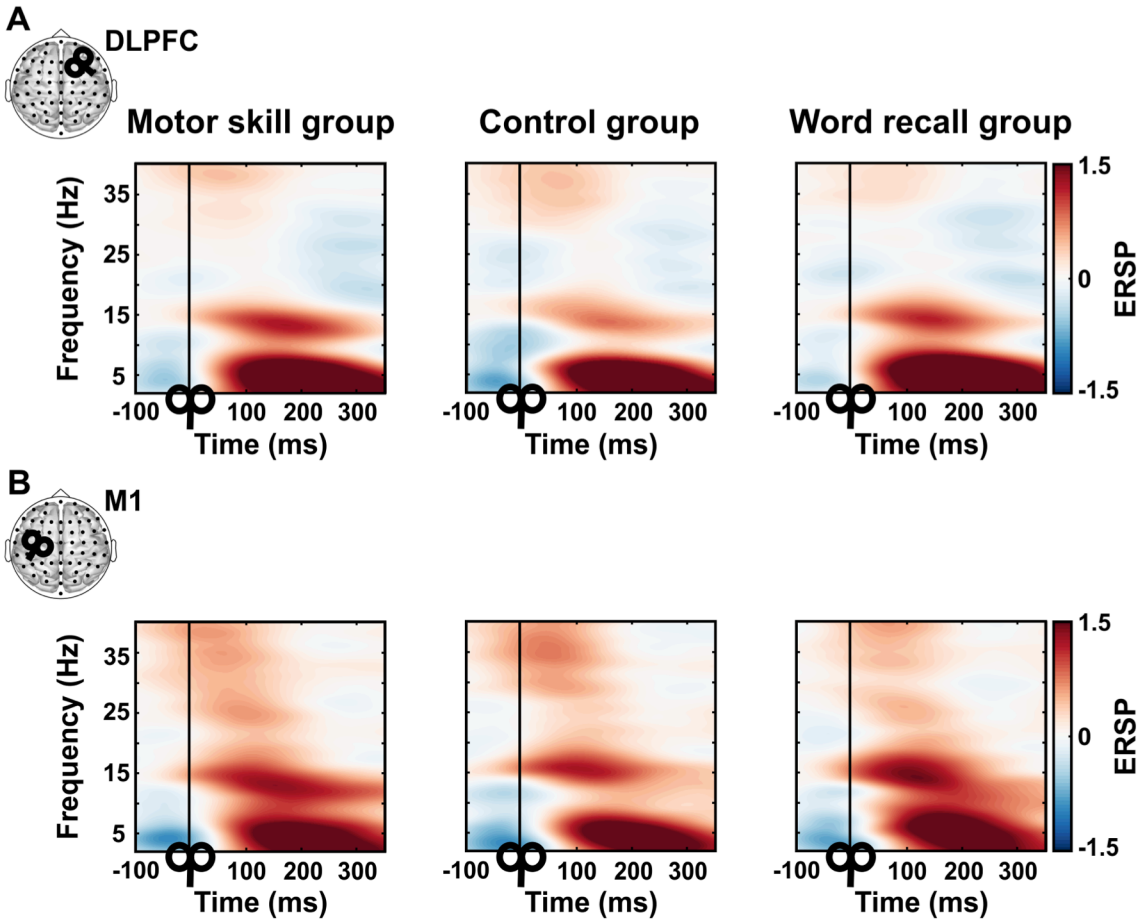

Figure S1. Baseline response to single pulse transcranial magnetic stimulation (TMS). Related to Figure 2 and Figure 3.

We show the grand average of the EEG response (mean calculated from all 62 channels) to a TMS pulse applied over **(A)** the right DLPFC or **(B)** the left M1 before the behavioral tasks were performed.

This baseline response to TMS did not differ significantly across the three groups (motor skill, word recall and control groups; ANOVA, DLPFC all p-values > 0.642; ANOVA, M1 all p-values > 0.286). The power changes occur within the same frequency bands at approximately the same time after the application of single TMS pulses, as in an earlier study that targeted the DLPFC [S1].

In both panels, the stimulation site is shown by the position of the TMS coil over the brain schematic (A, DLPFC; B, M1), and the 62-channel EEG montage depicted by an overlaid array of dots. In the time-frequency plots, the black vertical line and black coil indicate the TMS-pulse onset (i.e., 0ms).

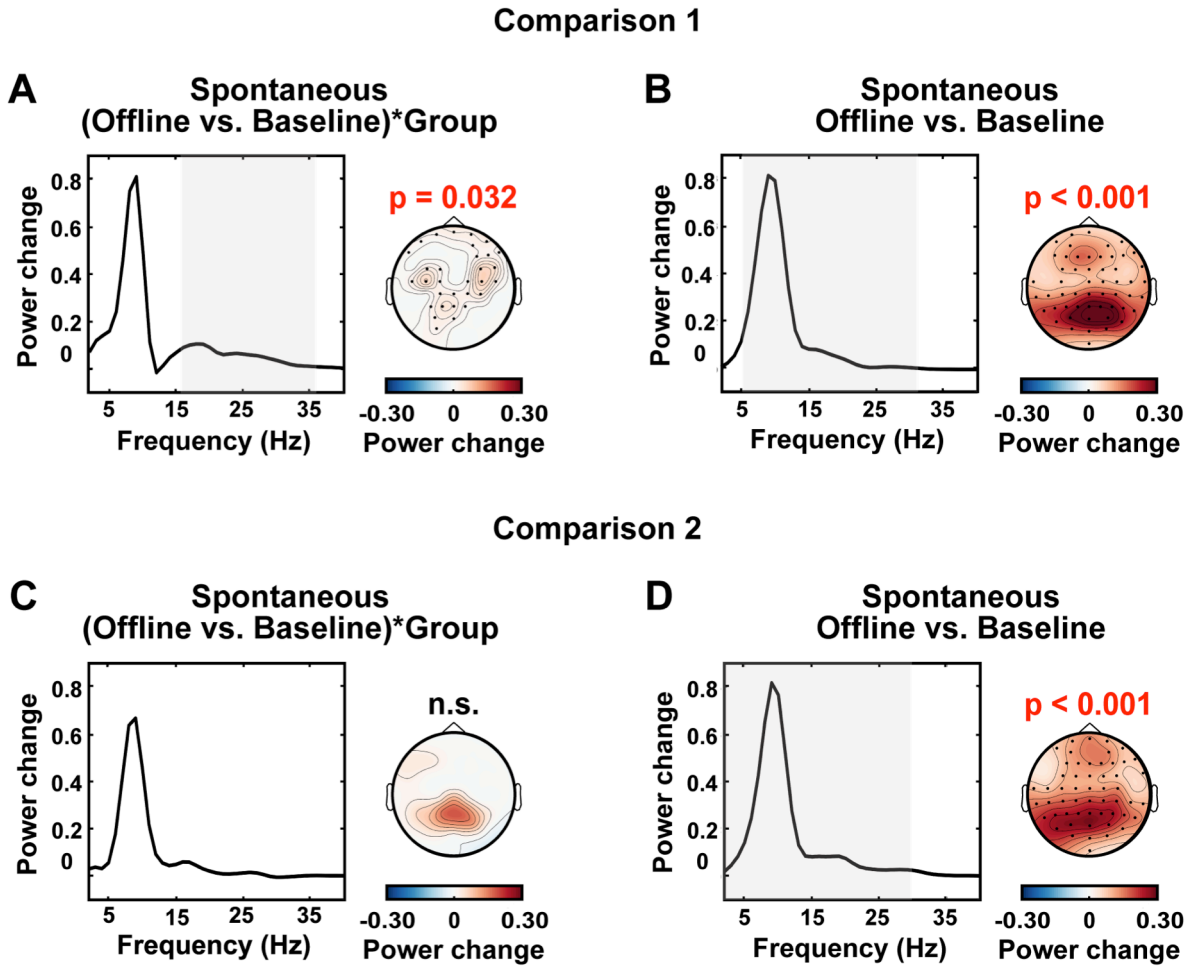

Figure S2, Spontaneous oscillatory changes following task performance. Related to Figure 1, Figure 2, and Figure 3.

We examined how spontaneous activity – oscillatory activity before the application of single pulses of stimulation – was affected by task performance by comparing spontaneous activity before (baseline) and after (offline) task performance. As in the main analysis, we compared the changes between the motor skill against the control group (Comparison 1) and the motor skill against the word-recall group (Comparison 2; **Figure 1**).

(A) In comparison 1, we found a significant difference between the groups in the change of spontaneous activity ((offline vs. baseline)*group(motor skill vs. control), $p = 0.032$). The identified cluster was within the beta frequency range (16-36 Hz) and covered bilaterally the prefrontal/central/parietal channels (shown in the topography plots).

(B) There was a significant change in spontaneous activity following the tasks (Comparison 1; both groups combined; offline vs. baseline; $p < 0.001$). The identified cluster was within the alpha/beta frequency range (5-32 Hz) and covered bilaterally the prefrontal/occipital channels (shown in the topography plots). However, we only found a significant change in the spontaneous activity when there was an interaction between memory tasks (motor skill group; $p <$

0.001), whereas; there was no activity change when there was no interaction between the tasks (control group; p values > 0.078). Thus, these spontaneous activity changes in alpha/beta frequency were only present when different memory types interact (motor skill group). This is consistent with the main analysis showing a (prefrontal) network response to stimulation in the alpha/beta frequency range, which was present only during memory interactions (**Figure 2**).

(C) In comparison 2, we found no significant difference between the groups in the change of spontaneous oscillatory activity ((offline vs. baseline)*group(motor skill vs. control); p > 0.104).

(D) However, there was a significant change in spontaneous activity following the tasks (both groups combined; offline vs. baseline, p < 0.001). The identified cluster was within the theta/alpha/beta frequency range (2-30 Hz) and covered bilaterally the prefrontal/occipital channels (topographical plot). Thus, these spontaneous activity changes were not affected by task order, which shows that they occurred regardless of how memory interactions were produced. Broadly, this is consistent with the main analysis; however, it does not provide the detail (in frequency or spatial networks) available by examining how a network response to single pulse stimulation changes due to task performance (**Figure 3**).

We found no significant difference across the groups (motor skill, control, word recall groups) in spontaneous activity before task performance (baseline; p>0.3). In the power-spectrum plots, the gray boxes highlight the frequency range of the significant clusters. In the topographical plots, the small black dots show the channels included in the significant clusters.

Supplemental Reference

S1. Vallesi, A., Del Felice, A., Capizzi, M., Tafuro, A., Formaggio, E., Bisiacchi, P., Masiero, S., and Ambrosini, E. (2021). Natural oscillation frequencies in the two lateral prefrontal cortices induced by Transcranial Magnetic Stimulation.Neuroimage *227*,117655. 10.1016/j.neuroimage.2020.117655