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INFLUENCE OF AUDITORY STIMULI ON BALANCE MAINTAINING CAPABILITIES IN HEALTHY SUBJECTS

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Introduction: Preventing falls is a subject with the potential to significantly enhance one's quality of life. Improving the ability to maintain balance can reduce the likelihood of falling. While typically, enhancing postural stability requires prolonged and tiring rehabilitation or physiotherapy, there may be an approach to enhance stability without the need for strenuous rehabilitation. Over the past two decades, the use of virtual reality (VR) technology has been gaining recognition and popularity in the field of physiotherapy and rehabilitation. This research aims to investigate the impact of different sounds on an individual's ability to maintain balance. Specifically, the study examines whether the combination of playing sounds or noises alongside VR technology has a more substantial effect on balance compared to using a single stimulus.

Study group: A total of 40 participants volunteered for the study, comprising 17 males and 23 females aged between 18 and 41 years. The average age was 25.65±7.23 years, with an average height of 173.85±9.22 cm and an average weight of 72.63±15.1 kg. Among the participants, 15 reported experiencing mild motion sickness, while one reported moderate motion sickness, and one reported severe motion sickness. Additionally, five participants had sustained lower limb injuries, either chronic or occurring within two years prior to the measurements. However, these participants stated that their injuries would not hinder their ability to stand in the required position for the necessary duration.

Methods: Each participant underwent 15 measurement trials, organized into five blocks consisting of three trials each. These trials encompassed measurements conducted in a real environment with both open and closed eyes, a static virtual reality scene, an oscillating virtual reality scene, and a head-mounted display showing darkness. In each trial, participants were instructed to maintain an upright and steady standing position for 60 seconds while focusing on a point located approximately 2 meters in front of them, at eye level. For each set of measurements, one trial was performed in silence, one with audible white noise, and another with simulated uproar sounds. Additionally, all participants underwent a hearing examination before the measurements and completed a questionnaire about their general mood and familiarity with simulation sickness.

Results: The analysis focused on two variables: the overall length of the center of pressure (COP) path and the coefficient representing left-right asymmetry in the lower limbs. A statistically significant difference emerged between the conditions of silence and uproar, whereas no significant difference was observed between silence and white noise conditions. Furthermore, notable statistical distinctions were identified among the various measurement blocks corresponding to different visual environments.

Conclusions: In individuals without health complications, auditory stimuli appear to have a minimal impact on sustaining a stable and composed upright position. Such stimuli contribute to the maintenance of balance to a considerably lesser extent when compared to visual stimuli.