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BACKGROUND

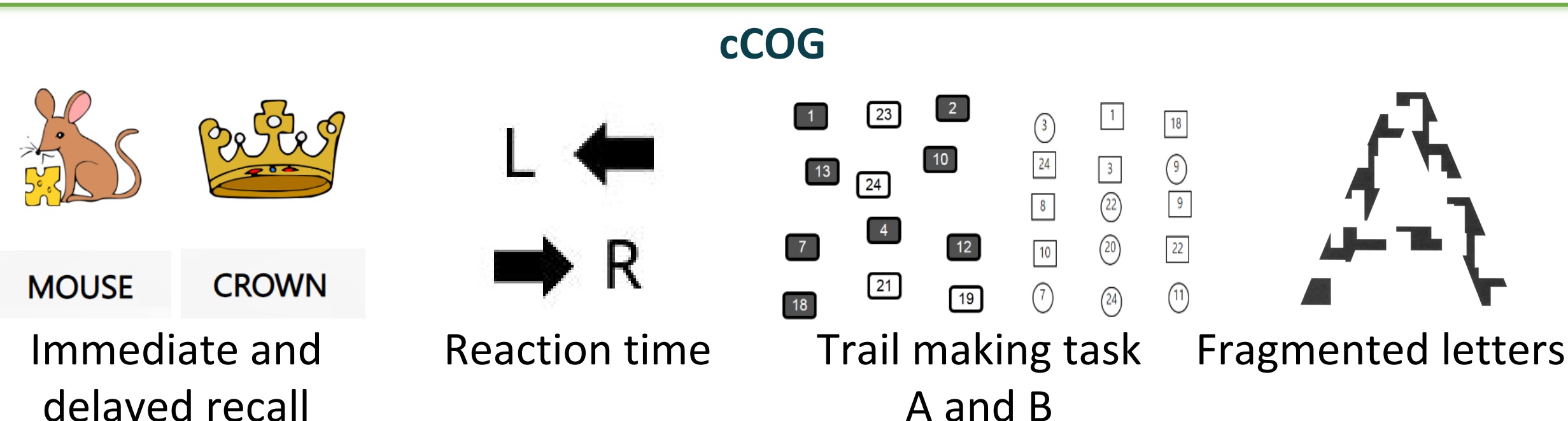
cCOG is a web-based **digital cognitive assessment** designed for **remote measurement** of cognitive functioning in the context of neurodegenerative disorders. It can accurately distinguish mild cognitive impairment (MCI) and dementia from normal cognition^{1,2}. An important next step to foster successful **implementation into clinical practice** is to enable **meaningful interpretation** of test results³.

AIM

To generate age, sex and education adjusted **normative data** for web-based digital cognitive assessment cCOG and to **validate** these norms in a memory clinic cohort.

METHODS

- Participants & design:** Normative data were derived from the Dutch population-based ABOARD Cohort (n=4419; mean age±SD 66.6±7.9 years; 69% female), including only participants without cognitive complaints. Participants completed cCOG remote and unsupervised on their own devices (PC, tablet or laptop).
- Validation sample:** The validation sample consisted of two memory-clinic cohorts (the PredictND and Amsterdam Dementia Cohort; n=401; mean age±SD 66.7±9.1 years; 55% female) of which 230 were cognitively normal (CN), 84 had a diagnosis of MCI, and 87 of dementia.
- Statistical analyses:** Generalized Additive Models for Location, Scale, and Shape (GAMLSS) were used to model age, sex, and education effects. ROC curves were used to determine diagnostic accuracy.



RESULTS

- Figure 1 demonstrates the normative GAMLSS model across age split by sex and years of education with a reading example in the footnote. We found a slightly non-linear association for age with cCOG, with gradual decline across the adult lifespan. Higher educational attainment and female sex were associated with slightly better cCOG performance.

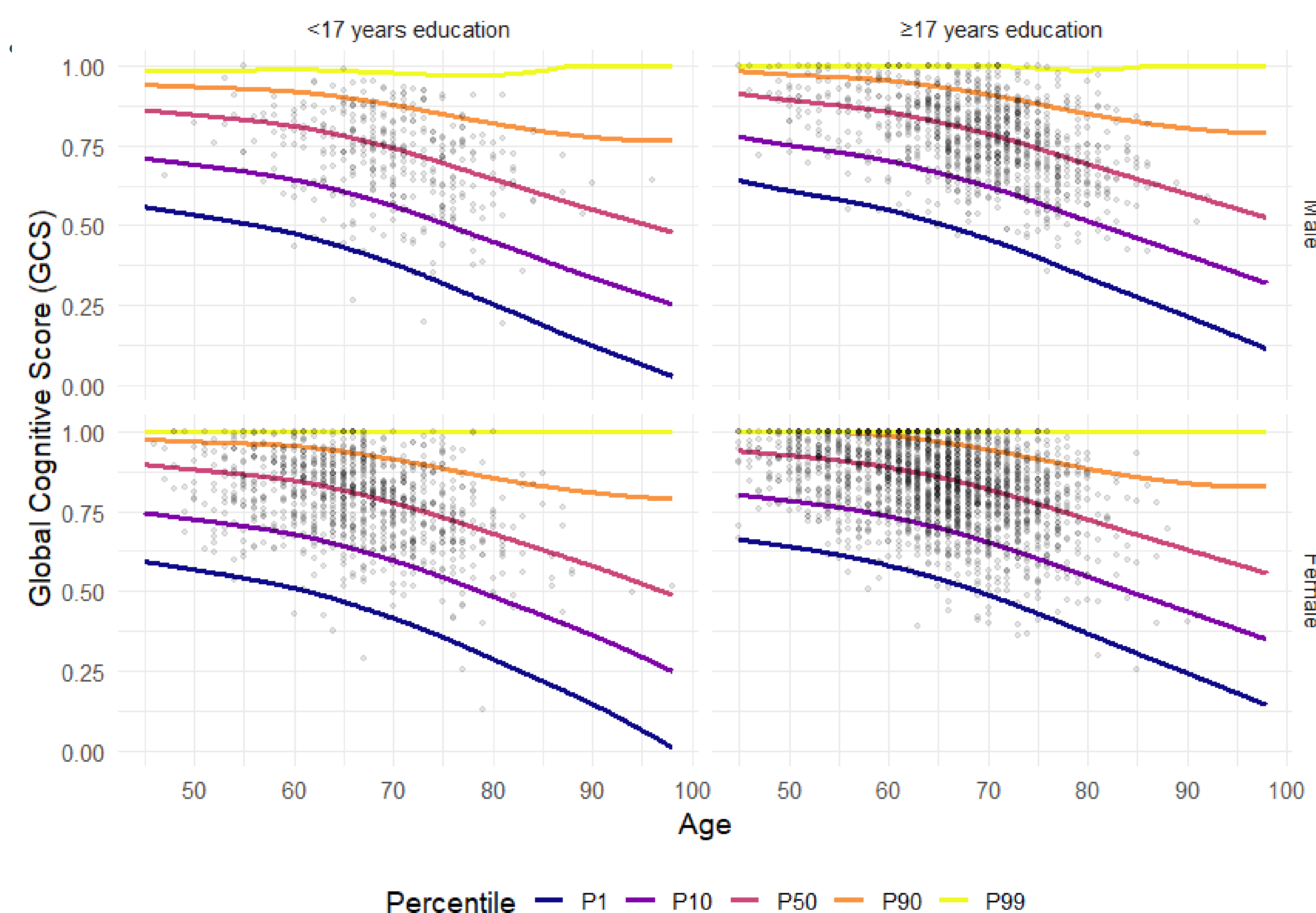


Figure 1. GAMLSS-based normative percentile curves for cCOG global cognitive scores (GCS) across age split by sex and years of education. Reading example: a GCS of 0.6 for a 70-year-old female participant with 18 years of education (corresponding to the bottom right figure), falls between the dark blue and purple percentile curve meaning a percentile score between 1-10 indicating low performance.

- In the validation sample, 57.3% of the cognitively impaired participants scored below the cut-off for abnormal performance (>-1.5 SD below the population mean), versus 9.1% of those with normal cognition. Figure 2 shows the distribution Z-scores across the diagnostic groups.
- Diagnostic accuracy was high with an AUC of 0.84 (95% CI: 0.80-0.88; sens/spec = 76/83%; Figure 3A) for distinguishing MCI and dementia from CN, and an AUC of 0.86 (95% CI: 0.81-0.91; sens/spec = 57/91%; Figure 3B) for dementia from CN and MCI.

RESULTS

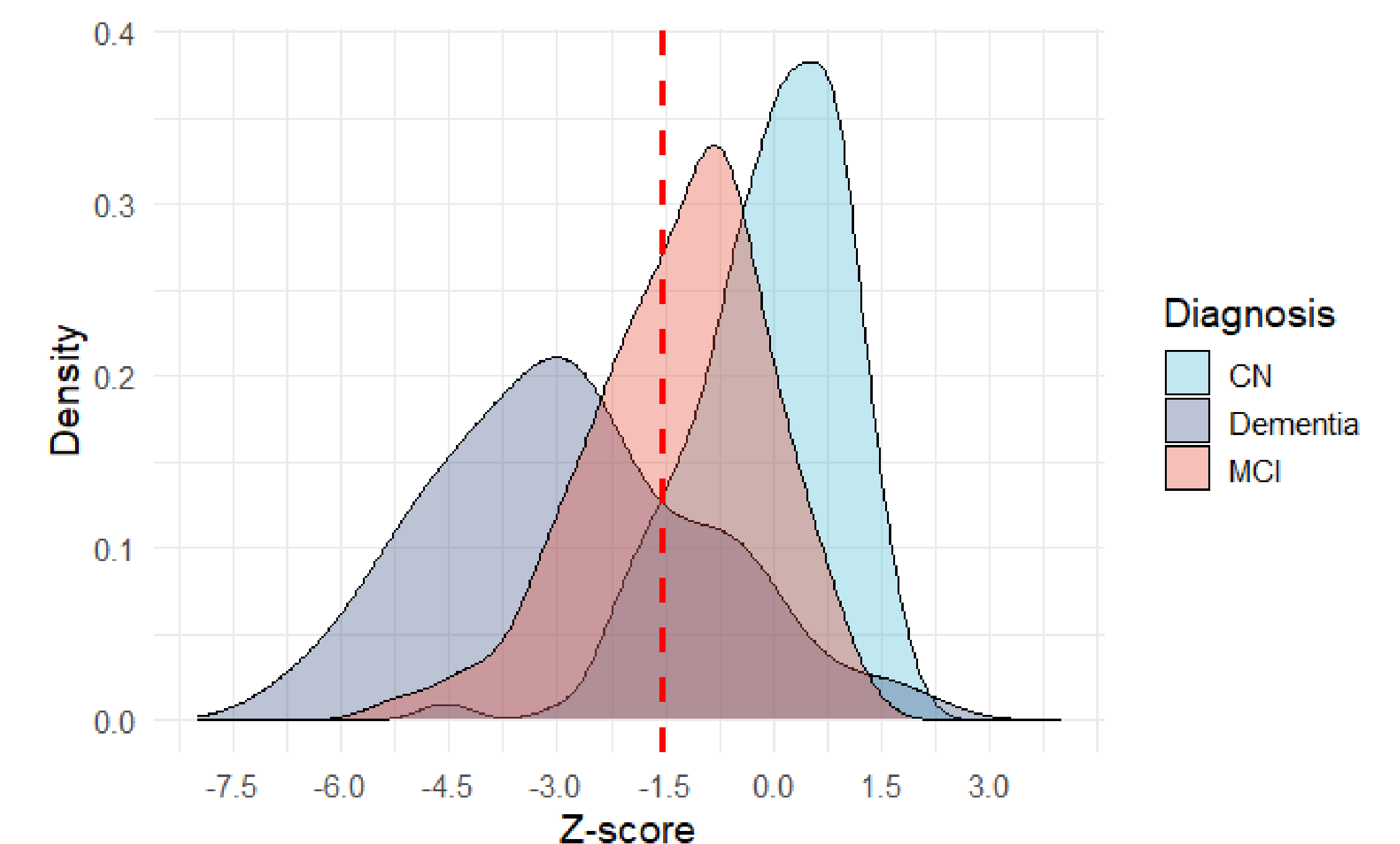


Figure 2. Distribution of normative Z-scores per diagnostic group in the validation sample. The dashed red line indicates the a priori defined cut-off of Z = -1.5 SD below the population mean.

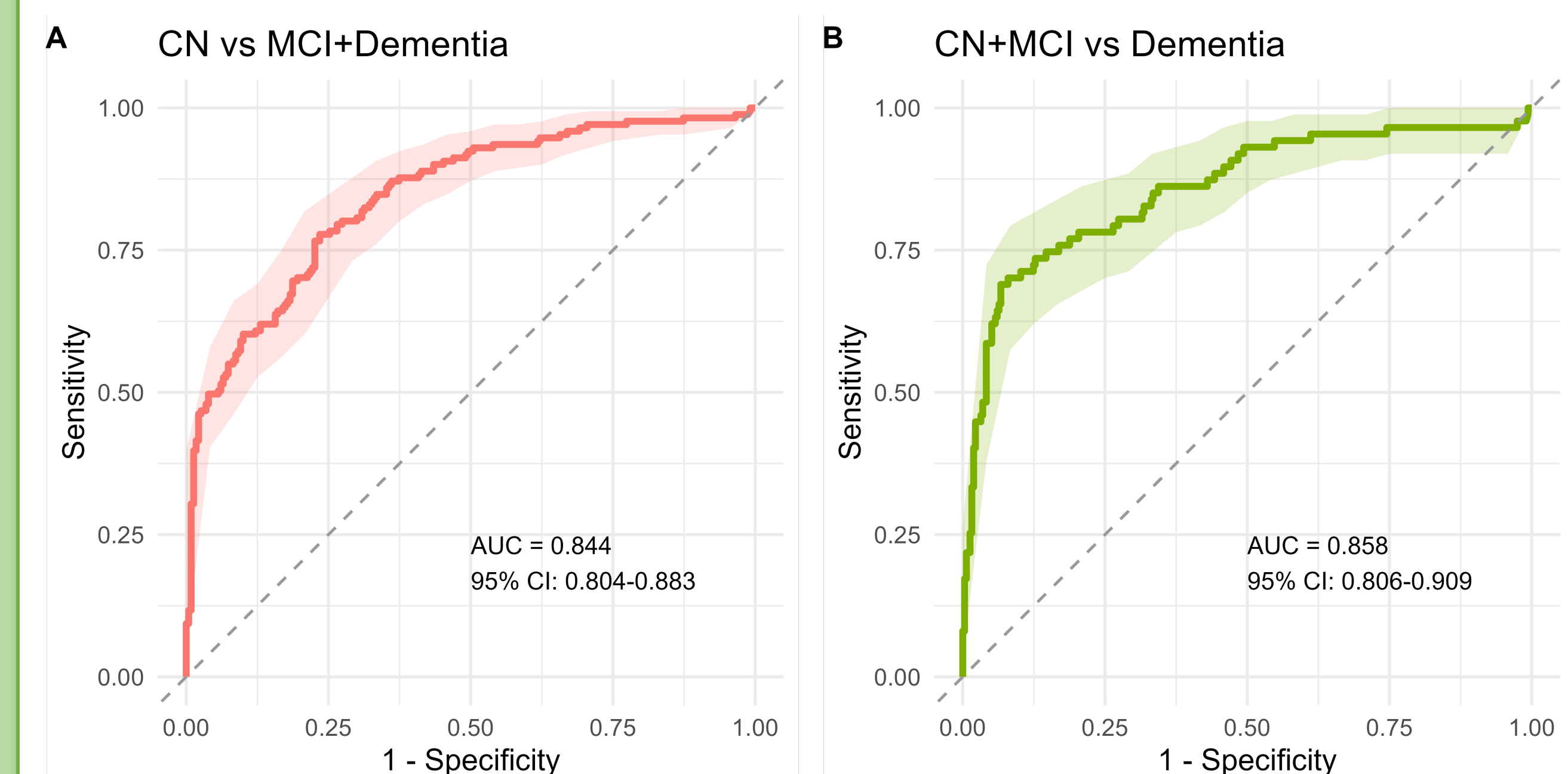


Figure 3. ROC curves for comparing (A) CN versus MCI + dementia, and (B) CN + MCI versus dementia.

CONCLUSION

We **established normative percentile scores** for cCOG based on data from cognitively normal participants of a large population-based sample.

Application of these norms to a memory clinic sample yielded **high diagnostic accuracy** in distinguishing impaired (MCI and/or dementia) from normal cognition, demonstrating the utility of cCOG in early screening and particularly in streamlining the diagnostic process.