

The 360° Mental Screening (MS-360°): A Screening Test for an Ecological Assessment of Everyday Cognitive Functioning

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Background: Comprehensive neuropsychological evaluations are often time-consuming and may not be suitable for every situation. Screening tests represent a useful tool to detect the altered status of cognitive functioning briefly. However, the majority of currently available tools show low to moderate ecological validity, limiting their capability to detect real-life impairments. Virtual Reality (VR) technology emerged as a possible solution as it can simulate everyday tasks maintaining a standard setting in almost any possible situation. Many VR-based cognitive tests are now present in the literature, but their psychometric properties are rarely assessed.

Objective: The project has two objectives: achieving incremental evidence toward the feasibility of using 360° photos and videos in the neuropsychological assessment and creating a screening test for a valid and reliable clinical application.

Methods: We are developing a new screening test (The 360° Mental Screening - MS-360°) that, instead of using computer-generated environments as scenarios, employs 360° photos and videos to generate an innovative, highly immersive VR environment. This media can simulate real-life situations in a photorealistic fashion, providing ecological stimuli and recording meaningful behavioral measures.

The MS-360° uses videos recorded with an omnidirectional camera (Insta360 One X) as virtual environments, which can be administered wirelessly using a portable head-mounted display (Oculus Quest 2) and a 5GHzWi-Fi network. The test consists of a set of 360° videos including fourteen different scenarios: in each of these, the participant is asked to perform some ecological tasks aimed to elicit specific cognitive functions. We quantified the accuracy in each specific task as a measure of outcome.

We are studying two groups at the current stage: patients reporting subjective cognitive impairment recruited from the CEMS Memory Center of Verona and healthy controls matched for age and education. We analyze differences and correlations between the score obtained at the MS-360° test and scores obtained in other established paper-and-pencil screening tests (e.g., MOCA, MMSE). We also analyze the user-experience, including usability and immersivity/presence measures.

Results: Data collection is in due course. We expect that the MS-360° will show adequate user-experience rates as compared to similar technology.

We also expect to find correlations between our test and the paper-and-pencil screening tests (range between |.5| and |.8|). Finally, we expect that the MS-360° will be able to distinguish patients' and control's performances.

Conclusions: VR is emerging as a valid tool to design neuropsychological tests. However, the lack of proper validation studies limits the evidence for widespread use of this technology for a reliable assessment of cognitive functions. Moreover, the study of the ecological value of 360° scenarios compared to paper-and-pencil tests or computer graphic VR has the potential to unlock a new, easy-to-use, technological improvement.