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Feasibility study of a new extended reality system in Parkinson's disease

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Introduction: Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor and non-motor symptoms. Recent research has been indicating eXtended Reality (XR) as a promising tool for innovative and tailored therapeutic-rehabilitative intervention. XR refers to the application of immersive technologies that allow users to submerge in a virtual world or interact with a virtually extended world.

Objectives: Our aim was to assess the feasibility of a new XR system in PD patients.

Patients and Methods: We enrolled 22 PD patients (17M/5F; mean ± age SD 62.7±8.7 years) with MMSE >23. The experimenter started the game by the remote connection between the PC and the Hololens2 viewer applied to the subject's head. The patients performed the game session while sitting in a fixed position. The XR application was organized in two training sessions, and eight experimental game sessions (four for side) carried out respectively in "free" condition, during a simple cognitive task, during a contralateral motor task and during complex cognitive task. Then, System Usability Scale (SUS) and the User Experience Short Questionnaire (UEQ-S) were administered.

Results: The mean ± SD of the SUS score was 77.9±18.1 (SUS score > 70 suggests good usability). UEQ-S scores were high for both the pragmatic and the hedonic quality. We found no significant differences between the scores obtained by the more affected hand for all play levels nor between the more affected and the less affected side in all game sessions. Furthermore, there was not any significant relationship between the questionnaire scores, the game results, and the demographic and clinical data.

Conclusions: The usability, the acceptance and the tolerability were good, and the application was considered clear, interesting, and innovative by most of the patients. Our XR system could be considered a tool for use in research settings and in clinical practice.