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THE INTERSECTION OF COGNITIVE PERFORMANCE AND SPACE TOURISM PROPENSITY IN A VR-SIMULATED MICROGRAVITY ENVIRONMENT.

Abstract

Introduction. Our pioneering study presented at the International Astronautical Congress in Paris in 2022 established that guided imagery can replicate microgravity's effects, impacting cognitive estimation tasks and weight perception. Building on this foundation, the current research delves into whether virtual reality (VR) can simulate microgravity's cognitive effects and examines the influence of an individual's inclination towards space tourism on these effects. Methods. We engaged n=50 undergraduates in an experimental study. Following their completion of the Space Tourism Propensity Questionnaire (STP-Q; Gatti et al., 2023), participants were randomly assigned, ensuring balance in gender, age, and questionnaire scores, into two distinct groups: the experimental (Space) group and the control (Nature) group. Each group was exposed to a VR scenario (using Vive Eye Pro) tailored to their assigned condition (Space vs. Nature) before undertaking a series of cognitive and weight estimation tasks, including mental rotation, mass and weight estimation of objects, and time estimation. Results. The space scenario participants demonstrated significant decremental effects in cognitive task performance, aligning with existing literature, unlike the control group. Intriguingly, these effects were inversely correlated with the STP-Q scores, indicating a nuanced relationship between space tourism inclination and cognitive response to VR-induced microgravity. Discussion. Our findings endorse virtual reality as a potent simulator of microgravity's cognitive effects, proposing that immersive experiences in a VR space environment may trigger psychological and neurocognitive mechanisms akin to those activated in actual microgravity conditions. The inverse prediction of experimental outcomes by space tourism propensity underscores a complex interplay between psychological predispositions towards space exploration and cognitive reactions to simulated environments. This suggests that individuals with a lesser proclivity for space tourism might exhibit heightened sensitivity to VR's space-mimicking effects. This investigation not only reaffirms virtual reality's efficacy in simulating microgravity's impact on cognitive functions but also accentuates the critical role of individual predispositions, like space tourism propensity, in influencing these effects. The study contributes significantly to our comprehension of VR technology's potential and signals new directions for future research into space sciences.

Keywords: microgravity, spatial cognition, simulation, virtual reality, cognitive functions, weightlessness training