

CORRECTION

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Correction: Impact of cumulative exposure to anticholinergic and sedative drugs on cognition in older adults: a memory clinic cohort study

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Following the publication of the original article [1], seven paragraphs of the Discussion section and the last sentence of the second paragraph under “Multivariate linear mixed model (random intercept and slope)” section were unintentionally omitted from this article during Typesetting process.

The last paragraph of “Multivariate linear mixed model (random intercept and slope)” section should have read:

A cognitive decline of 1.26 points per year on the MMSE ($\beta = -1.26$, p value < 0.001) was observed for patients without any anticholinergic or sedative

exposure. With moderate exposure to these drugs extent of cognitive decline increased by 0.48 points per year (p value < 0.001), and extent of cognitive decline increased by 0.48 points per year (p value < 0.001), and extent of cognitive decline increased by 0.44 points per year with high exposure (p value $= 0.005$, Table 2). Overall, the MMSE score significantly decreased by 1.74 points per year for patients with moderate DBI scores $((-1.26) + (-0.48) = (-1.74))$ and 1.70 points per year for patients with high DBI scores $((-1.26) + (-0.44) = (-1.70))$.

The Discussion section should have read:

Discussion

The present longitudinal study showed that moderate and high cumulative long-term exposure to anticholinergic and sedative drugs in older adults was associated with an additional decrease in MMSE score of 0.48 and 0.44 points per year, respectively, further strengthening the evidence that anticholinergic and sedative drug exposure negatively impacts cognition in older adults.

The main finding of the present study is consistent with previous results from both longitudinal and cross-sectional studies [10–12,18,27–31]. However, the present study is the first, to our knowledge, to estimate cumulative drug exposure several years before cognitive assessment, providing stronger evidence of the negative impact of anticholinergic and sedative drugs on cognition. These findings provide evidence that the impact of medication on cognition should be considered based not only

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on single daily exposure (as measured by the DBI daily score) but also on cumulative exposure over time.

The present results show no trend towards a dose-response effect between moderate and high exposure to anticholinergic and sedative drugs. This could be explained by the high proportion of patients in the moderate-exposure group, a proportion nearly twice as high as the 20–35% of patients in the moderate-exposure group previously reported [13,32–34]. It is possible that the extrapolation of the daily DBI to a cumulative DBI using the proposed approach led to miscategorisation of patients. Further methodological research, such as cluster analysis, will be carried out to better delineate the cumulative exposure groups that could characterize patients in these longitudinal studies.

However, several studies in the literature have shown no association between anticholinergic or sedative exposure and cognition [13,14,35–37]. These discordant results may be explained by the heterogeneity in the tools used due to the high number of validated scales available to measure cognition and drug exposure. The DBI itself, which was used herein because it is described as the most suitable measure for longitudinal studies [15], also has limitations. First, it does not take into account the different anticholinergic levels of drugs. Second, it represents a daily burden, and thresholds do not exist for categorising long-term exposure levels to anticholinergic and sedative drugs. Finally, different results might be produced for a single patient depending on the country or the authors (i.e., the minimal effective dose in the DBI formula is calculated according to national references, and the drug lists used can vary from one author to another) [38–42].

Moreover, most studies did not control for confounding factors such as behavioural disorders and functional autonomy loss [10–14,26,33]. On the one hand, these factors are commonly associated with poorer cognition, and on the other hand, patients with these symptoms are more likely to receive anticholinergic or sedative drugs. These potential confounding factors, such as the NPI and IADL scores, were included in the present multivariate model.

The use of the PHIF to collect data might represent the main limitation of the present study. Due to its nature, medication data can only be obtained biannually and thus do not reflect the true daily dose needed to calculate DBI. Moreover, although data obtained from the PHIF allow treatment compliance to be ensured, as the PHIF presents drugs actually purchased by patients in pharmacies, it does not consider non-reimbursed or over-the-counter drugs. However, we assume that this would not impact the exposure group distribution as very few over-the-counter drugs have strong anticholinergic and sedative properties and their

use is generally occasional and limited in time. More importantly, PHIF data are reliable for longitudinal studies because they reflect all medication changes during a studied period.

Moreover, below are the references details of the citations mentioned from these paragraphs.

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The original article [1] has been updated. Note: References were renumbered accordingly in ascending numerical order in the original article.

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Reference

1. Reallon E, Gervais F, Moutet C, et al. Impact of cumulative exposure to anticholinergic and sedative drugs on cognition in older adults: a memory clinic cohort study. *Alz Res Therapy*. 2024;16:163. <https://doi.org/10.1186/s13195-024-01530-8>.