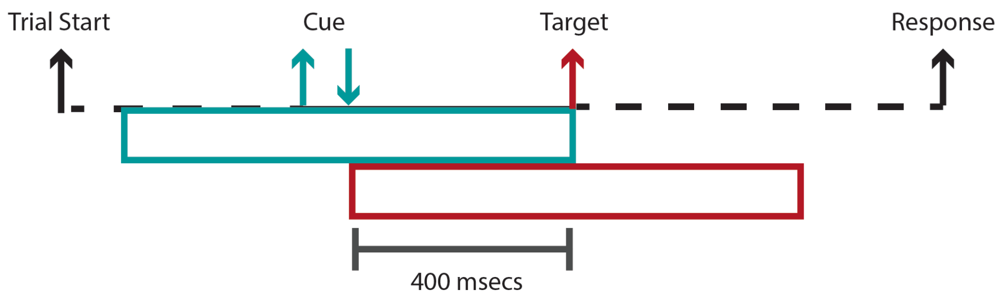
SUPPLEMENTARY DATA AND FIGURES

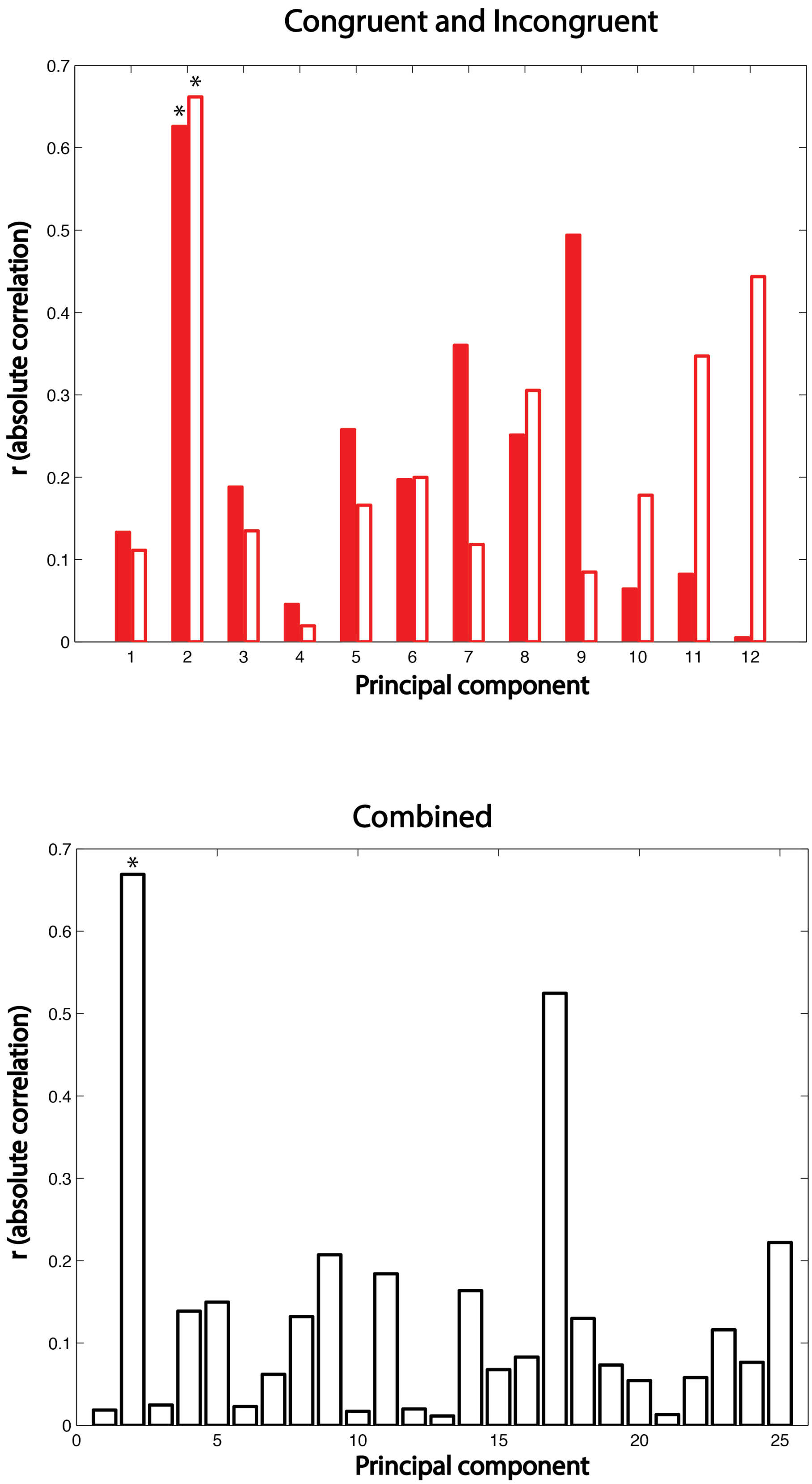
1. EEG analysis epoch windows:



Supplementary Figure 1. For analyses reported in manuscript, the 400 msec segment before target (baseline) was subtracted from the 400 msec segment after target. Similarly, for the cue analyses, the 400 msec segment before cue was subtracted from the segment after the cue.

2. ANT executive network – principal components vs executive network score:

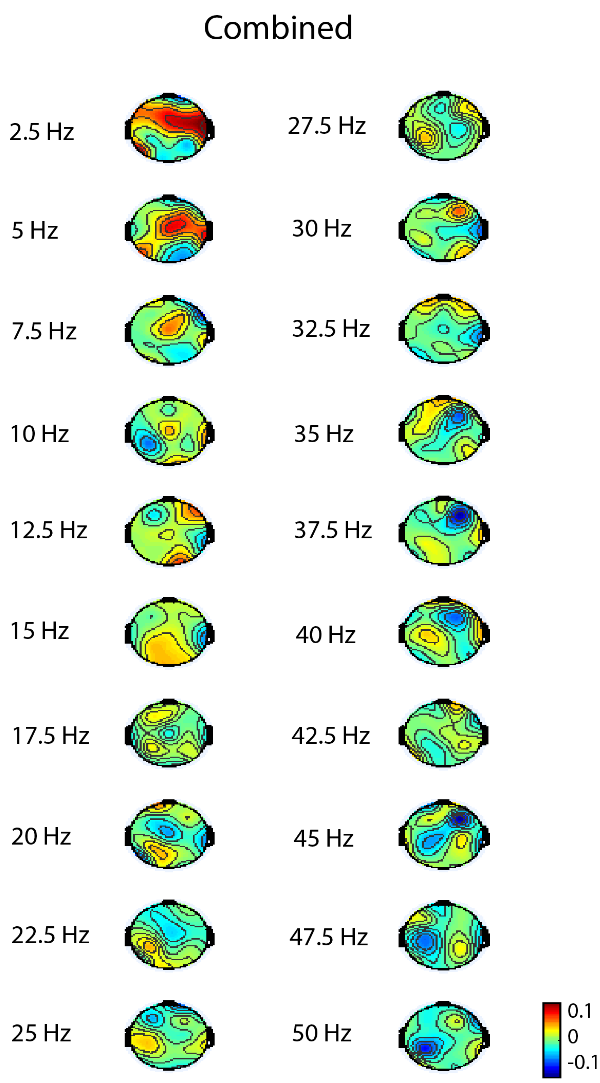
For each of the condition specific (congruent, incongruent) analyses and the combined (congruent and congruent) analyses, we explored the relationship between each extracted principal component and the executive network score. The second principal component in each analysis had the largest correlation and was the only one that passed significance criteria ($p<0.05$).



Supplementary Figure 2. Correlations of principal components with executive network score. Only the second principal component in the condition specific analyses (Top Panel) and the combined analyses (Bottom panel) had a significant relationship with executive network score (shown with *).

3. ANT executive network with gamma activity:

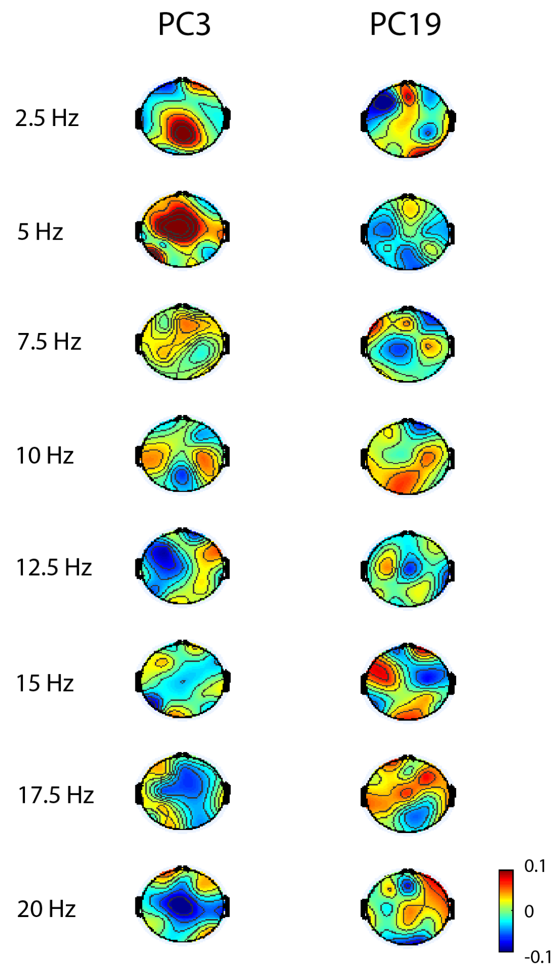
We repeated our executive network (combined) analyses (Figure 2) by including the gamma frequencies up to 50 Hz. We extract a PC (4th) that correlates with the executive network score (r = -0.50, p=0.05). PC4 extracted here shows a similar increase in delta frontally and a more focused midline frontal increase in theta band similar to the PC2 reported in the text (Figure 3).



Supplementary Figure 3. Principal component (4th) of executive network (congruent and incongruent conditions combined) of TBI subjects with gamma frequencies included. Correlation with executive network score: PC4 (r = - 0.5, p = 0.5).

4. ANT executive network – congruent-incongruent:

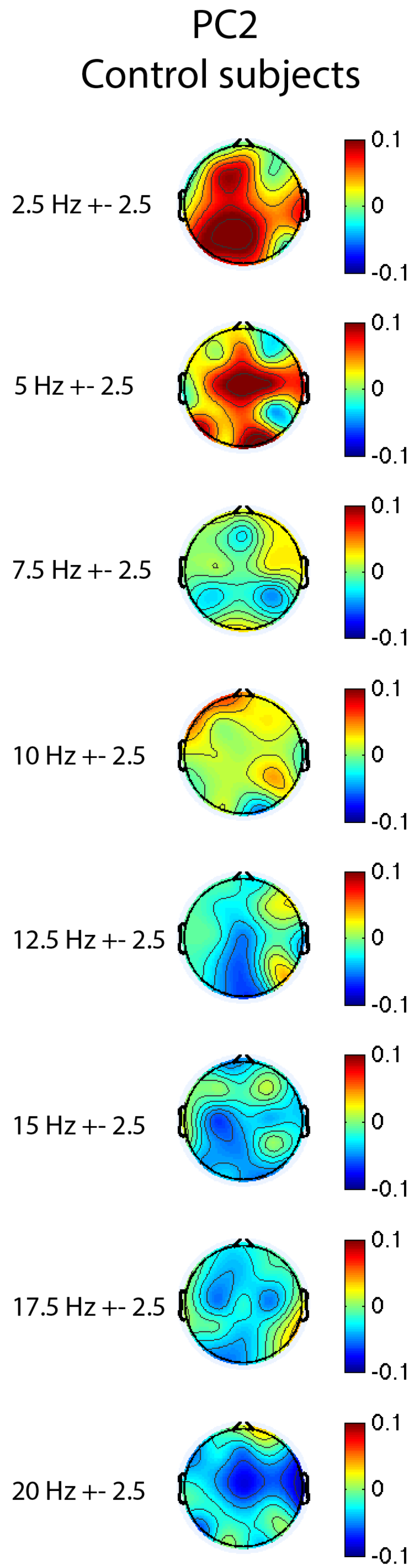
Efficiencies of the ANT networks are analyzed by subtracting between two conditions (e.g., executive score = $RT_{\text{incongruent flanker}} - RT_{\text{congruent flanker}}$). Therefore, to contrast between the two conditions, we analyzed EEG data for 400 msec after appearance of marker (target) and calculated the spectral differences between congruent and incongruent trials to closely approximate the behavioral network score calculation. We did this two ways: (1) we subtracted each condition's baseline before subtracting between the conditions i.e. (congruent – baseline) – (incongruent – baseline) and (2) we subtracted the conditions without subtracting the baseline. We then implemented the PCA analysis (as described in the Methods/Results of our study) to both analyses for each group separately. For the TBI group only analyses, there were no PC's that correlated with executive network. For the control subjects' only analyses, only one PC in each analysis had a significant relationship with executive network: PC3 for baseline subtracted ($r=-0.43$, $p<0.05$) and PC19 for congruent-incongruent ($r=-0.42$, $p<0.05$). Note the similarities between PC3 and the reported PC2 (Figure 3). Because this analysis fails to extract a PC that correlates with behavior in the TBI subjects, we chose to contrast (subtract spectra) each individual target/cue type (i.e., no cue, center cue, spatial cue, congruent and incongruent) to the immediately preceding baseline (within each trial) as has been done before (Deiber et al., 2010) (see Methods and Results).



Supplementary Figure 4. Principal components for executive network (difference between congruent and incongruent conditions). Correlation with TBI subjects: Baseline corrected PC3: $r = -0.43$, $p<0.05$ (left panel); Non-baseline subtracted PC19: $r= -0.42$, $p<0.05$ (right panel).

5. ANT executive network – controls only:

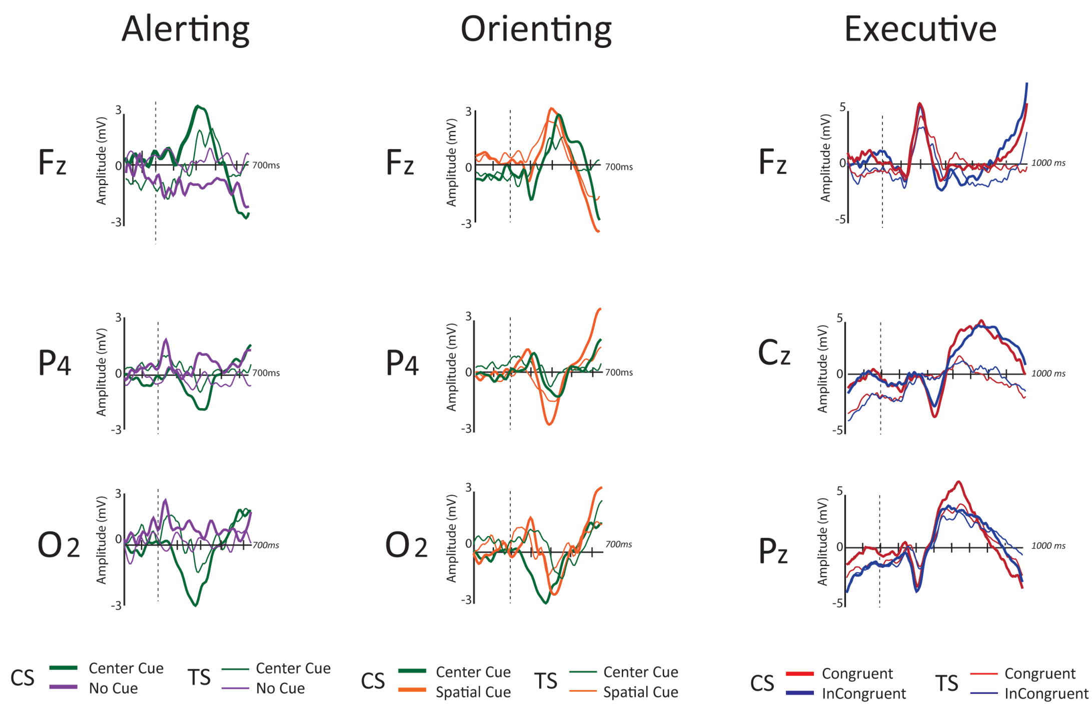
We also conducted a principal component analysis of the control subjects only. Similar to the analysis in TBI subjects, we explored the relationship between the extracted components and control subjects' behavior. This did not result in any meaningful relationship. However, projecting the TBI subjects' EEG responses into the control subjects' PC space, results in a significant relationship between TBI subjects' executive network score with PC2 ($r = -0.4794$, $p = 0.0132$). Note the increased midline frontal theta (also bleeding into posterior regions) and suppression of frontal high beta in PC2 similar to the PC2 (Figure 3) in our paper.



Supplementary Figure 5. Principal component (2nd) of executive network (congruent and incongruent conditions combined) of control subjects' only. After projecting TBI subjects into this space, correlation with TBI subjects' executive network score: PC2 (r = - 0.48, p = 0.0132).

6. ANT- Evoked Response Potentials:

Event-related potentials for all three ANT networks were derived and compared across groups. Processing of the EEG data for ERPs was performed using Net Station software (version 5.0; EGI). ERPs were filtered using a 60 Hz notch filter before segmentation. ERPs were segmented into epochs that were time-locked according to cue onset and target onset. The cue epoch was defined as the period from 200 msec precue to 500 msec postcue (cue, if presented, was on for 100 msec). The target onset epoch was defined as the period from 200 msec prestimulus to 800 msec poststimulus. The mean baseline activity (first 200 msec of each epoch) was then subtracted from the entire segment. The individual waveforms were then exported to Matlab for statistical testing. For each condition (3 cue types and 2 target types), significance of group-level (TBI subjects vs control subjects) differences (t-test) was determined via the t-test (unpaired, two-tailed) (for time samples between 100–300 msec after cue and 100 – 600 msec after target) and corrected for multiple comparisons using false discovery rate error adjustments. They showed no differences between the groups for any condition.



Supplementary Figure 6. Event-related potentials for all three ANT networks, shown separately for control subjects (thick line) and TBI subjects (thin line).