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Validation of a Double-Coil TMS Method to Assess Corticospinal Excitability

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Abstract

Transcranial magnetic stimulation (TMS) applied over the primary motor cortex (M1) elicits motor-evoked potentials (MEPs) which provide a temporally precise and muscle-specific readout of state-changes in the motor output system. Many studies have used TMS over M1 to investigate corticospinal excitability changes occurring when choosing which hand to use for an action. So far, these studies have used single-pulse TMS eliciting MEPs in one hand when this hand is either selected or non-selected. However, an important limitation of this “Single-Coil” method is that MEPs are measured in selected and non-selected conditions during separate trials and even more importantly, they are computed in relation to the movement of different hands. The purpose of the present study was to evaluate a “Double-Coil” TMS method by which MEPs are elicited in both hands at once. We compared the amplitude of left and right hand MEPs evoked at rest (at 100, 115, 130, 145 or 160 % of the resting motor threshold, rMT) using a Double-Coil method with those obtained using Single-Coil TMS over the right or left M1, respectively. Because the Double-Coil TMS pulses were applied with a 1 ms inter-pulse interval (to avoid direct interference between the two pulses), TMS was either applied over the left M1 first or the right M1 first, in separate trials. As expected, MEPs increased with the intensity of stimulation, reaching the highest amplitude at 160% of rMT. Besides that, MEPs were comparable whether they were elicited in the left or right hand using a Single- or Double-Coil method, regardless of the pulse order. These results suggest that Double-Coil TMS may be used to assess corticospinal excitability in both hands at a near-simultaneous time.