

Multidirectional Transparent Body Weight Support Engages Specific Kinematic Response Patterns in Controls and Spinal Cord Injury Patients

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Body weight support (BWS) enables locomotor training early in the rehabilitation process¹. Overground BWS is an ecologically valid approach that, while technically challenging, has the potential to increase functional gain from training². When providing BWS, a central challenge is minimizing forces that interfere with the natural pattern of locomotion. We developed a novel, cable-based BWS system (FLOAT) that provides constant BWS while incurring minimal interaction forces in other movement directions³.

To determine if constant unloading while walking overground with this BWS system engenders physiological movement patterns in healthy and spinal cord injured (SCI) populations, we recorded walking kinematics at six BWS levels (0-50% bodyweight) in 19 healthy and 12 SCI patients. Gait parameters associated with stability, joint motion patterns and intra-limb coordination were analyzed to identify contraindications to using the FLOAT for overground locomotor training.

Stability parameters and stance/swing timing were increasingly affected with rising BWS in both groups, similar to what is reported from unloading on the treadmill. In healthy controls, joint motion patterns and intra-limb coordination were affected by BWS >30%. This adaptation was reduced in patients.

The reported results show that providing BWS with the FLOAT in SCI patients is feasible and does not lead to deterioration of gait kinematics. Adaptations observed in the healthy cohort indicate that slight kinematic modifications are physiological at high BWS levels, however these were partially impaired in SCI patients. Therefore, there are no contraindications to providing even high support for patients in rehabilitation, maximizing bandwidth for optimally challenging the patient.

References:

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