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Body & sensorimotor integration #2

Role of the Supplementary Motor Area in sensory suppression: a single pulse TMS study

Maria Pyasik, Adriana Salatino, Dalila Burin, Raffaella Ricci, Lorenzo Pia

First author address: University of Turin , Turin, Italy. First author email: maria.pyasik@unito.it

Introduction: *Sensory attenuation (i.e., self-generated stimuli are perceived as less intense than externally-generated stimuli of the same intensity) is thought to enhance the ability to disentangle self-produced from externally-generated actions. Hence, sensory attenuation is considered a crucial implicit component of our ability to experience agency over voluntary actions (Blakemore et al., 2002). Some evidence suggests that the supplementary motor area (SMA) is a key brain structure for this phenomenon (Haggard & Whitford, 2004). The aim of present study is to further investigate the role of SMA in sensory attenuation of tactile electrical stimulation. We hypothesized that interfering 'online' with the activity of SMA by using single pulse TMS would decrease sensory attenuation.*

Methods: *Twelve healthy right-handed volunteers participated in the study. The figure of-eight TMS coil was placed on the SMA Participants were instructed to press a button with the index finger of their left hand following a visual cue presented on the screen (i.e., Self and TMS conditions), or to look at the co-experimenter's hand as she pressed the button (Other condition). Button press triggered electrical stimulation of the subject's right index finger. In each trial, the subject had to rate the stimulus on a 0-7 Likert scale. TMS pulse (115% of rMT in TMS condition, 0% in Self and Other) was delivered 10 ms before the cued movement onset. Mean electrical stimuli ratings were compared between conditions (Wilcoxon matched pairs test).*

Results: *All participants presented typical sensory attenuation effect by rating the stimuli in Self condition significantly lower than in Other (3.94 vs 4.82, $p = 0.002$). Ratings in TMS condition were higher than in Self (4.23 vs 3.94, $p = 0.005$) but lower than in Other (4.23 vs 4.82, $p = 0.005$). The results show that single pulse TMS delivered to the SMA 10 ms before the onset of a voluntary movement affects sensory attenuation.*

Discussion:*Our results show that single-pulse TMS over the SMA decreases sensory attenuation. These findings suggest that SMA, known to subserve motor preparation (e.g., Cunnington et al., 2005), also plays a crucial role in sensory attenuation. Moreover, the single-pulse TMS protocol in our study further confirmed the timing of SMA activity in voluntary movement preparation, which has been previously shown for the attenuation of perceived size of motor evoked potentials (Haggard & Whitford, 2004). Our results confirmed the same timing for sensory attenuation of tactile electrical stimulation with a simpler experimental protocol (single-pulse TMS on the SMA without the second coil for inducing MEPs).*

References: *Blakemore S et al. Trends Cogn Sci (2002) 6(6):237-42*
Cunnington R et al. Hum Mov Sci (2005) 24:644-56
Haggard P et al. Cogn Brain Res (2004) 19:52-8

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