

# Longitudinal at-home measurement of disease profile in Alzheimer's disease with Cumulus NeuLogiq™

John Dyer<sup>1</sup>, Florentine Barbey<sup>1</sup>, Alison R. Buick<sup>1</sup>, Laura Rueda-Delgado<sup>1</sup>, Md Nurul Islam<sup>1</sup>, Hugh Nolan<sup>1</sup>, Brian Murphy<sup>1</sup>  
<sup>1</sup>Cumulus Neuroscience Ltd.



## Cumulus NeuLogiq platform for use in real-world settings

Developed in collaboration with leading pharma companies and KOLs (below) for use in clinical trials.

Cumulus provides full service:

- Protocol / study / SAP design
- On-site training, off-site support
- Data package
- Reporting and custom analytics

Audit ready including FDA 510(k), UKCA, HIPAA, GDPR, ISO13485.

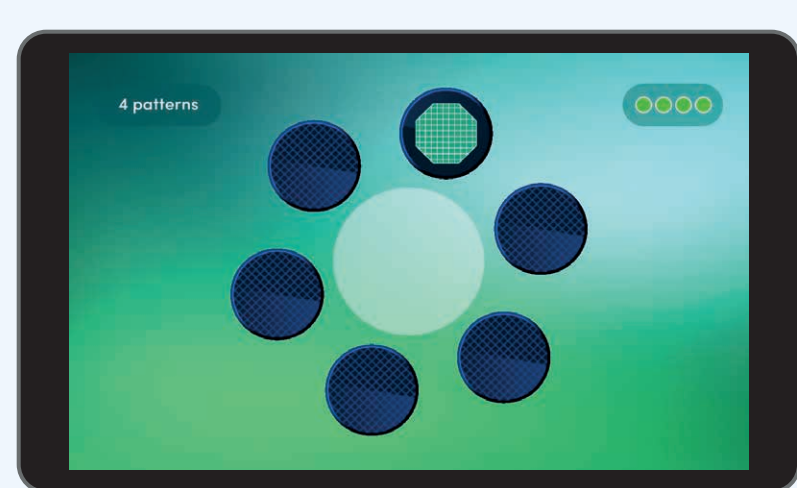
Designed for and with patients and clinicians, deployed in Phase 0-1b CNS trials.

Secure automatic upload and QC.

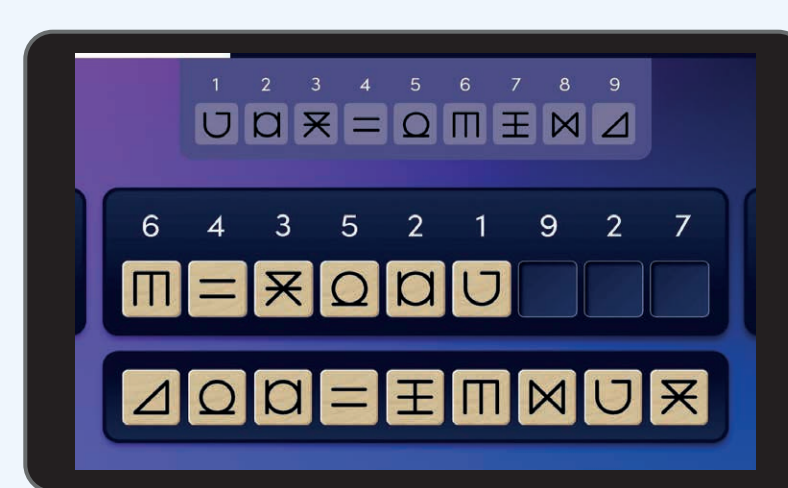
Real-time dashboard monitoring of decentralized and home-based data collection.

Cumulus cognitive tests are designed to be highly repeatable, with large banks of non-repeating stimuli.

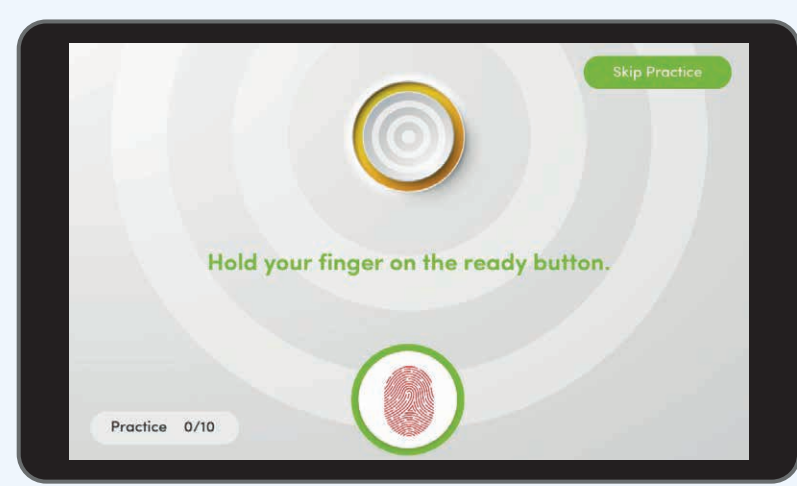
- Objectively administered and automatically scored
- Results available in minutes, enabling remote monitoring
- Suitable for detecting change over time
- Designed to be an approachable and friendly experience for patients, minimising assessment burden
- A variety of behavioural, EEG and hybrid test paradigms are available



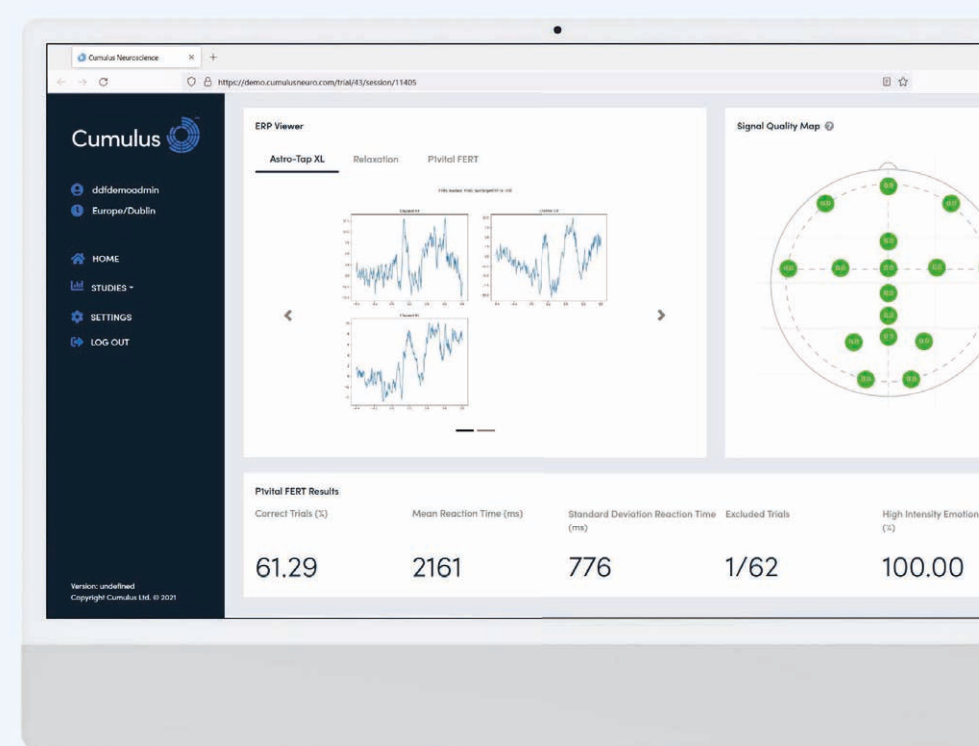
**Memory Match:**  
Visual episodic memory (5-10m)



**Symbol Swap:**  
Symbol / digit coding (~3m)



**Rapid Response:**  
Reaction / Psychomotor speed (~3m)



## Continuous engagement with patients informs task design



Patient Advocate User Panel members are chosen for their experience with dementia, depression, schizophrenia and other neurological conditions. Each group includes a mix of patients, family members, and healthcare professionals.

### Key Activities:

- Focus groups
- Usability testing
- User scenario simulation
- In-clinic sessions
- Remote sessions
- Study schedules

### Outcomes may influence:

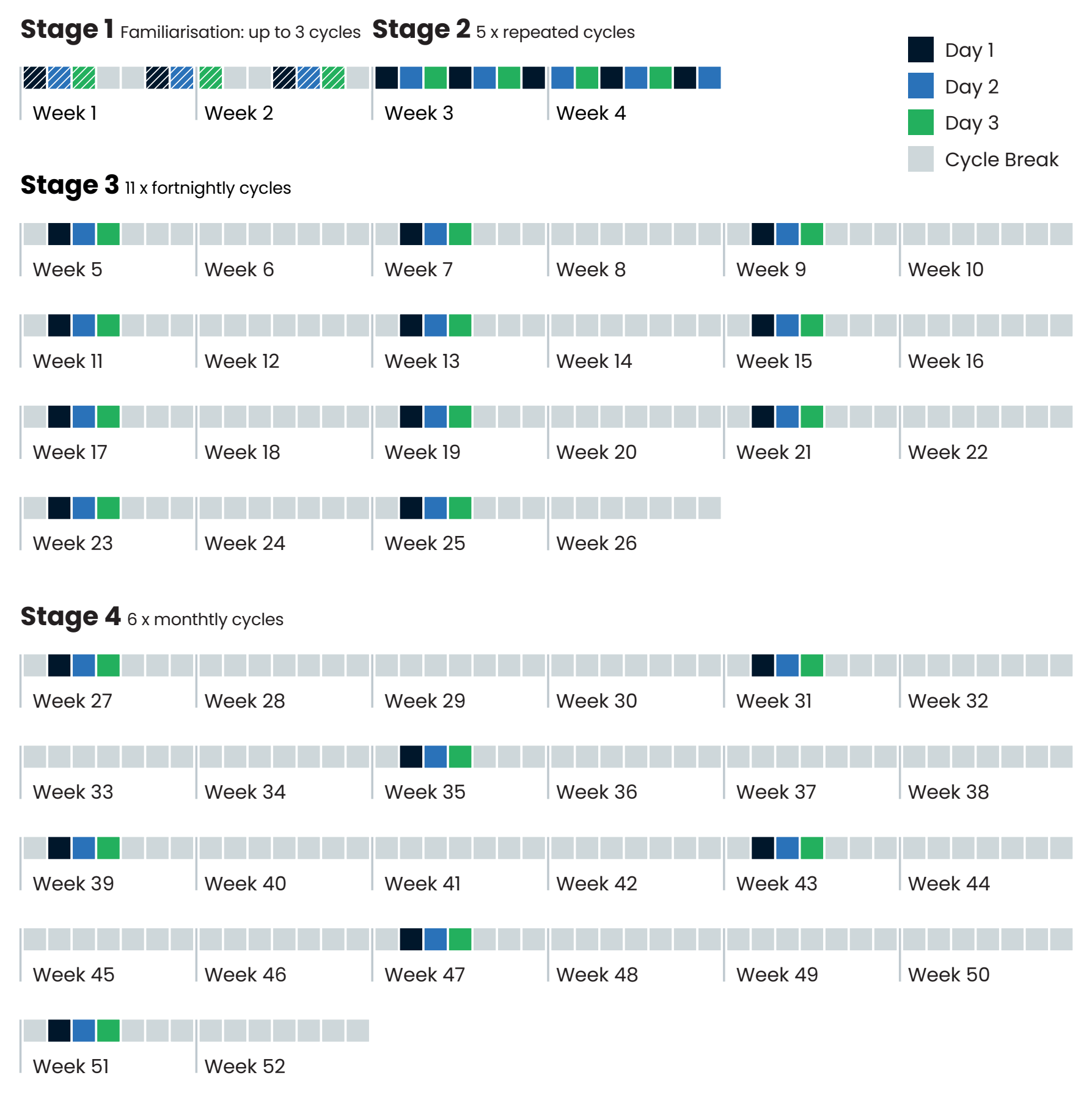
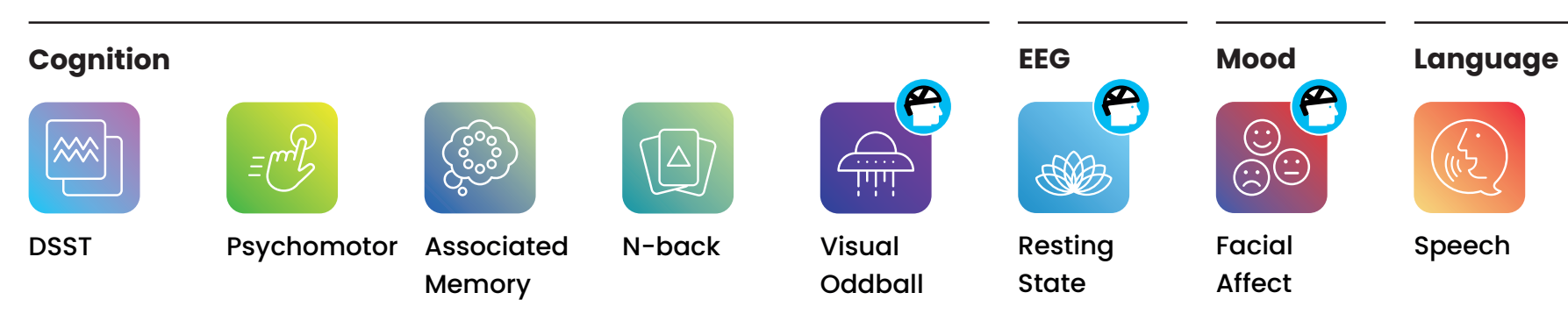
- Task development
- Hardware selection
- Onboarding procedures
- Session/task list features
- Study scheduling features
- Site staff training
- Participant facing materials



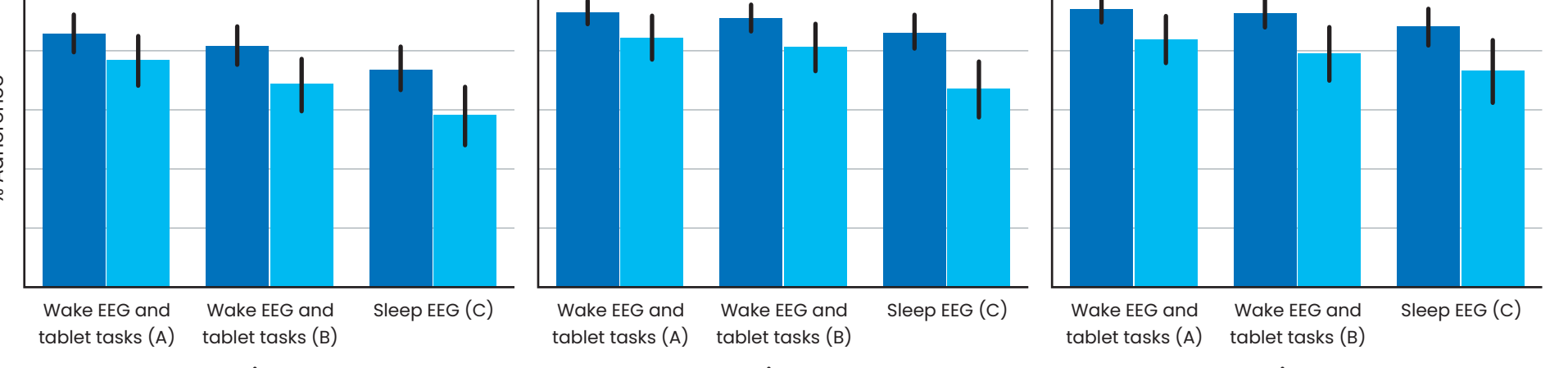
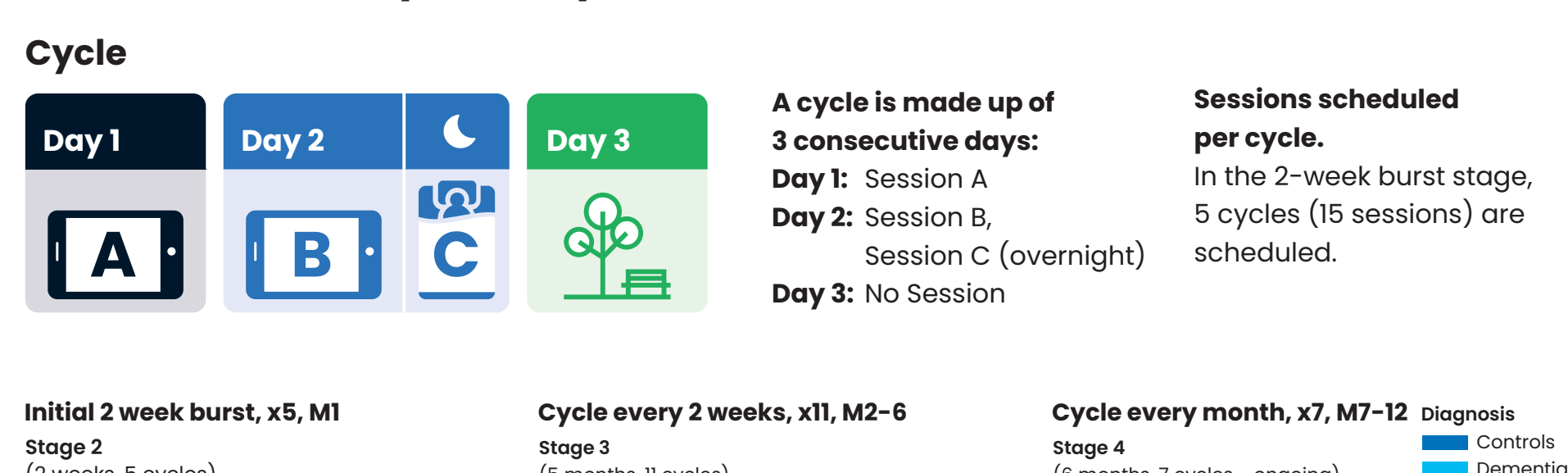
## At-home validation study in mild AD

### Study protocol

- N = 59 Alzheimer's type mild dementia patients (ACE-III scores >60 and ≤ 88) and N = 60 matched cohort of controls recruited across 7 UK sites.
- Asked to use the platform during the day, as well as a sleep EEG device at night over a year at home. Data collection completed mid 2024.
- Day sessions consisted of completing 8 assessments on a mobile tablet consisting of behavioural tasks (memory, executive function, affective processing and language) overlaid with EEG.

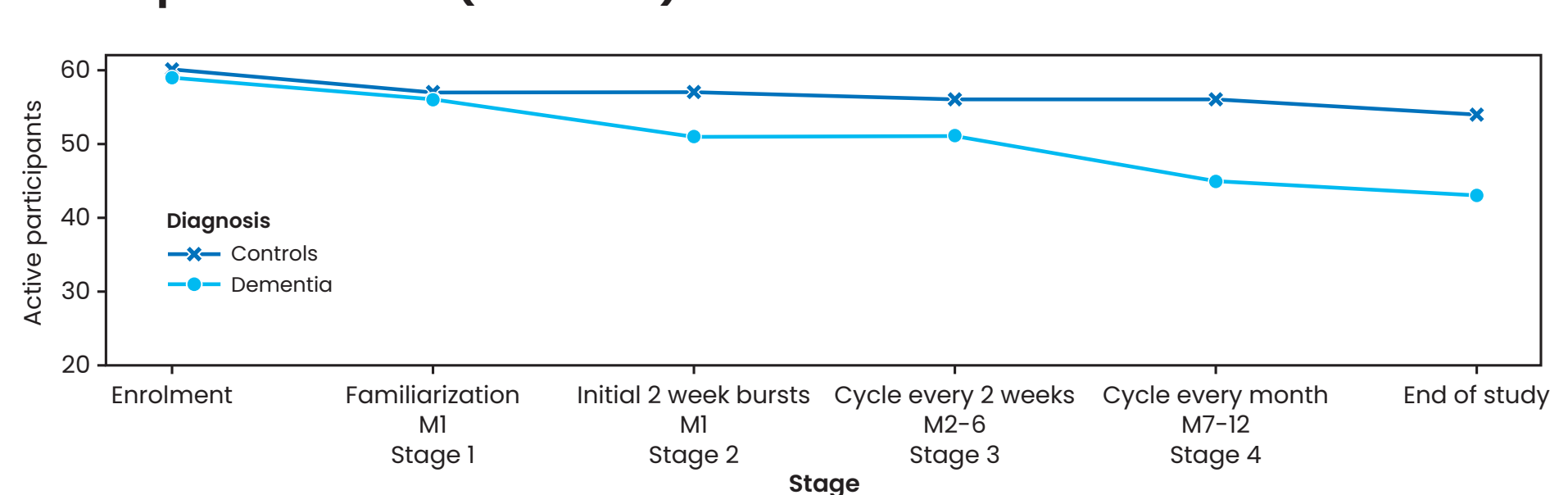


### Adherence to requested protocol



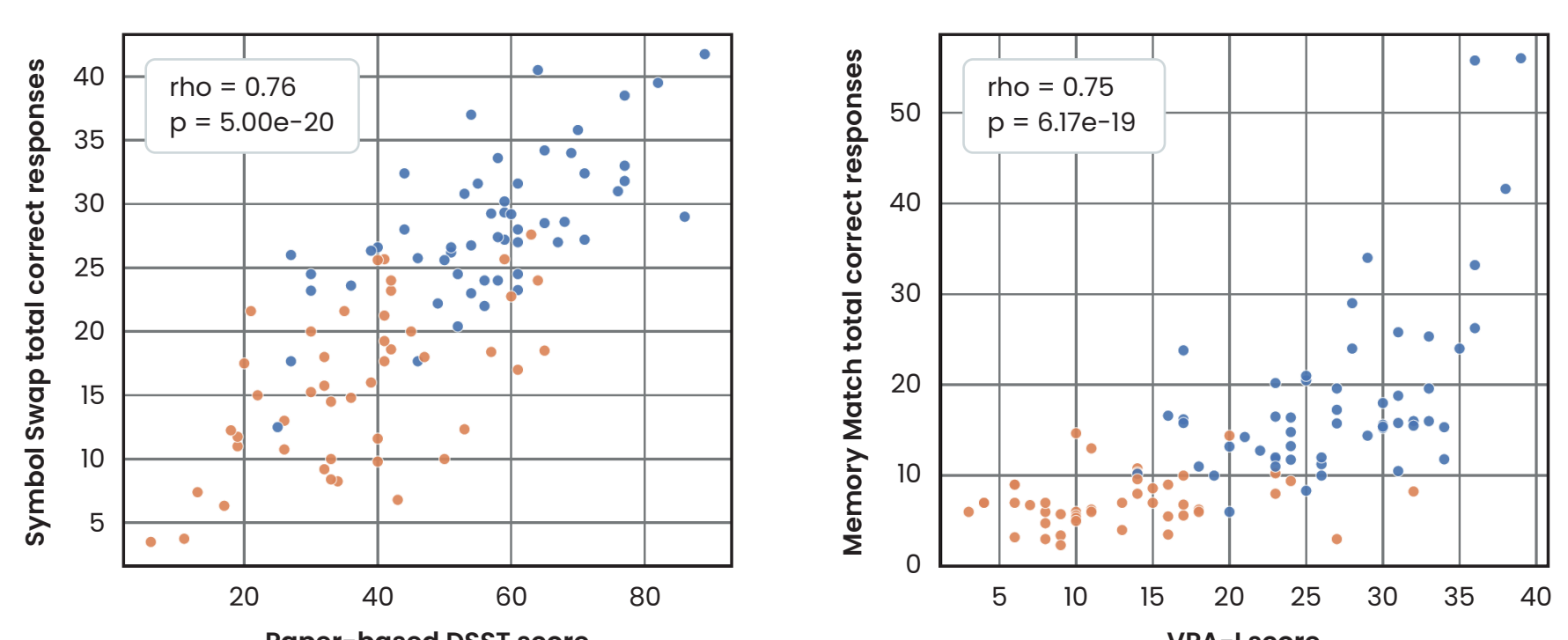
**Mean adherence by group:** Expressed as a percentage of total sessions requested in the protocol, across the four phases of the 52-week study.

### Participant retention (52 weeks)



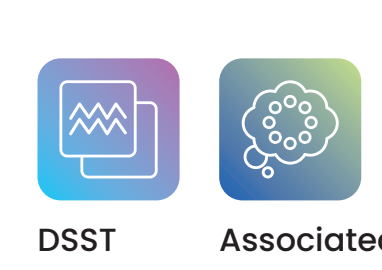
**Participant retention:** Total participants remaining per study stage, by group.

### Snapshot validation against standard benchmarks

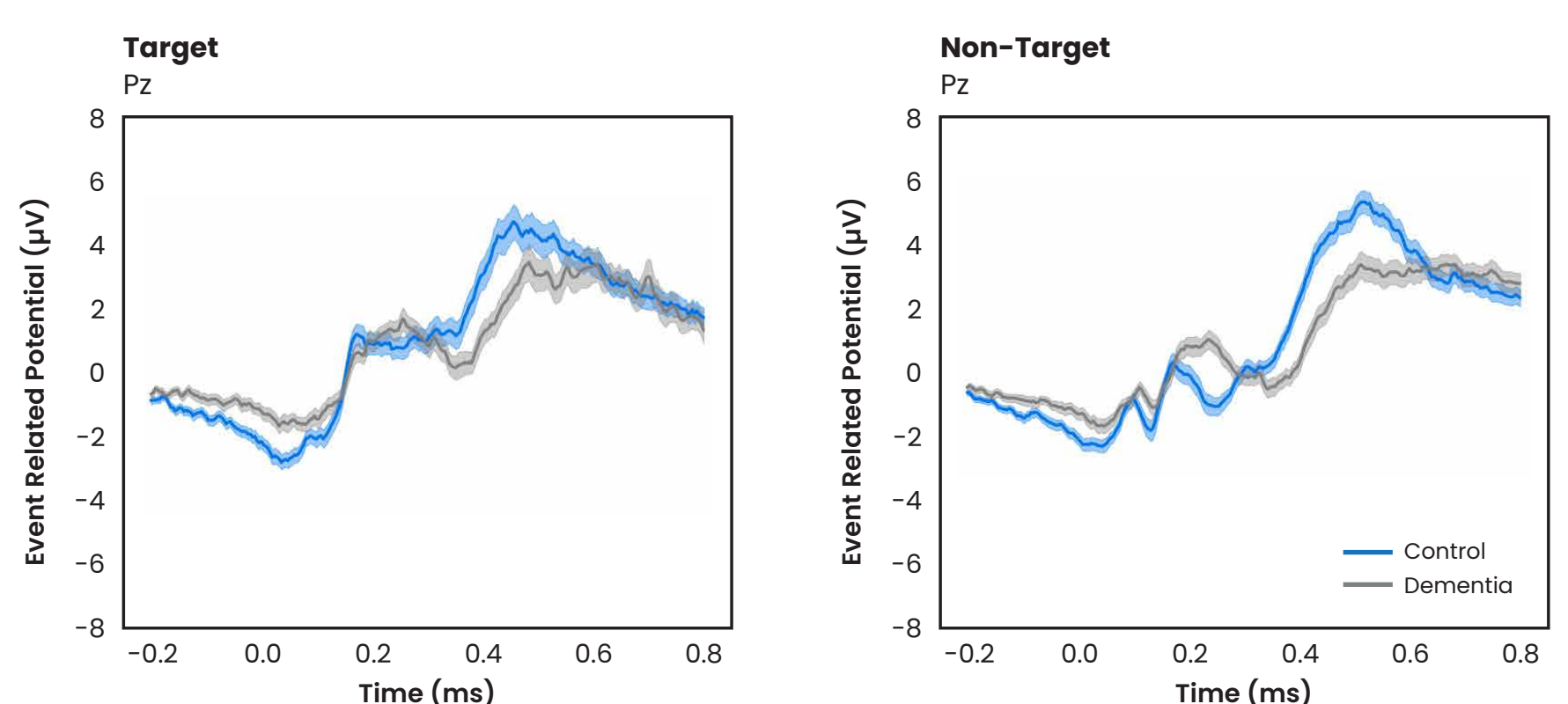


### Comparison to paper-based and clinician-administered tools:

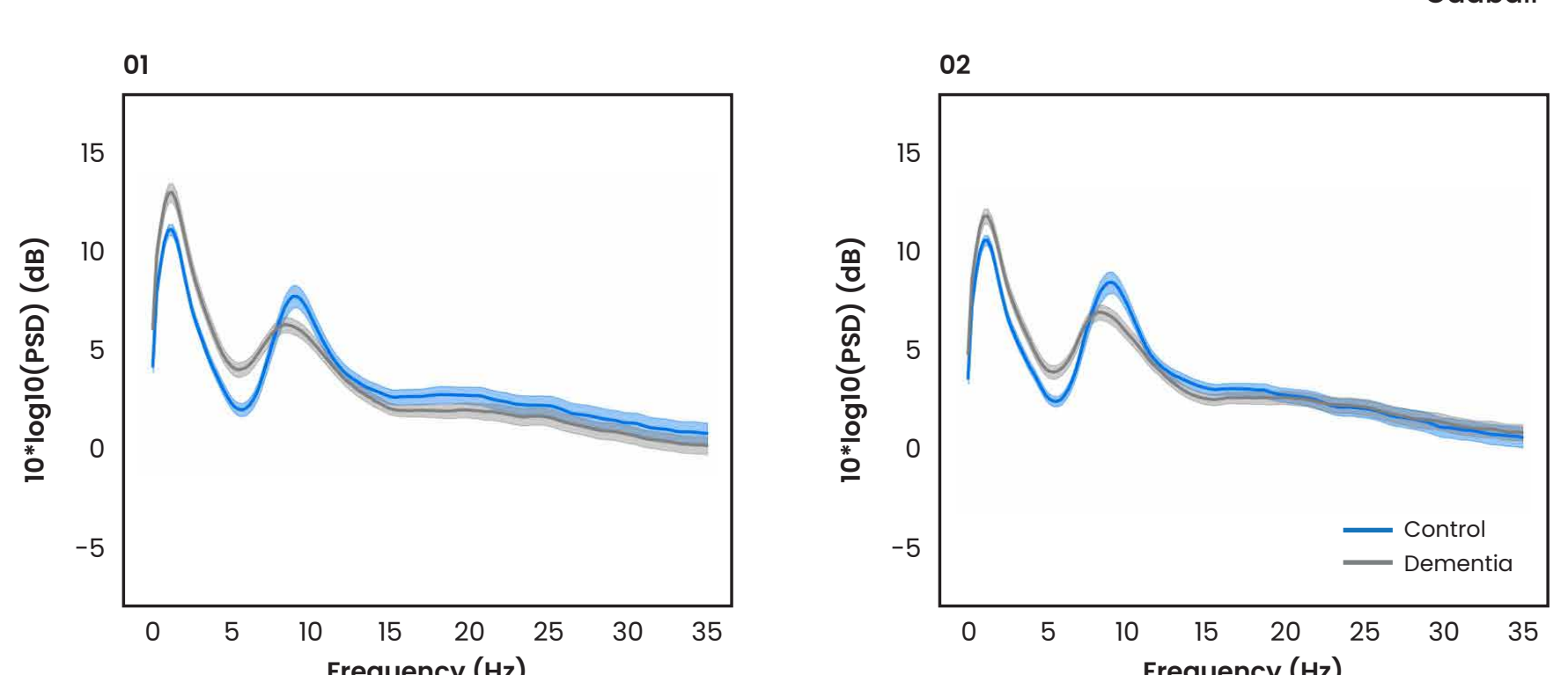
Strong correlations were observed between Cumulus tasks and traditional benchmarks (paper DSST and Verbal Paired Associates I).



### Self-setup EEG: patterns of impairment

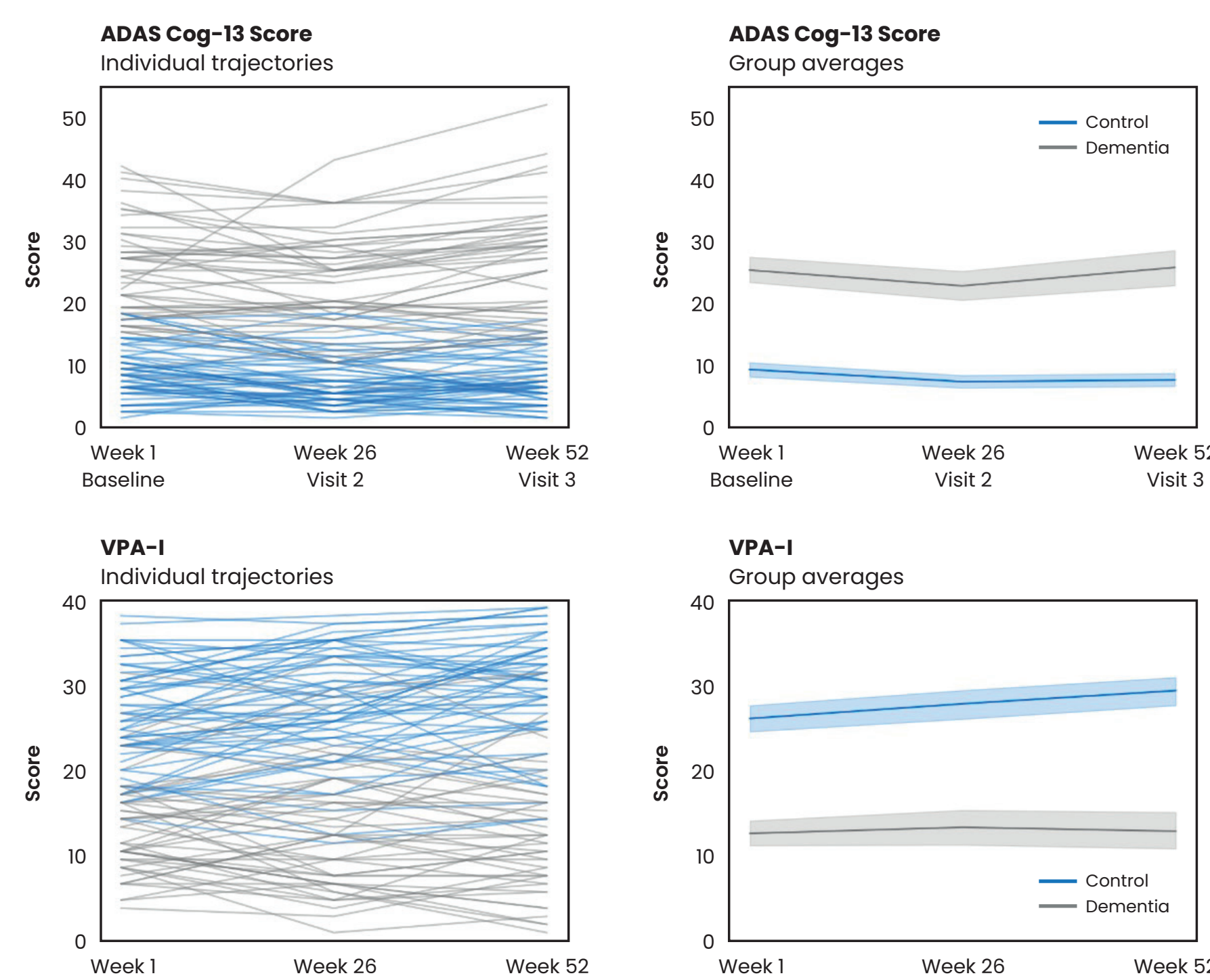


**Visual oddball P300:** Study grand average ERP gamified 2-stimulus oddball "Astro-Tap". Left is the target stimulus, right is non-target. Error bars are 5% trimmed SEM

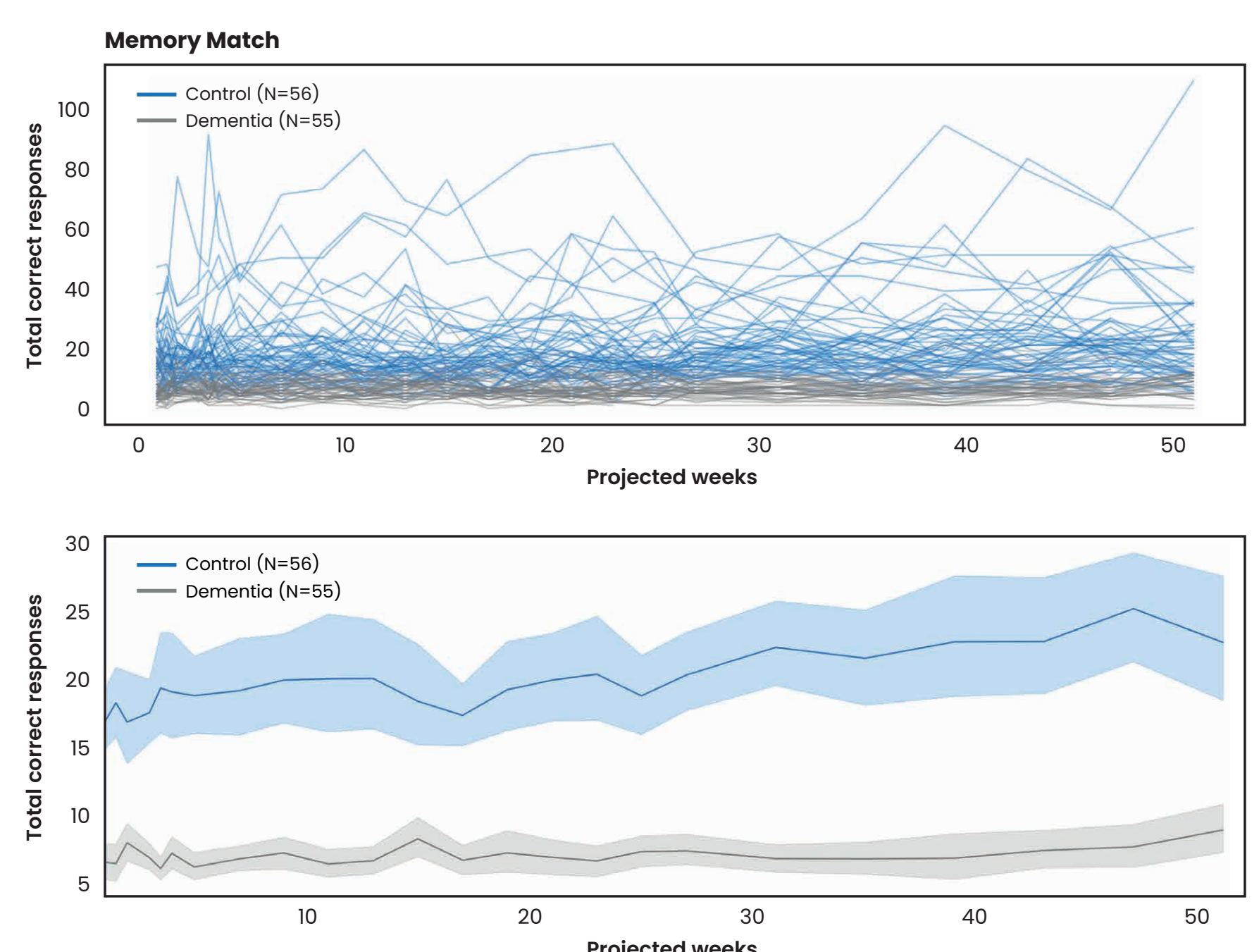


**Resting state PSD:** Study grand average power spectral density from a 2-minute period of eyes-closed resting state. Note reduced Alpha power and Alpha peak slowing in the dementia group. Additionally, an increase in the Delta and Theta bands can be seen in patients. Error bars are 5% trimmed SEM.

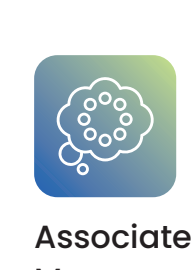
### Repeated testing reveals consistent impairment



**Standard benchmark tests:** ADAS-Cog and Verbal Paired Associates I were administered three times: beginning, middle and end (52 weeks).

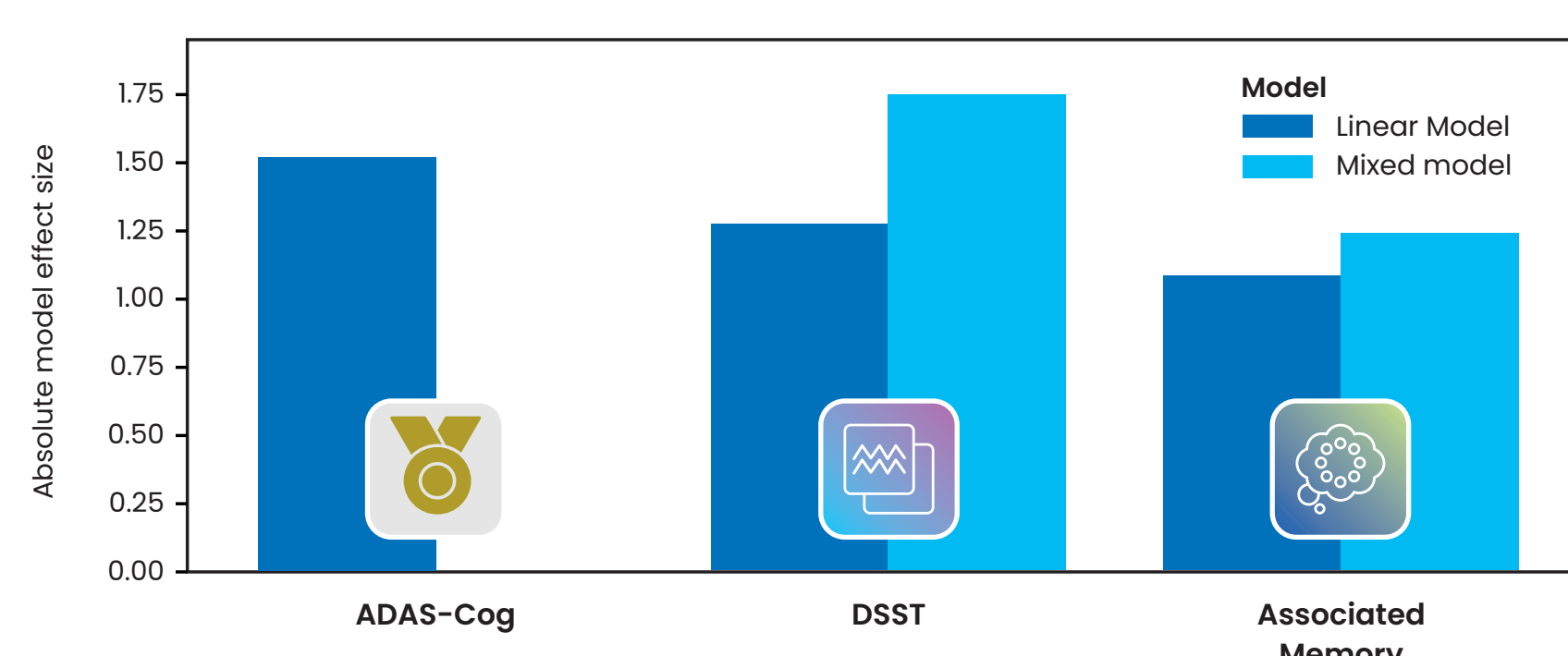


**Visual episodic memory:** Individual performance varies much more so in the control group, but slopes across the year-long study reveal slightly diverging performance over time (greater divergence than on ADAS-Cog: see below).



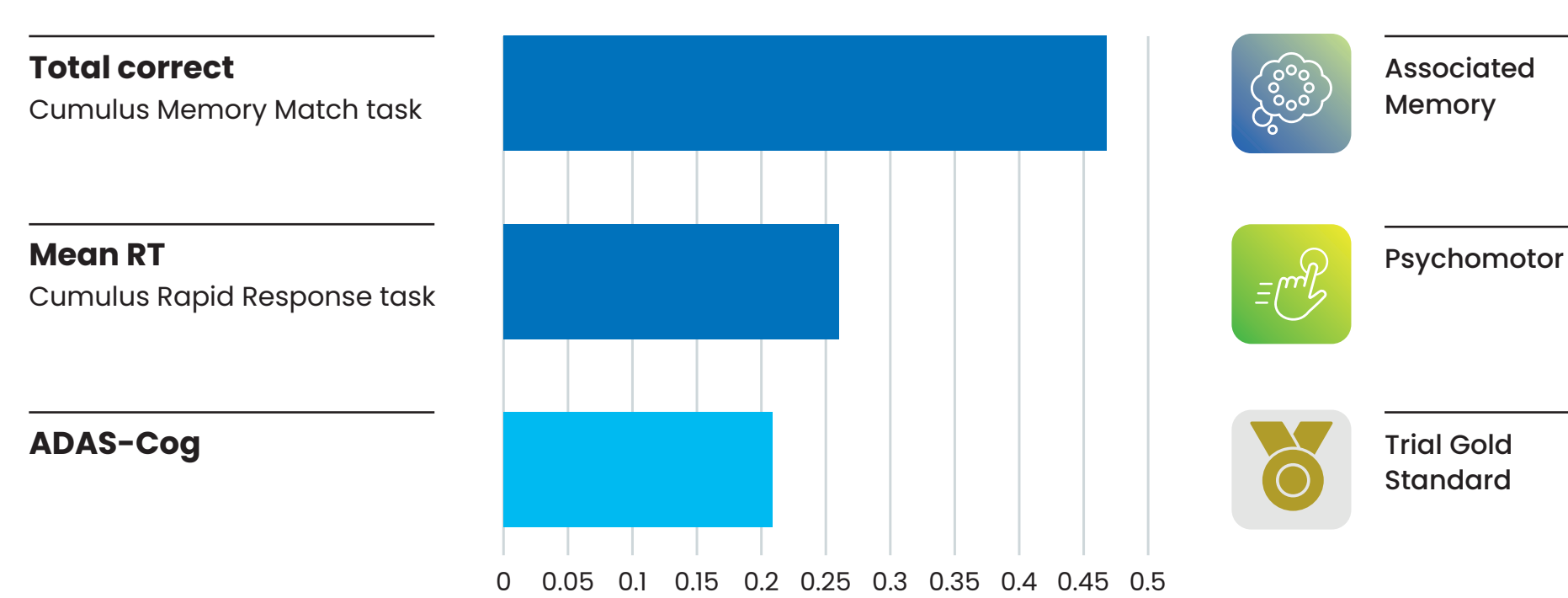
## Clinical Validation: Comparable or better sensitivity to AD-related cognitive impairment

### Effect size of group difference (AD vs. control), by data type

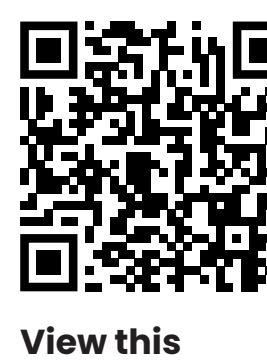


**Sensitivity to disease status:** Group effect size of selected Cumulus tasks (total correct) and the ADAS-Cog 13 (45m clinician-administered battery). Using a simple linear model, the average of Cumulus sessions results in a lower effect size than that obtained from ADAS-Cog, but with mixed models, we exploit within-user variability to boost task sensitivity and obtain a greater effect size.

### Standardised group/time interaction effect size (non-signed)



**Change over time:** Linear mixed models were used to estimate effect sizes for group x time interactions for pre-specified variables over the 52-week study. Values were standardised by their mean and SD at baseline prior to analysis to allow comparison of effect sizes.



View this poster online