The Effect of Music on Body Sway When Standing in a Moving Virtual Environment

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Movement of the visual surrounding using virtual reality (VR) is an established tool for testing body sway for clinical and research purposes. There are, however, no conclusive studies showing the effects music can have on body sway especially if it is heard in conjunction with a shifting visual surrounding. For this study subjects stood quietly with their eyes closed, with their eyes open, and with their eyes open as they viewed a VR environment translating forward and backward at 0.1 Hz. In addition to these visual conditions, they simultaneously experienced "no sound" and music conditions. The music conditions consisted of their hearing a section of Mozart's Jupiter and a section of the subjects' self-selected popular music played normally and also modified so that the loudness and frequency shifted in sync with the VR movement. Body sway was assessed through analysis of center of pressure movement (COP) recorded with force plate, a commonly used device for assessing balance. To date, we have analyzed the body sway of one subject and have found, for that subject, that the addition music enhanced the effect of the translating scene on body sway as measured by increased COP variability, velocity, and a shift in median COP frequency. For this subject, however, it did not appear neither to make a difference whether the subject heard Mozart's Jupiter or listened to their own self-selected music nor whether the music's frequency or loudness was synced to the movement of the scene. Should these findings hold with further body sway analysis of more subjects, they would be of interest to clinicians and researchers examining the impact of sound on balance as well as to video game and computer graphics designers looking to create more immersive VR environments.