ETH zürich

DHEST
Department of Health Sciences and Technology

Neural Control of Movement

2-B-5

Motor fatiguability in humans is associated with a shift from mesial to lateral premotor-motor interactions and changes in motor cortex inhibition

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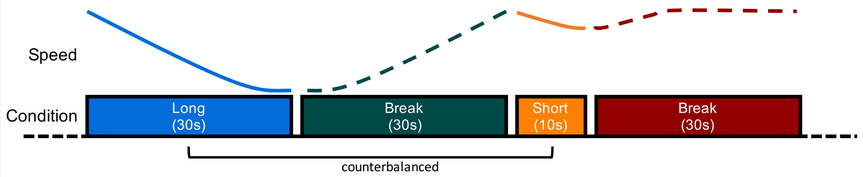
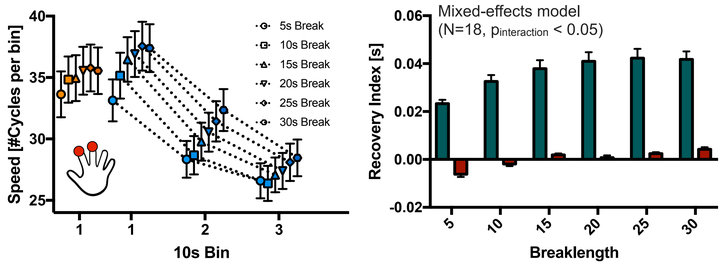
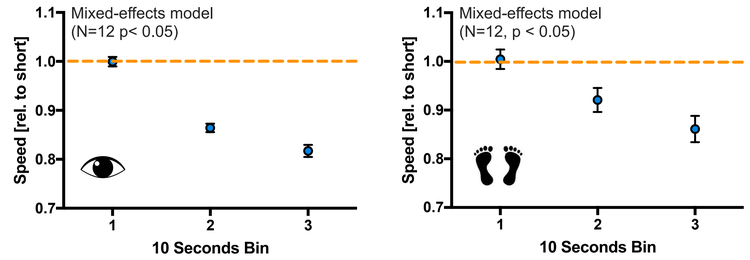
Motor fatiguability as indexed by motor slowing is a decrease in performance over time which generalises across effectors and repetitive tasks



General measurement paradigm: participants were instructed to move as fast as possible for a long period (30s or more; slowing condition) or a short period (10s; non-slowing condition).

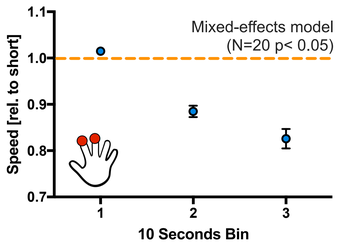


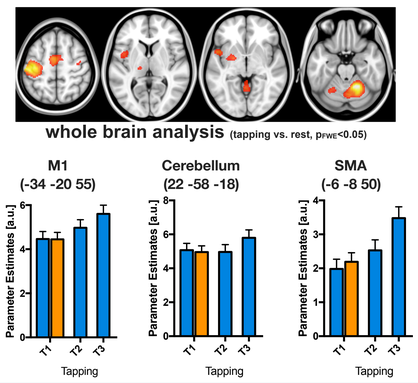
Influence of different break lengths on motor slowing

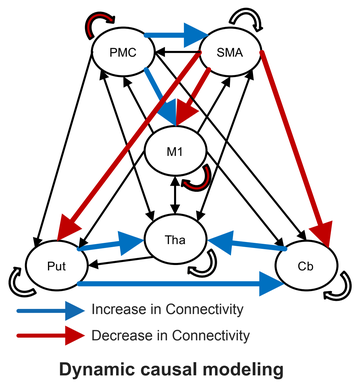


Motor slowing occurs not only during finger movements

Increase in hemodynamic response and changes in effective connectivity during slowing

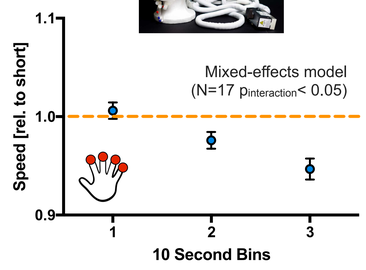


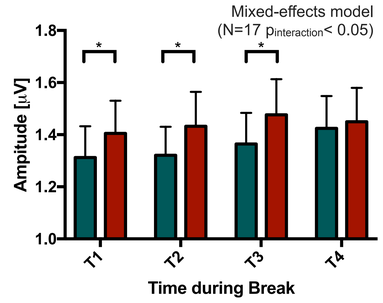


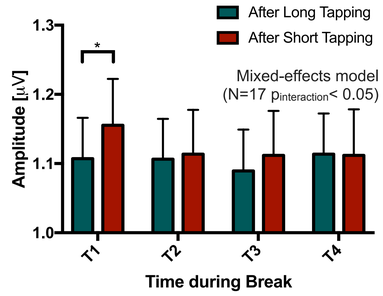


Dynamic causal modeling

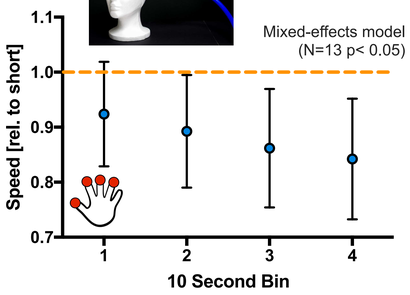
Slower recovery of alpha power and reduced beta rebound after motor slowing

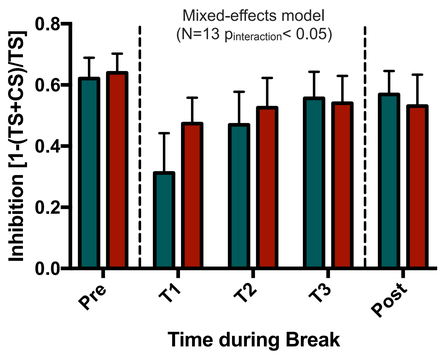




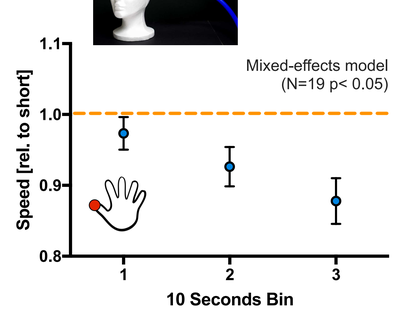


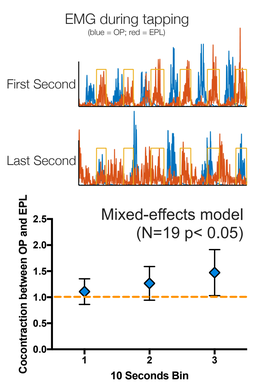
Decreased short-latency intracortical inhibition after motor slowing

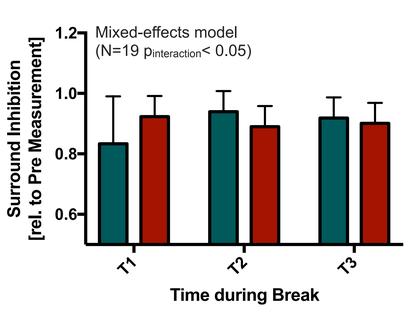




Decreased surround inhibition after motor slowing







Conclusions

Repetitive movements lead to motor slowing which is associated with:

(I) An overall increased hemodynamic response in the motor system
(II) A shift from mesial to lateral premotor-motor interactions
(III) Slower recovery of spontaneous alpha activity and a decreased beta rebound
(IV) Decreased inhibition of the primary motor cortex
(V) A decrease of surround inhibition and an increase in cocontraction of agonistic muscle groups.

Our results propose that two mechanisms are involved in motor slowing: (1) fMRI, EEG and SICI data converge to indicate that motor fatiguability is associated with dis-inhibiting motor cortex This decrease in inhibition reflects a break-down of surround inhibition which leads to increased cocontraction of antagonistic muscle groups which ultimately causes motor slowing. (2) Our DCM results reveal that dis-inhibition of motor cortex is associated with reduced effective connectivity from SMA, a key area for intrinsic movement generation.

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