Expectations developed over multiple timescales facilitate visual search performance

Supplementary Materials

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Detection performance comparison between experimental sessions

We investigated whether subjects’ detection performance was different between the first and second sessions of the experiment. Regarding subjects of the control group, we conducted a three-way within-subjects ANOVA between location, session, and subjects. There was no significant effect of session on detection performance ($p = 0.49$) and no significant interaction of location*session ($p = 0.76$).

Regarding subjects of the bimodal group, we conducted a four-way within-subjects ANOVA between stimulus location, session, frequency of location, and subjects. There was no significant effect of session on detection performance ($p = 0.64$) and no significant interaction of location*session ($p = 0.81$) or session*frequency ($p = 0.06$), but there was a significant effect of frequency ($p = 0.007$, see main text).

Supplementary Figure 1. Detection performance comparison between experimental sessions. (A) The fractions of correctly detected stimuli are plotted against presented stimulus location for the control group in the first experimental section (black solid line) and in the second experimental session (black dashed line). (B) The fractions of correctly detected stimuli are plotted against presented stimulus location for the frequent and non-frequent conditions of the bimodal group in the first experimental section (red and green solid lines respectively) and in the second experimental session (red and green dashed lines). Results are averaged over all subjects and error bars show within-subject standard error.
Frequency of a stimulus presentation at the same location $n$-trials back

Supplementary Figure 2. Frequency of a stimulus presentation at the same location $n$-trials back. The number of times a stimulus was presented at the same location in the current trial and in the $n$-trial back for the control group (black), and for frequent (red) and non-frequent (green) conditions of the bimodal group. Results are averaged over all subjects and error bars show within-subject standard error.

Simulations of the Bayesian model with a uniform prior

Supplementary Figure 3. Simulations of 16 ‘observers’ presented with the same stimuli as the experimental subjects using a uniform prior over all presented locations: for each location $i$, $\text{prior}(s) = b \cdot (1/12)$, where $b$ is the fraction of trials in which a stimulus is presented ($b = 0.7$).