Validity of a remote supervised Preclinical Alzheimer's Disease Cognitive Composite (PACC) score in preclinical and prodromal Alzheimer's disease.

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Background

Neuropsychological tests administered to individuals in locations different from the assessor (i.e., remote assessment) can provide substantial reductions in patient burden, study cost and barriers to access. However, such tests must be optimized and validated for use in remote settings. The preclinical cognitive composite score (PACC) is derived from neuropsychological tests of episodic memory, complex attention, and general mental status and has been validated as an outcome for use in clinical trials of preclinical Alzheimer's disease (AD) . This study determined whether a set of neuropsychological tests of these domains, can provide a valid and reliable digital PACC score in individuals with early AD, when given in a remote context.

Method

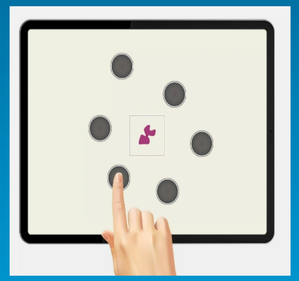
Participants: Older adults classified as cognitively unimpaired (CU, n=30), preclinical AD (n=30) or prodromal AD (n=25) were recruited from the Australian Dementia Network (ADNET) online registry and from the Australian Imaging Biomakers and Lifestyle (AIBL) study. All individuals had their cognition characterized using the AIBL neuropsychological test battery from which the AIBL PACC was computed.

Remote cognitive tests: The neuropsychological test battery consisted of three computerized cognitive tests, validated for use in preclinical and prodromal AD in supervised contexts. These were the International Shopping list Test (ISLT, Fig 1), Continuous Paired Associate Learning Test (CPAL, Fig 2) and the International Digit Symbol Substitution Test-medicines (I-DSST meds, Fig 3). Tests were administered on a tablet running an android operating system

Procedure: Participants were assessed in the clinic and in their home (7 days (+/-4 days) apart. In both contexts, the tablet was handed to the participant and the rater instructed them on how to progress through the tests. In remote assessments, raters communicated with the participant using videoconferencing software.

	In Clinic	Remote	r
Preclinical AD			
Mean	22.93	22.29	**0.77**
SD	4.43	4.75	
Prodromal AD			
Mean	15.83	15.11	**0.79**
SD	3	4.11	
d	**-1.69**	**-1.62**	

Fig 1: ISLT & performance in Preclinical & Prodromal AD



	In Clinic	Remote	R
Preclinical AD			
Mean	35.83	37.46	**0.73**
SD	17.11	16.9	
Prodromal AD			
Mean	17.3	17.9	**0.78**
SD	15.6	16.2	
d	**-1.13**	**-1.18**	

Fig 2: : CPAL & Performance in Preclinical & Prodromal AD

	In Clinic	Remote	r
Preclinical AD			
Mean	52.1	53.1	**0.81**
SD	11.2	10.1	
Prodromal AD			
Mean	31.4	32.1	**0.79**
SD	10.17	11.4	
d	**-1.94**	**-1.95**	

Fig 3: : I-DSST-meds & Performance in Preclinical & Prodromal AD

Results

Group mean performance for the Preclinical and Prodromal AD groups in the In-Clinic and Remote assessment contexts is shown for the ISLT (Fig 1), CPAL (Fig 2) and IDSST-meds (Fig3) for the Preclinical and Prodromal AD group. For each test, the magnitude of the difference (Cohen's d, abbreviated as d) between the AD groups in each context.

Data for each test showed that in each group, test-retest correlations were uniformly high (i.e., r >0.7). Additionally, the prodromal AD group performed consistently worse than the preclinical AD group on each test, across both the In Clinic and Remote assessment contexts.

For each test, in each assessment context, performance was standardized using the mean and SD of the In-Clinic Preclinical AD group. Standardized scores for each assessment were averaged to yield a PACC score. There was no difference in rates of missing data or group mean score on individual test or PACC scores, between in-clinic and remote settings.

Compared to the preclinical AD group, impairment in performance on the digital PACC in the prodromal AD was substantial and equivalent between In-clinic (z = -1.57) and remote (z = -1.56) contexts. The reliability of the digital PACC score between contexts was also very high (r = 0.87). The digital PACC was also associated strongly with the AIBL-PACC (r = 0.92).

Conclusions

The digital PACC derived from computerized neuropsychological tests given in remote supervised contexts is valid, reliable and sensitive to early AD related cognitive impairment when given In-clinic or remotely.