Alpha power indexes working memory load for durations

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Seminal models of explicit duration perception include a working memory component, serving the comparison between just encoded durations and durations stored in long-term memory. Yet, neither time perception models, nor time memory models provide clear predictions as to the representation of duration in memory. Previously, we have been able to show based on a novel n-item delayed reproduction task, that the precision of duration recall decreases with the number of items to be remembered in sequence, but not with the duration of the sequence (Herbst et al., 2025). This suggests that durations are maintained as discrete items, rather than a continuous temporal code. Here, we investigated the neural signatures of a sequence of durations (n-item sequence) held in working memory. We recorded human participants using magnetoencephalography (MEG) while they performed the n-item delayed reproduction task, which required to encode a sequence of durations, maintain it, and then reproduce it. The number of items in a sequence (one or three) and the duration of the sequence were varied orthogonally. Our results show that during working memory maintenance, the number of durations, but not the duration of the sequence, affected recall precision and could be decoded from alpha and beta oscillatory activity. Parieto-occipital alpha power showed a direct link with the precision of temporal reproduction. Our results extend the earlier behavioral findings suggesting that durations are itemized in working memory and that their number, not their duration, modulates recall precision. Crucially, we establish that alpha power reflects a universal signature of working memory load and mediates recall precision, even for abstract information such as duration.

Keywords: duration perception, working memory, alpha oscillations, beta oscillations, duration reproduction