

Acceptability and Validity of the Smartphone-Administered Version of the Cogstate Brief Battery in Adult Participants of the Healthy Brain Project



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Background

- Unsupervised, remote administration of cognitive tests may lead to more accessible and accurate representations of cognitive function in everyday life compared to in-clinic neuropsychological assessments (Maruff et al., 2023), (Papp et al., 2021).
- Given technological developments and widespread use of smartphones, the extent to which personal smartphones can be used to measure cognition requires investigation.
- We aimed to examine the acceptability and validity of the smartphone-administered version of the Cogstate Brief Battery (CBB) in cognitively unimpaired middle-aged and older adults.

Method

- Cognitively unimpaired adults aged 41-75 years enrolled in the Healthy Brain Project (n=173), M(SD) age = 62.72(7.18), completed the smartphone CBB in a remote, unsupervised setting.
- The CBB includes tests of psychomotor function (Detection; DET), attention (Identification; IDN), and working memory (One Back; OBK), for which the main outcome is response speed, and visual learning (One Card Learning; OCL) for which the main outcome is response accuracy.
- Acceptability was determined by the percentage of participants that completed the CBB in full.
- Relationships between CBB performance with age and test difficulty were described to inform validity.
- Relationships between objective cognitive performance and subjective rating of overall performance, obtained via survey (CFI, Cognitive Function Index), were also explored.

Results

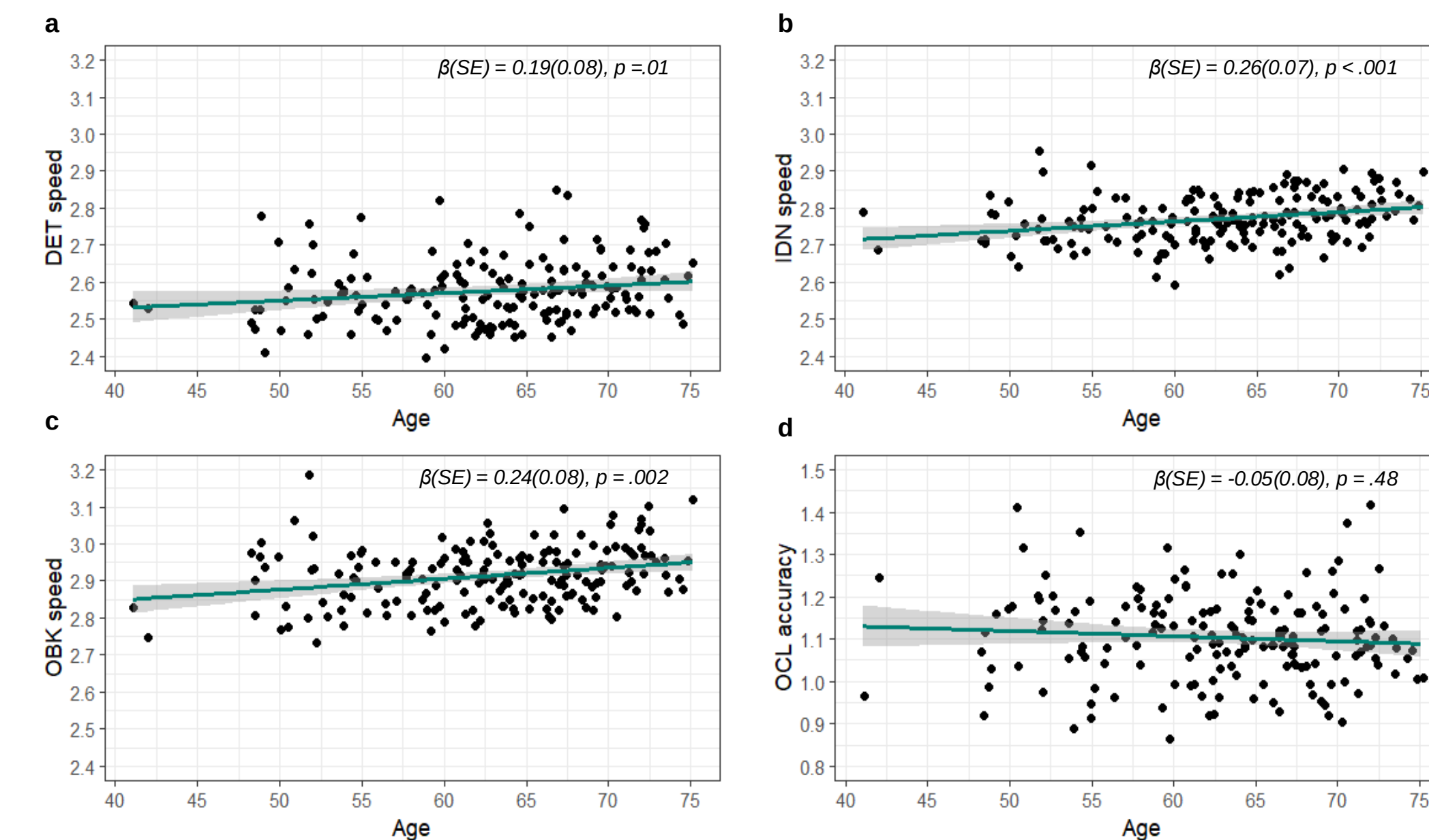


Figure 1. Associations between increasing age and the primary outcome of each cognitive test within the smartphone CBB. Note. Panels **a**, **b** and **c** show an association between increasing age and slower performance speeds on the DET, IDN and OBK tests, respectively, while panel **d** shows that no significant association was observed between increasing age and accuracy on the OCL test; beta estimates are standardized and additionally adjusted for sex and years of education; DET = Detection test, IDN = Identification test, OBK = One Back test, OCL = One Card Learning test.

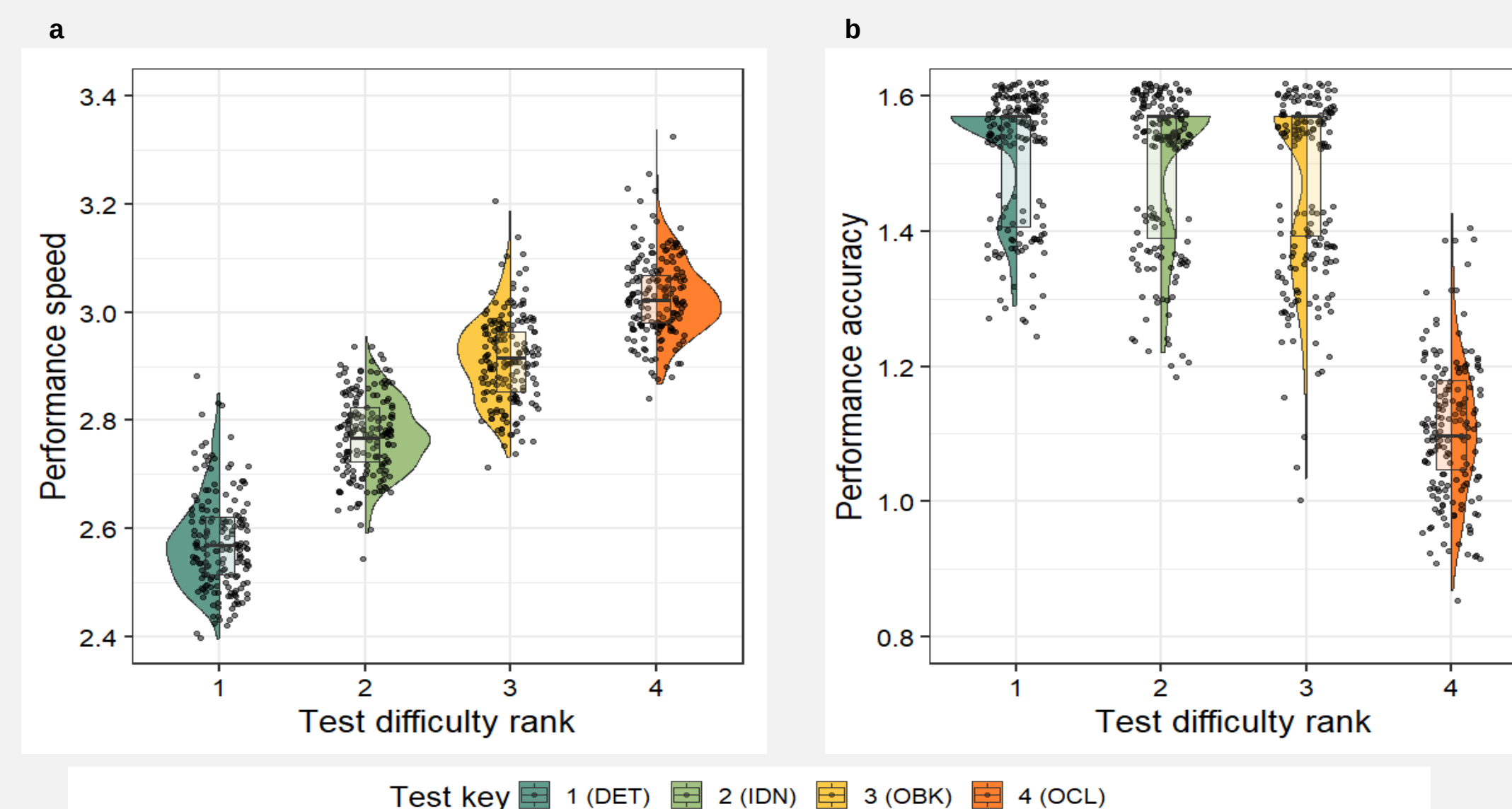


Figure 2. Performance speed (**a**) and performance accuracy (**b**) across the individual cognitive tests in the Cogstate Brief Battery ranked by difficulty. Note. Individual cognitive assessments are listed in order of increasing difficulty; For performance speed, higher values reflect lower cognitive performance; For performance accuracy, higher values reflect higher cognitive performance; DET = Detection test, IDN = Identification test, OBK = One Back test, OCL = One Card Learning test.

Results

- All participants completed the full smartphone CBB.
- Increasing age was associated with slower performance on DET, IDN and OBK (Figure 1a-1c). When the performance of middle-aged adults (40-65 years) was compared to older adults (66+ years), older adults performed slower on these tests (d=0.26-0.33).
- Age was not associated with OCL accuracy (Figure 1d).
- Performance speed across all tests slowed with increasing test difficulty (Figure 2). Whilst a ceiling effect was observed for accuracy of simpler tests (DET, IDN, OBK), accuracy was lowest for the most difficult test (OCL) (Figure 2).
- Subjective ratings of overall CBB performance were significantly, albeit weakly, correlated with OCL accuracy (r=0.23, p=.003).

Conclusion

- Consistent with previous observations with the computer-administered CBB, these results support the acceptability and validity of the remote, unsupervised administration of the smartphone CBB in cognitively unimpaired middle-aged and older adults.
- Whilst future research is required to understand the performance of the smartphone CBB across larger and more diverse populations, these findings support the use of smartphone-administered tests to measure cognition.

References

- Maruff, P., Bransby, L., Yassi, N., Buckley, R.F. and Lim, Y.Y. (2023), Remote assessment of cognition with the unsupervised version of the Cogstate Brief Battery: Association of composite endpoints with Alzheimer's disease biomarkers. *Alzheimer's Dement.*, 19: e079309. <https://doi.org/10.1002/alz.079309>
- Papp KV, Samaroo A, Chou H-C, et al. Unsupervised mobile cognitive testing for use in preclinical Alzheimer's disease. *Alzheimer's Dement.* 2021; 13:e12243. <https://doi.org/10.1002/dad2.12243>