Supplemental materials for *Category-based and location-based volitional covert attention affect memory at different timescales*

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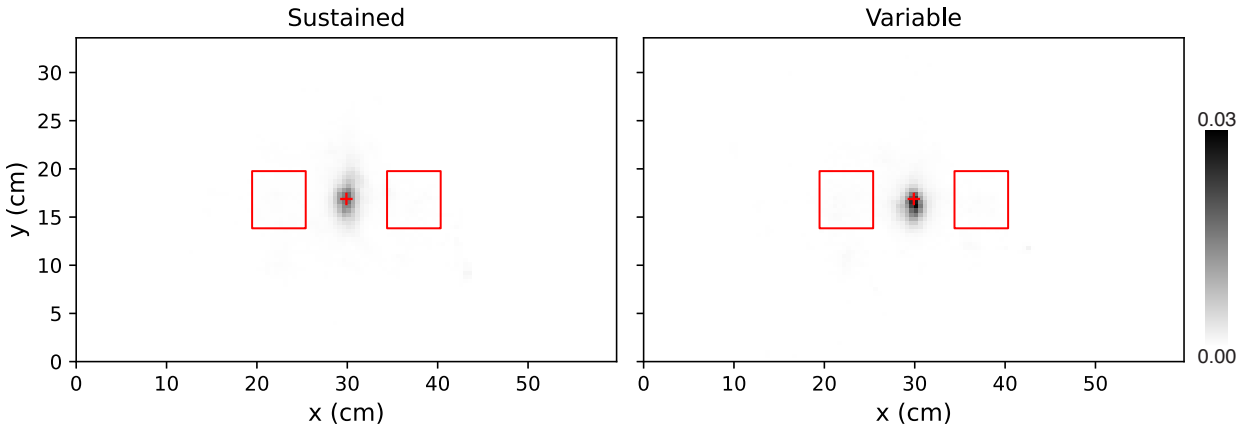

Figure S1: **Gaze location histograms.** We divided the experimental display into 120 horizontal bins and 78 vertical bins, each comprising a roughly 0.5 cm square. The panels display the average proportions of time (throughout the duration of the experiment) participants spend looking at each location. The left panel displays data from participants in the sustained attention condition and the right panel displays data from participants in the variable attention condition. In both panels, the locations of the central fixation cross (red +) and composite images (red-outlined squares) are indicated.

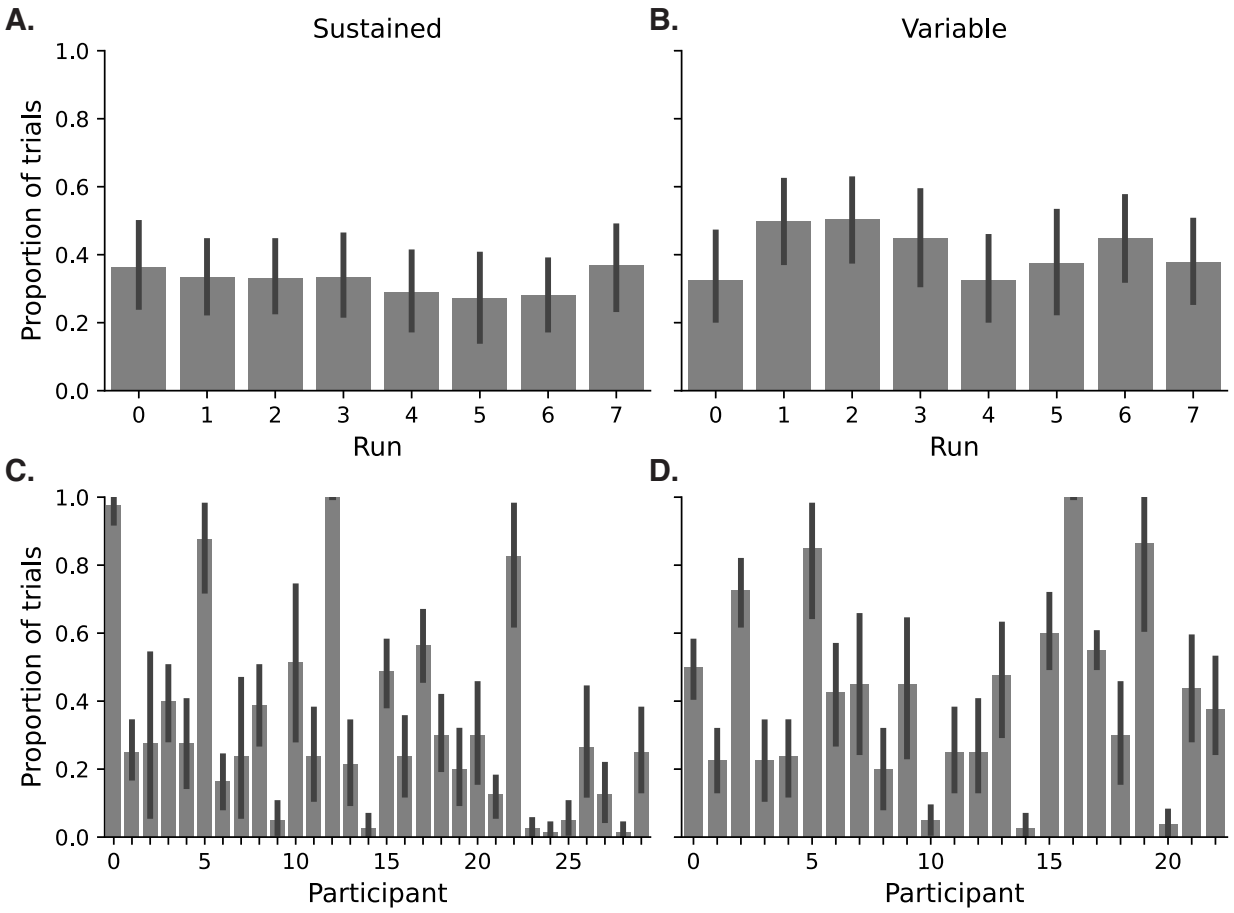

Figure S2: **Proportions of excluded trials.** We excluded from our analyses any images from trials where the participant's gaze touched on any part of the attended composite image (attended-side red squares in Fig. S2). **A–B. Proportions of excluded trials, by run.** Across both experimental conditions (left: sustained attention; right: variable attention), the bars display the average proportions of presentations from each run where participants looked at any part of the attended composite image, for any non-zero duration. Error bars denote across-participant bootstrap-estimated 95% confidence intervals. **C–D. Proportions of excluded trials, by participant.** Across both experimental conditions (left: sustained attention; right: variable attention), the bars display the average proportions of presentations across different runs where the given participants looked at any part of the attended composite image, for any non-zero duration. Error bars denote across-run bootstrap-estimated 95% confidence intervals.

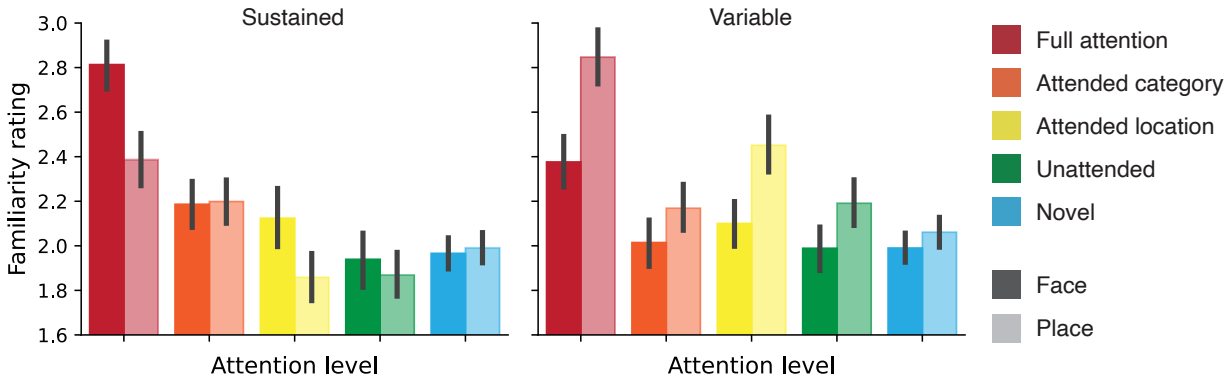

Figure S3: **Familiarity by attention level and stimulus category.** The bars display the average familiarity ratings participants gave to images from the same category and location as the attention cue (fully attended), the same category (but opposite location) as the attention cue (attended category), the same location (but opposite category) as the attention cue (attended location), the opposite category and location as the attention cue (unattended), or novel images. Each family of bars is further sub-divided according to whether the rated stimulus was a face (darker shading) or a place (lighter shading) image. The left panel displays familiarity ratings from the sustained attention condition and the right panel displays familiarity ratings from the variable attention condition. All error bars denote across-participant bootstrap-estimated 95% confidence intervals. Also see Figure 2 in the main text.

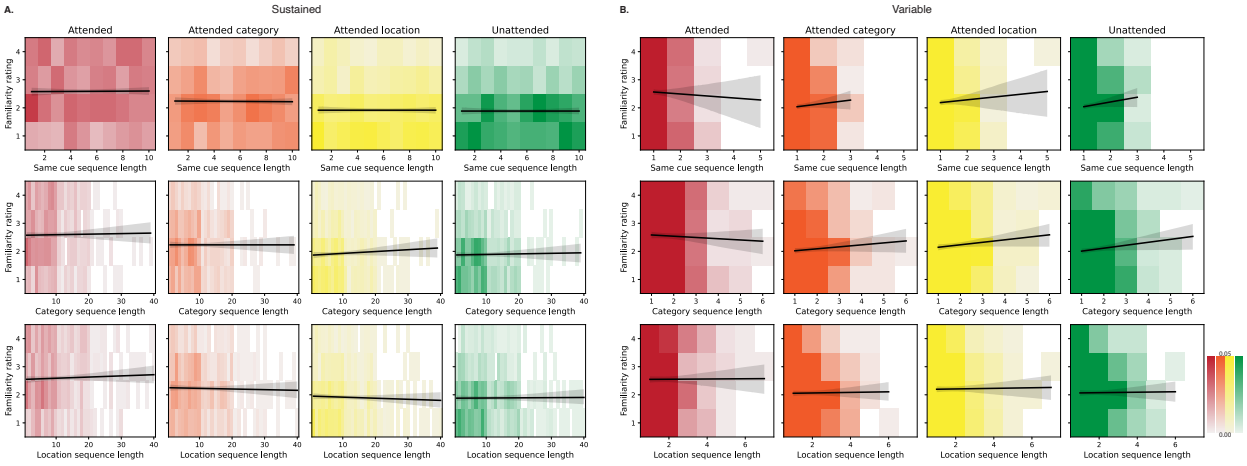

Figure S4: **Effects of attention cue sequence length on familiarity. A. Sequence effects (sustained attention condition).** Each heat map displays the proportions of images that participants rated at each familiarity rating (rows), broken down by the number of successive matching attention cues the participant received at the time the given image was presented as part of a composite pair (up to and including the image's composite pair; columns). The trend lines (with bootstrap-estimated 95% confidence intervals) show regressions fit to the corresponding heatmap's data (x: sequence length; y: familiarity rating). Heat maps are organized into rows based on how the sequence lengths were computed (top row: successive attention cues had the same category and location; middle row: successive attention cues had the same category; bottom row: successive attention cues had the same location). Columns (and colors) denote attention levels (as in Figs. 2 and S3). **B. Sequence effects (variable attention condition).** This Panel is in the same format as Panel A, but displays results from the variable attention condition.

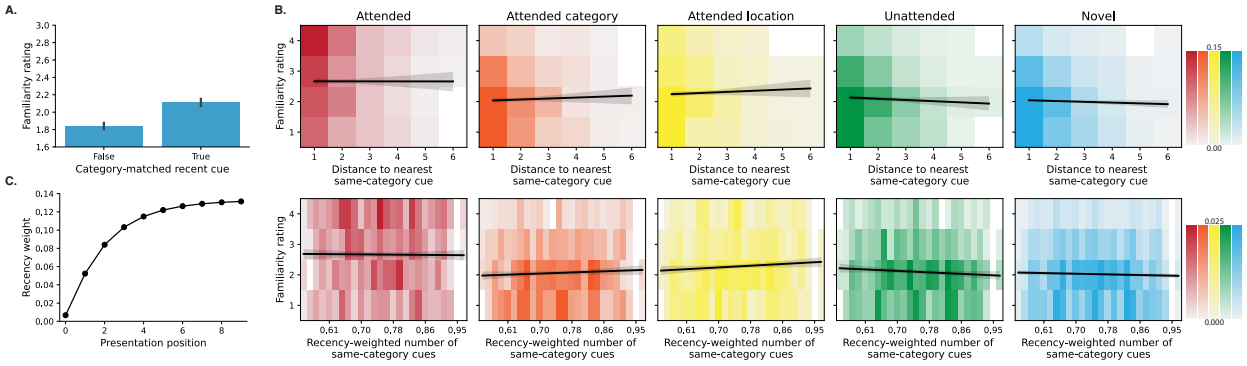

Figure S5: **Response bias analyses. A. Sustained attention condition.** The bars display the mean familiarity ratings participants gave to novel memory probes (lures) that matched ("True") versus did not match ("False") the prior run's attention-cued category. Error bars denote across-participant bootstrap-estimated 95% confidence intervals. **B. Variable attention condition.** Each heat map displays the proportions of images that participants rated at each familiarity rating (rows), broken down by metrics related to recent same-category attention cues participants received on the prior run (columns). The trend lines (with bootstrap-estimated 95% confidence intervals) show regressions fit to the corresponding heatmap's data (x: metrics related to same-category cues; y: familiarity rating). The top panels's columns reflect the temporal distances to the most recent same-category attention cues, measured in numbers of presented items (where 1 denotes the final item on the most recent run). The bottom panel's columns denote the recency-weighted average numbers of same-category cues presented on the most recent run. Each column of matrices corresponds to a different attention level, as in Figures 2 and S3. **C. Weights by recency.** The panel displays the weights used to compute recency-weighted numbers of same-category cues on the most recent run. The x-axis displays the presentation positions of each attention cue, and the y-axis displays the weight assigned to same-category cues at the given presentation position. The weights are first computed using $w = \max\left[1 - \exp\{-\frac{x}{\tau}\}, \epsilon\right]$, where $\tau = 2$, $\epsilon = 0.05$, and x is the cue's presentation position. To obtain the y-values shown in the Panel (and used in Panel B), the weights for $x \in [0, 1, 2, ..., 9]$ are normalized to sum to 1.