Supplemental Figures and Legends:

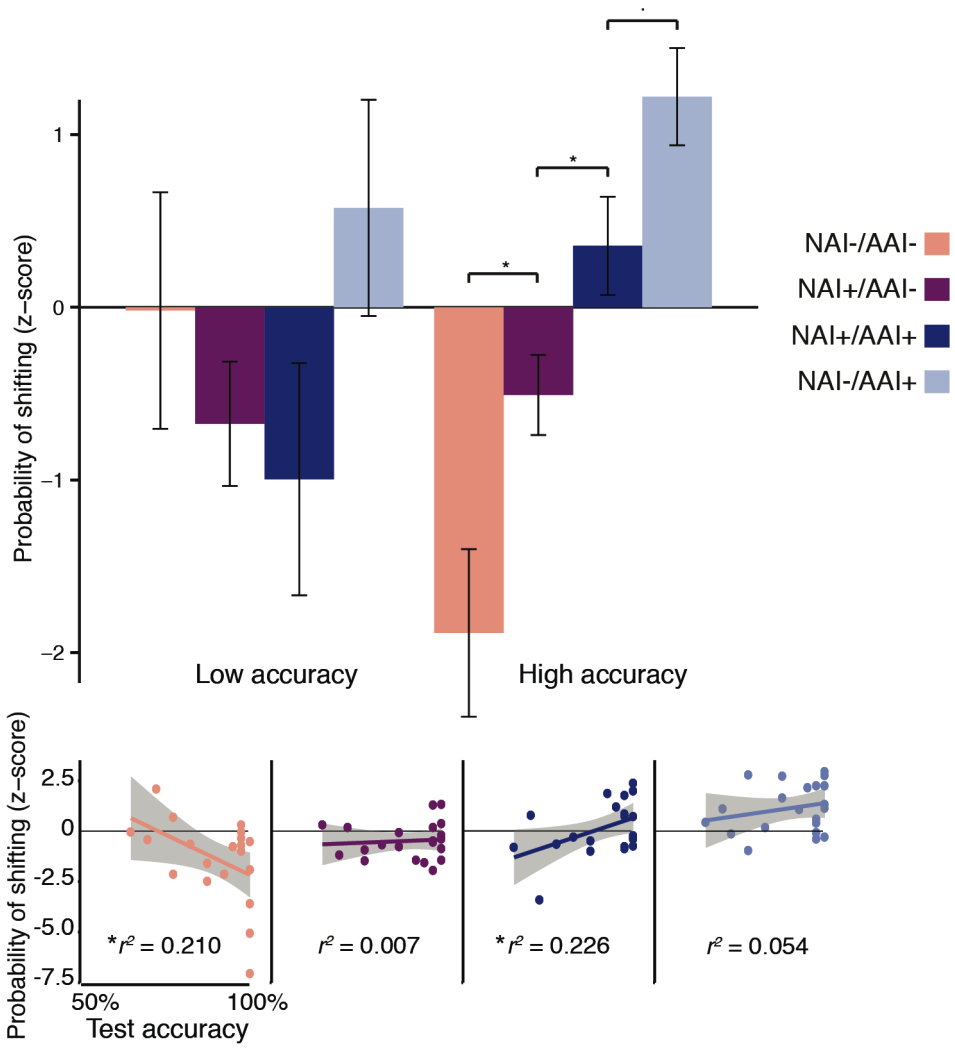

Figure S1. Sensitivity of exploration decisions to modeled information in the fMRI subsample, related to Figure 4. Behavioral results for the fMRI subsample demonstrate similar overall patterns as reported for the full sample in Figure 4, including the distinction between high-accuracy and low-accuracy subjects. Furthermore, there was no significant interaction between the probability of shifting for the four information trial types and whether subjects were in the fMRI subsample or in the non-fMRI subsample [$F(3,156)=1.204, p=0.310$]. Likewise, two-sample t-tests of probability of shifting between behavioral and fMRI high-accuracy subjects were not significant for each of the four information trial types. As shown by the scatter plots, the fMRI subsample also demonstrated similar patterns between shifting behavior and later memory performance as indicated for the full sample in Figure 4. Background shading on linear fits represents 95% confidence intervals. Error bars represent s.e.m.

. $p < 0.1$, * $p < 0.05$.

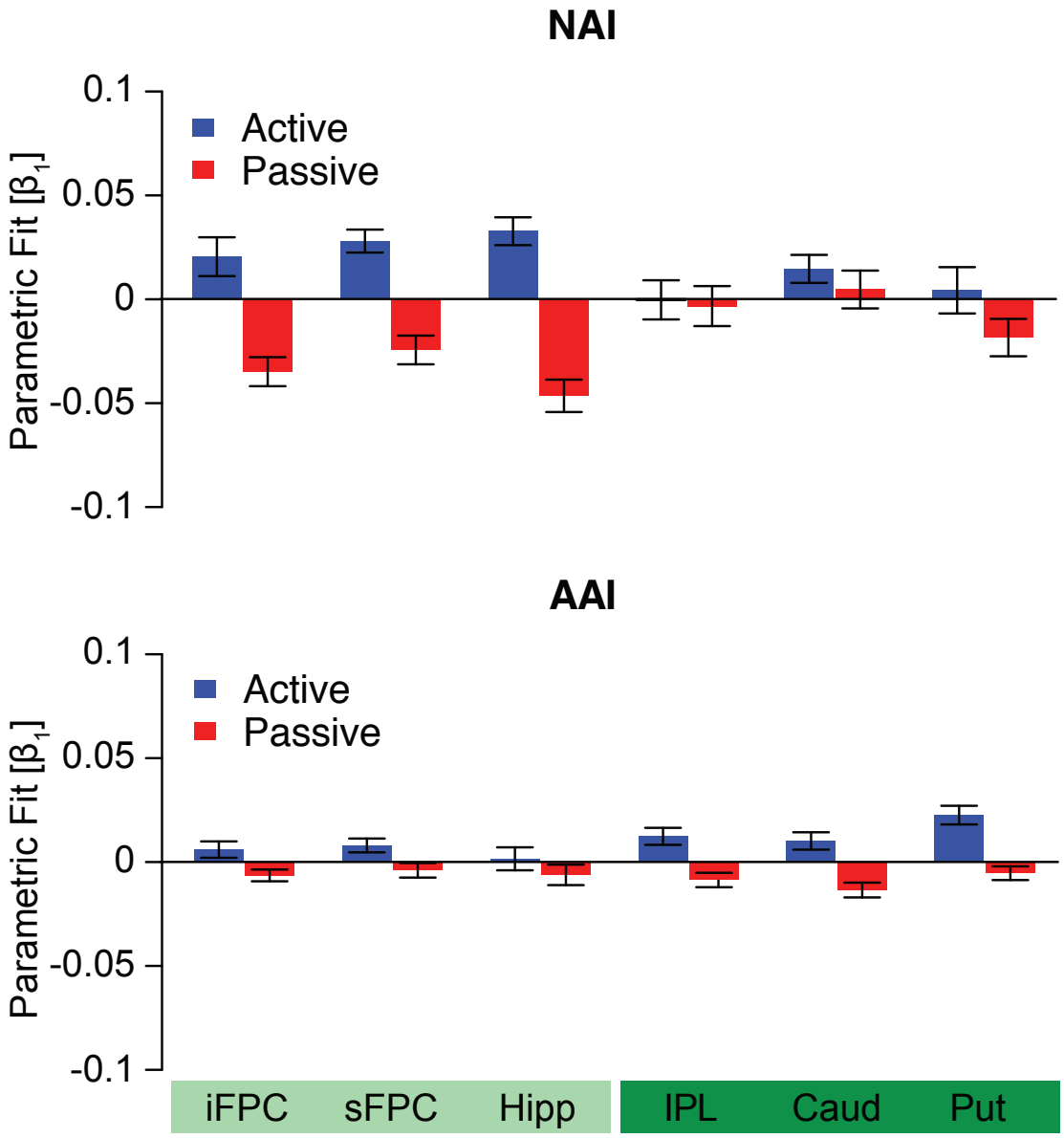

Figure S2. NAI- and AAI- related activity estimates for the Active and Passive conditions for the six regions identified in Figure 6. Beta values for fit to NAI and AAI parametric regressors for the 6 regions identified are shown separately for the Active and Passive conditions. Error bars represent s.e.m.

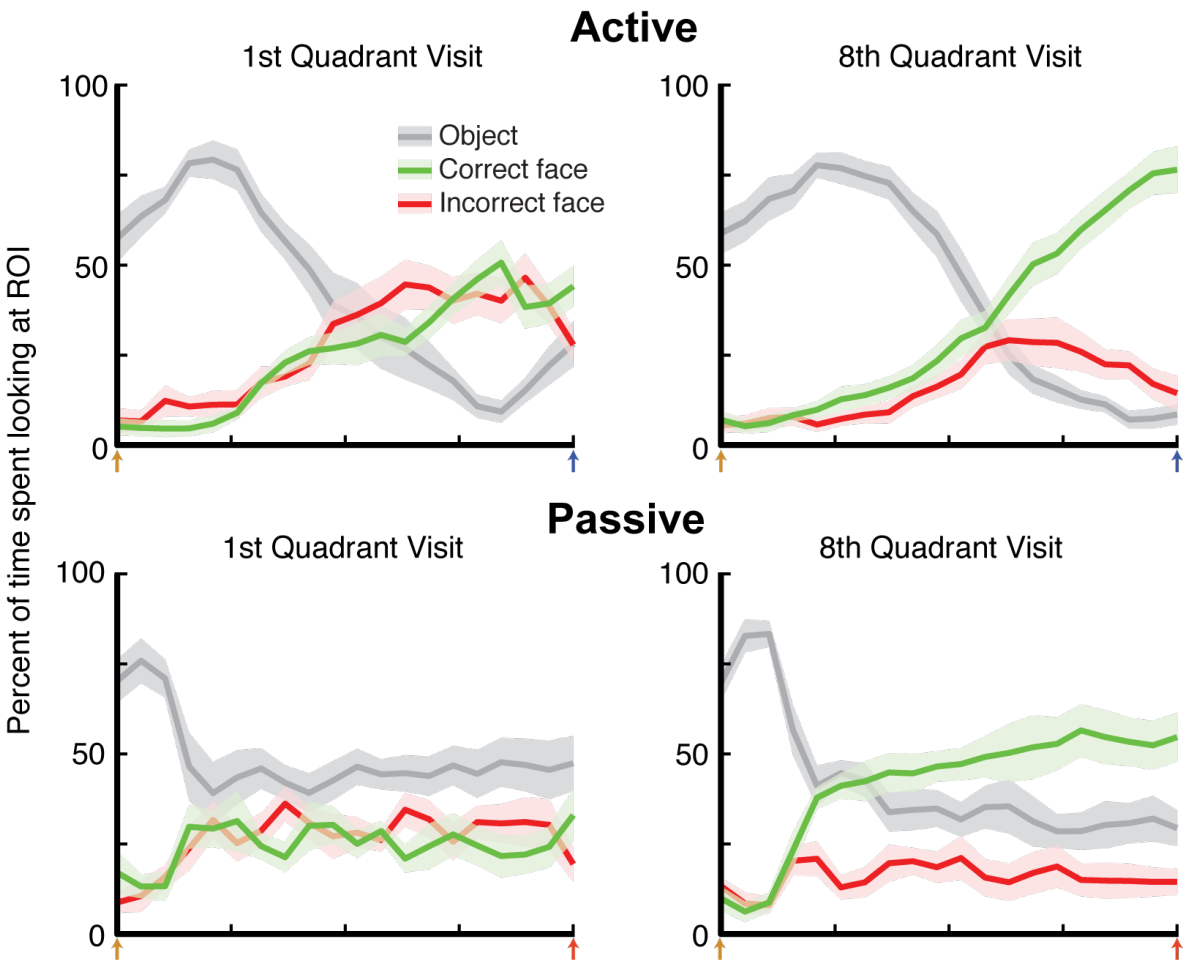

Figure S3. Viewing of target faces increases with subsequent visits to the same quadrant, related to Figure 7. (**top**) Analyses of eye-tracking data during the face selection period of the Active Learning condition shows that, upon first visiting a quadrant for the first time (**left**), there is no preference for viewing the target face. Upon the eighth visit (**right**), there is a clear preference for viewing the target face over the foil face, indicating that eye-movement measures of preferential target viewing demonstrate memory processing. (**bottom**) The same analyses for the Passive Learning condition yield similar results. Yellow arrows denote onset of stimulus presentation, blue arrows denote face selection during Active condition, and red arrows denote onset of feedback for the Passive condition (5 s after stimulus presentation). Shading indicates error bars (s.e.m.).

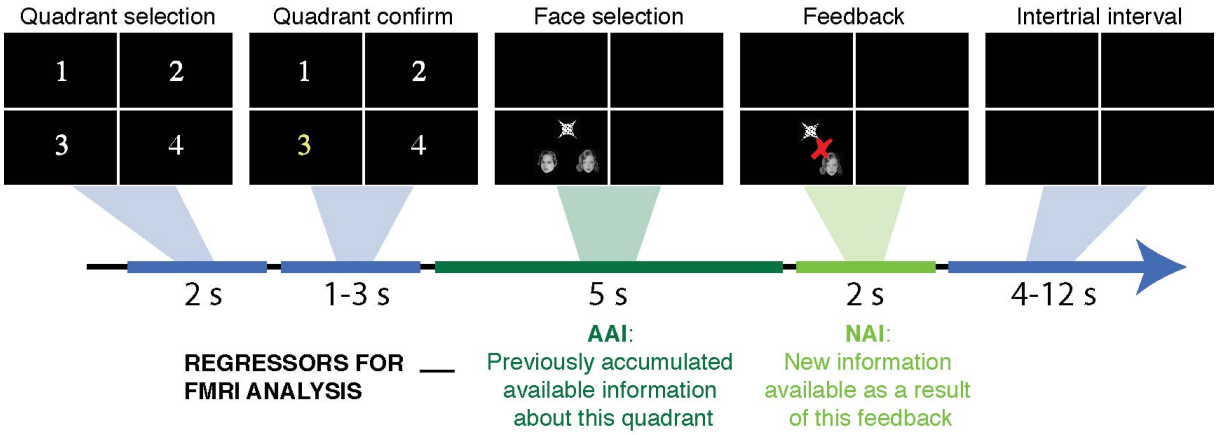

Figure S4. Description of trial timing for fMRI analyses, related to Experimental Procedures. Trials for both analyses were modeled by using a regressor of event onsets generated by convolving a boxcar function of 3-s duration with a canonical hemodynamic response function. For the information intake analysis, event onsets were at the beginning of the Feedback period and were amplitude modulated by information intake values, with accumulated information values regressed out as a nuisance factor. For the accumulated information analysis, event onsets were at the beginning of the Face Selection period and were amplitude modulated by accumulated information values, with information intake values regressed out as a nuisance factor.

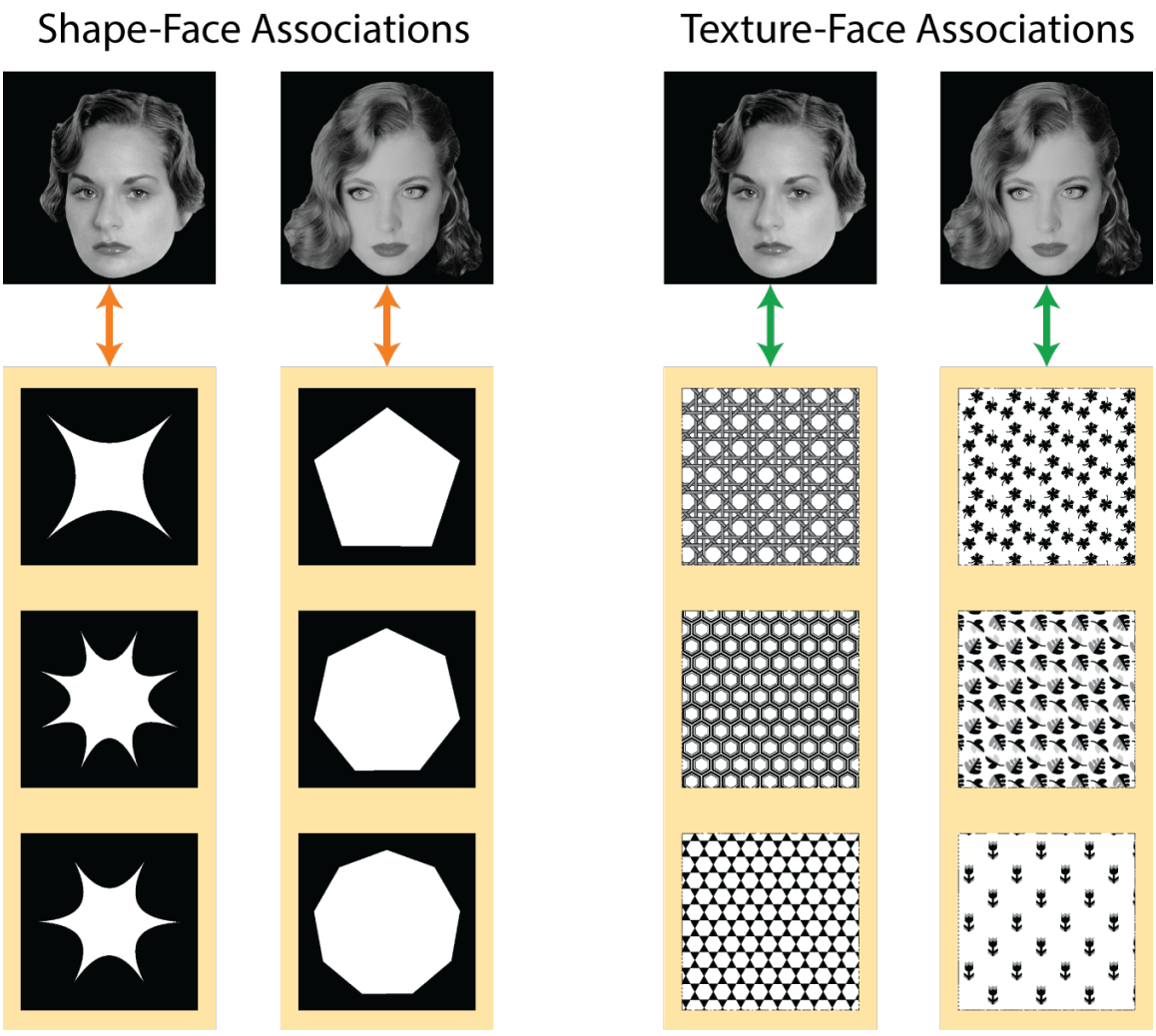

Figure S5. Example set of face-object feature associations for one block, related to Experimental Procedures. Two faces are associated with two shape categories (e.g. starry shapes and polygonal shapes) and two texture categories (e.g. white circle textures and dark leafy textures). Each category has three exemplars. Color of arrows indicates either face-shape association (orange) or face-texture association (green), as in Figure 1A.

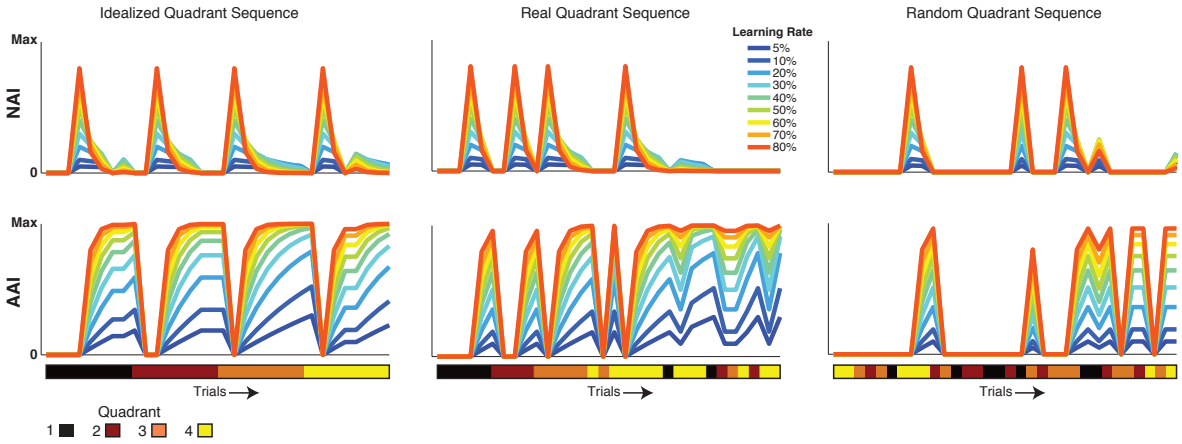

Figure S6. Scaling of NAI and AAI with learning rate values, related to Experimental Procedures. Varying the learning rate between 5% and 80% monotonically scales information intake and almost linearly scales overall accumulated information. Therefore, the choice of learning rate did not meaningfully affect the behavioral results (which depend only on a presence or absence of NAI and AAI, not their specific values). Further, changing the learning rate within moderate ranges (30%-60%) did not significantly change fMRI results, and only significantly affected fMRI results at extreme values.