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Training-induced improvements in inhibitor control

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Inhibitory control — the ability to deliberately suppress dominant, automatic or prepotent responses — is essential for adaptive functioning, with deficits in this ability implicated in various psychiatric and neurological disorders. Despite a recent upsurge of positive findings regarding the training of other executive functions, whether inhibitory control can be trained and the underlying neural mechanisms remains unclear. In the present study, fifty-four adults were randomly assigned to train on either a standard Go/Nogo task (GNG; n = 18), a combined Go/Nogo–Stop-signal (GNG-SS; n = 18) or a control task (n = 18) during a single training session (8 blocks). Task difficulty was adaptively manipulated in the GNG condition using reaction-time deadline (RTD), while both RTD and stop-signal delay (SSD) were employed in the GNG-SS. The control task involved counting Go stimuli for the duration of the training. To assess transfer effects, all participants completed identical pre/post assessments using tasks indexing different inhibitory control functions (Go–Nogo, Flanker, Stop-signal), with the post-training assessment taking place in a separate session 3 days later. Across conditions and task, ERPs revealed decreased N1 and N2, but increased P2 amplitudes at post-training. Relative to the control, the inhibition training conditions showed similar improvements in the active inhibition of responses during the Go–Nogo and Stop-signal task, with ERP analyses showing overlapping increases in fronto-central regions; suggesting a top-down augmentation and near-transfer of inhibitory processes. However, these effects did not extend to the interference control domain, with no training effects seen for the Flanker task. Overall, these findings suggest that adaptively manipulating task difficulty can lead to improvements in actively inhibiting stimuli in untrained tasks, leading to quantitative changes in brain activity, but that these effects are dependent on the whether the training and Pre/Post tasks engage overlapping processing components and brain regions.