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Supplemental information

Encoded and updated spatial working memories share a common representational format in alpha activity

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SUPPLEMENTAL INFORMATION

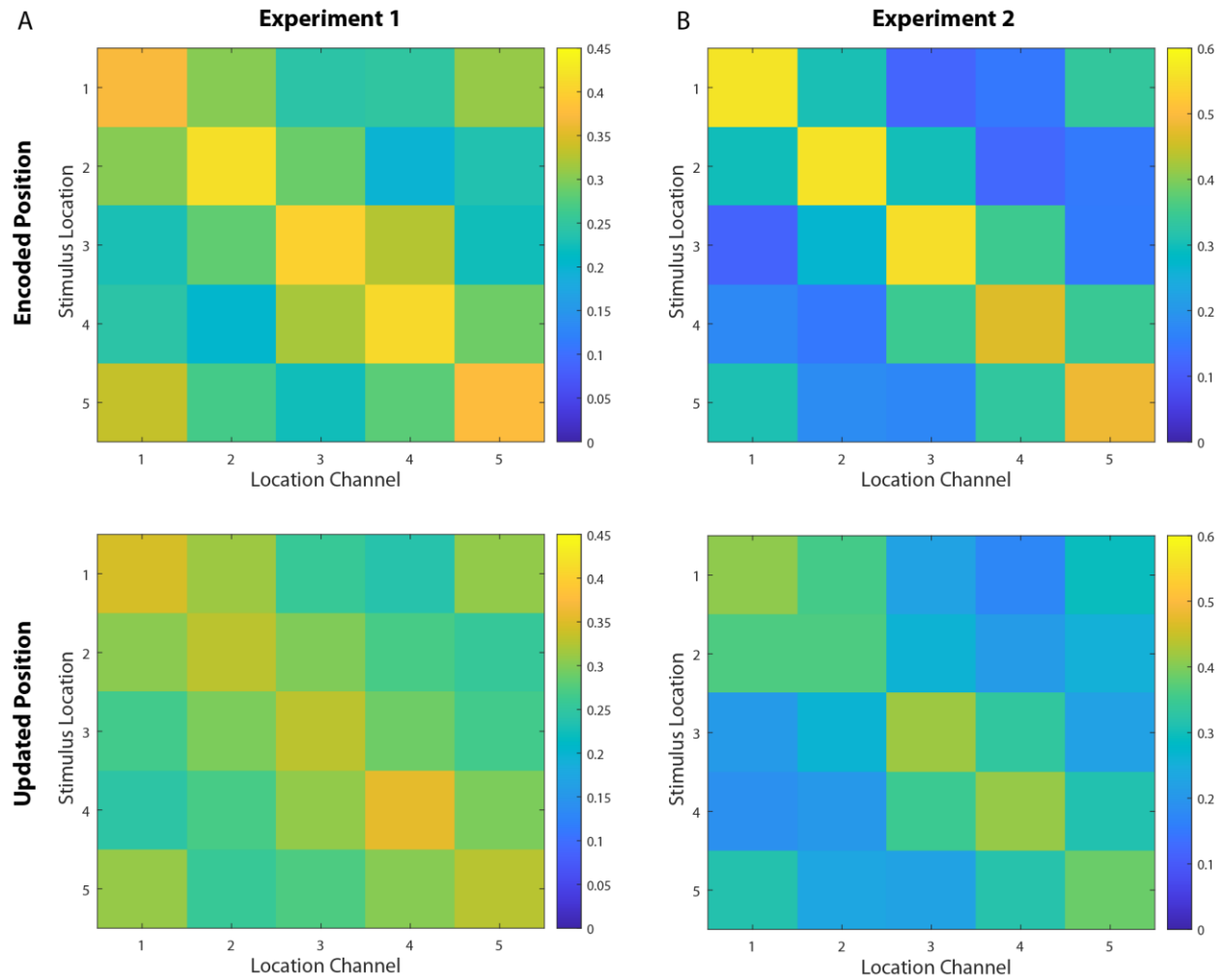


Figure S1. Unshifted channel responses, related to Figure 2

Unshifted channel responses reconstructed from alpha-band power separately for the encoded position, averaged during the initial retention, and the updated position, averaged during the second retention interval in (a) Experiment 1 and (b) Experiment 2. For each time window, the peak response was at the channel tuned for that position. This result suggests that the topography of alpha power tracked the precise location held and updated in working memory.

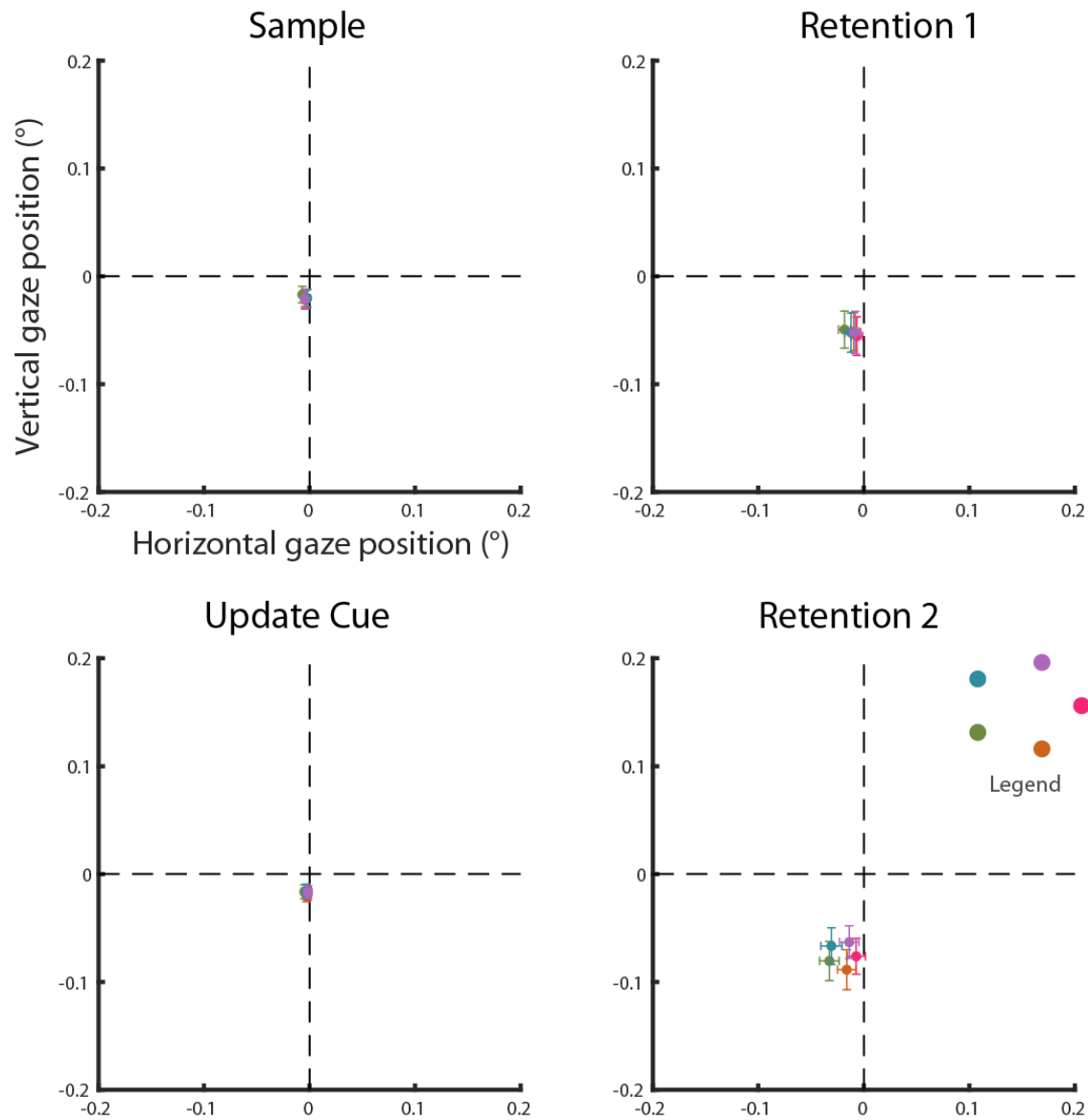


Figure S2. Residual gaze positions, related to EEG Analyses, related to the section “Eye movements do not account for the location selectivity in the EEG signal”

Residual gaze positions after artifact rejection in Experiment 2, averaged for the time windows of the sample display, first retention, update cue, and second retention. The legend illustrates the arrangement of the 5 positions for the encoded position (top panel) and the updated position (bottom panel). Residual gaze positions, given in visual degrees, were very small and systematically varied with the memory positions for the initial position during retention 1 ($p_s = 0.043$ and 0.722 for horizontal and vertical positions, respectively) and for the updated position during retention 2 ($p_s \leq 0.001$ for horizontal and vertical positions) but not during the memory display or the update cue ($p_s > 0.19$) as revealed with a repeated measures ANOVA with 5 positions as levels. These systematic variances were also very small (the largest difference across gaze positions being around 0.025 visual degrees).

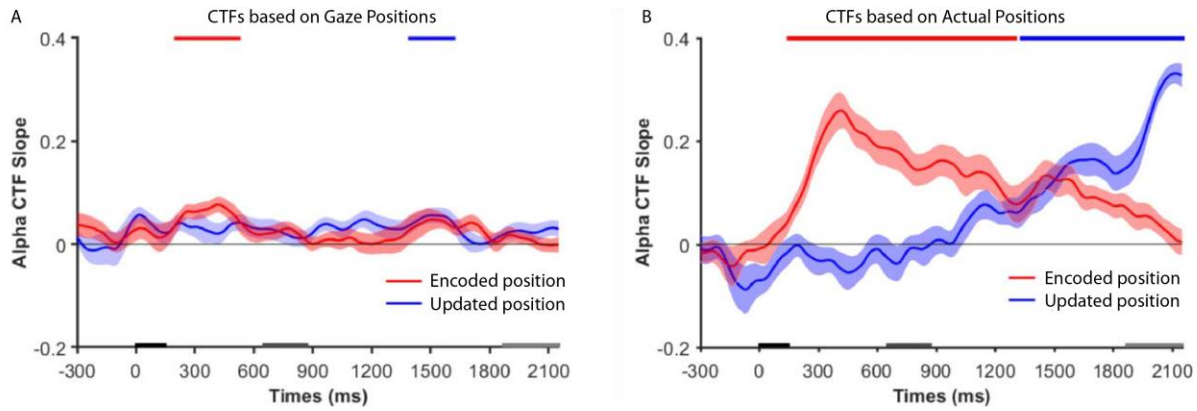


Figure S3. Location selectivity obtained via gaze position vs the actual positions, related to the section “Eye movements do not account for the location selectivity in the EEG signal”

Location selectivity in the EEG, quantified as channel tuning function (CTF) slopes for Experiment 2 and calculated using position bins based on (a) gaze position and (b) actual working memory positions as encoded and updated in the experiment. Encoded and updated positions are shown in different colors. The markers along the top of the panels indicate the time points at which the CTF slopes were reliably above chance for the encoded (red) and updated (blue) positions, as indicated by a cluster-based permutation test ($p < 0.05$; two-tailed). Shaded error bars show the bootstrapped standard error of the mean CTF slope. These results show that eye movements alone cannot account for the location selectivity in the EEG signal.

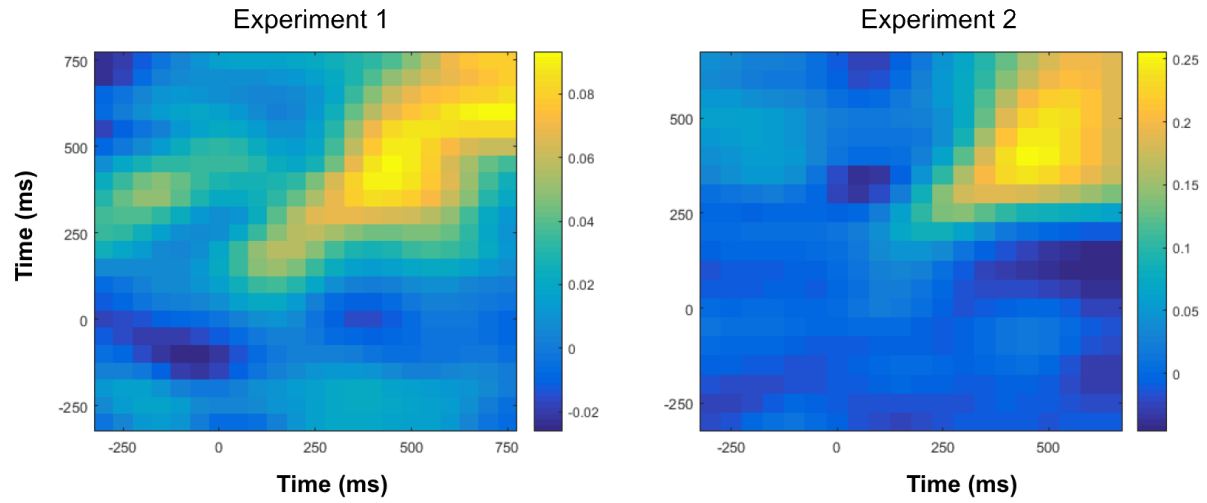


Figure S4. Cross-temporal CTF slopes, related to STAR methods.

Cross-temporal CTF slope prior to the onset of the update cue, separately for Experiment 1 (left) and Experiment 2 (right). The CTF slope became stable after about 300 ms in both experiments.