

Does cognitive performance in older adults differ according to whether it is assessed pre- or post- MRI scan in UK Biobank?

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Our results suggest that whether cognition is assessed pre- or post- MRI scan for UK Biobank participants may not have a meaningful impact on mean cognitive test scores at the group level, although unmeasured factors such as test-related anxiety or postprandial effects could be the subject of future investigations for their role in cognitive test performance at the population level.

INTRODUCTION

Neuroimaging research studies often include a cognitive assessment component conducted during the same visit. While it is known that time of day can affect cognitive performance in older adults, it is unknown whether the timing of cognitive assessments during a research visit, specifically pre- or post- MRI scan, affects mean test scores across cognitive domains.

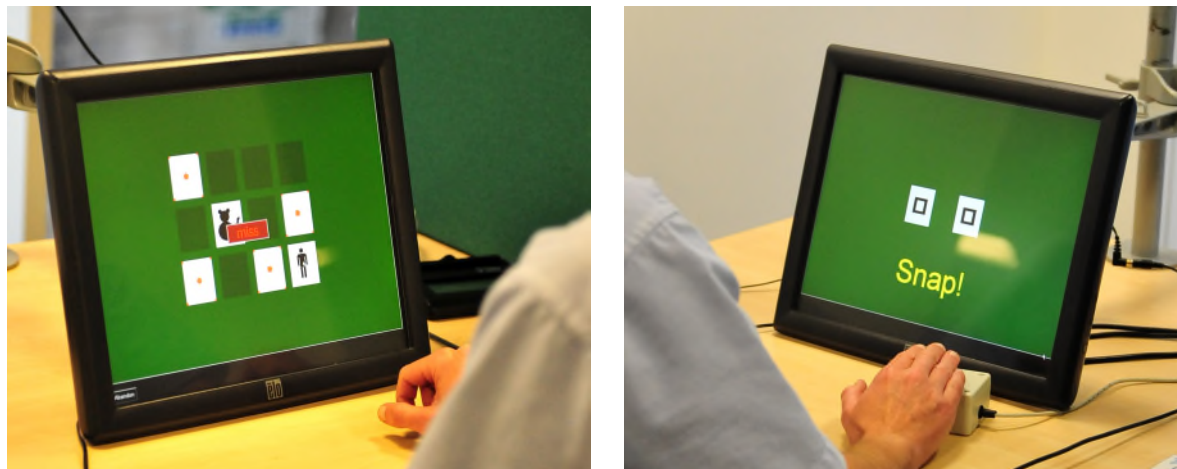


Figure 1: A participant at the assessment centre taking (left) the pairs matching test and (right) the snap reaction time test.

WHAT DID WE DO?

This study includes UK Biobank bespoke touchscreen cognitive assessments on participants (aged 50+) who visited a UK Biobank imaging centre between **October 2016** and **August 2025** (n = 81,823 with 52.3% female).

Participants attended one of four imaging centres for a duration of 3-4 hours, and completed various health assessments, including MRI and cognitive tests such as

- **Pairs matching**
- **Reaction time (snap)**
- **Trail Making Test (A and B)**
- **Symbol digit substitution**
- **Paired word associations.**

For each cognitive test, a regression model was fit with test order as the exposure and age, sex, and time of day as covariates.

- Mean cognitive scores in test order groups were additionally compared within 5-year age-stratified groups.
- To control for potential diurnal effects, a **sensitivity analysis** was conducted on age- and sex-matched groups of participants (n = 11,484) who attended appointments between 3:00 p.m. and 3:30 p.m. at each assessment centre.

WHAT DID WE FIND?

- Mean cognitive test scores differed by age group and sex.
- Pre- vs post-MRI assessment order did not meaningfully affect mean scores, despite statistically significant differences from the large sample size.
- Reaction times differed significantly between age groups; however, the pre-MRI group was only marginally faster (<0.01 s), indicating a negligible effect.
- These trends were replicated in the sensitivity analysis with participants tested pre-MRI and post-MRI (n = 5,742 in each group).

Table 1: Mean scores of cognitive tests based on whether they were taken pre- or post-MRI

Test	Mean pre-MRI (sd) N = 16,425	Mean post-MRI (sd) N = 65,398	p value
Pairs matching (n errors)	3.94 (3.11)	3.77 (2.99)	1×10 ⁻⁶ *
Reaction time (ds)	6.1 (1.2)	6.1 (1.1)	3×10 ⁻⁶ *
Trails Making Test A, time (ds)	238.7 (86.9)	236.9 (89.6)	0.01 *
Trails Making Test B, time (ds)	609.5 (286.9)	598.2 (279)	0.0002 *
Symbol digit substitution (n correct)	18.49 (5.29)	18.48 (5.27)	0.04 *
Paired word associations, score /10	6.84 (2.56)	6.63 (2.69)	2×10 ⁻¹⁶ *

*p < 0.05

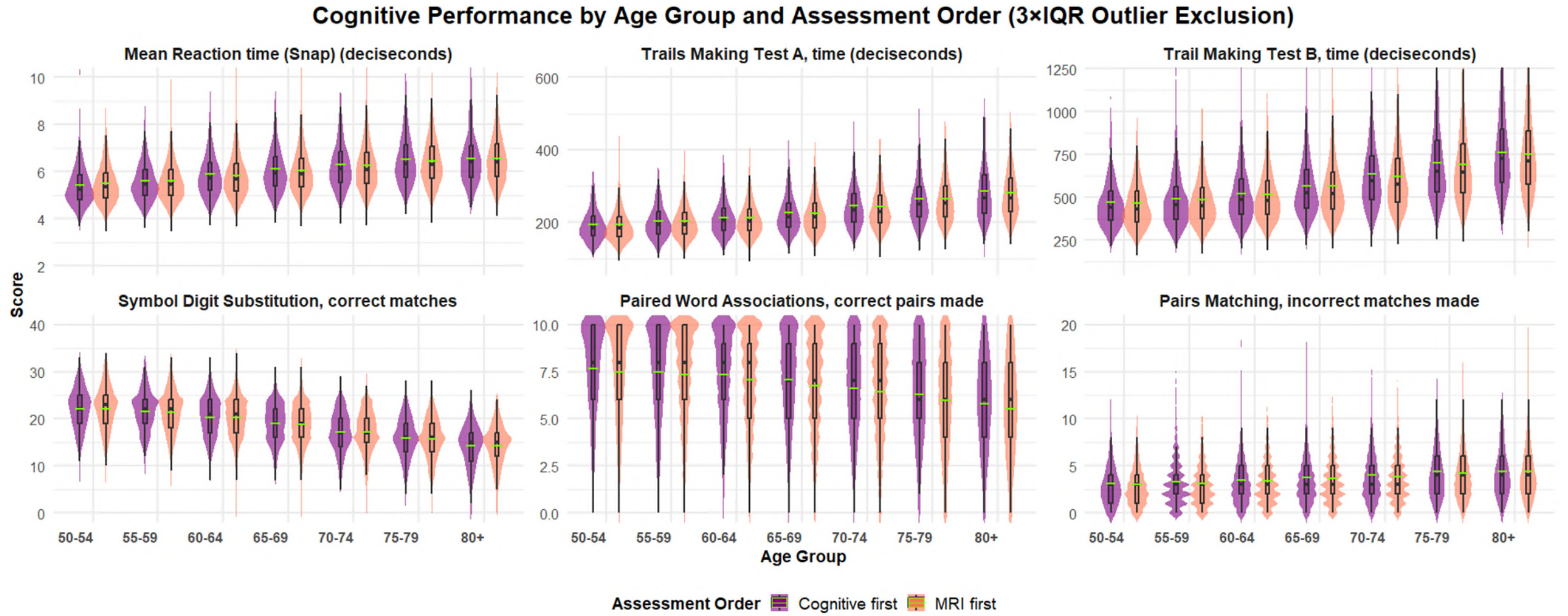


Figure 2: Violin plots (mean in green) of participant performance in each of the cognitive tests, taken pre- or post-MRI, stratified by 5 year age group. Mean differences between cognitive test scores when tested pre-MRI and post-MRI are statistically significant for all age groups (p<0.05).

FURTHER THOUGHTS

The analysis is limited to group-level differences and does not account for individual level differences. The large sample size may produce statistically significant results that may not be clinically meaningful.

There is possible selection bias as individuals with cognitive impairments are less likely to attend assessment centres.

Unmeasured confounders like pre-test refreshments and anticipatory anxiety related to imaging appointments may also influence results.

CONTACT



Scan to Explore

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