Behavioral/Cognitive

(i.e., during reinforcement learning). Here we address both of these lacunae by administering a reinforcement learning task using simultaneous fMRI and EEG measurements. We estimate DM parameters allowing for reward values to change with experience, and assess whether decision threshold is modulated on a trial-to-trial basis as a function of choice conflict, mediofrontal theta, and BOLD signals from mediofrontal cortex and STN.

channels were replaced on a trial-by-trial basis with a spherical spline algorithm (Srinivasan et al., 1996). EEG was measured with respect to a vertex reference (Cz). Independent component analysis was used to remove residual MR and cardioballistic artifact, eye-blink, and eye-movement artifact.

The EEG time course was transformed to current source density (CSD; Kayser and Tenke, 2006). CSD computes the second spatial derivative of voltage between nearby electrode sites, acting as a reference-free spatial filter. The CSD transformation highlights local electrical activities at the expense of diminishing the representation of distal activities (volume conduction). The diminishment of volume conduction effects by CSD transformation may reveal subtle local dynamics. Single-trial EEG power was computed using the Hilbert transform on this CSD data filtered in

would substantially increase the number of parameters/nodes in the model (Cavanagh et al., 2011, 2014). Moreover, Bayesian parameter estimation inherently deals with collinearity in the sense that it estimates

ence in expected values between each of the options on each trial, with smaller differences signifying greater degree of conflict (Fig. 1*B*). We tested whether threshold was modulated not only by decision conflict, but by trial-to-trial variations in mediofrontal theta power from EEG, STN BOLD, and their interactions:

$$a$$ □

of these conditions. The higher choice consistency for higher valued options can be seen by the fact that choice probabilities are higher (further to the right) on the plot as value differences increase. In sum, these posterior predictive plots confirmed that the DDM provided a reasonable fit to behavioral choices (proportion of choices of high-value vs low-value option) and, simultaneou6.3(vs)-366.3(o(vs)-59.7,)-3sand, simultane-

dence needs to be integrated across time. While reinforcement values also need to be integrated across trials, it is natural to ask why evidence would need to be accumulated within a trial in this