Time-frequency representations: encoding and maintenance of an image in memory, general inhibitory control and level of inhibition

In the frequency-sensitive TFR analysis, we found statistically significant modulations in TFRs in the delta, theta, alpha, beta and low gamma frequency bands reflecting the encoding of an image to be kept in short-term memory, inhibition of an irrelevant visual input, and processing of a difficult, compared to an easy distractor. Overall, the outcome of the TFR analysis emphasized frequencies below 45 Hz, specifically the delta, theta, alpha, beta and low gamma frequency bands.

For the encoding and maintenance stage, these clusters covered theta-band (1–4 Hz) fronto-centrally, as well as alpha-band (8-13 Hz) and beta-band (15-25 Hz) that encompassed a wide array of sensors across the MEG helmet (Figure S1A). For the general inhibitory control the frequency-sensitive TFR analysis demonstrated similar spatiospectral clusters to the above frequency-based analysis, located either centrally, for low theta (1-7 Hz) and low gamma (35-38 Hz) or more with more distributed pattern, mainly for beta frequencies (13-30, 15-25 Hz) (Figure S1B). Finally, the neural correlates of the *level of inhibition* (inhibiting a difficult *vs.* an easy distractor; see S1C), as reflected by time-based analysis, revealed modulation of MEG signal power within similar frequency range (1–25 Hz) as compared to the frequency-based analysis, although with narrower spectral profile (1–25 Hz, 8–13 Hz, 15–25 Hz) and spatially extending more bilaterally (Figure S1C).

The statistically significant modulations in neural activity described above, defined in specific COIs and specific time-windows (TFRs) and frequency bands were tested for significant correlations with behavioral data using the correlation tests mask as described in "Correlations between neural activity and behavioral measures" in the Methods section (CERAD, 2 tests; Stroop, 3 tests; TMTB-A, 2 tests). No significant correlations between neural activity and behavioral data were detected for the COIs identified via the frequency-sensitive TFR analysis.

Figure S1. Statistically significant results of the cluster-based permutation analysis for the frequency-sensitive TFR statistical analysis. Each topoplot represents one statistically significant cluster. White circles indicate MEG channels that demonstrate statistically significant modulations in MEG signal power. The frequency bands in which the statistically significant effect is observed as well as the p-values are reported underneath each topoplot. *A.*, statistically significant modulations in MEG signal power for the first *vs.* second fixation

(before *vs.* after encoder). ***B***., statistically significant modulations in MEG signal power for the second *vs.* third fixation (before *vs.* after distractor image). ***C***., statistically significant modulations in MEG signal power for the within third fixation contrast (after an easy *vs.* a difficult distractor).