# Motor learning with augmented feedback enhance motor performance and motor cortical excitability

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Objective: To examine whether learning of force control under visual feedback could enhance motor performance and motor cortical excitability.

Methods: Nine young healthy individuals completed the study. They were instructed to grip a force transducer with their non-dominant thumb and index finger. Subjects were instructed to reach the target force as accurate and as fast as possible. Feedback about the target force and the time taken to complete each set of exercise was indicated on the computer screen. Subjects were requested to complete 15 sets of exercises, which took about 20 minutes. Outcome measures consisted of purdue pegboard test that recorded the number of pins to be inserted in the pegboard in 30 seconds, tapping test that recorded the number of letter 'b' typed on a computer keyboard for 30 seconds, and maximum pinch grip force exerted by thumb and index finger. For the electrophysiological test, transcranial magnetic stimulation (TMS) was used to elicit single pulse to the hemisphere contralateral to stimulate first dorsal interossei (FDI). Motor evoked potential recruitment curve was obtained from stimulator output of 100% to 160%, and the peak MEP amplitude was also recorded.

Results: There were significant increases in the tapping speed (number of letter increased from 162.2±21.8 to 168.7±22.8, $p = 0.030$), and purdue pegboard score (number of pins increased from 14.7±2.1 to 15.7±1.8, $p = 0.028$). The peak MEP significantly increased from 1.0±0.3mV to 1.4±0.5mV after training ($p = 0.005$). Results of the one-way repeated measures ANOVA showed that there was significant effect of training on the recruitment curve, with MEP amplitude increased after training at each stimulus output ($p = 0.002$).

Conclusions: Findings from this study demonstrate that 20 minutes of motor learning with visual feedback about the target force and movement speed could improve motor performance and motor cortical excitability.