Supporting Online Material for:

Subjective and model-estimated reward prediction: Association with the feedback-related negativity (FRN) and reward prediction error in a reinforcement learning task.

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This file includes:

Supporting online figures for the reliability test of FRN (Figure S1, S2), the FRN results with the models which used a fixed learning rate (S3), comparison of the log-likelihoods between the original dynamic learning rate model and the optimized-fixed learning rate model (S4), and histograms of the correlation coefficient between subjective and objective RPE in the Learnable and Unlearnable conditions (S5).

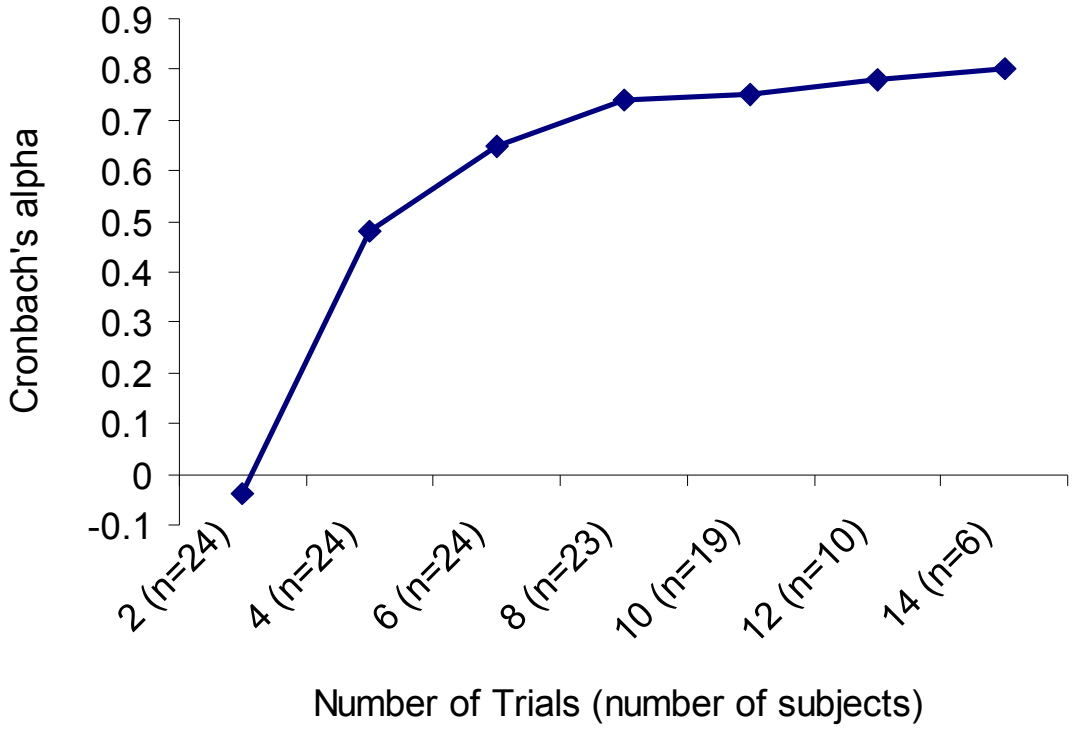

Figure S1. The reliability test (Cronbach's alpha) for the FRN at Cz with each number of trials. The trials were pseudorandomly selected from the trials with negative feedback in the Learnable condition (80/20%) in which subjects had smaller number of negative feedback trials compared in the Unlearnable condition (50/50%). Note that the different number of subjects was included in the calculation of Cronbach's alpha for each number of trials.

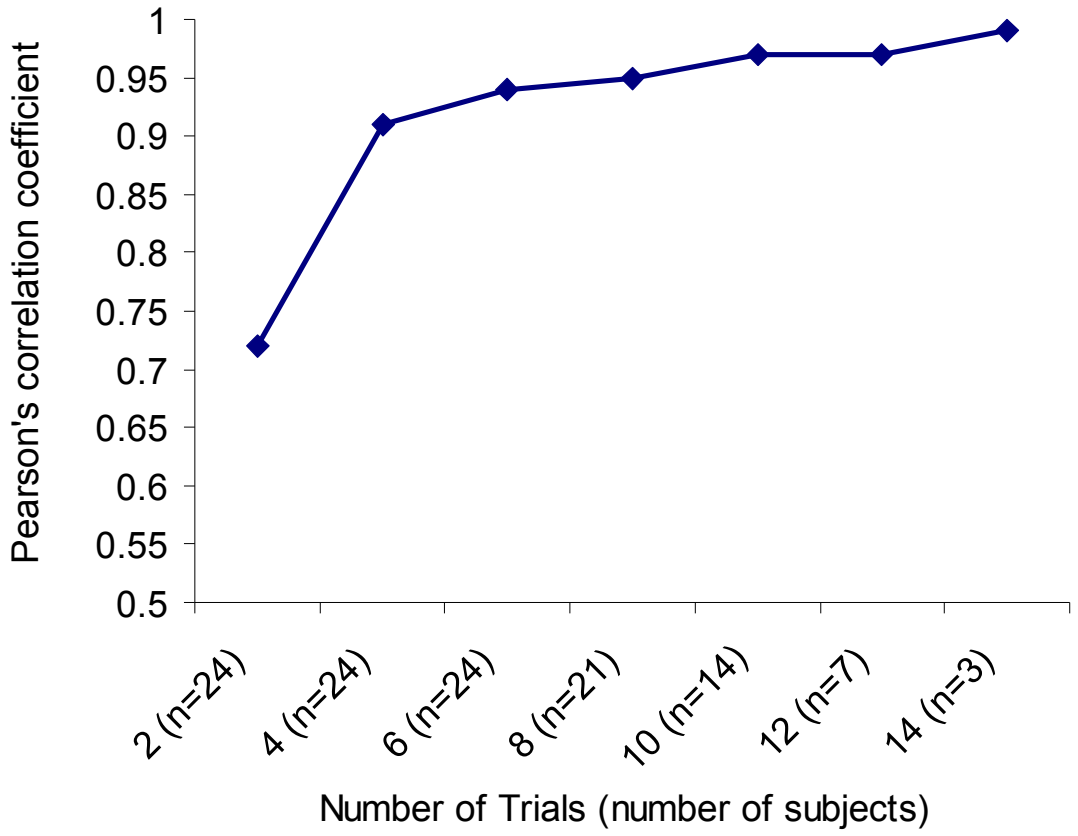

Figure S2. The correlation (Pearson's correlation coefficient) between the FRN from averages based on each number of trials and the grand average FRN at Cz. The trials were pseudorandomly selected from the trials with negative feedback in the Learnable condition.

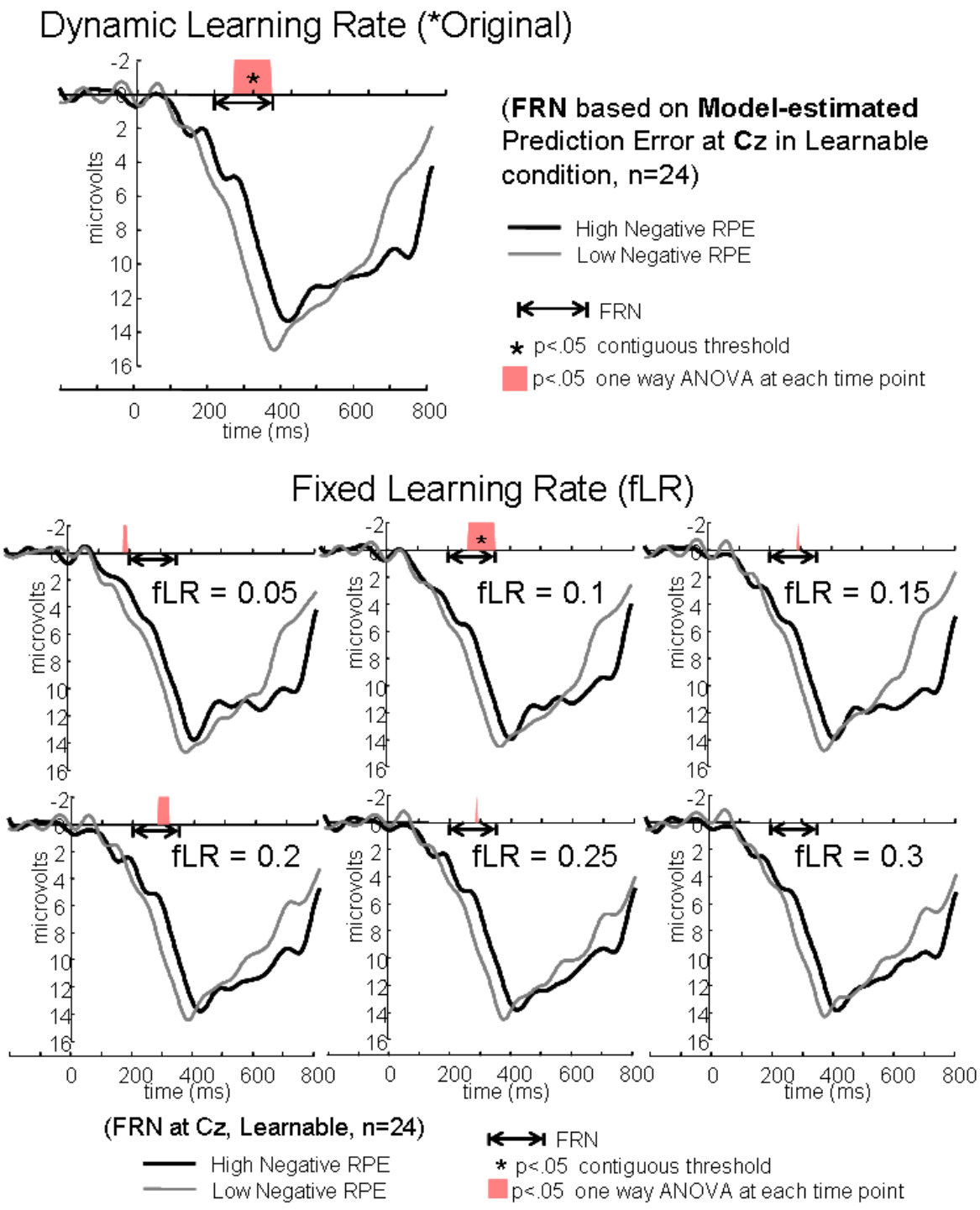

Figure S3. The FRN results associated with model-estimated prediction error at Cz based on the models which used a "fixed" learning rate (fLR = 0.05, 0.1, 0.15, 0.2, 0.25, 0.3).

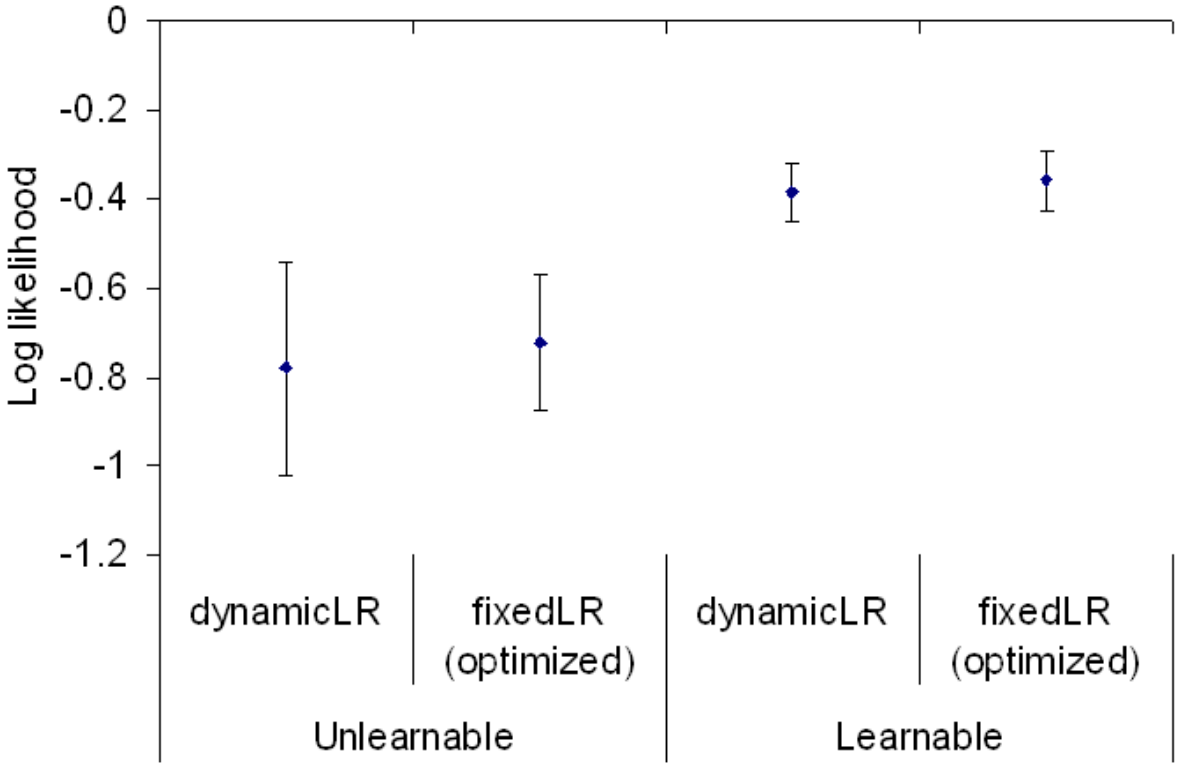

Figure S4. Comparing models: Likelihood of data from all the subjects (n = 25) for each condition (Learnable, Unlearnable) with the original dynamic learning rate model and the optimized-fixed learning rate model (optimized for each individual). The range of fixed learning rate was set from .10 to .27 with an increment of .01 for optimization (each *M(SD)* of optimized-fixed LR between subjects was .22 (.05) for Learnable condition and .19 (.08) for Unlearnable condition). Likelihoods did not drastically differ between the models in Learnable (dynamic LR: *M(SD)* of log-likelihood = -.38 (.06); optimized-fixed LR: log-likelihood = -.36 (.06)) and Unlearnable condition (dynamic LR: *M(SD)* of log-likelihood = -.78 (.24); optimized-fixed LR: log-likelihood = -.72 (.15)).

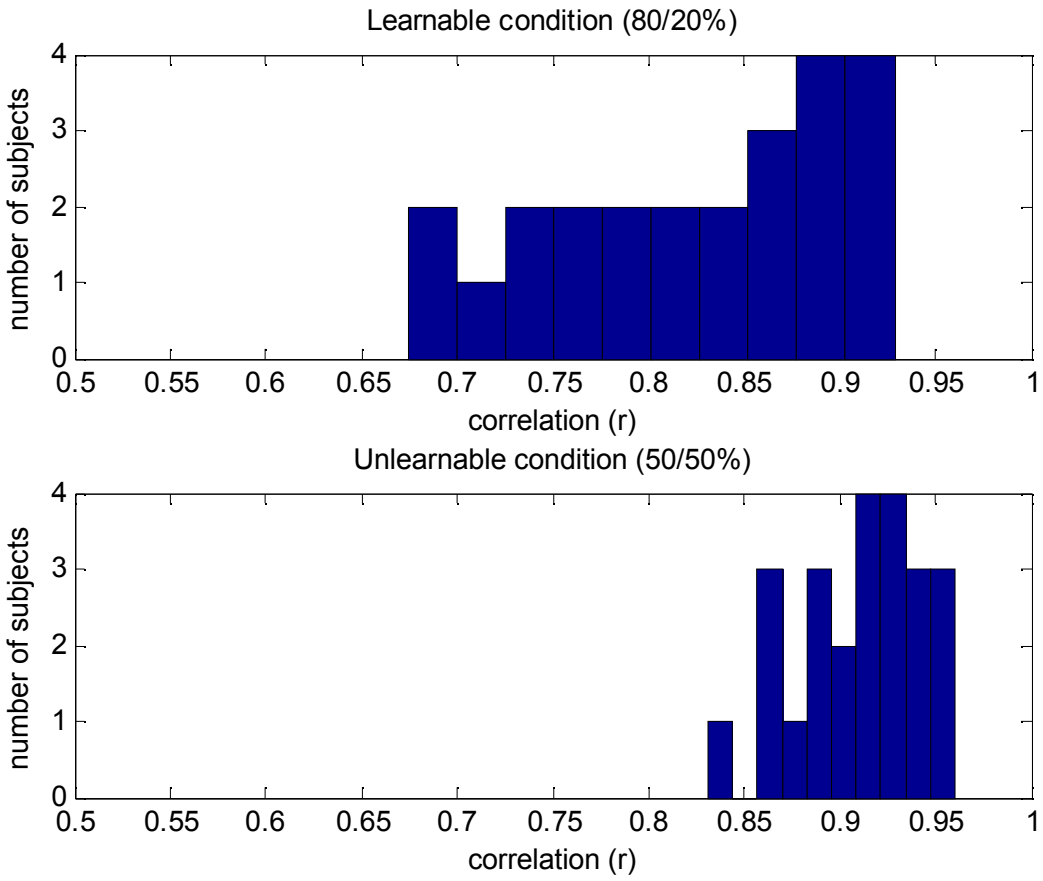

Figure S5. Histograms of the Pearson's correlation coefficient between subjective and model-estimated (objective) reward prediction error (RPE) in the Learnable condition (upper; $M(SE)$: r = .82(.02)) and in the Unlearnable condition (lower; $M(SE)$: r = .91(.01)). The correlation between subjective and objective RPE was higher in the Unlearnable condition compared to that in the Learnable condition ($t(23) = 7.05$, $p < .001$).