

Glide-symmetric visual feedback for gait improvement in patients with multiple sclerosis

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Objectives: To compare the effects of gait training with distinctly symmetric visual feedback cues, adapted to the "glide symmetry" of human locomotion, to the effects of training with visual feedback cues without distinct symmetry, on the walking abilities of patients with multiple sclerosis (MS).

Methods: A wearable virtual reality (VR) device was used to create visual feedback cues, responding dynamically to the patient's motion in a feedback fashion, so that they appear to be fixed in space. The device was capable of producing one of two repetitive patterns, the first comprising equally spaced transverse lines (no distinct symmetry), and the second squared black and white tiles in checkerboard arrangement (distinct symmetry, called "glide reflection"). The side-length of the tiles in the second arrangement was equal to the spacing between the transverse lines in the first. Two disjoint groups of randomly selected patients with gait disorders due to MS were each trained with visual feedback cues consisting of one of the two patterns. Ten patients used the transverse lines arrangement while eleven patients used the checkerboard tile arrangement. Patients in the two respective groups were instructed to step between the transverse lines or within alternating black and white tiles. Baseline performance (walking speed and stride length along a 10m straight track) was measured before device use. Following 20min training with the device and 10min rest, performance without the device was measured again and compared to the baseline performance.

Results: The average improvement in the group using the visual cue of transverse lines was 7.79% \pm 4.24% in walking speed and 7.20% \pm 3.92% in stride length. The average improvement in the group using the visual cue of checkerboard tile arrangement was 21.09% \pm 18.39% in walking speed and 12.99% \pm 11.72% in stride length.

Conclusion: Patients with gait disorders due to multiple sclerosis, training with a glide-symmetric visual feedback cue, showed a significantly higher improvement in their gait than patients training with a visual feedback cue without distinct symmetry.

References

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