Digital disruption of dementia

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Background
Detection and monitoring of cognitive decline is critical for improving low dementia diagnostic rates around the world and triage of preventative resources. The most sensitive and specific clinical tests assess episodic verbal memory (EVM). Whilst effective clinically, these are time and human-resource intensive and access to neuropsychological services is limited and unequal.

Objectives
LOGOS aims to positively disrupt the *status quo* by putting reliable and validated EVM test technology in the hands of informed citizens and their primary care clinicians.

Method
LOGOS is a fully automated telephone-based app that delivers a series of word lists to the user, records audio, transcribes speech-to-text and scores test performance. We developed our own customised speech identification algorithm because commercial software performance was poor.

Results
Our deep learning algorithm achieved >95% word-level transcription accuracy over a variety of linguistic backgrounds. LOGOS results were significantly correlated to gold standard EVM tests (RAVLT r=0.58, p<0.001 and LM r=0.47, p<0.01). Retest reliability was also adequate (r=0.68, p<0.05). LOGOS was deployed as an endpoint in the NHMRC Maintain Your Brain Trial (N=4532). Using this large cohort we are now revealing the combinatorial "environomics" of EVM, specifically how risk factors combine to influence memory performance.

Conclusions
LOGOS is a validated method of automated EVM assessment that can be deployed at scale. Exciting potential applications include integration in primary care for assisting in dementia diagnosis and management, outcomes in clinical trials, screening into preventative services, paralinguistic feature analysis, and multi-linguistic versions for international use.