

## **From shared to distinct affects via rTMS/fMRI combined: Neuroenhancement of self-other distinction in empathy depends on dispositional empathic understanding**

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Self-other distinction is crucial for empathy, since it prevents the confusion of self-experienced emotions with those of others. We aimed to extend our understanding of the neurocognitive mechanisms of self-other distinction. Thirty-one female participants underwent continuous theta burst transcranial magnetic stimulation (cTBS) targeting the right supramarginal gyrus (rSMG), a sub-region of the temporoparietal junction previously shown to be involved in self-other distinction, and the vertex, a cortical control site. Right after stimulation they completed a visuo-tactile empathy task in an MRI scanner. Self-other distinction was assessed by differences in emotion judgments, and brain activity between conditions differing in the requirement for self-other distinction. Effects of brain stimulation on self-other distinction depended on individual differences in dispositional empathic understanding: cTBS of rSMG, compared to vertex, enhanced self-other distinction in participants with lower dispositional empathic understanding, but diminished it in participants with higher empathic understanding. On the neural level, this inverse relationship between empathic disposition and self-other distinction performance was linked to a reduction of cTBS-induced rSMG activity in persons with lower dispositional empathy, and an increase in those with lower dispositional empathy. These opposite impacts of cTBS were associated with two anatomically and functionally distinct networks. These findings open up novel perspectives on the causal role of rSMG in self-other distinction and empathy. They also suggest that considering individual differences may yield novel insights into how brain stimulation affects higher-level affect and cognition, and its neural correlates.

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