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MEASURING EVENT-RELATED BRAIN DYNAMICS

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A new measure of event-related brain dynamics, the *event-related spectral perturbation* (ERSP), has been introduced to study event-related dynamics of the EEG spectrum induced by, but not phase-locked to, external stimuli or events (Makeig, 1993). The ERSP reveals aspects of event-related brain dynamics not captured in ERP averages of the same response epochs.

Using the ERSP transform:

- Rare auditory events have been shown to induce a ridge of augmented EEG amplitude from 11 to 19 Hz which peaks 1 s or more after stimulus onset.
- This induced auditory response has a frontal distribution, is larger following attended stimuli, and does not occur following stimuli to which a subject fails to respond.
- Simultaneously-recorded EEG and MEG responses to tones contain separate ERSP time frequency features.
- Still other ERSP features have been found in experiments requiring timed delays between auditory stimuli and subject responses.
- In a simple reaction time paradigm, realted time-frequency methods have recently demonstrated structured differences in 40 Hz EEG spectral dynamics between fast and slow responders.

The ERSP and related time-frequency analysis techniques can be used to observe a large range of event-related brain dynamic phenomena than can be seen using time-domain averaging methods. The results noted above demonstrate that studies of human event-related electromagnetic brain dynamics need not be restricted to phase-locked phenomena captured in ERP averages.

References

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