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Digital Rehabilitation for Navigation Impairment

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Abstract : Navigation ability is essential for autonomy and mobility in daily life. In patients with acquired brain injury, navigation impairment is frequently impaired; however, in this study, we tested the effectiveness of a serious gaming training protocol as a tool for cognitive rehabilitation to reduce navigation impairment. In total, 38 patients with acquired brain injury and subjective navigation complaints completed the experiment, with a partially blind, randomized control trial design. An objective navigation test was used to construct a strengths and weaknesses profile for each patient. Subsequently, patients received personalized compensation training that matched their strengths and weaknesses by addressing an egocentric or allocentric strategy or a strategy aimed at minimizing the use of landmarks. Participants in the experimental condition received psychoeducation and a home-based rehabilitation game with a series of exercises (e.g., map reading, place finding, and turn memorization). The exercises were developed to stimulate the adoption of more beneficial strategies, according to the compensatory approach. Self-reported navigation ability (wayfinding questionnaire), participation level, and objective navigation performance were measured before and after 1 and 4 weeks after completing the six-week training program. Results indicate that the experimental group significantly improved in subjective navigation ability both 1 and 4 weeks after completion of the training, in comparison to the score before training and the scores of the control group. Similarly, goal attainment showed a significant increase after the first and fourth week after training. Objective navigation performance was not affected by the training. This navigation training protocol provides an effective solution to address navigation impairment after acquired brain injury, with clear improvements in subjective performance and goal attainment of the participants. The outcomes of the training should be re-examined after implementation in a clinical setting.

Keywords : spatial navigation, cognitive rehabilitation, serious gaming, acquired brain injury
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