Supporting Information:

Supplementary Figure Legends

Fig. S1. Average time-frequency analysis of power. (*A and B*) Time-frequency power averaged over all selected V1 electrodes of both monkeys, with attention toward (*A*) and away from (*B*) the activating stimulus. Power is expressed as the logarithm (base 10) of the ratio between the power during stimulation plus task performance, and the power during the pre-stimulus baseline. (*C and D*) Same as A and B, but for area V4. Note that these time-frequency power analyses are based on trials of variable length. As a consequence, the power estimates for later time points are based on fewer trials. The dropping out of trials causes the visible temporal discontinuities (particularly notable for V4, attend away). The log-ratio of power is not biased by the number of trials, and therefore, the visible increase of theta power in V1 with attention away is most likely genuine.

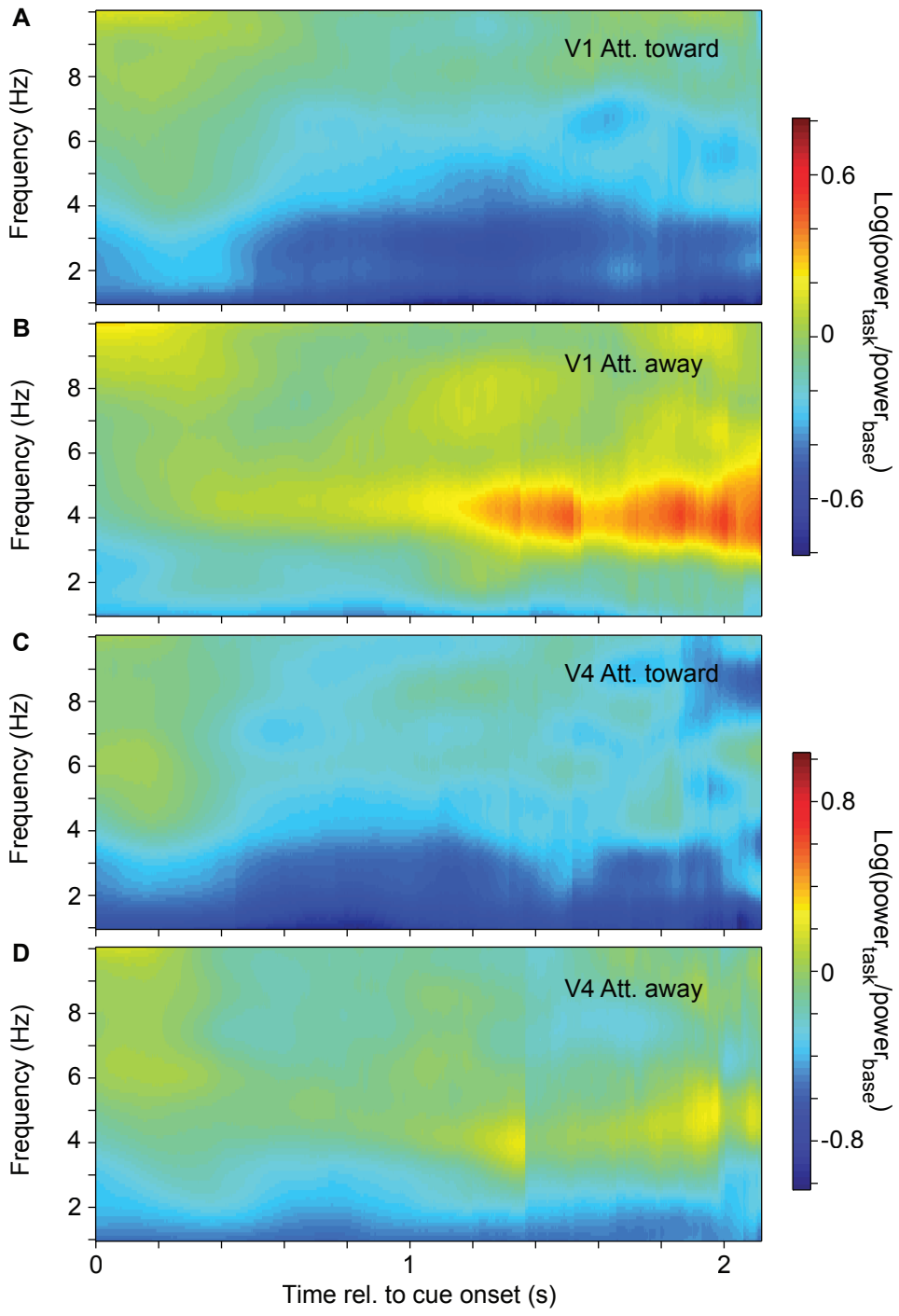
Fig. S2. Average low-frequency Granger causality (GC) spectra between V1 and V4 sites, controlling for differences in noise between areas or for theta power differences between attention conditions. (*A*) Average GC-influence spectra between V1 and V4 in the feedforward and feedback directions for the original (dark green and black respectively) and time-reversed signals (gray and light green respectively). Lines on the bottom indicate frequencies with a significant difference between feedforward and feedback directed GC for the original (black) and the time-reversed signals (gray) ($p<0.05$; non-parametric permutation test with correction for multiple comparisons across frequencies). (*B*) Average GC-influence spectra between V1 and V4 in the feedforward direction after theta power stratification, with attention toward (red) and away from (blue) the activating stimulus. (*C*) Same as *B*, but for the feedback direction. Neither *B* nor *C* revealed any significant differences.

Fig. S3. Modulation of PAC by selective attention, excluding epochs with microsaccades. (*A and B*) Average PAC in area V4 with attention toward (*A*) and away from (*B*) the activating stimulus. (*C*) Average PAC difference in area V4 between the two attention conditions shown in *A* and *B*. (*D-F*) Same as *A-C*, but using the phase in area V1 and the amplitude in area V4. The semitransparent gray mask exposes frequency pairs with significant PAC, or PAC difference, respectively ($p<0.05$; non-parametric permutation test with correction for multiple comparisons across frequency pairs). The black area indicates frequency pairs excluded from the analysis (see Methods).

Fig. S4. Attention contrast, controlled for microsaccade (MS) rate. (*A*) Cumulative distribution of MS rate with attention toward (red) and away from (blue) the activating stimulus. Solid lines show data before stratification; dashed lines show data after stratification. Note that after stratification, the lines for the two attention conditions overlap essentially perfectly. (*B*) Average LFP power spectra in area V1, with attention toward (red) and away from (blue) the activating stimulus. (*C*) Same as *B*, but for area V4. (*D* and *E*) Same as *B* and *C*, after removing the $1/f^n$ component. (*F*) Average LFP phase locking between sites in area V1 and sites in area V4, with attention toward (red) and away from (blue) the activating stimulus. (*G* and *H*) Same as *F*, but for pairs of sites within area V1 (*G*) and area V4 (*H*). (*B-H*) Gray-shaded regions indicate frequencies with a significant difference between attention conditions ($p<0.05$; non-parametric permutation test with correction for multiple comparisons across frequencies). (*I*) Average PAC difference between the two attention conditions using the phase in area V1 and the amplitude in area V4. (*J*) Same as *I*, but for area V1. (*K*) Same as *I*, but for area V4. The semitransparent gray mask exposes frequency pairs with significant PAC difference ($p<0.05$; non-parametric permutation test with correction for multiple comparisons across frequency pairs). The black area indicates frequency pairs excluded from the analysis (see Methods).

Fig. S5. Modulation of PAC by selective attention, after theta power stratification. (*A*) Average PAC difference between the two attention conditions in area V1. (*B*) Same as *A*, but for area V4. (*C*) Same as *A*, but using the phase in area V1 and the amplitude in area V4. The semitransparent gray mask exposes frequency pairs with significant PAC difference ($p<0.05$; non-parametric permutation test with correction for multiple comparisons across frequency pairs). The black area indicates frequency pairs excluded from the analysis (see Methods).

Fig. S6. Average low-frequency LFP phase-locking (PPC) spectra and their modulation by selective attention, after theta power stratification. (*A*) Average LFP phase locking between sites within area V1 with attention toward (red) and away from (blue) the activating stimulus. (*B*) Same as *A*, but between sites within area V4. (*C*) Same as *A*, but between sites in area V1 and sites in area V4. Neither *A, B* nor *C* revealed any significant differences.



Suppl. Figure 1
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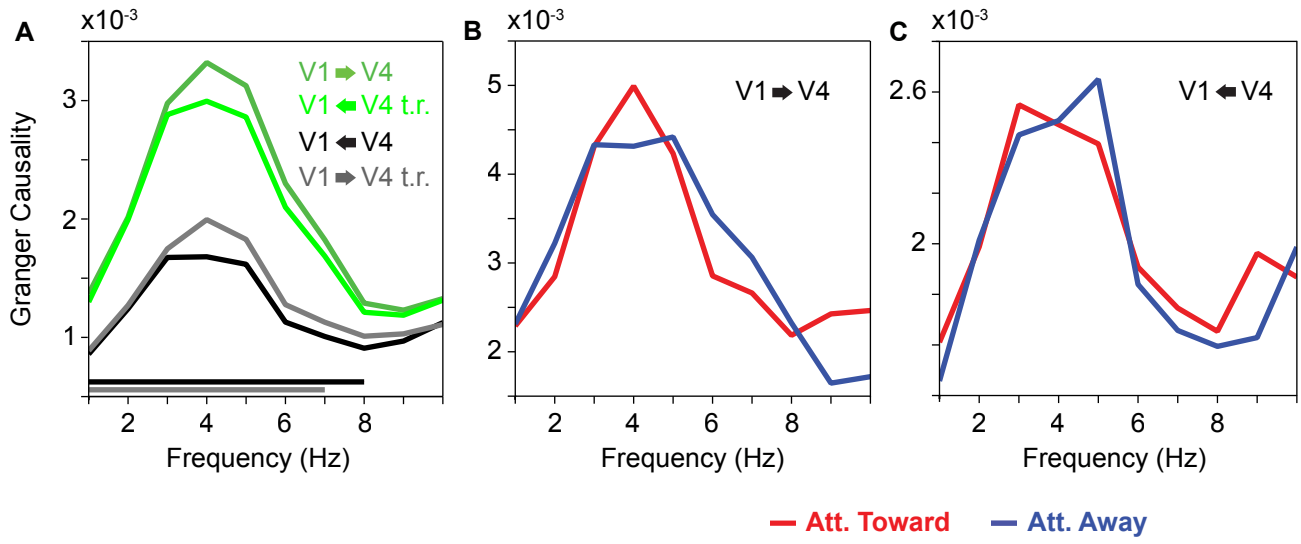

Suppl. Figure 2
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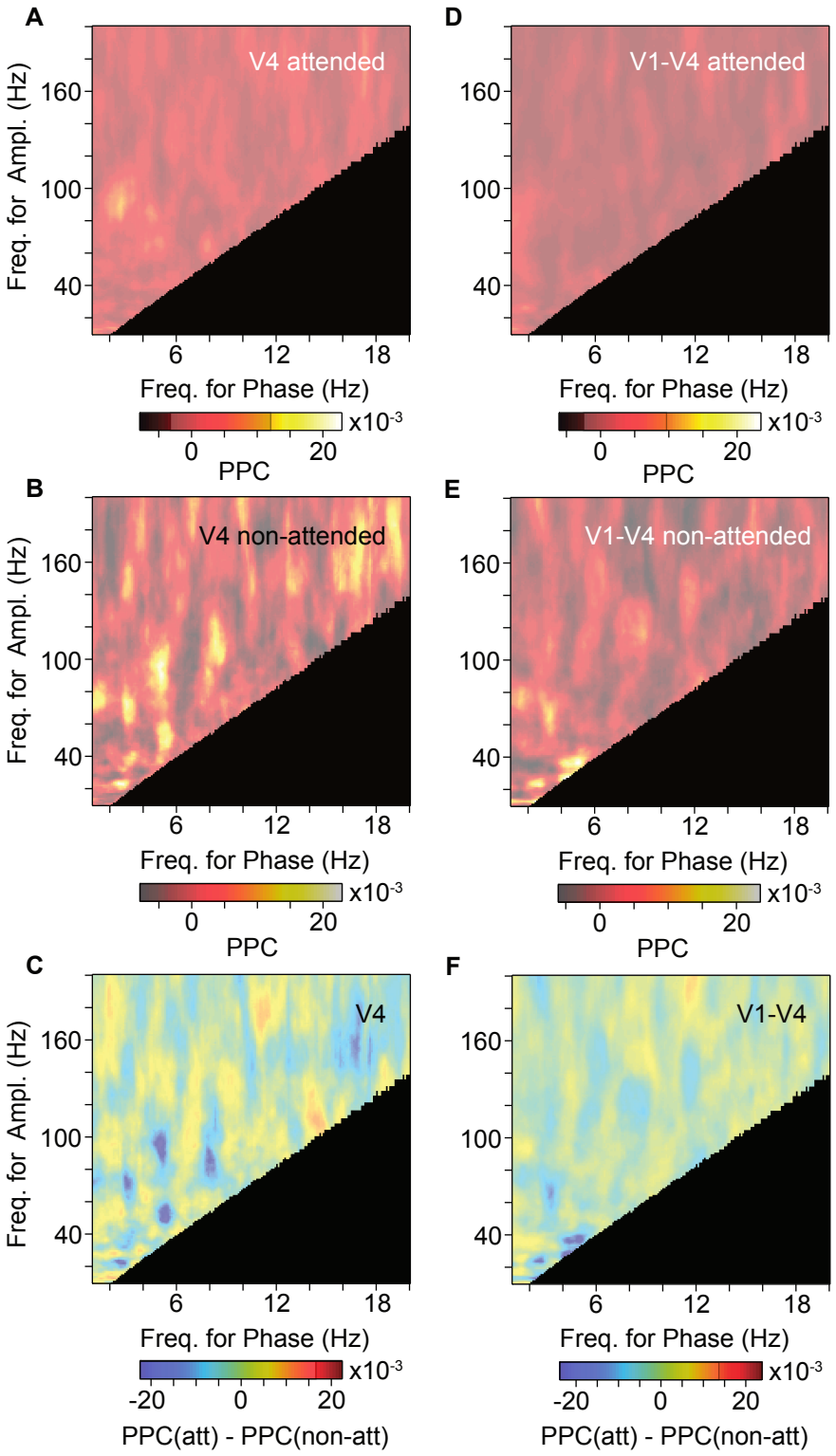

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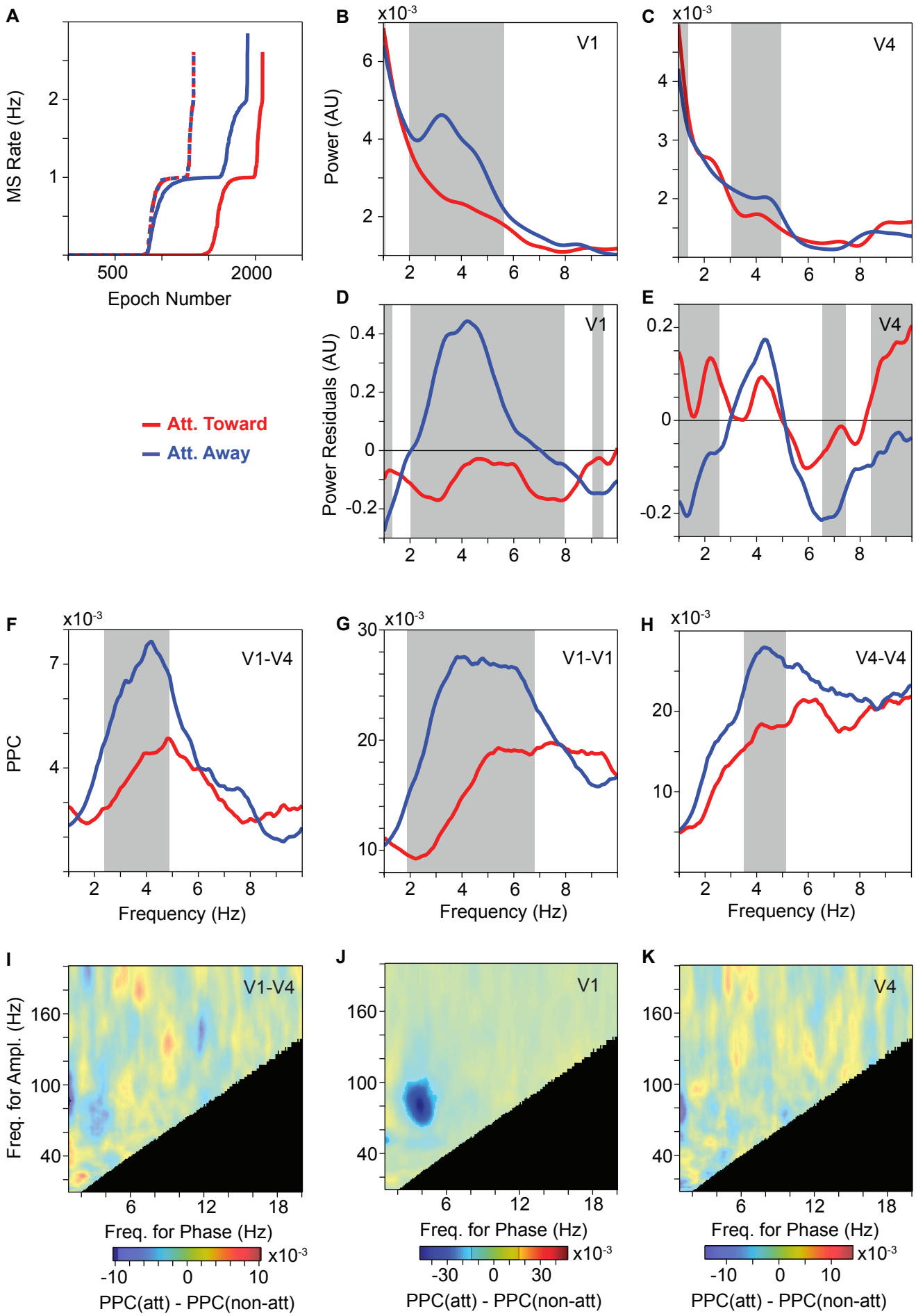
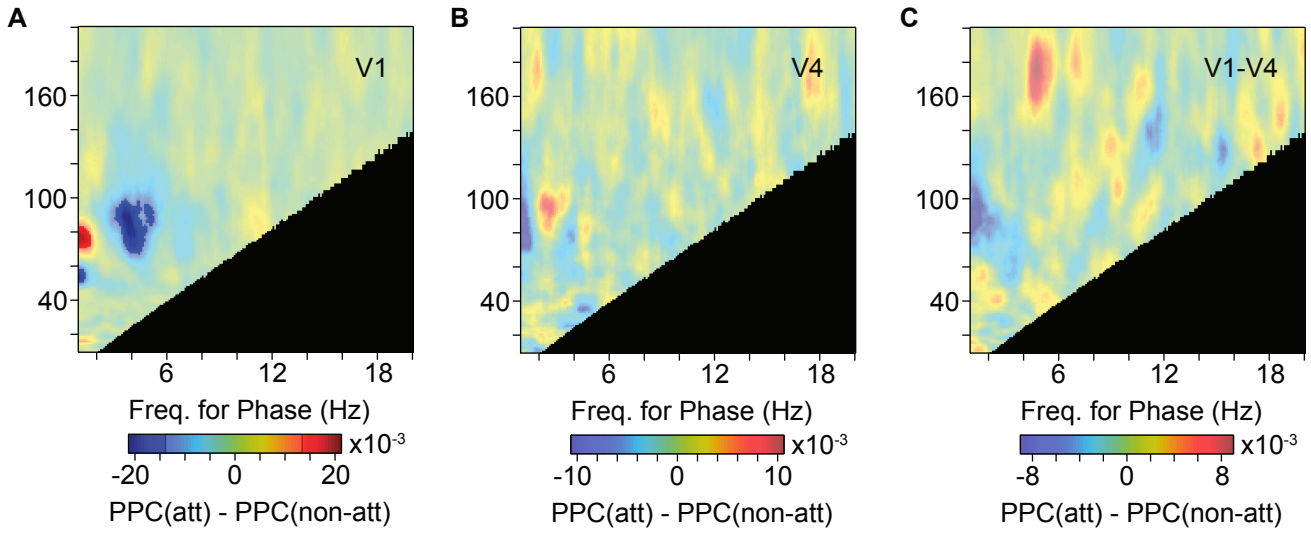


Suppl. Figure 4 Spyropoulos et al.



Suppl. Figure 5
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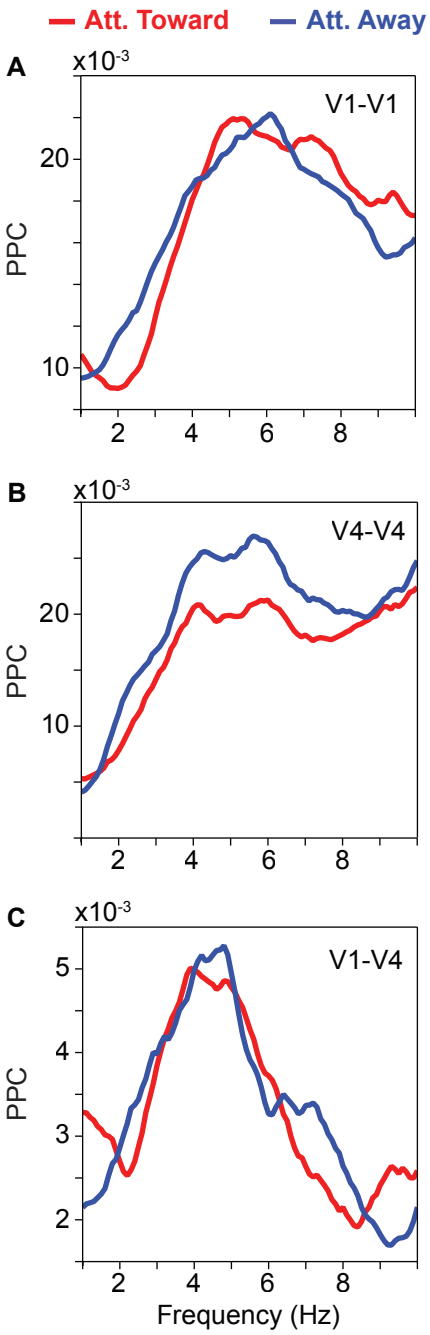

Suppl. Figure 6
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