THE ROLE OF THETA OSCILLATIONS IN VESTIBULAR GUIDED SPATIAL WORKING MEMORY

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Human navigation involves storing internal representations of self motion and spatial location. The vestibular system plays a crucial role in spatial cognition. Furthermore, theta (4-8Hz) brain oscillations, important in spatial memory processing, are disrupted by vestibular lesions. We hypothesised that theta oscillations are involved in spatial memory encoding during vestibular-guided spatial navigation.

Scalp electroencephalograms (EEG) were recorded in 9 healthy subjects during a vestibular navigation task divided into 3 consecutive memory phases: (i) Encoding (ii) Maintenance and (iii) Retrieval. We hypothesised that theta would be increased during the encoding versus maintenance. Time-series data was analysed using a Welch windowed spectrogram on each individual's data to obtain power spectral density (PSD) and significance ascertained by repeated measures ANOVA and t-tests.

We found a significant PSD increase in electrodes T5 and T6 between encoding and maintenance ($p = 0.03$ and 0.02 respectively).

Our data supports the evidence that human temporal cortex is involved in encoding vestibular motion signals and that the related neural synchronisation occurs at the theta frequency.