Virtual reality cognitive assessment tools in major psychiatric disorders: A narrative systematic review

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Introduction

Cognitive impairment in psychiatric disorders is associated with real-world functioning, and when persistent can have a significant impact on quality of life and functional outcomes [1]. A continuing challenge has been to develop and implement measures to accurately evaluate cognitive impairment in psychiatric populations. While standard traditional neuropsychological (NP) assessment tools that employ paper-and-pencil testing have demonstrated adequate predictive value, their ecological validity has been questioned [2].

Virtual reality (VR) presents a promising alternate paradigm for conducting cognitive assessments. VR systems have shown promise in assessing cognition across various neurodevelopmental and neurological disorders [3,4], though its use in psychiatric populations has yet to be systematically explored. Cognitive assessments using VR mediums may address the limitations of standard testing methods by assessing cognitive function in a carefully controlled, replicable and ecologically valid environment [5]. The purpose of this systematic review is to assess the applicability of VR cognitive assessments in a psychiatric population to help further our understanding of its potential applications and limitations in clinical practice.

Methods

A narrative systematic was conducted to explore the use of virtual reality (VR) towards the assessment of cognition in adults with psychiatric disorders. We outlined our primary outcomes as examining the construct validity, ecological validity, and sensitivity of immersive and non-immersive VR tasks towards cognitive assessment.

Our inclusion criteria defined eligible clinical populations as adults aged 18 to 65 years with a major psychiatric disorder (mood disorders, schizophrenia/psychiatric disorders, anxiety disorders or substance use disorders). These disorders were selected based on their population prevalence, contribution to global disability and known association with cognitive dysfunction [6,7]. Using PRISMA guidelines [8], we searched four online databases (MEDLINE, EMBASE, PsycINFO and Web of Science) for related peer-reviewed studies.

Main Outcomes Investigated

- **Sensitivity:** Differences in performance on VR assessments between patient and non-clinical groups
- **Ecological Validity:** Correlation of performance on VR assessments with measures of real-world functioning
- **Construct Validity:** Correlation of performance on VR assessments with traditional neuropsychological tests

Results

After a search of four databases, a total of 9229 titles were extracted. A total of 3216 duplicates were removed leaving 6013 articles to be screened. The titles and abstracts of the final list were reviewed independently by two authors, and 59 papers remained for full-text review. Upon reviewing the full-text, two titles were corrections for papers already included and 3 articles were removed as it was determined they did not meet the inclusion criteria. In total, 56 articles were included in the analysis (Figure 1).

![Figure 1. PRISMA 2009 Flow Diagram [8]](image)

Diagram providing visual representation of the literature review process.

Discussion

While the descriptive analysis of the qualitative data extracted is preliminary, some noticeable patterns and trends have already become apparent. As seen in Figure 2, the psychiatric population that was most involved in VR cognitive assessment studies was schizophrenia. This may be due to the well-documented cognitive deficits associated with such a diagnosis [9], making effective VR cognitive assessment tools pertinent for this population.

When looking at our main outcomes, most of the literature focused on the sensitivity of VR cognitive assessments in psychiatric adult populations, followed by construct validity; ecological validity was the least common outcome evaluated. This may be associated with the challenges or cost of comparing and translating VR assessments to real-world tasks in a standardized and reliable way [10]. However, VR capitalizes on the potential of creating more ecologically valid assessments [11], therefore this outcome should be considered for future research with psychiatric populations.

Finally, regardless of the main outcome measured, most of the articles deemed that VR cognitive assessments were as valid or sensitive as traditional cognitive assessments. This suggests that VR is an effective and engaging tool for assessing cognitive dysfunction in psychiatric populations.

![Figure 2. Distribution of studies using VR cognitive assessment by psychiatric population](image)

Conclusion

Overall, our results suggest that VR can be a useful tool to assess cognition in adult psychiatric populations. However, the review of the literature has revealed some limitations that future research can address. Specifically, while it is assumed that the utility of VR cognitive assessments lies in increased ecological validity, there are few studies investigating this with psychiatric populations; future research should aim to address this main outcome. Additionally, the current literature heavily addresses schizophrenia; further research is needed to validate VR assessment in other psychiatric populations. Further analyses will provide a more detailed and robust representation of the data extracted.

Reference / Bibliography


