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Examining the Neurocognitive Validity of Commercially Available, Smartphone-Based Puzzle Games

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ABSTRACT

Cognitive assessment typically involves assessing a person's cognitive performance in unfamiliar and arguably unnatural clinical surroundings. User-centred approaches to assessment and monitoring, driven by issues such as enjoyability and familiarity, are largely absent. Everyday technologies, for example, smartphones represent an opportunity to obtain an objective assessment of a person's cognitive capabilities in a non-threatening, discreet and familiar way, e.g. by everyday puzzle games undertaken as a leisure activity at home. We examined the strength of relationships that exist between performance on common puzzle games and standard measures of neuropsychological performance. Twenty-nine participants, aged 50 - 65 years, completed a comprehensive neuropsychological test battery and played three smartphone-based puzzle games in triplicate: a picture puzzle [Matches Plus], a word puzzle [Jumbline] and a number puzzle [Sudoku]. As anticipated, a priori, significant correlations were observed between scores on a picture puzzle and visual memory test ($r = 0.49$; $p = 0.007$); a word puzzle and estimated verbal IQ ($r = 0.53$; $p = 0.003$) and verbal learning ($r = 0.30$; $p = 0.039$) tests; and a number puzzle and reasoning/problem solving test ($r = 0.42$; $p = 0.023$). Further analyses making allowance for multiple comparisons identified a significant unanticipated correlation ($r = 0.49$; $p = 0.007$) between number puzzle scores and a measure of nonverbal working memory. Performance on these smartphone-based games was indicative of relative cognitive ability across several cognitive domains at a fixed time point. Smartphone-based, everyday puzzle games may offer a valid, portable measure of assessing and monitoring cognition in older adults.

KEYWORDS

Cognitive Assessment; Alzheimer's Disease; Information & Communication Technology (ICT); Smartphone

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