

Postural Responses After Gain Adaptation in VR

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A common source of discrepancy between the motion in Virtual Reality (VR) environments and the equivalent physical world is a gain difference between visual and kinesthetic motion. Previous studies have shown that the gain perceived as corresponding to a stationary environment during self-motion did not shift following prolonged adaptation to non-unity gain. In the current study, we asked whether observers show adaptation in spontaneously and visually-elicited synchronous postural responses when immersively viewing a moving room oscillating back and forth sinusoidally. During adaptation observers continuously walked to pick up and post objects while their virtual motion was scaled by a factor of 0.67, 1 or 2 times their physical motion in separate blocks. Each block consisted of 10-minutes of initial adaptation, followed by four testing segments interleaved with three 2-minute top-up adaptation periods. Postural sway during quiet stance was recorded during testing segments. Data from 18 observers showed changes following exposure to both low and high gain blocks relative to the unity gain block. The root mean square variability of postural sway was larger, suggesting that both gain manipulations resulted in destabilization compared to a gain of 1. A power analysis at 0.2 Hz confirmed these trends. Collectively our results show that exposure to altered gain in virtual environments produces adaptation effects on postural measures of balance, but no shift in perceived stability. The apparent dissociation between the perceptual and motor adaptation outcomes suggests that the results may reflect differences between the adaptive responses in dorsal and ventral processing streams.