

Longitudinal data are crucial for identifying *superagers*

The possibility of successful *memory aging* has been considered for more than 50 years [5]. Today, with global population aging, this topic is as relevant as ever. By studying older individuals who seemingly have avoided age-typical memory loss, so-called *superagers* [3], we might gain new insight into the factors that promote successful aging. However, this has proven to be a challenging task, with variable patterns of results across studies. For instance, some studies highlighted the importance of adhering to a Mediterranean diet [11], whereas other studies did not find this variable to distinguish superagers from age-typical individuals [2]. Variable outcomes have also been reported for genetic factors, such as APOE ϵ 4 [2,9]. A recent study highlighted yet another discrepancy [4]. Keenan and colleagues attempted a conceptual replication of a previous finding that superagers have stronger intrinsic functional connectivity in certain resting-state networks and that the degree of connectivity in these networks correlated with memory performance [12]. The results did not replicate the original study, leading Keenan et al. to highlight the need for consensus definitions and longitudinal data in superaging studies.

A common approach to identifying superagers is to single out 80+ years old individuals with a level of episodic memory that is at least on par with normative data for the age range 50–60 years [8]; see also [1]. The mean age of superagers was lower in the Zhang et al. ($M = 67.8$) and Keenan et al. ($M = 72.1$) studies, and they were benchmarked against considerably younger individuals. Keenan et al. [4] noted that the ages of the younger comparison group vary considerably across studies, but in view of longitudinal evidence for a high degree of stability in episodic memory from age 30–60 years [10], it is not apparent that variability in the age of the reference group strongly influences reproducibility. Using a lower age cutoff than 80 years for identifying superagers will likely impact reproducibility to a higher degree. Longitudinal change patterns [10] suggest that 65–70 years-old individuals can have a level of performance on par with the average of younger individuals simply because they have not yet started to suffer from (marked) age-related memory decline -- not because they are superagers.

Whereas a higher age cutoff is likely to reduce the risk of misclassifying an individual as a superager, it is important to note that a high score of an older individual does not necessarily equate with *well-preserved* episodic memory. Rather, as illustrated in Fig. 1, the red slope lines, denoting rate of change, may be very similar for different individuals, but they may or may not pass a cutoff (dashed line) depending on variability in initial performance levels. Longitudinal data from the Betula study [6] provide empirical support for the pattern in Fig. 1 [7]. Crucially, longitudinal studies also provide evidence that some individuals maintain a stable level of episodic memory well into older age (Fig. 1, green lines, for a review of empirical studies, see [5]). Capturing stable versus declining trajectories of older individuals with a youthlike level of performance will hopefully contribute positively to the reproducibility of findings across studies.

In summary, documenting failures to replicate is important for scientific progress, and the Keenan et al. [4] study highlights several important points. In this commentary I have stressed the importance of longitudinal data for firm conclusions on whether an older individual truly shows evidence of preserved memory. Supplementing cross-sectional level-based identification of superagers with longitudinal data will hopefully result in a more precise identification of superagers, thereby enhancing the reproducibility of findings across studies.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DOI of original article: <https://doi.org/10.1016/j.nbas.2024.100114>.

<https://doi.org/10.1016/j.nbas.2024.100118>

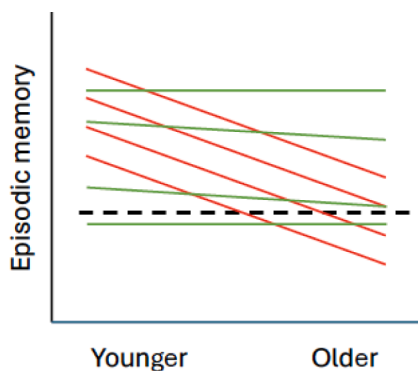


Fig. 1. Some individuals (red lines) may have similar rates of change in episodic memory from younger to older age, but due to differences in starting levels at younger ages they will or will not meet the criterion of a ‘youthlike’ level of episodic memory in old age (indicated by the dashed line). The green lines represent individuals with well-preserved episodic memory from younger to older age, but their levels of performance at older age still vary considerably. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

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