Behavioral and Neural Changes Following Gains and Losses of Conditioned Reinforcers

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Supplemental Material

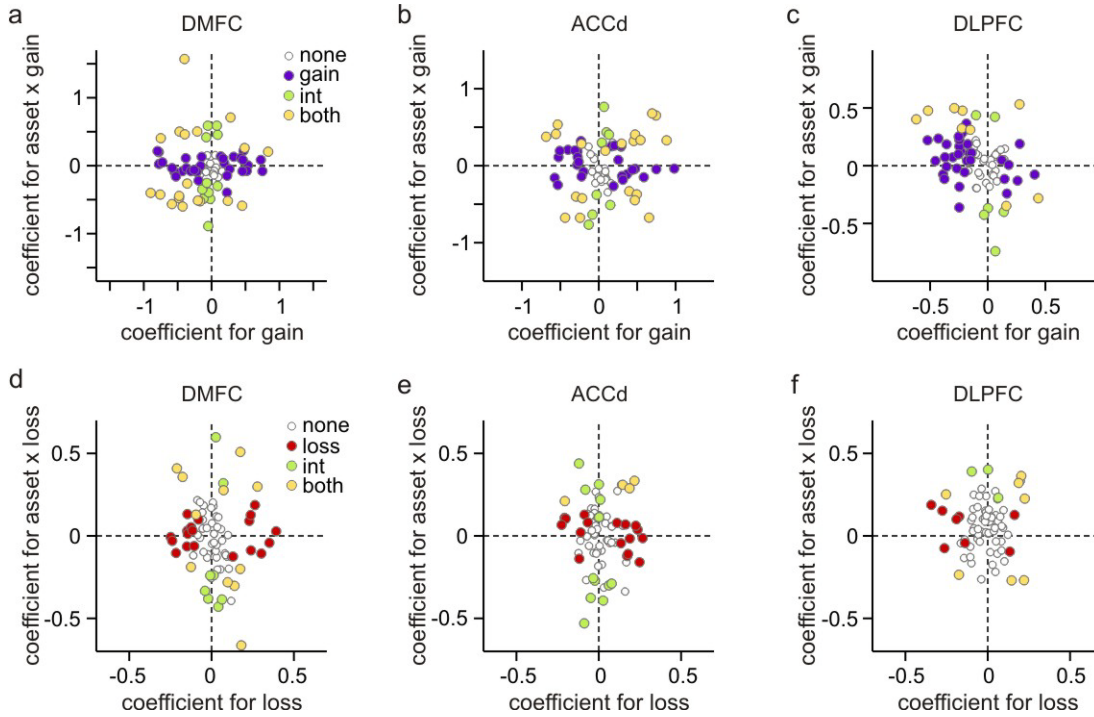Effects of feedback colors on neural activity related to gains and losses

Both neurons illustrated in Figure 7 of the main manuscript significantly increased their activity during the feedback period in gain trials compared to the activity in neutral trials despite the changes in the colors of feedback rings. In addition, the DLPFC neuron shown in Figure 7b significantly increased its activity in loss trials regardless of the colors of the feedback rings. Overall, the standardized regression coefficients related to gains that were estimated for the original colors were significantly and positively correlated with those estimated for the second set of colors (Spearman's r=0.76, p<0.001; Supplemental Figure 1). The value of Spearman's rank correlation coefficient for these two different estimates of gain effect was 0.70, 0.79, and 0.74 for DMFC, ACCd, and DLPFC, respectively. This positive correlation was significant for ACCd (n=20 neurons) and DLPFC (n=32 neurons), when the neurons recorded in each area was analyzed separately. The same correlation was not significant for the DMFC, presumably due to the small number of neurons (n=5) tested for both sets of colors. The correlation for the regression coefficients related to losses were weaker, but still statistically significant when the results from all cortical areas were combined (Spearman's r=0.25, p<0.05; Supplemental Figure 1). The value of Spearman's rank correlation coefficient for losses was 0.30, 0.42, and 0.21, for DMFC, ACCd, and DLPFC, and this was statistically significant only for ACCd.
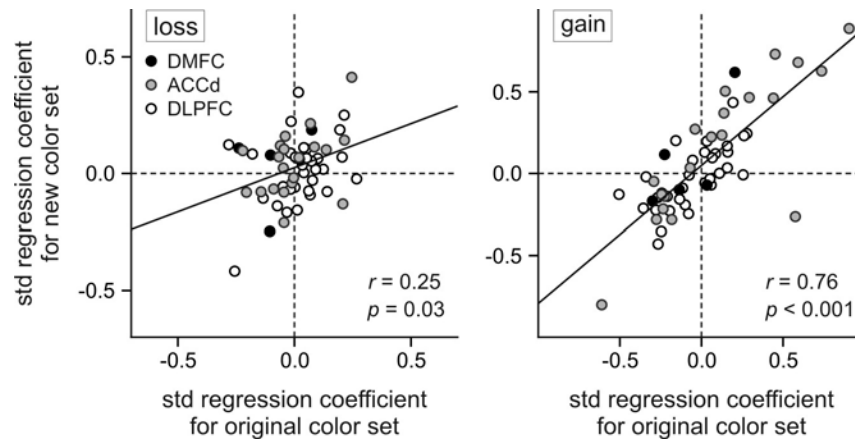
Supplemental Figure 1. Effects of feedback ring colors on activity related to gains and losses. Standardized regression coefficients associated with gains (losses) estimated using the original and new colors for the feedback rings are plotted. Different symbols indicate the neurons recorded from different cortical areas. The values within each plot show the Spearman's rank correlation coefficient (r) and its statistical significance (p), and the solid line is the best-fitting regression line.

Supplemental Figure 2. Effects of assets on neural activity related to gains (a-c) and losses (d-f). a-c. Scatter plots showing the standardized regression coefficients associated with asset×gain interaction and the standardized regression coefficient associated with gain outcome. Neurons in which the effect of asset×gain interaction (int) and/or the effect of gain outcome were statistically significant are indicated by different colors. d-f. Scatter plots showing the standardized regression coefficients associated with asset×loss interaction and the standardized regression coefficient associated with loss outcome. Neurons in which the effect of asset×loss interaction (int) and/or the effect of loss outcome were statistically significant are indicated by different colors.