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Motor Cortex Excitability and Vaccine Hesitancy: A TMS Approach to Sensorimotor Responses

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The Centers for Disease Control and Prevention recommends updated COVID-19 vaccines for the 2024–2025 season, emphasizing their importance in preventing severe illness and hospitalization. Nonetheless, vaccine hesitancy continues to represent a critical barrier, undermining the success of immunization efforts and contributing to the ongoing circulation of the virus. To better understand the psychological and neurophysiological mechanisms associated with vaccine hesitancy and resistance, we investigated sensorimotor responses to vaccination-related stimuli in individuals characterized by different levels of hesitancy. Using transcranial magnetic stimulation, we measured motor-evoked potentials in the deltoid muscle —a typical site of vaccine administration —while participants viewed images depicting people receiving the COVID-19 vaccine, alongside control conditions involving the same muscle. Our results revealed a selective increase in deltoid motor cortex excitability in highly hesitant individuals, as compared to low-hesitant ones, specifically in response to images of COVID-19 vaccination. This effect was not observed when participants viewed images of flu vaccination or when excitability was measured in a control muscle (extensor carpi radialis). These findings suggest that COVID-19 vaccine imagery triggers a somatotopically localized motor facilitation in highly hesitant individuals, potentially reflecting an anticipatory or automatic avoidance response. Such motor patterns are typically associated with the processing of threatening or emotionally charged stimuli, pointing to the role of affective and embodied mechanisms in shaping attitudes toward vaccination.

Keywords: COVID-19 anti-vaccination attitude; Motor cortex excitability; Deltoid; Transcranial magnetic stimulation; vaccine hesitancy

If you're submitting a symposium talk, what's the symposium title?

Dissecting the Social Brain with Neurostimulation: Mapping Connectivity, Plasticity, and Individual Differences

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