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Treatment-related changes in EEG activation in Tourette's syndrome

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Abstract:
Background
The challenge in studying cortical activity in Tourette's Syndrome is involuntary movements that prohibit the use of MRI due to movement artifacts. We propose the use of EEG measurement with computational data mining as a promising alternative.
Materials and Methods
21 patients of chronic tic disorder participated, and 17 of them underwent two sessions before and after Habit Reversal Training. We administered three 5-minute sessions: tic freely; verbal instruction to suppress tic; the same but with $10 reward. Tic severity was evaluated using Yale Global Tic Severity Scale. EEG was recorded from 40 scalp channels. EEG data were annotated with tic onset markers and analyzed with EEGLAB (SCCN, UCSD).
Results
Tic counts during tic freely condition was average 29 (SD 15); verbal suppression 14 (8); reward suppression 13 (10). Independent component clustering analysis found a cluster centered at [0 13 43] in Talairach coordinates, which we identified to be supplementary motor area, to which 12/17 participants contributed. The inter-trial phase coherence of this cluster after training was significantly associated with treatment-related behavioral improvement in tic severity and frequency ($r = 0.78$, $p < 0.005$).
Conclusion
We found treatment-related changes in EEG activation in Tourette's Syndrome. We demonstrated the usefulness of EEG measurement with this neurological disorder, and revealed the electrophysiological representation of pre-tic brain

dynamics in the supplementary motor area.

Inter-trial phase coherence resolved at Supplementary Motor Area
Before minus After Habit Reversal Training
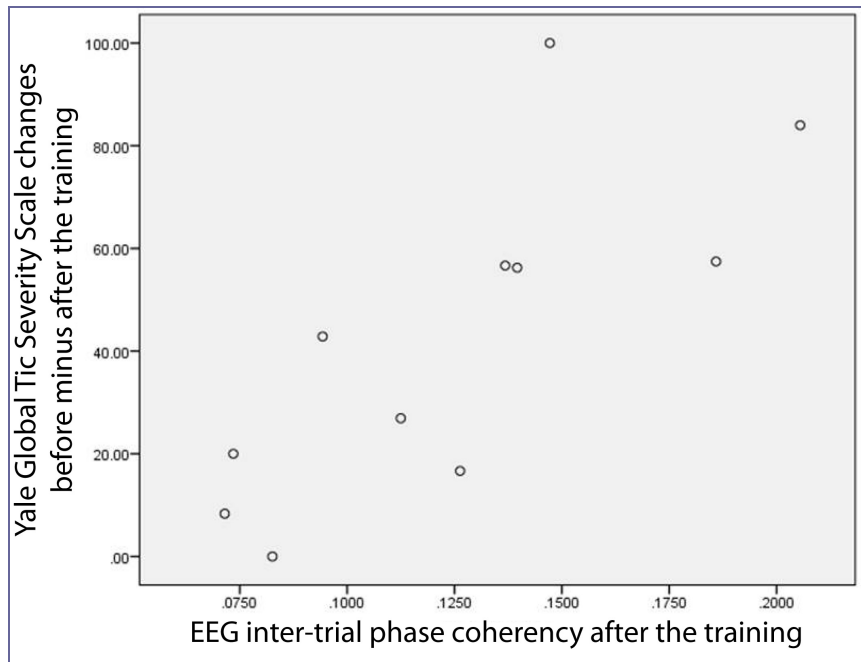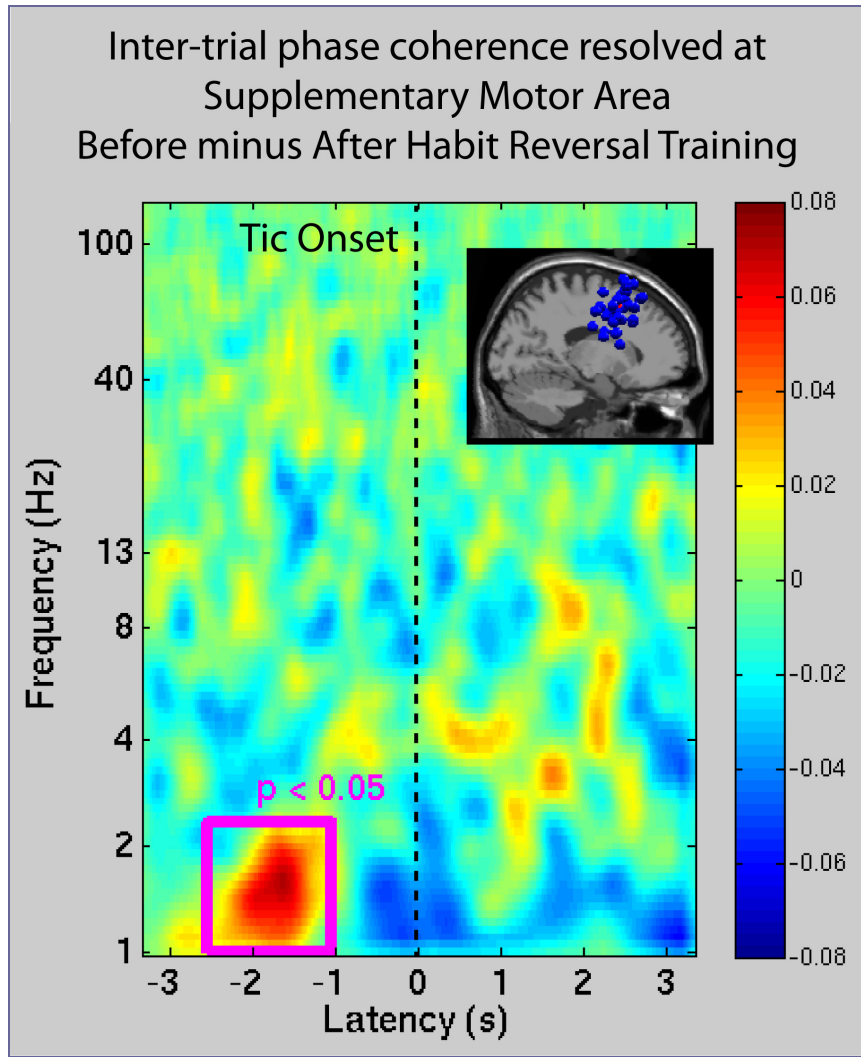
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