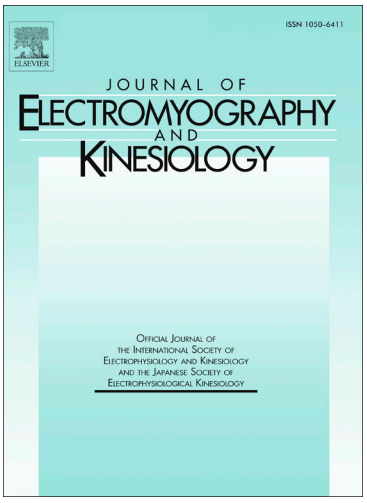

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Muscle synergies reveal impaired trunk muscle coordination strategies in individuals with thoracic spinal cord injury

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Abstract

Spinal cord injury (SCI) can result in paralysis of trunk muscles, which can affect sitting balance. The objective of this study was to analyze trunk muscle coordination of individuals with thoracic SCI and compare it to able-body individuals. A total of 27 individuals were recruited and subdivided into: (a) high thoracic SCI; (b) low thoracic SCI; and (c) able-body groups. Participants were seated and asked to lean their trunk in eight directions while trunk muscle activity was recorded. Muscle coordination was assessed using the non-negative matrix factorization (NMF) method to extract muscle modules, which are the synergistic trunk muscle activations, and their directional activation patterns. Our results showed that individuals with SCI used less muscle modules, more co-contractions, and less directional tuning, compared to able-bodied people. These results suggest impaired and simplified muscle coordination due to the loss of supraspinal input after SCI. Observed variability in muscle coordination within SCI groups also suggests that other mechanisms such as spasticity and muscle stretch reflexes or individual