



Feedback

Supplementary Material

Response

Supplementary Figure S1. Sequences of topographic maps of the power of β -band oscillations in response-locked data; significant sensors are indicated by open circles. Each map represents β power averaged over a 200-ms time window (-100 – 100 ms relative to the timestamps indicated).

(A) Each choice type minus baseline (t-statistics, uncorrected);

(B) 'Losses' minus 'gains', for each choice type (LMEM statistics, FDR-corrected for 17 time windows x 102 sensors).



Decision-related β power (-900 – -300 ms before a response onset)

Supplementary Figure S2. Additional time-frequency analysis for the decision-related effect.

(A) Timecourses of β -band power averaged over three most significant sensors (shown in the inset at the top). Each graph represents two timecourses and the difference between them. Lines at the bottom of each graph indicate significance of the difference (t-test, p < 0.05; green: uncorrected; brown: FDR-corrected over time points).

(**B**) Event-related spectral perturbations of MEG power averaged within the same three sensors obtained in the main LMM analysis.

'0' on the timeline corresponds to response, and '1000' - to feedback onset.

Decision-related α power (-900 – -300 ms before a response onset)



Supplementary Figure S3. Enhanced decision-related α -power suppression (α -ERD) distinguishes explorative LP in a pattern similar to that for β -power suppression (β -ERD). Decision-related α -band power change was averaged within -900 - -300 ms relative to response, over the cluster of sensors marked by colored rings in Figure 3A. The α power change for each choice type shows averages across sensors per the cluster marked. Points and error bars on graphs represent M ± SEM in single trials in all subjects.

** - p<0.01, *** - p<0.001 (LMM, Tukey HSD test).

Early feedback-related β power (100 – 500 ms after feedback onset)



Supplementary Figure S4. Additional time-frequency analysis for the early feedback effect.

(A) Timecourses of β -band power averaged over three most significant sensors (shown in the inset at the top). Each graph represents two timecourses and the difference between them. Lines at the bottom of each graph indicate significance of the difference (t-test, p < 0.05; green: uncorrected; brown: FDR corrected over time points).

(**B**) Event-related spectral perturbations of MEG power averaged within the same three sensors obtained in the main LMM analysis.

'0' on the timeline corresponds to response, and '1000' – to feedback onset. '100 - 500 ms' denotes respective time window relative to feedback onset.

Choice type	Trials [¥] : Previous $\rightarrow Current \rightarrow Next$	Number of trials	% of trials	RT, ms $(M \pm SD)$
HP	$\mathbf{A} \to \mathbf{A} \to \mathbf{A}$	3148	64.4	1383 ± 88
pre-LP	$A \rightarrow A \rightarrow DA$	600	12.3	1502 ± 96
LP	$\mathbf{A} \to \mathbf{D}\mathbf{A} \to \mathbf{A}$	539	11.0	1806 ± 95
post-LP	$DA \rightarrow A \rightarrow A$	602	12.3	1514 ± 97

Supplementary Table S1. Choice Types and Overall Behavioral Statistics

 ${}^{\text{\tiny \$}}$ A – advantageous choice, DA – disadvantageous choice.

Supplementary Table S2.	LMM	statistics	for	the resp	ponse	time

-	df1	df2	F	р
Choice type	3	3519.35	17.09	<0.001* **
Previous feedback	1	3519.89	1.85	0.174
Choice type x Previous feedback	3	3515.64	4.72	0.003**

** - p<0.01, *** - p<0.001.

Supplementary Table S3. LMM statistics for the effects of choice types, feedback valence, and their interaction for beta power change averaged across the pre-specified sensors and time windows based on the previous LMM analysis results^{\pm}

Effect	Factor	df1	df2	F	р
Decision-related effect	ision-related effect Choice type [†]		4324.4	28	<0.001***
Early feedback-related	Choice type [†]	3	4317.9	13.9	<0.001***
effect	Feedback	1	4316.5	0.02	0.874
_	Choice type x Feedback	3	4316.9	1.65	0.176
Late feedback-related	Choice type	3	4318.6	2.8	0.037*
effect (posterior cluster)	Feedback	1	4316.8	13.7	<0.001***
	Choice type x Feedback [†]	3	4317.4	13.3	<0.001***
Late feedback-related	Choice type	3	4322.8	9.78	<0.001***
effect (anterior cluster)	Feedback	1	4316.9	37.3	<0.001***
	Choice type x Feedback [†]	3	4319.1	11	<0.001***

[¥] LMM statistics were computed to ensure that the effects obtained for beta power at the level of single sensors and time bins survived after averaging beta values across space and time and should not be considered in isolation from the previous results.

[†] Significance is a consequence of the procedure used to define time intervals and clusters of sensors (cf. Figure 2 in the main text).

* - p<0.05, *** - p<0.001 (Tukey HSD).