Diagnostic Value of Digital Clock Drawing Test in Comparison with CERAD Neuropsychological Battery Total Score for Discrimination of Patients in the Early Course of Alzheimer's Disease from Healthy Individuals

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Background: Currently available diagnostic tools to detect mild cognitive impairment (MCI) or dementia are time-consuming, invasive or expensive and thus not suitable for wide application as screening instruments. Methods: Digital Clock Drawing Test (dCDT) was performed in 138 patients with amnestic MCI (aMCI), 106 patients with mild Alzheimer’s dementia (mAD) and in 137 healthy controls (HCs) and was compared with the diagnostic value of the Consortium to Establish a Registry for Alzheimer’s Disease (CERAD) neuropsychological battery total score. Results: dCDT variables provided a slightly higher diagnostic accuracy of 81.5% for discrimination of aMCI from HCs than using CERAD total score (accuracy 77.5%). In aMCI patients with normal conventional Clock Drawing Test (cCDT) scores, both dCDT (accuracy 78.0%) and CERAD total scores (accuracy 76.0%) were equally accurate in discriminating against HCs. Finally, in differentiating patients with mAD from healthy individuals, accuracy of both dCDT (93.0%) and CERAD total scores (92.3%) was comparably high. Conclusions: dCDT is a fast, simple and suitable screening tool to identify early cognitive changes. Its performance is comparably well as the time-consuming established psychometric measure CERAD test battery.

GameChanger: Can Digital Biomarkers Transform the Detection of Preclinical Alzheimer’s Disease?

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Background: Smartphone-based digital biomarkers provide a low-burden opportunity for remote, high frequency cognitive assessment. As such, these tools may enable earlier detection of cognitive decline than achievable via traditional memory clinic routes. The GameChanger study, supported by Alzheimer’s Society, tests the feasibility of conducting longitudinal, smartphone-based cognitive assessment in a general population. Individual differences in ‘healthy’ cognitive ageing will be assessed as a function of demographic characteristics and risk of Alzheimer’s disease (AD). Methods: GameChanger is open to ‘healthy’ UK-based adults as part of a citizen science initiative. Participants download the Mezurio smartphone ‘App’, through which they are prompted to complete 5 minutes of novel, AD-targeted cognitive tasks every day for a month. In addition, frequent reports of subjective sleep, mood and cognitive errors in everyday life are collected. Results: Although data collection for the baseline wave of GameChanger is ongoing, by the end of the first month the study has more than 10,000 participants (age range 18-93 years). Qualitative feedback from 1708 participants confirms the acceptability of this ‘little and often’ approach to measuring cognition remotely, with an average score of 4.02 out of 5 for participant enjoyment. Ongoing analyses will explore individual differences in longitudinal cognitive performance according to demographic characteristics (e.g. age, education) and dementia risk (family history, subjective cognitive change). Conclusions: The response to GameChanger to date demonstrates the enormous potential for digital biomarkers to explore ‘healthy’ ageing and preclinical AD at scale in a general population. Qualitative feedback was positive in the majority; however, several key steps were highlighted to maintain long-term engagement in the e-cohort. In addition to longitudinal follow-up at 12- and 24-months, organized collaborations with existing UK-based cohorts will enable medical records, genetics and standardised neuropsychological test scores to be analysed alongside GameChanger performance.