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Centre-surround organization of fast sensorimotor integration in human motor hand area - DTU Orbit (09/11/2017)

Centre-surround organization of fast sensorimotor integration in human motor hand area

Using the short-latency afferent inhibition (SAI) paradigm, transcranial magnetic stimulation (TMS) of the primary motor hand area (M1HAND) can probe how sensory input from limbs modulates corticomotor output in humans. Here we applied a novel TMS mapping approach to chart the spatial representation of SAI in human hand-knob. We hypothesized SAI is somatotopically expressed in M1HAND depending on both the site of peripheral electrical nerve stimulation and the cortical spot targeted by TMS within M1HAND. The left index or little finger was stimulated 23 ms before focal single-pulse TMS of the right M1HAND. Using frameless stereotaxy, we applied biphasic-TMS pulses at seven stimulation positions above right M1HAND and recorded the motor evoked potentials (MEPs) from relaxed left first-dorsal-interosseous (FDI) and abductor-digiti-minimi (ADM) muscles. Homotopic stimulation of the finger close to the muscle targeted by TMS revealed a somatotopic expression of afferent inhibition matching the somatotopic representation of unconditioned MEPs (homotopic SAI). Conversely, heterotopic stimulation of a finger distant to the muscle targeted by TMS induced short-latency afferent facilitation (SAF) of MEPs in M1HAND. Like homotopic SAI, heterotopic SAF was somatotopically expressed in M1HAND. Together, the results provide first-time evidence that fast sensorimotor integration involves centre-inhibition and surround-facilitation in human M1HAND.

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