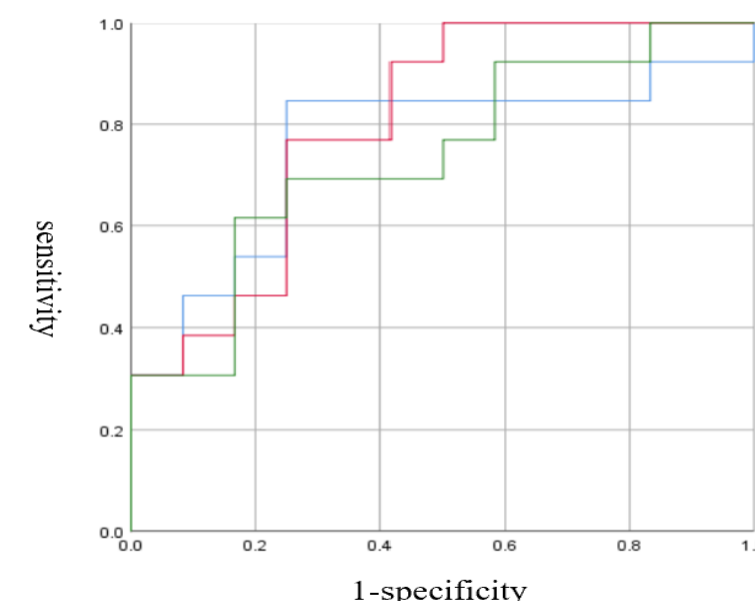


Comparative Diagnostic Performance Of Paper-based, Tablet-based, And Virtual Reality Cognitive Assessments For Dementia: A Pilot Study

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All three assessment modalities effectively differentiated AD from controls. VR achieved the highest diagnostic accuracy, and reaction time consistently identified cognitive impairment across platforms, highlighting the potential of digital cognitive testing for dementia screening.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS	REFERENCES																												
Early detection of cognitive impairment is crucial in dementia. This study compared the ability of paper-, VR-, and tablet-based cognitive assessments to differentiate Alzheimer’s disease (AD) from cognitively normal controls, with digital platforms incorporating reaction time (RT) as an additional behavioral metric.	A total of 24 participants (AD: n=12; control: n=12) were enrolled. Participants completed cognitive assessments across paper, tablet, and VR modalities. Accuracy and RT were analyzed, composite Z-scores were generated for each modality, and ROC analysis was performed to evaluate their ability to discriminate AD from controls. <table><tr><td></td><td>AD</td><td>Control</td><td>p value</td></tr><tr><td>Age, years</td><td>80.3 ± 5.2</td><td>76.4 ± 4.7</td><td>0.065</td></tr><tr><td>Sex, male (%)</td><td>5 (41.7%)</td><td>5 (41.7%)</td><td>1.000</td></tr><tr><td>Education, years</td><td>11.8 ± 2.9</td><td>12.3 ± 3.0</td><td>0.733</td></tr><tr><td>CASI</td><td>77.8 ± 7.6</td><td>90.8 ± 7.8</td><td><0.001</td></tr><tr><td>MMSE</td><td>22.8 ± 2.2</td><td>26.3 ± 2.8</td><td>0.003</td></tr><tr><td>CDR</td><td>0.63 ± 0.23</td><td>0.00 ± 0.00</td><td><0.001</td></tr></table>		AD	Control	p value	Age, years	80.3 ± 5.2	76.4 ± 4.7	0.065	Sex, male (%)	5 (41.7%)	5 (41.7%)	1.000	Education, years	11.8 ± 2.9	12.3 ± 3.0	0.733	CASI	77.8 ± 7.6	90.8 ± 7.8	<0.001	MMSE	22.8 ± 2.2	26.3 ± 2.8	0.003	CDR	0.63 ± 0.23	0.00 ± 0.00	<0.001	Groups were similar in age, sex, and education, whereas AD participants had poorer cognitive performance (all p < 0.01). AD patients showed lower accuracy and longer reaction times across all modalities. All modalities significantly discriminated AD from controls (all p < 0.05), with VR showing the best performance (AUC = 0.80) and 100% sensitivity at the optimal cutoff.  Figure 1. ROC curves for three modalities. (paper: green; VR: red; tablet: blue)	All three cognitive assessment modalities effectively distinguished AD patients from controls; however, digital platforms—particularly VR—demonstrated enhanced discriminative performance. These findings support the integration of multimodal digital cognitive testing in dementia screening, with potential advantages in sensitivity and ecological validity.	1. Rentz DM, Dekhtyar M, Sherman J, Locascio JJ, Becker JA, Amariglio RE, et al. Association of digital clock drawing with PET amyloid and tau pathology in normal older adults. <i>Neurology</i>. 2021;96(24):e3002-e3012. 2. Tarnanas I, Schlee W, Tsolaki M, Müri RM, Mosimann UP, Nef T. Ecological validity of virtual reality daily living activities screening for early dementia: longitudinal study. <i>J Med Internet Res</i>. 2013;15(7):e103. 3. Coyle H, Traynor V, Solowij N. Computerized and virtual reality cognitive training for individuals at high risk of cognitive decline: systematic review of the literature. <i>Am J Geriatr Psychiatry</i>. 2015;23(5):463-484. 4. Onoda K, Hamano T, Nabika Y, Aoki R, Takahashi T, Watanabe H. Validity of a novel touch screen tablet-based assessment for mild cognitive impairment and probable Alzheimer disease in older adults. <i>Assessment</i>. 2019;26(8):1540-1553.
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