LOCOMOTOR ADAPTATIONS AND AFTEREFFECTS TO RESISTANCE DURING WALKING IN INDIVIDUALS WITH SPINAL CORD INJURY.

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ABSTRACT

Muscle activity during the swing phase of walking is influenced by proprioceptive feedback pathways. Previous studies have shown that feedback and anticipatory motor commands contribute to locomotor adaptive strategies to prolonged exposure to a resistance against leg movements during walking. The purpose of this study was to determine whether people with motor-incomplete spinal cord injuries (SCI) modulate flexor muscle activity in response to different levels of resistance in a similar way as uninjured controls. A second purpose was to determine whether people with motor-incomplete SCI have the capacity to form anticipatory motor commands following exposure to resistance. Subjects walked on a treadmill with the Lokomat robotic gait orthosis. The Lokomat applied different levels of a velocity-dependent resistance, normalized to each subject's maximum voluntary contraction of the hip flexors. Each condition consisted of 20 steps against resistance followed by 20 steps without. Electromyography and kinematics of the lower limb were recorded. Although both groups responded to the resistance with an overall increase in rectus femoris activity during swing, the SCI group showed weak modulation of muscle activity to different levels of resistance. Following removal of the resistance, both groups showed aftereffects, but they were manifested differently. Controls responded to the removal of resistance with a high step, whereas the SCI subjects exhibited increased step length. The size of the aftereffect was related to the amount of added resistance. In addition, the SCI group showed a negative relationship between the size of the aftereffect and locomotor function.