was celebrated by audiologists throughout the world with citations continuing to build as pointed out by Pichora Fuller (2024). In contrast to

the attention showered on the paper by Jiang and colleagues, there has been little mention of the retraction by our colleagues. Stakeholders in our field continue to propagate the myth that "eliminating or entirely mitigating hearing loss could *potentially* yield an 8% reduction in the overall number of cases of dementia (Livingston et al. 2020). Further, the tendency of hearing aid manufacturers and audiologists to compel persons with hearing loss to purchase hearing aids by linking hearing aid use to dementia risk reduction continues. Lin and colleagues continue to present the findings and conclusions of their groundbreaking and landmark ACHIEVE study, but reference to the reinterpretation of the findings of Jiang and colleagues in light of Mur's timely attempt to correct the scientific record has been limited.

A mechanism by which a paper published in an academic journal is flagged, a **retraction*** is only issued when the academic publisher considers the paper to be seriously flawed to the extent that the results and conclusions can no longer be relied upon. *Retraction Watch* typically provides updates on new retractions so the scientific community is kept abreast of a scientific mistake. *Retraction Watch* which tracks retractions as a window into the scientific process published a lengthy piece on the retraction, are relatively rare. Once, retracted, Mur commented in *Retraction Watch* that the end result of his discussions with the *Lancet Public Health* is good for the scientific community.

Pichora-Fuller (2024) referenced a few of the comments on the retraction including a Letter to the Editor by Deal and Reed (2024) who raised concerns about the comparison group used by Jiang and colleagues. They made no mention of the alternative set of findings and conclusions of Mur. In the January 4, 2024 issue of HHTM, Dr. Brian Taylor commented on the protracted and complicated process surrounding the Lancet's decision, underscoring that "the publication and subsequent retraction of this peer-reviewed article is an important lesson in responsible interpretation and messaging."

A lengthy piece in *Retraction Watch* made clear that they were convinced by communications from Mur and colleagues (2023) that it was clear that "a causal role for the use of hearing aids to reduce the risk of dementia is far from a settled issue. *Retraction Watch* (2024) included reactions of 14 scholars to the exchange between Mur, Jiang and the editors of the *Lancet Public Health*.

On January 6, 2024, Chris wrote:

"I still don't understand how articles such as this – which only show some weak correlation – get published at all, let alone in premiere journals. If you look long enough, I am sure you can correlate dementia rates in any population with preference of a blue shirt vs. a red shirt, or the won/loss records of Manchester United – but we all know that is meaningless. Logically, by what action would wearing a hearing aid cause or prevent dementia? Unless an article like this has some specifics about actions and causation I don't think they should get published at all"

Science Media Centre (April 13, 2023) in a piece titled: "*Expert reaction to observational study looking at hearing aid use and risk of dementia"* also published interesting reactions and conclusions that bear repetition.

Prof David Curtis, Honorary Professor, UCL Genetics Institute wrote:

“It is hard to think of plausible mechanisms whereby having trouble hearing could lead to the kinds of damage to brain cells which are observed in the different types of dementia studied. On the other hand, we are already aware that struggling to understand conversations can be an early sign of dementia and it may be people with this kind of hearing difficulty are less likely to be prescribed a hearing aid and/or are less likely to wear one. The relationship between hearing loss and dementia needs to be investigated further before we advocate widespread usage of hearing aids as a preventative strategy.”

The comments and conclusions of Prof Tara Spires-Jones, Professor of Neurodegeneration and Deputy director of the Centre for Discovery Brain Sciences at the University of Edinburgh, and BNAPresident-Elect are worthy of repetition, as well.

“*This type of study cannot prove conclusively that hearing loss causes dementia. For example, it is possible that people who are already in the very early stages of disease are less likely to seek help for hearing loss. However, on balance, this study and the rest of the data in the field indicate that keeping your brain heathy and engaged reduces dementia risk. I agree with the conclusions of the paper that it is important to help people with hearing loss to get effective hearing aids to help keep their brains engaged through allowing richer social interactions.”*

Acknowledging the difficulty of doing convincing studies to explore the question of the link between dementia and hearing loss given the need for large samples and long enough periods of follow-up, Prof Tom Dening, Professor of Dementia Research, University of Nottingham, concluded regarding the Jiang piece that:

“as someone has recently started to use hearing aids myself, I am greatly encouraged by these findings, and as a clinical researcher I appreciate having better data on which to base my advice to patients. We need to use studies like this to encourage the public not to be embarrassed by hearing problems and to seek assessment and treatment sooner rather than later”

Dr. Charles Marshall, Clinical Senior Lecturer in Neurology, Preventive Neurology Unit, Queen Mary University of London commented that the observational nature of the Jiang study makes it difficult to be sure that hearing aids are causing the reduced risk of dementia. He went on to conclude the following:

“Hearing aids produce slightly distorted sound, and the brain has to adapt to this in order for hearing aids to be helpful. People who are at risk of developing dementia in the future may have early changes in their brain that impair this adaptation, and this may lead to them choosing to not use hearing aids. This would confound the association, creating the appearance that hearing aids

were reducing dementia risk, when actually their use was just identifying people with relatively healthy brains.

"Hopefully the evidence from this paper will lead to randomized trials of hearing aid use that will provide a stronger foundation for public health advice about whether correcting hearing loss might help to prevent dementia"

Consistent with Robert Evans's thinking that there are always three sides to a story and they should all be heard, my goal in writing this *Letter to the Editor* was to expose readers of the *Canadian Audiologist* to the varying perspectives of well-respected scientists.

Concluding Remarks

I would like to suggest that the complexities of hearing aid signal processing and changes in cognitive processing with age may contribute to the alternative conclusion offered by Mur and colleagues regarding hearing aid use and dementia risk. In short, rather than addressing some of the methodological/procedural flaws inherent in either of the studies, the hearing aid fitting process per se may be at issue. It is feasible that the interaction between cognitive status, auditory processing, hearing aid use, and communication function could help explain the finding of Mur and colleagues that the rate of dementia was higher among hearing aid users. As Windle, Dillon & Heinrich (2023) discuss in detail - consideration of hearing aid parameters including compression ratio, compression speed, are critical to hearing aid fittings and function with hearing aids. In short, "signal processing strategies may create benefit or impediment for individuals with differing degrees of cognition and auditory processing." The "optimum" hearing aid fitting should not solely consider peripheral hearing loss but should aim to deliver maximum benefit over time, considering hearing loss, auditory processing, cognition and non-auditory factors that affect an individual, their perception of treatment and ability or intention to comply with it Windle, Dillon & Heinrich (2024)."

As Windle and colleagues point out, no amount of fine-tuning of a hearing aid's gain will deliver benefit if there is a perception of unacceptable distortion which of course will impact how persons with and without dementia will process and understand the speech of others. Failure to include information on signal processing, and absent reliable and valid verification and validation protocols to ensure that hearing aid settings are optimal, or at least acceptable, to each user, especially participants in studies exploring hearing aid use and risk of dementia renders the conclusions of many of the studies on the topic questionable. To reiterate, hearing aid signal processing, functional hearing with hearing aids, and dementia are complex and multidimensional entities. Any conclusions to date regarding the links are premature. It is not however premature to conclude that:

"We need effective messages to overcome the stigma that is a barrier to hearing testing and treatment. Frightening or negative messages can be ineffective, and they can backfire. Tailoring messages to maximize desired behavior change is not soft-pedaling. It is a matter of being effective. …. In promoting hearing health, we believe that the most effective message will be positive rather than ominous….. there are benefits of better hearing, regardless of age and stage in life…hearing better helps you think better (Blustein, Weinstein & Chodosh)"

References

1. Blustein, J., Weinstein, B. & Chodosh, J. (2023). Messaging Clearly and Effectively About Hearing Loss and Increased Dementia Risk
2. *JAMA Otolaryngol Head Neck Surg*. 149(10):862-863. doi:10.1001/jamaoto.2023.2561.
3. Deal, J. A., & Reed, N. S. (2023). Hearing health and dementia. Correspondence in The Lancet Public Health, 8 (10), e751.
4. Jiang, F., Mishra, S., Shrestha N, et al. (2023). Association between hearing aid use and all-cause and cause-specific dementia: an analysis of the UK Biobank cohort. *Lancet Public Health. 8(5). E329-e338.* 2023. https://doi.org/10.1016/S2468-2667(23)00048-8
5. Livingston, G., Huntley, J., Sommerlad, A., Ames, D., Ballard, C., Banerjee,
6. S., Cooper, C. (2020). Dementia prevention, intervention, and care: 2020 report of the Lancet Commission. *Lancet*, 396, 413–446.
7. Mur, J., Klee, M., Muniz-Terrera, G, & Leist,A. K.(2023).
8. No evidence for a protective role of hearing aids for the risk of dementia in UK Biobank: a response to Jiang et al. https://retractionwatch.com/wp-content/uploads/2024/01/2_comment_article.docx.pdf
9. Pichora-Fuller, K. (2024). Retraction of a publication error reporting that hearing aid use modified dementia risk. *Canadian Audiologist*. 11 (1).
10. Retraction Watch (2024). We should have followed up': Lancet journal retracts article on hearing aids and dementia after prodding.
11. https://retractionwatch.com/2024/01/04/we-should-have-followed-up-lancet-journal-retracts-article-on-hearing-aids-and-dementia-after-prodding/
12. Science Media Center (2023). Expert reaction to observational study looking at hearing aid use and risk of dementia. https://www.sciencemediacentre.org/expert-reaction-to-observational-study-looking-at-hearing-aid-use-and-risk-of-dementia/
13. Windle R, Dillon H, Heinrich A. A review of auditory processing and cognitive change during normal ageing, and the implications for setting hearing aids for older adults. Front Neurol. 2023 Jun 20;14:1122420. doi: 10.3389/fneur.2023.1122420. Erratum in: Front Neurol. 2023 Jul 18;14:1254802. PMID: 37409017; PMCID: PMC10318159.

*https://scientific-publishing.webshop.elsevier.com/research-process/paper-retraction-meaning-and-main-reasons/