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Retraction of a Publication Error Reporting That Hearing Aid Use Modified Dementia Risk

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Kathy Pichora-Fuller, PhD, Aud(C), RAUD, FCAHS

Kathy Pichora-Fuller, PhD, Aud(C), RAUD, FCAHS
Professor Emerita, Psychology, University of Toronto
Adjunct Professor, Gerontology, Simon Fraser University
Past President, International Collegium of Rehabilitative Audiology

This is a genie we need to try to put back in the bottle.

January 2024 began with important news about research concerning whether hearing aid use could possibly modify dementia risk. Specifically, The Lancet Public Health Editors published a retraction notification (Lancet Public Health Editors, 2024a) for an article entitled "*Association between hearing aid use and all-cause and cause-specific dementia: an analysis of the UK Biobank cohort*" (Jiang et al., 2023). It had been learned that the paper had made erroneous claims that using hearing aids modified dementia risk. The paper was originally published online in April 2023, a corrected version appeared in July 2023, and further corrections were made on September 28, 2023. Then a retraction notice was published online in December 2023, followed by the publication of the official retraction in January 2024.

The retraction by the Lancet Public Health Editors reads

> "*On Nov 27, 2023, we have been informed by the authors of the paper—Association between hearing aid use and all-cause and cause-specific dementia: an analysis of the UK Biobank cohort—published on April 13, 2023[Jiang et al., 2023], that an error was introduced in the output format setting of their SAS codes (data for people with hearing loss using hearing aids and with hearing loss without using hearing aids were switched), leading to errors in their analysis which render their findings and conclusions false and misleading. These errors were identified by the authors following an exchange with scientists seeking to reproduce the authors' findings. We are therefore retracting this article*."

The retracted paper of Jiang et al. claimed that there was a significant difference in dementia risk when comparing people with self-reported normal hearing to people who self-reported hearing problems and did not use hearing aids; in contrast, there was no significant difference in dementia risk when comparing people with self-reported normal hearing and those who self-reported hearing problems and used hearing aids. The strength of the claims made in the paper were commented on by leading researchers across multiple continents. In May 2023, two commentaries on the paper

appeared in *The Lancet Public Health*. One commentary, "*Preventing dementia through correcting hearing: huge progress but more to do*", by Livingston and Costafreda (2023) from the UK cautioned that the reduced risk of dementia attributed to hearing aid use could be due to other confounding factors insofar as those who use hearing aids might have better access to financial, social, or cognitive resources to look after their health compared with those without hearing aids. The commentary compared the possible benefits from hearing aids to those realized from hypertension treatment, except that randomized control trials supported reduced risk of dementia for those treated for hypertension while randomized control trials (RCT) were still needed to provide this type of evidence for hearing aid use. Recall that the ACHIEVE RCT by Lin et al. (2023) was not published until July 2023 with the finding of no overall evidence that hearing aid use reduced the rate of cognitive decline (for a discussion in the *Canadian Audiologist* see Pichora-Fuller, 2023). The second commentary published in May 2023, "Addressing hearing loss at all ages", was by the Lancet Public Health Editors themselves. Importantly, by January 2024, both of these commentaries were also retracted (The Lancet Public Health Editors, 2024b,c). The Erratum for the commentary by Livingston and Costafreda published on January 1, 2024 reads "*In this Comment, the authors cite and interpret data based on an Article we now know to be erroneous and which has now been retracted. In these circumstances, the UK Committee on Publication Ethics advises that the linked Comment should also be retracted to avoid any misunderstanding among readers. We are therefore retracting this Comment.*"

In October 2023, other researchers raised questions about the findings reported in the retracted paper by Jiang et al. (2023) and their correspondence was published in *The Lancet Public Health*. Pádraig T Kitterick and Brent Edwards from the National Acoustics Laboratories and Macquarie University in Australia pointed out that that the research (and the commentary on it by Livingston and Costafreda) conflated self-reported hearing difficulties with the presence of a hearing loss (Kitterick & Edwards, 2023). Jennifer Deal and Nick Reed from Johns Hopkins in the USA, wrote that it was not appropriate to use people with normal hearing as the comparison group in the analyses. The authors of the retracted paper (Jiang et al., 2023) replied to these letters in an attempt to explain their analyses (Zhu et al., 2023). However, it seems that the scrutiny of the findings and the astute questions from other researchers around the world may have led to the discovery of the critical analysis error.

Given that there seems to have been a simple error in labelling the groups, a correction of this error would essentially reverse the results to show that when comparing to people with normal self-reported hearing to those who self-reported hearing problems, those who did NOT use hearing aids had the same risk of dementia as those with normal self-reported hearing, whereas those who used hearing aids actually had significantly greater risk of dementia. A likely simple interpretation could be that those who use hearing aids had a greater degree of hearing loss compared to those who self-report hearing problems but did not use hearing aids. A finding that dementia risk increases with increases in hearing loss (with or without hearing aids) would be consistent with previous research. Unfortunately, although the UK Biobank collects quantitative digit-triple speech-in-noise threshold data as a proxy for audiometry, the analyses of Jiang et al. (2023) used categorical self-reported hearing loss data rather than a continuous behavioural measure of hearing loss.

It is reassuring that good science has prevailed, the analysis error was discovered, and the original paper and papers commenting on the original findings have been retracted. However, as of the first week of January, the original paper had already been cited in 25 more papers (not counting the commentaries or the retraction notifications outlined above). For example, an (otherwise) excellent review paper was published on December 30 (Rosenau et al., 2023). Other papers citing the

retracted paper of Jiang et al. (2023) are opinion papers written by those who caution about our messaging (Blustein et al., 2023), as well as by those who are not so cautious (e.g., Beck, 2023). In turn, there have been 41 more papers citing the papers that cited the original retracted paper. It is difficult to know how long it will take for the retractions published in January 2024 to halt citations that are rapidly propagating the erroneous findings. This is a genie we need to try to put back in the bottle. This tale provides an important lesson about the need to keep questioning results that seem too good to be true.

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