Postural control instability caused by virtual reality – fast multidimensional adaptation and gender effects

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**Background**
The ability to handle sensory conflicts and use the most appropriate sensory information is vital for successful recovery of human postural control after injury. The objective was to determine if virtual reality (VR) could provide a vehicle for sensory training, and determine the temporal and spatial nature of such adaptive changes.

**Method**
Twenty healthy subjects participated in the study (10 females, mean age 27.2 years). The subjects watched a 90-second VR simulation of a railroad travel in mountainous terrain. During five repeated VR simulations, the subjects stood on a force platform recording stability.

**Results**
Repeatedly watching the same VR movie made the subjects significantly reduce both the anteroposterior (62%, p<0.001) and lateral (47%, p = 0.001) energy used. Females adapted more slowly to the VR stimuli as reflected by higher use of total (p = 0.007), low frequency (p = 0.027) and high frequency (p = 0.026) energy.

A female and male subject’s stability during the first (red) and fifth VR test (blue), during quiet stance with eyes open (green) and eyes closed (black). Note the poor adaptation to VR in the female subject.

**Conclusion**
Healthy subjects can significantly adapt to a multidirectional provocative visual environment after 4-5 repeated sessions of VR. Consequently, VR technology might be an effective tool for rehabilitation that include sensory reweighting. However, some females may require more training sessions to achieve effects with VR.

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