Potential Of Corticomuscular And Intermuscular Interactions To Evaluate And Detect Alteration Of Motor Control In Healthy People And People With Cervical Spinal Cord Injury

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The realization of a contraction involves simultaneous activation of agonist and antagonist muscles, both directly controlled by the central nervous system. Spinal Cord Injury (SCI) causes an increase in the level of antagonist co-activation, associated with a loss of motor efficiency. To gain insights into the mechanisms responsible of alteration of motor function after SCI, corticomuscular and intermuscular coherences (CMC, IMC) are particularly relevant tools allowing the investigation of the common inputs reaching groups of synergistic muscles. We evaluated CMC and IMC in 8 people with cervical SCI (below C5) and 10 healthy controls while they performed voluntary isometric elbow flexion contractions at different force levels. Although people with cervical SCI and healthy controls had similar capacity of maximum force production during flexion contractions, the antagonist muscles activation was increased in people with cervical SCI. Concomitantly, the magnitude of all CMC and IMC was modulated with the force level. However the magnitude of the CMC with antagonist muscles and the magnitude of IMC between agonist and antagonist muscles differed in people with cervical SCI compared to controls. The motor cortex remains functional to control muscle contractions after SCI, but the plasticity induced by cervical SCI on the common inputs reaching both agonist and antagonist muscles may reflect decreased cortical control of spinal inhibitory mechanisms regulating antagonist muscles co-activation.