

Figure S1. Activity related to Choices, Rewards, and their Conjunctions in Past Trials, Related to Figure 3. Each row of panels shows the time course of signals related to the animal's choice (top), reward (middle), and its conjunction (bottom) in different cortical areas. The fraction of significant neurons for each variable is shown for up to 3 trials in the past. Symbols indicate significantly greater than chance (1-tailed binomial, $p < 0.05$).

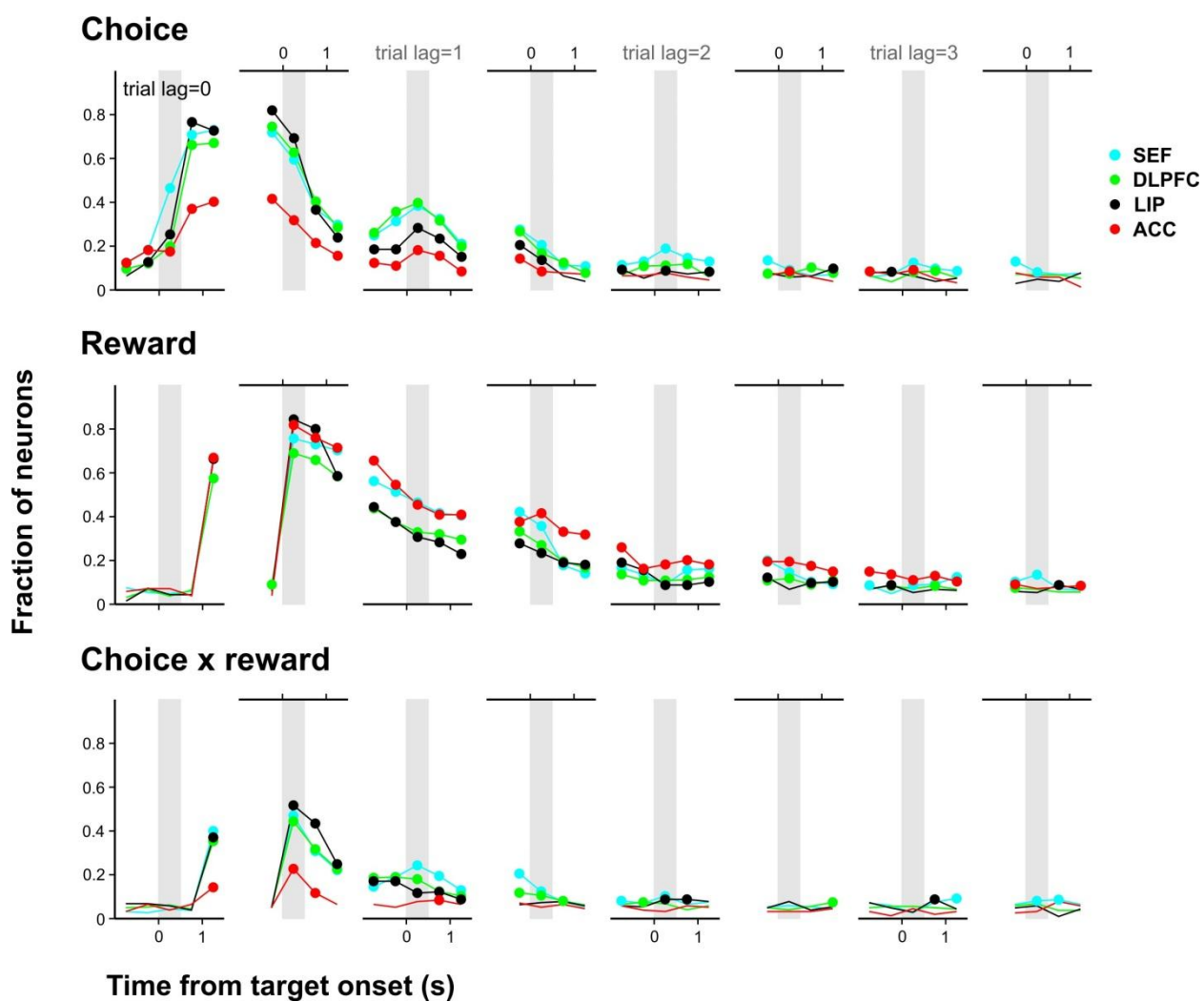


Figure S2. Relationship between Neural and Behavioral Biases, Related to Figure 5.

Scatter plots show the session-by-session or block-by-block relationship between behavior and neural biases, averaged separately for each combination of animal and cortical area. **A.** Left panel plots the increase in the decoding accuracy for the previous choice after rewarded vs. unrewarded trials against the probability of switching in the same session. Right panel plots the same difference in the decoding accuracy against the sum of the win and loss parameters for the modified reinforcement learning model (see Experimental Procedures). **B.** The difference in the decoding accuracies estimated for smaller blocks of trials is plotted against the correlation coefficient between the difference in decoding accuracies and the probability of switching. Asterisks indicate significant correlation coefficient ($p < 0.05$), which was found only for the SEF.

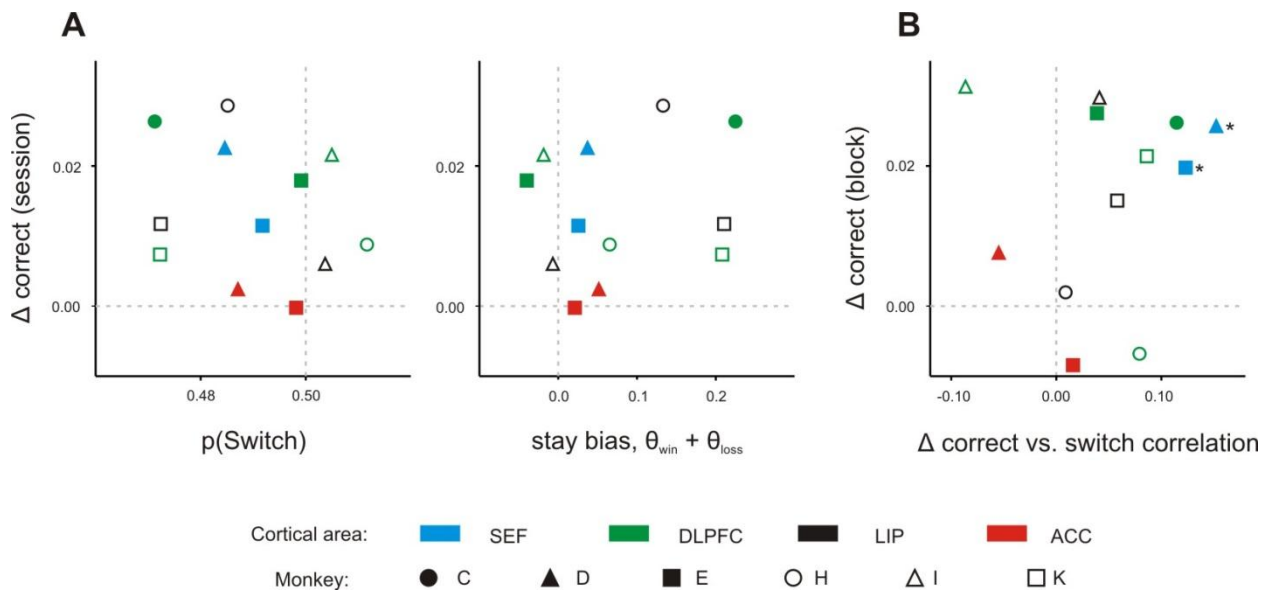


Figure S3. Location of the Neurons Recorded in the SEF, Related to Figures 3, 5, and 7.
Sites in which saccades were evoked by electrical stimulation are indicated by dashed lines.

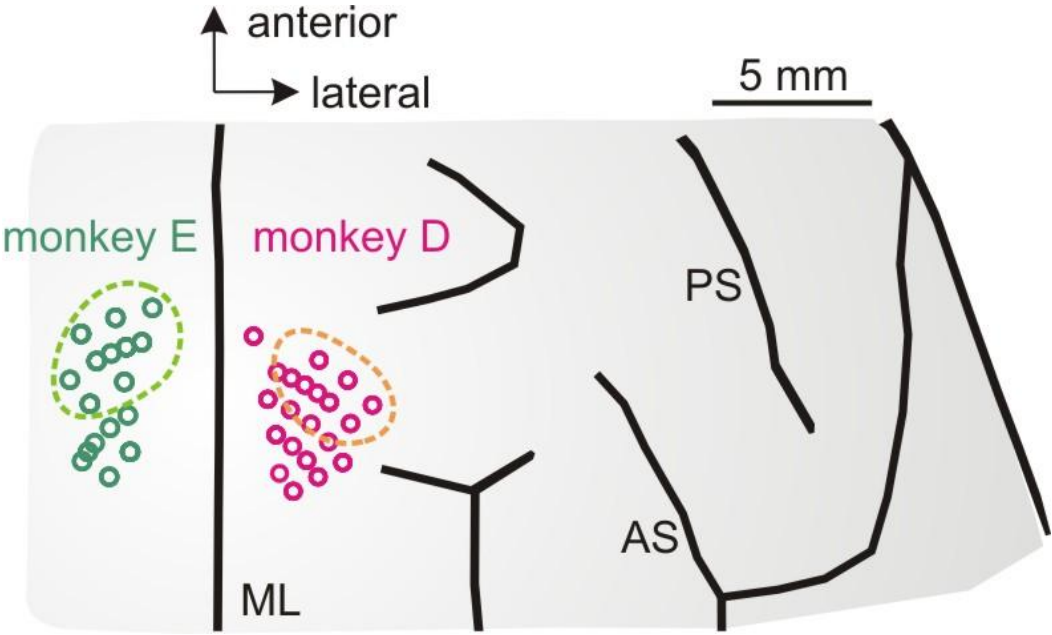


TABLE S1. Summary of Neural Data, Related to Figure 2 and Table 1. Each entry contains the number of neurons recorded (**bold**), sessions, and trials. In some sessions (monkeys H, I, and K), neurons were recorded from the DLPFC and LIP simultaneously.

monkey	SEF	DLPFC	LIP	ACC	Total
C		45 / 21 (18,003)			45 / 21 (18,003)
D	98 / 39 (28,893)			77 / 40 (26,579)	175 / 79 (55,472)
E	87 / 30 (23,779)	88 / 44 (25,884)		77 / 37 (26,729)	252 / 111 (76,392)
H		21 / 10 (3,035)	66 / 31 (11,036)		87 / 32 (11,223)
I		91 / 41 (26,362)	82 / 32 (19,483)		173 / 47 (29,549)
K		77 / 24 (7,758)	57 / 27 (8,479)		134 / 29 (9,589)
Total	185 / 69 (52,672)	322 / 140 (81,042)	205 / 90 (38,998)	154 / 77 (53,308)	866 / 319 (200,228)