An alternative ERF analysis to access the altered working memory prefrontal network in MS.

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BACKGROUND

Working memory (WM) is one of the most impaired cognitive domains in patients with multiple sclerosis (MS)[1].

→ Traditional event-related analyses of EEG data (ERPs) reported altered temporal dynamics in MS during WM tasks.

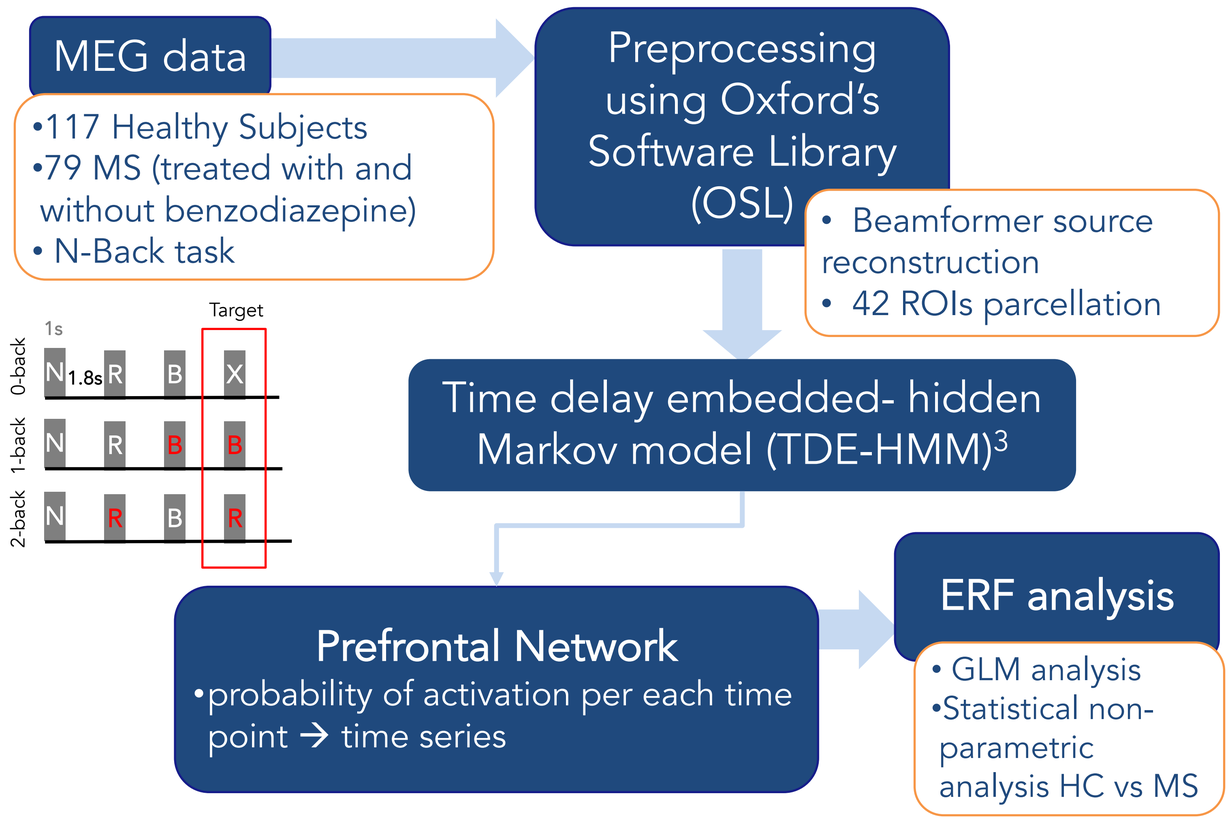
→MEG time-frequency analyses reported a decreased theta power in prefrontal regions in MS compared to HC[2].

→*However*, MEG data analyses did not yet reveal any altered event-related fields (ERFs) waves[2].

NOVEL PERSPECTIVE

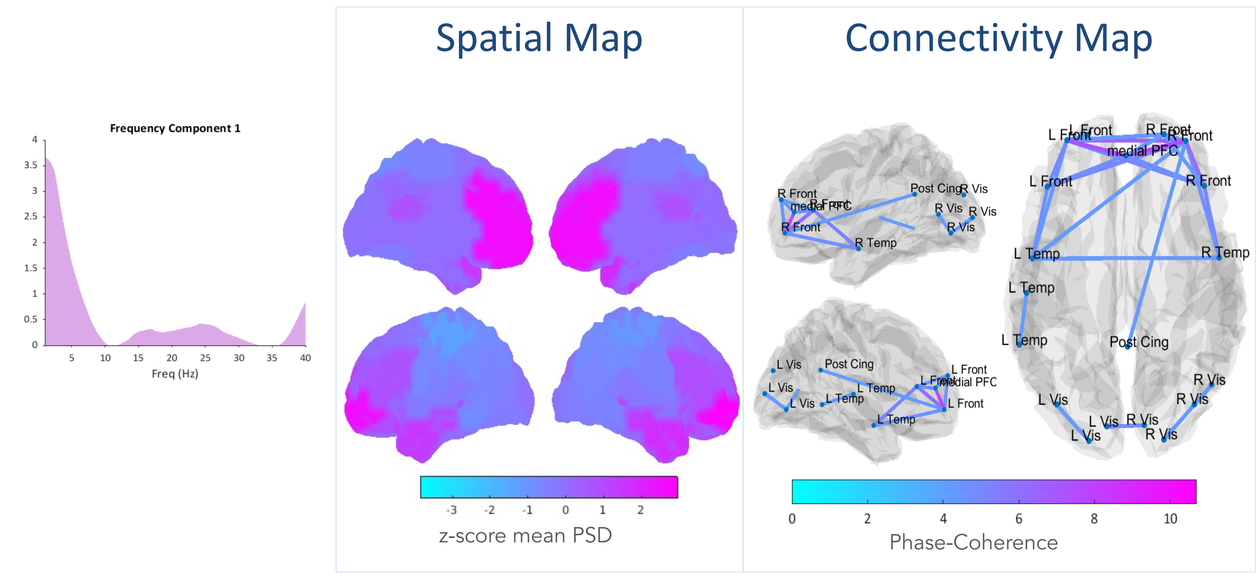
We apply the ERF analysis to investigate how MS alters the time course of the prefrontal brain network characterizing WM dynamics.

RESEARCH FRAMEWORK

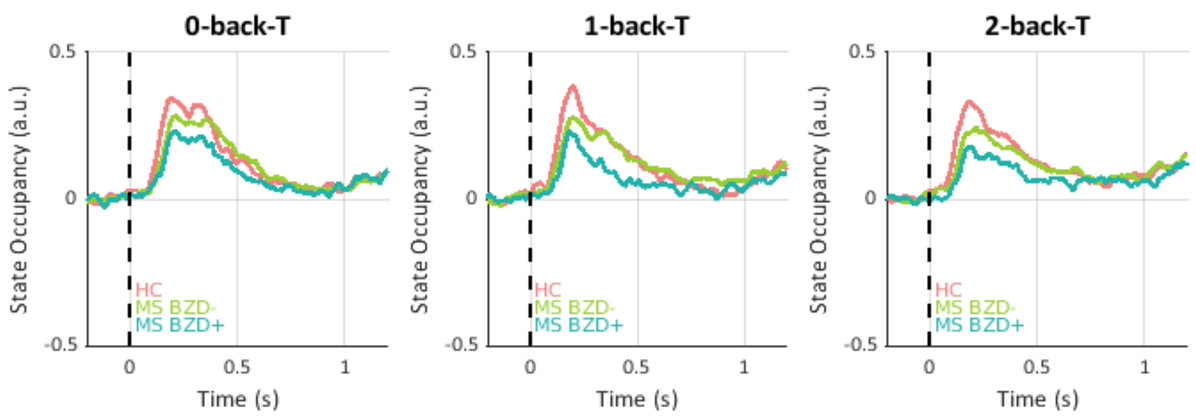


The HMM prefrontal state presents an altered ERF wave in MS: the reduced and delayed theta prefrontal activation is likely caused by demyelination.

THE TDE-HMM PREFRONTAL STATE



SPECTRAL PROFILES. This state recruits prefrontal regions and the posterior cingulate, and the peaks of mean power spectral density (PSD) is in the low frequency spectrum (left plot). In the same frequency range, these regions synchronize as shown by the connectivity map.



TEMPORAL PROFILES. The temporal dynamics of this state is displayed for the 3 groups: HC, MS BZD- (patients treated with benzodiazepine) and MS BZD+ (patients treated without benzodiazepine); we observe the three paradigm conditions (0, 1, 2-back) for the target trails.

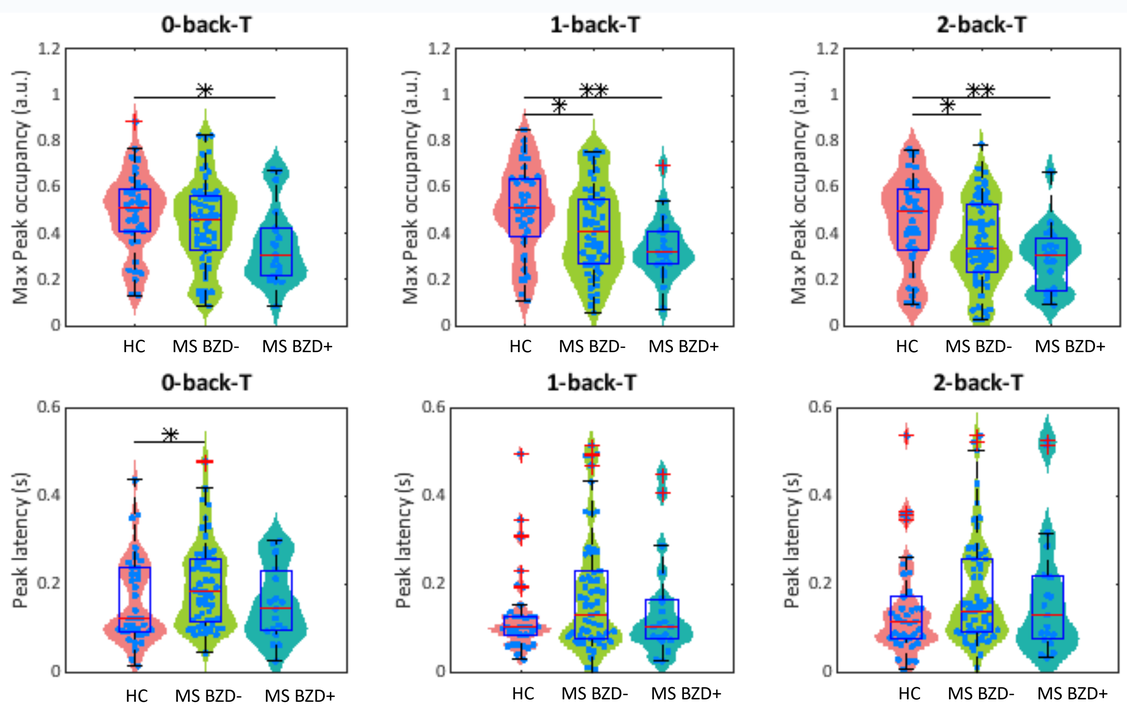
DISCUSSION

In agreement with the literature, the MS group shows an early decreased excitatory theta power during WM stimulus encoding compared to HC[4]:

→This is shown by the lower and delayed peaks of activation of the prefrontal network compared to HC.

→The peak delay can be explained by the increased conduction delay caused by demyelination in MS[2,5].

→This effect is amplified in patients treated with benzodiazepine as the treatment amplifies the inhibitory circuits[5].



PEAKS & LATENCIES. These plots report the peaks (top row) and latencies (bottom row) of the state's time courses for the three groups (HC, MSBZD-, and MSBZD+) in the three target conditions (0, 1, 2-back). *(0.005<p_value<0.05) **(p_value<0.005)

REFERENCES

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4. Riddle J, et al. 2020. Causal Evidence for a Role of Theta and Alpha Oscillations in the Control of Working Memory. *Curr Biol*.
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