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Relation between post-movement-beta-synchronisation and corticomuscular coherence

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Objective: To analyse post-movement-beta-synchronisation in the EEG and EEG-EMG coherence simultaneously.

Background: The mechanisms and function of EEG synchronisation in the beta-band after the end of a short movement is not clear. The corticomuscular coupling during isometric muscle contractions

occurs in the same beta-band. It is unclear however, if these two features of cortical motor physiology are related.

Methods: 64-channel EEG was measured simultaneously with surface EMG of the right FDI-muscle in 11 healthy volunteers. Subjects kept a constant medium strength contraction of the FDI-muscle during the entire experiment. Superimposed on this they performed repetitive self-paced brisk short contractions. Time-frequency analysis including coherence over time was performed with respect to the onset of the brisk movements and averaged for 40 contractions in each subject.

Results: Post-movement-beta synchronisation (PMBS) was found in the contralateral electrodes C1, C3 and C5 with a maximum 1-2.5 sec. after the brisk movements in the frequency range between 16 and 27 Hz for all the subjects. In 9 of the subjects there was coherence between the EEG recorded from these electrodes and the FDI in the same frequency range as the PMBS and with the maximum occurring at the same time. The other two subjects did not show any corticomuscular coherence.

Conclusions: Post-movement-beta-synchronisation coincides with corticomuscular coherence in the same frequency band. Thus PMBS is not merely a cortical phenomenon but seems to involve the whole corticomuscular system, possibly reflecting recalibration after brisk movements.