

Title

Pain and touch differentially modulate corticospinal excitability, independent of afferent inhibition

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Abstract (200 words)

Pain can profoundly impact motor functioning for self-preservation but is also associated with motor and somatosensory disturbances. Despite considerable research, it remains unclear whether pain and touch modulate motor processes independently or interacting. Across two transcranial magnetic stimulation (TMS) experiments, we tested the effects of tactile and nociceptive inputs on corticospinal and sensorimotor processes using an afferent inhibition (AI) paradigm. In Experiment 1, a single electrocutaneous stimulus was delivered to the left index finger before single pulse-TMS over the right first dorsal interosseous (FDI) motor hotspot at one of five delays (15, 25, 35, 45, 60, or 160 ms). In Experiment 2, the same paradigm examined the effects of pain by administering moderate tonic heat pain to the forearm. In both experiments, significant reductions in TMS-induced motor output occurred at 25, 35, and 160 ms, with facilitation at 60 ms. This was unaffected by tactile afferent duration (Experiment 1) or tonic heat pain (Experiment 2). However, overall, corticospinal excitability was significantly reduced in painful compared to painless conditions. In summary, our findings show that tonic pain has a direct (inhibitory) effect on motor processes; however, in this context, tactile sensorimotor interactions remain unaltered.

Title

Temporal constraints of conscious tactile perception in the primary somatosensory cortex

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Abstract (200 words)

The primary somatosensory cortex (S1) has long been implicated in tactile perception, yet its precise role in conscious detection remains uncertain. This study examined the causal and time-specific involvement of S1 in tactile detection. In two experiments, single-pulse transcranial magnetic stimulation (spTMS) was delivered over contralateral S1, an active control site (inferior parietal lobe; IPL), or in a sham condition. spTMS occurred at short (25 & 75 ms; Experiment 1) or longer (130 ms; Experiment 2) intervals following electrotactile finger stimulation. Participants completed a go/no-go detection task at sensory threshold. In Experiment 1, tactile sensitivity was significantly reduced following early S1 TMS compared with both control and sham. No such effect was observed at the later interval in Experiment 2. Importantly, self-reported TMS- distraction did not account for the sensitivity differences, suggesting sensitivity-specific modulation. These findings support a causal role for early S1 activity in conscious tactile detection. We propose that disruption at this early stage interferes with the initial encoding of tactile input, thereby attenuating perceptual awareness and subsequent functions such as discrimination and retention. These results underscore the constrained but critical role of S1 in stimulus detection and highlight the importance of S1 for the subsequent cognitive processes.