

Cyclic fluctuations of sensorimotor cortex sensory processing in migraine may be important for attack initiation: observations from event related EEG changes

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Objective

Mapping of cyclic fluctuations of cortical activity in the migraine brain in relation to migraine attacks.

- Baseline beta activity
- Beta Event Related Desynchronization (Beta-ERD)
- Post Movement Beta Synchronization (PMBS)

Methods

We recorded ERD/PMBS in the beta band (12-19 Hz) during a motor task and a sensorimotor task of right hand movements. More beta suggest less activation or more inhibition.

We performed longitudinal analyses comparing the preictal (< 36 hours before headache attack) and ictal (during headache attack) phases to the interictal phase.

Results

- Preictal, contralateral increase of baseline beta power and beta-ERD ($p < 0,049$).
- Preictal, ipsilateral increase of PMBS, post-hoc side difference ($p = 0,001$).
- Ictal, ipsilateral increase of baseline beta power and decrease of PMBS ($p < 0,045$).

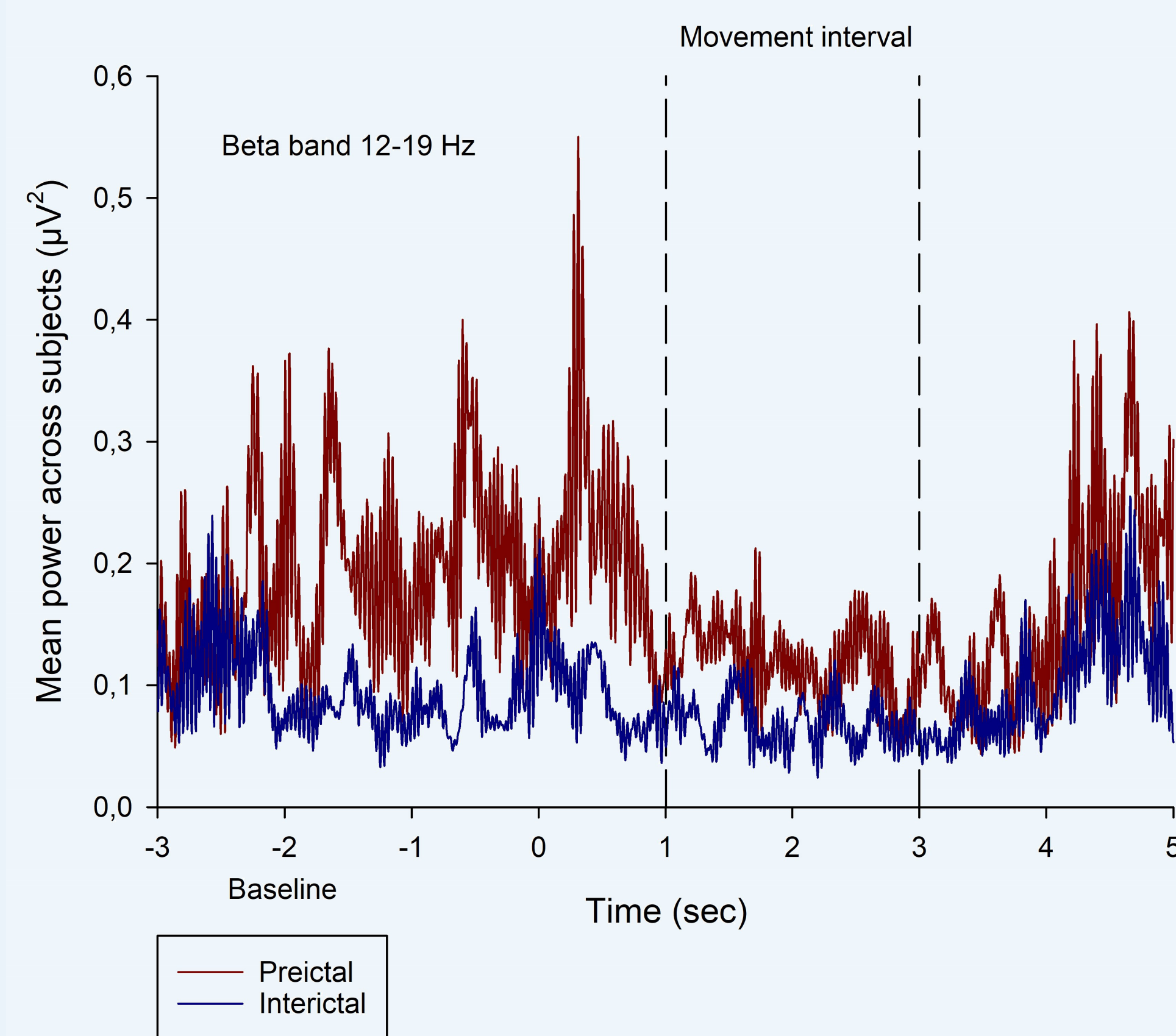


Figure 1: Grand mean power across subjects at the contralateral C3 electrode for the sensorimotor task in migraine patients for interictal and preictal recordings. First two seconds (-3 to -1) represent pre-movement onset baseline. 0 represent start of movement. Broken vertical lines indicate the selected interval (1 to 3 seconds) for the ERD period.

Conclusion

We found cyclic fluctuations of cortical activation, possibly supporting cortical hyperresponsivity with fluctuating thresholds for inhibitory control in migraine.

Culminating alterations of pre-activation and inhibitory thresholds may escalate to a switch in excitatory/inhibitory balance triggering the headache attack.

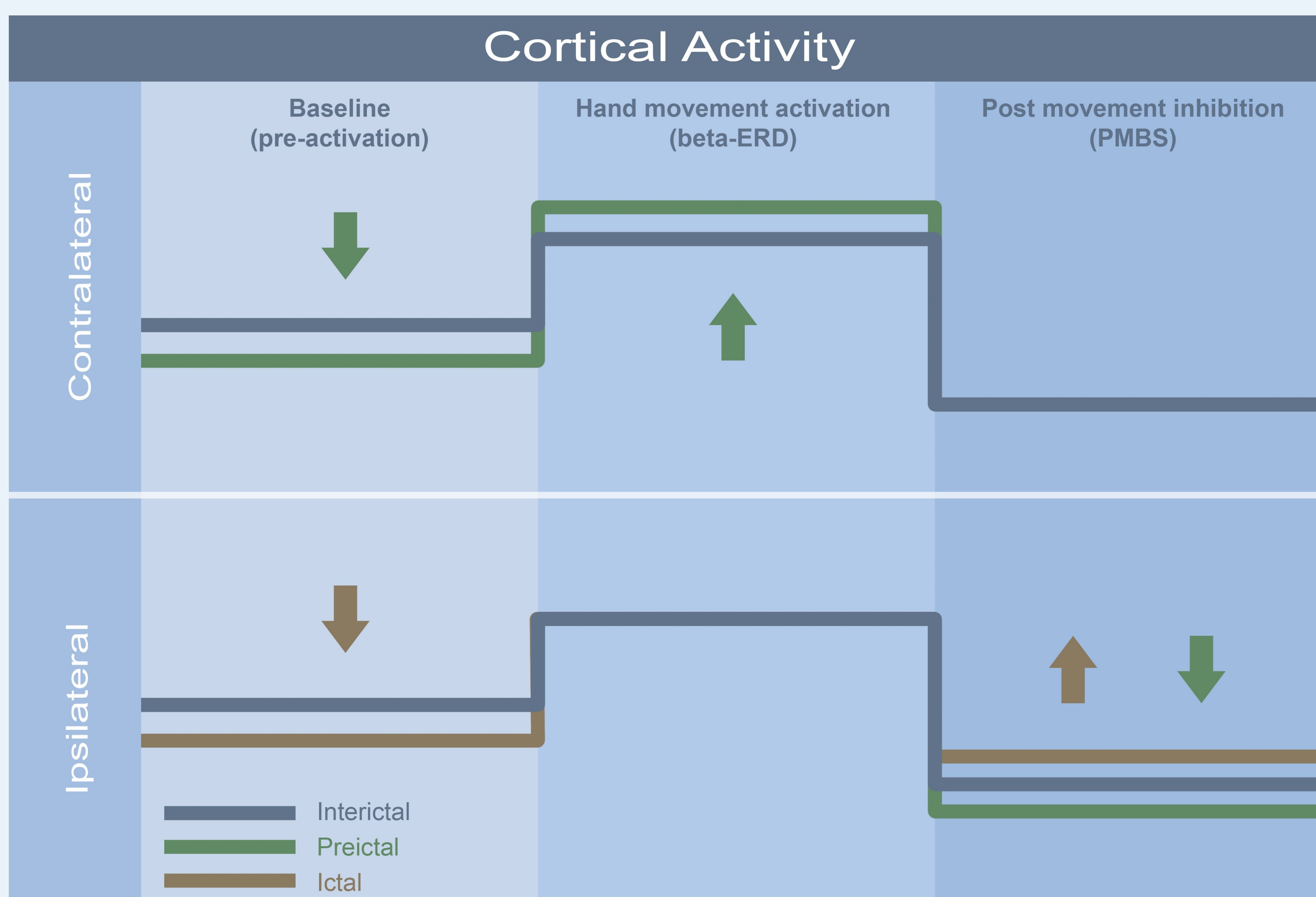


Figure 2: Simplified illustration of cortical activity during baseline, hand movements and post movement inhibitory reset for migraine patients.

Preictal findings indicate lower contralateral sensorimotor cortical pre-activation and increased responsivity during sensory processing, followed by increased inhibition of the ipsilateral sensorimotor cortex.

During the ictal phase, cortical pre-activation and post stimuli inhibition ipsilateral to stimuli decrease, with contralateral normalization.