COMMENTARY

New insights on later-life memory decline over time with a variable-centered approach

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Longitudinal studies have provided researchers with invaluable insights into cognitive aging trajectories while affording insights into protective factors for cognition in later years (Lindenberger, 2014). Such data can help inform public health messages for helping maintain cognitive health in later life. However, many longitudinal studies contain only self-reported data on cognition, do not extend their efforts over a robust time frame, or contain objective cognitive measures but lack a broad but well-characterized population of study.

The approach of Fernández *et al.* (2023) in *International Psychogeriatrics* seeks to fill a gap in the extant literature on trajectories of cognitive decline, specifically in recent and delayed memory, so as to give a more nuanced view of cognitive health span and better inform early intervention strategies. Their methodological approach utilizes a variable-centric, rather than a person-centric approach, with Latent Growth Modeling (LGM) allowing for some inter-individual variability in their analysis of data from the Survey of Health, Aging and Retirement in Europe (SHARE) across a 10-year period. Indeed, Terrera *et al.* (2010) argue in *International Psychogeriatrics* for more thoughtful applications of a wider range of models to suit different questions and populations when examining patterns of cognitive decline in later life.

The results presented by Fernández *et al.* are significant in that they are derived from a sample of 56,616 individuals ranging from age 50 to 103 at the initial sampling period and followed for 10 years. Objective measures of immediate and delayed recall were obtained; covariates include age, gender, educational attainment, physical inactivity, social engagement and depression. LGM was used to model the change in recent and delayed memory scores over time, which in each case showed steeper rates of decline over time, with age and educational attainment having the greatest effect on both. The covariates examined explained a substantial amount of the variance (45% and 38.1% for recent and delayed recall, respectively) of the intercept in these analyses.

Education is probably one of the most important variables when considering both trajectories of cognitive decline as well as risk for dementia in later life, one which has been examined from a variety of perspectives over time. The issue of identification of dementia and cognitive decline in populations characterized by low education or illiteracy has been discussed by Paddick *et al.* (2017) in *International Psychogeriatrics*. This is an issue with relevance to research and assessment approaches in low- and middle-income countries (LMIC), but also is a relevant issue in other contexts, including the European context. Fernández *et al.'s* sample includes countries which have both very high (e.g. Switzerland) and very low (e.g. Portugal) literacy and educational levels. Future research efforts might examine in more detail the effects of literacy and education in greater depth when examining the effects of education on cognitive decline across time in later life.

Social engagement was found to have a relatively small effect on cognitive decline compared to both age and education in Fernández *et al.'s* study. In Fernández *et al.'s* sample, social engagement was indicated by the number of social network contacts with which the participant had weekly or more social interactions (ranging from 0–7). However, the impact of social disengagement on cognitive decline and dementia risk has also been demonstrated in a variety of studies which view social engagement and disengagement through multiple lenses. Holwerda *et al.* (2014) found that feelings of loneliness were predictive of dementia onset whereas social isolation did not. In contrast, in a recent systematic review and meta-analysis, Penninkilampi *et al.* (2018) found that impoverished social networks and social support were more predictive of risk of dementia than loneliness. Goldberg *et al.* (2021), in *International Psychogeriatrics,* reported on the relatively less-commonly studied parameters of restriction of physical and instrumental activities of daily living in predicting cognitive decline and incipient dementia; both were positively associated with such decline. Their analyses also demonstrated a bidirectional reciprocal relationship between activity restriction and memory impairment, with declines in each

impacting negatively on the other. However, the impact of restricted activities on memory was larger than the reversed relationship. With respect to interventions, this relationship of activities to memory is important, as positive gains in activities can positively influence memory performance. From a research agenda perspective, longitudinal research on health and aging should include a number of measures of social engagement, as it is an important variable of interest in cognitive decline but also in examinations of healthy aging more broadly (Pachana and Wahl, 2022).

One variable absent from Fernández et al.'s study is occupational complexity. Marioni et al. (2014) examined predictors of longitudinal cognitive decline and mortality risk in the Paquid cohort, a French longitudinal study of aging with up to 20 years of follow-up data (Marioni et al., 2012). They report that, as in the Fernández et al. study, that higher education and higher social engagement were associated with more favorable trajectories of cognitive decline. In addition, Marioni et al. (2014) found that higher occupational complexity was associated with more favorable trajectories of cognitive decline, but with a smaller magnitude of association than education.

While occupational complexity in relation to both physical and cognitive health has been examined in a wide variety of studies, occupational stress has been shown to have negative impacts on mental wellbeing (e.g. Marchand et al., 2018). A recent systematic review and meta-analysis concluded that occupational complexity was associated with lower risk of dementia, but occupational stress was associated with increased risk of cognitive decline (Huang et al., 2020). Interestingly, Hybels et al. (2022), in *International Psychogeriatrics*, note that older workers may be more resilient to the negative effects of job stress than younger workers, of interest with increasing numbers of older persons working part traditional retirement ages. Both occupational complexity as well as occupational stress would be important variables to focus on in future longitudinal analyses of cognitive function trajectories in later life.

An important takeaway from Fernández et al.'s study is that it extends findings in the extant literature by using an alternative methodological approach, demonstrating that depression, physical activity levels and social engagement are related to memory performance in the here and now to a greater extent than they affect future memory trajectories. In a similar longitudinal study, the English Longitudinal Study of Ageing (ELSA; Steptoe et al., 2013), Olaya and colleagues (2017) found that factors associated with cognitive reserve (such as education and physical activity) were

associated with better memory performance while depression and cardiovascular disease were associated with poorer memory performance. Depression played a relatively lesser productive role in Fernández et al.'s study as opposed to Olya and colleagues' findings. It should also be noted that education and depression are not unrelated; Leigh et al. (2016), in a large longitudinal study of women's health, found that higher levels of education were associated with reduced odds of reporting poor or average mental health compared to high excellent mental health.

Overall, Fernández et al.'s study underscores the need to continue to bring new methodologies and methods of analyses to bear on the question of contributions to cognitive decline in later life. Future studies might bring a greater range of sociodemographic variables (e.g. occupational complexity) and socioemotional variables (e.g. occupational stress) to bear on the issue of cognitive resilience in later life. Later-life anxiety, a variable that has been shown to be co-morbid with depression (Beattie et al., 2010) and related to risk of dementia (Santabárbara et al., 2019), often is absent from longitudinal studies but would constitute a worthwhile addition. A richer inclusion of socioemotional variables measured over time would enhance our understanding of protective and risk factors, and their inter-relationships, upon cognitive trajectories in later life.

Conflict of interest

None.

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