TMS-evoked Potentials during finger movements and at rest

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The registration of electroencephalography during single pulse TMS (TMS-EEG coregistration) allows to record the spread of neural activation from the stimulated area to connected regions. In a previous work, we have shown that stimulation of the motor cortex generates an early latency positive component that reflects transcallosal signal transmission. Later components occurring around 40-50 ms have been associated with sensory feedback from the activated muscle that may reach the cortex around those latencies.

Here, we recorded TMS-evoked potentials (TEPs) from 15 right-handed healthy volunteers while the contralateral hand was resting or while was performing unimanual finger opposition movements, and the ipsilateral hand was contracted. Two target sites were stimulated: the primary motor cortex (M1) and the dorsal premotor cortex (PMC). Sixty single pulses were delivered for each condition and on each hemisphere.

We show that TEPs components around 30-60 ms after stimulation are modulated by the task and by the site of stimulation, without interaction of these two factors. Extensive differences are found between M1 and PMC stimulation, on both ipsilateral and contralateral electrodes. Similarly, task performance is associated with differences in fronto-parietal areas.

Our data suggest that task performance may influence the sensory feedback from activated muscles, which interacts with the activation generated by the TMS pulses. Moreover, they show that the activation of different targets in the motor systems generated specific patterns of signal propagation.