Supporting Information

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SI Text

Magnetic Resonance Imaging Scanning Procedure. The experiment was carried out on a 3-T scanner (Medspec 30/100; Bruker). We acquired 26 axial slices (19.2-cm field of view, 64 × 64 matrix, 4-mm thickness, 1-mm spacing) parallel to the AC-PC plane and covering the whole brain. Slice gaps were interpolated to generate output data with a spatial resolution of 3 × 3 × 3 mm. We used a single-shot, gradient recalled echo planar imaging (EPI) sequence (repetition time 2,000 ms, echo time 30 ms, 90° flip-angle). Before the functional runs, 20 anatomical MDEFT slices and 20 corresponding EPI-T1 slices were acquired. Stimuli were displayed by using VisuaStim (Magnetic Resonance Technologies), consisting of two small TFT monitors placed directly in front of the eyes, simulating a distance to a normal computer screen of ≈100 cm with a resolution of 1,024 × 768 and a refresh rate of 60 Hz.

Functional Magnetic Resonance Analyses. Analyses of fMRI data were performed by using in-house LIPSIA software (1). First, functional data were corrected for movement artifacts. The temporal offset between the slices acquired in 1 scan was then corrected by using a sinc interpolation algorithm. Data were filtered by using a spatial Gaussian filter with sigma = 0.8 (this refers to a FWHM = 5.65 mm). A temporal high-pass filter with a cutoff frequency of 1/160 Hz was used for baseline correction of the signal. All functional datasets were individually registered into 3D space by using the participants' individual high-resolution anatomical images. This 3D reference dataset was acquired for each participant during a previous scanning session. The 2D anatomical MDEFT slices, geometrically aligned with the functional slices, were used to compute a transformation matrix containing rotational and translational parameters that register the anatomical slices with the 3D reference T1 data set. These transformation matrices were normalized to the standard Talairach brain size (2) by linear scaling and finally applied to the functional data. The statistical evaluation was performed by using the general linear model for serially autocorrelated observations (3). The design matrix was generated with a synthetic hemodynamic response function (4) and its first derivative. The onsets for the event-related analysis were set to the presentation of the cues at the beginning of each trial. The model equation was convolved with a Gaussian kernel with a dispersion of 4 s FWHM. Contrast maps were generated for each participant.

After the individual functional datasets were all aligned to the same stereotactic reference space, a group analysis was performed. A one-sample *t* test of contrast maps across participants (random-effects model) was computed to ascertain whether observed differences between conditions were significantly different from zero. Subsequently, *t* values were transformed into *z*-scores. To correct for false-positive results, in a first step, an initial voxelwise *z*-threshold was set to $Z = 3.09$ ($P = 0.001$, uncorrected) for the speed vs. accuracy, speed vs. neutral, and neutral vs. accuracy contrast. In a second step, the results were corrected for multiple comparisons by using cluster-size and cluster-value thresholds obtained by Monte Carlo simulations using a significance level of $P = 0.001$ (Table S1). Finally, to investigate the neural substrates of setting response thresholds common to both speed vs. neutral and speed vs. accuracy, the corrected *z*-maps were included in a conjunction analysis, i.e., speed vs. accuracy and speed vs. neutral (5). This procedure allows us to conclude that the reported activations in the right anterior striatum and the right pre-SMA are significantly different at $P < 0.001$, corrected for multiple comparisons at the cluster level.

To compute the percentzge signal change of the hemodynamic response in the right anterior striatum and the right pre-SMA, we included all significantly activated voxels in the conjunction analysis that exceeded the critical threshold in the group-averaged whole-brain contrasts and belonged to a contiguous cluster in the right anterior striatum and the right pre-SMA, respectively. We then extracted the time course of the signal underlying these activated voxels for each participant from the preprocessed data. The percentage signal change was calculated in relation to the mean signal intensity across all time steps for these voxels. The signal change was averaged for each condition for 10 s beginning with the presentation of the cue. We then subtracted the time course of the null event from the time course of the relevant conditions to compensate for the overlap of the blood-oxygen-level-dependent (BOLD) response (6). The logic is that null events are (at least on average) embedded within the same past and future trial conditions as a regular event, and thus have the same preceding and succeeding average BOLD signal. By subtracting the null event from the relevant condition, one assumes that the brain area, i.e., activated voxels, exhibit no activation for the null event so that the remaining BOLD signal is solely caused by the experimental manipulation. We determined the largest value of the signal in the time window between 4 and 8 s after the presentation of the cue.

To investigate the neural underpinnings of individual differences in the setting of response thresholds, we computed Pearson correlations between changes in the LBA response threshold parameters and the percentage signal change derived from the right anterior striatum and right pre-SMA.

BIC Model Selection for the LBA Model. The LBA model has 5 parameters that determine its predictions for a pair of correct and incorrect response time distributions. However, constraint can be gained by fixing many of these parameters across different experimental conditions. For example, in our experiment, it is reasonable to expect that the response threshold parameter *b* should be equal for left and right moving stimuli. Equally, one might expect the response threshold parameter to be different across the 3 types of cue (speed, neutral, and accuracy) as these were intended precisely to manipulate response caution.

We investigated 32 different designs for constraining the parameters of the LBA model across the 2 experimental manipulations (i.e., left/right stimulus type, and speed/neutral/accuracy cue type). The 32 designs consisted of factorial combinations of all psychologically plausible parameter constraints. We allowed 3 parameters to vary (independently) with cue type or to remain constant for each participant (i.e., nondecision time t_0, response threshold *b*, and start point variability *A*). We allowed the remaining 2 parameters (i.e., drift rate *d* and drift variability *s*) to either both be fixed for each participant, to vary with cue type, to vary with stimulus type, or to vary with all combinations of cue and stimulus type. We obtained BIC measures of model adequacy (7) for each of the 32 resulting designs, separately for each participant.

The design with the best BIC summed across participants (BIC = 79,119) allowed drift rate and drift variability to vary with stimulus type (left-moving stimuli had higher estimated drift rates than right-moving stimuli by 7%) and allowed response threshold to vary with cue. The next four best-BIC designs were very similar and had summed BIC values between

192 and 368 units worse than the best design. All 5 of the best-BIC designs allowed the response threshold b to vary with cue type. One also allowed start point variability A to vary with cue, and another allowed for faster nondecision times (t_0) for increased cue urgency. Three of the top 5 models allowed drift rate d and drift variability s to be different for left- and right-moving stimulus types. The least adequate design of all was the one that kept all parameters constant (BIC = 83,341).

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Table S1. Anatomical location and Talairach coordinates with $Z > 3.09$ ($P < 0.001$, whole-brain corrected) for the whole-brain contrasts speed vs. accuracy and speed vs. neutral and the reversed contrasts

	Left hemisphere		Right hemisphere	
Anatomical area	Talairach coordinates	Z_{max}	Talairach coordinates	Z_{max}
Speed vs. accuracy				
Putamen			16, 2, 12	3.86
Cingulate gyrus			4, 8, 27	3.62
Pre-SMA			4, 5, 45	3.49
Accuracy vs. speed				
Medial frontal gyrus	−5, 53, 36	4.72		
Superior temporal gyrus	−29, 14, −30	4.14		
Inferior frontal gyrus	−53, 35, 3	4.10		
Middle frontal gyrus	−47, 29, 24	3.55		
Speed vs. neutral				
Caudate	−14, 11, 9	4.83	13, 8, 9	5.06
Posterior lobe			37, −58, −27	3.95
Pre-SMA			7, 5, 54	3.81
Thalamus	−14, −16, 15	3.69		
Medial frontal gyrus	−11, −10, 54	3.58		
Neutral vs. speed				
Superior frontal gyrus	−8, 50, 39	3.57		

Activations with a minimum volume size of 360 mm^3 are shown (10 adjacent voxels). The whole-brain contrasts neutral vs. accuracy and accuracy vs. neutral did not show significant activations.