

# A Comparison of Three Measures of Cognition: Trajectories of Cognitive Decline in Normal Aging

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## Introduction

Cognitive decline is a critical aspect of aging research for its relevant nature into one’s ability to function in latter’s life such as work performance and daily functioning. Hence, the study of longitudinal cognition functioning impairment in older adult should place a special emphasis on the research of aging and require a lot of public attention from the society. However, this phenomenon is more complex than we thought. Although cognition functioning declines in general as function of time, each facet of cognition (i.e., cognitive domains) decline with very different rates of change. For example, the slope of decline is faster for episodic memory (Hedden & Gabrieli, 2004), smaller for mental status (Jacqmin-Gadda et al., 1997), while there is no change in crystallized memory of vocabulary ability (Deary et al., 2009).

## Objective

the objective of this study is to examine whether the patterns of cognitive decline among older adults differ by three cognition domains: episodic memory, mental status, and crystallized intelligence. For this purpose, the data we used in this study is drawn from the University of Michigan Health and Retirement Study (or "HRS"), so let me explain the data first.

## HRS Dataset

- A longitudinal panel study that surveys a representative sample of approximately 20,000 people over 50 (years old) in America, since 1992 to 2016 (16 waves)
- Investigate many aspects of older adults, including their socioeconomic and psychological status, physiological conditions, genetic biomarkers of cognitive impairment, and cognition changes.
- Focus on the particularly three cognitive function measures: episodic memory, mental status, and crystallized intelligence.

## References

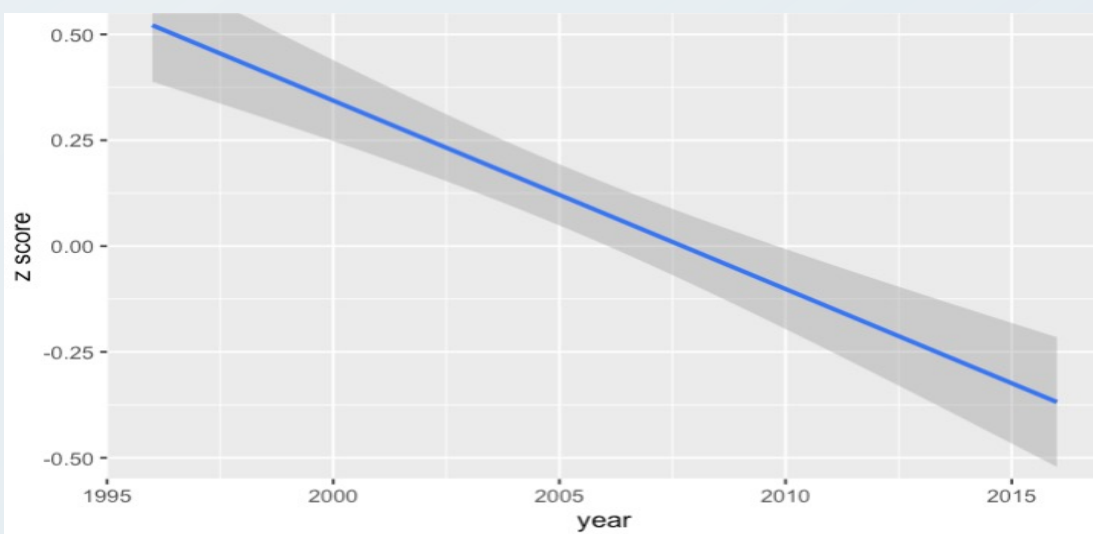
Hedden, T., & Gabrieli, J. D. (2004). Insights into the ageing mind: a view from cognitive neuroscience. *Nature reviews. Neuroscience*, 5(2), 87–96. <https://doi.org/10.1038/nrn1323>

Jacqmin-Gadda, Hélène & Fabrigoule, Colette & Commenges, Daniel & Dartigues, J.-F. o. (1997). A 5-Year Longitudinal Study of the Mini-Mental State Examination in Normal Aging. *American journal of epidemiology*. 145. 498-506.

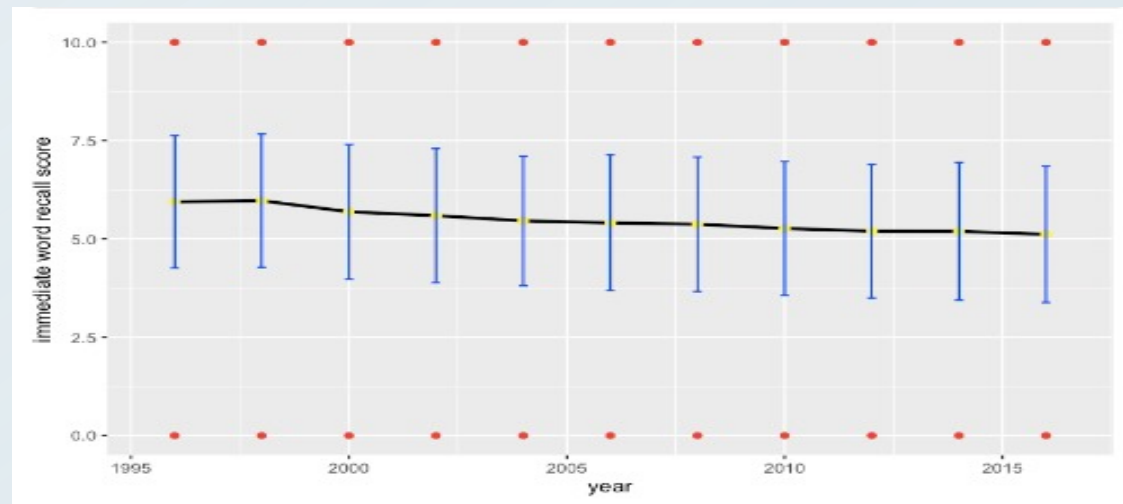
Deary, I. J., Corley, J., Gow, A. J., Harris, S. E., Houlihan, L. M., Marioni, R. E., Penke, L., Rafnsson, S. B., & Starr, J. M. (2009). Age-associated cognitive decline. *British medical*

## Results

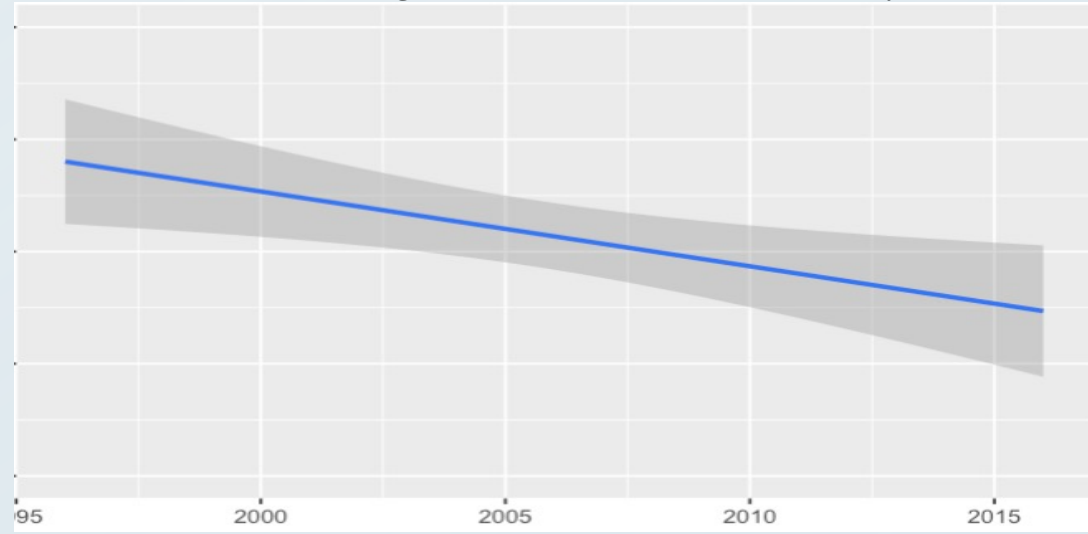
**Figure 1:**  
Standardized Change in Episodic Memory in 20 years



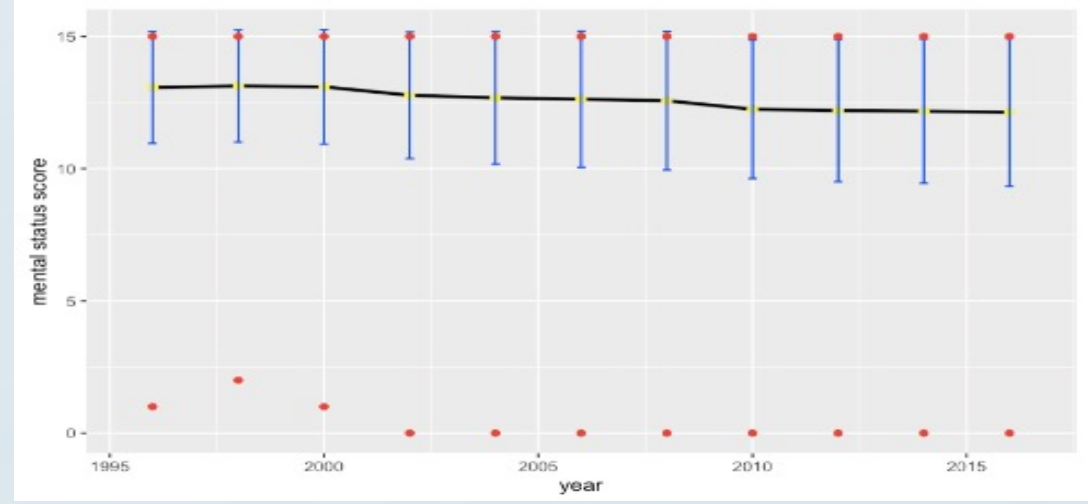
**Figure 1a**  
Change in Episodic Memory Performance Mean in 20 Years



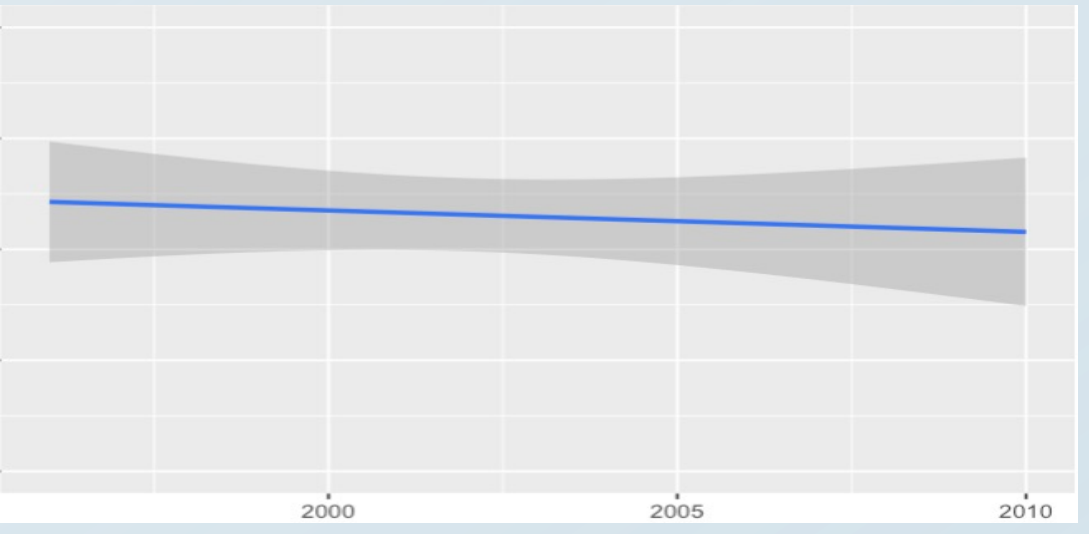
**Figure 2:**  
Standardized Change in Mental Status in 20 years



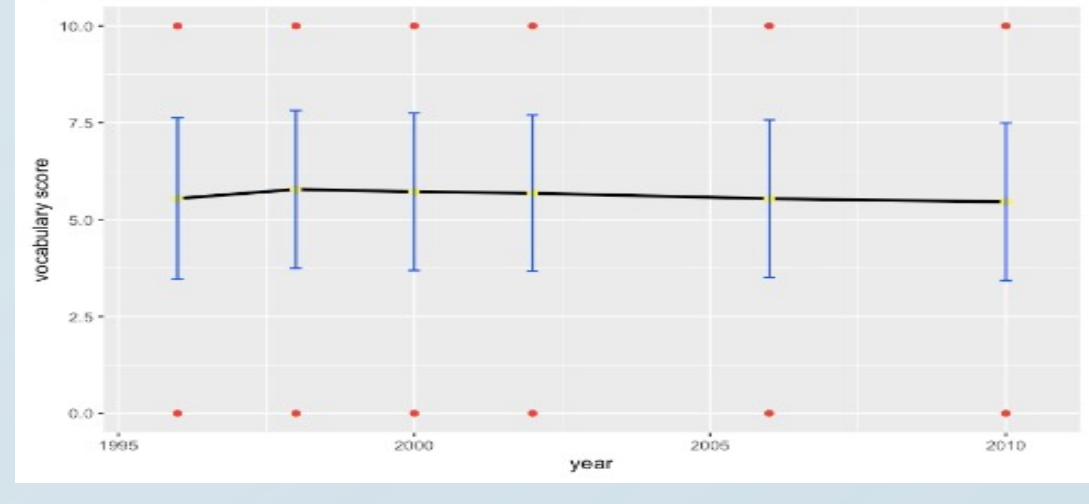
**Figure 2a**  
Change in Mental Status Performance Mean in 20 Years



**Figure 3:**  
Standardized Change in Vocabulary in 20 years



**Figure 3a**  
Change in Vocabulary Performance Mean in 20 Years



## Procedure

### Participants

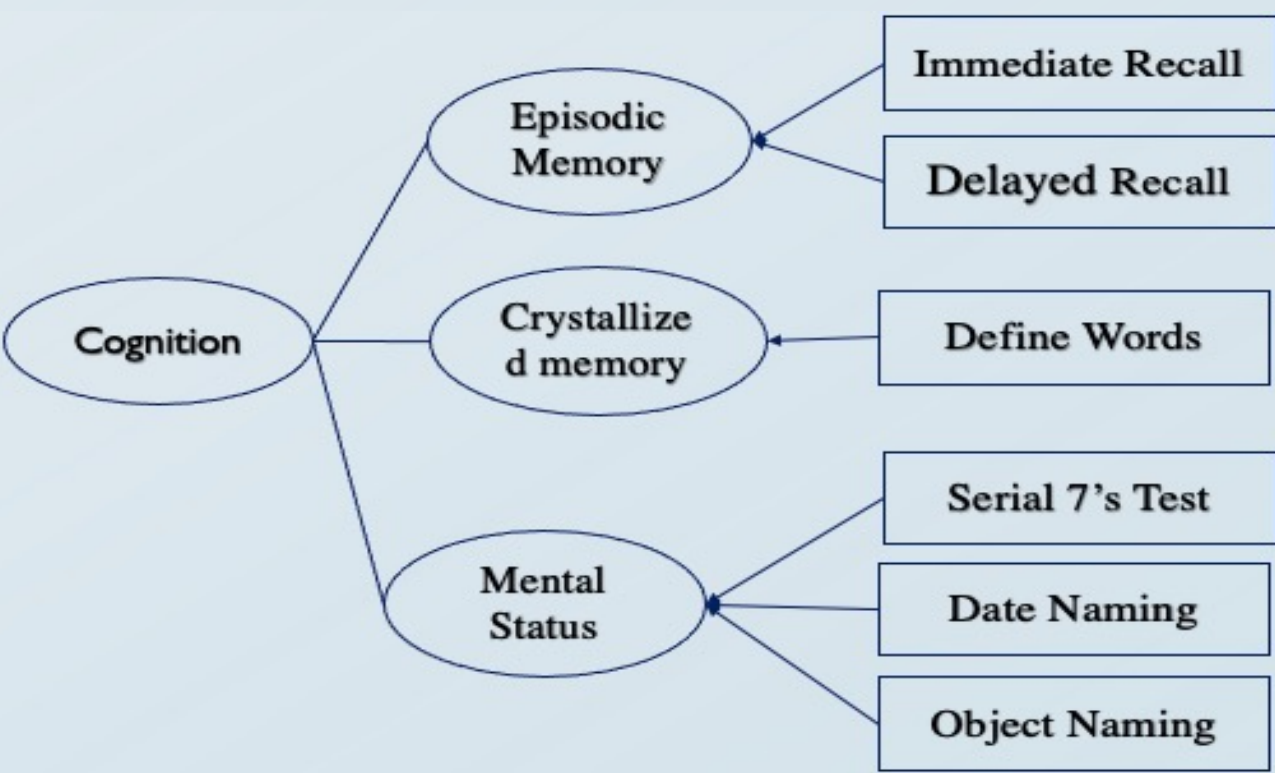
- Retain 13,816 participants having at least five times points in the last 20 years of HRS.
- Repeatedly measure each participant for two years from 1992 to 2016.
- Excluded waves 1992 and 1994 due to the noticeable difference in cognition measures.

### Cognitive Measurement

- Face-to-face interview (MML)
- Telephone Interview for cognitive status (TICS)

### Method

- Longitudinal Analysis



## Analysis

**Table 1:**  
Descriptive Statistics HRS between 1996 and 2016

Score/Y ear	1996	1998	2000	2002	2004	2006	2008	2010	2012	2014	2016
Mean of age	62.2	65.1	67.2	69.1	71.1	72.5	73.9	77.0	76.5	77.9	79.1
Male/ Female(%)	40.6/ 59.4	39.1/ 60.9	39.1/ 60.9	39.2/ 60.8	39.7/ 60.3	40.0/ 60.0	40.0/ 60.0	40.1/ 59.9	39.8/ 60.2	39.0/ 61.0	38.4/ 61.6

## Conclusion

- Three trajectories of cognitive decline had different rates of change (slope) over time for each domain. This result showed that although cognition performance decline in general, they are not equal in the rate of change for each domain.
- Across 11 waves, the most rapid decline of cognition comes to episodic memory. Mental status has a slightly smaller slope with a less steep trajectory. And crystallized memory seem to be stable over time, with the slope is approximately equal to 0

## Further Information

If you have interest in collaboration in future study, please contact :

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Schiepers, O., Harris, S., Gow, A. et al. APOE E4 status predicts age-related cognitive decline in the ninth decade: longitudinal follow-up of the Lothian Birth Cohort 1921. *Mol Psychiatry* 17, 315–324 (2012))