Disrupting prefrontal cortex prevents performance gains from sensory-motor training

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Humans show large and reliable performance costs when required to make more than one simple decision simultaneously. Such multitasking costs are thought to reflect capacity limits in response selection (RS), the information processing stage where sensory input is mapped to an appropriate motor response. Neuroimaging has implicated the left posterior lateral prefrontal cortex (pLPFC) as a key neural substrate of RS. For example, activity in left pLPFC tracks improvements in RS efficiency typically observed following training. To date, however, there has been no causal evidence for the involvement of pLPFC in RS or training effects, and the left hemisphere laterisation of this operation remains controversial. Here we employed excitatory, inhibitory and sham transcranial direct current stimulation (tDCS) and measured participants’ performance on high and low RS-load tasks after different amounts of practice. Both excitatory and inhibitory stimulation of the left pLPFC disrupted training effects for the high load condition relative to sham. No disruption was found for the low load and right pLPFC stimulation conditions. The findings support a causal role for the left pLPFC in both RS and training effects. It also suggests training improves RS efficiency by sharpening the neural ensemble in prefrontal cortex that performs sensory-motor translations.