Top-down Flow of Visual Spatial Attention Signals from Parietal to Occipital Cortex

T. Z. Lauritzen[1-4*], M. D'Esposito[2,3], D. J. Heeger[5], M. A. Silver[1-3].

[1]School of Optometry, University of California, Berkeley, Berkeley, CA,

[2]Helen Wills Neuroscience Institute, University of California, Berkeley, Berkeley, CA,

[3]Henry H. Wheeler, Jr. Brain Imaging Center, University of California, Berkeley, Berkeley, CA,

[4]Redwood Center for Theoretical Neuroscience, University of California, Berkeley, Berkeley, CA,

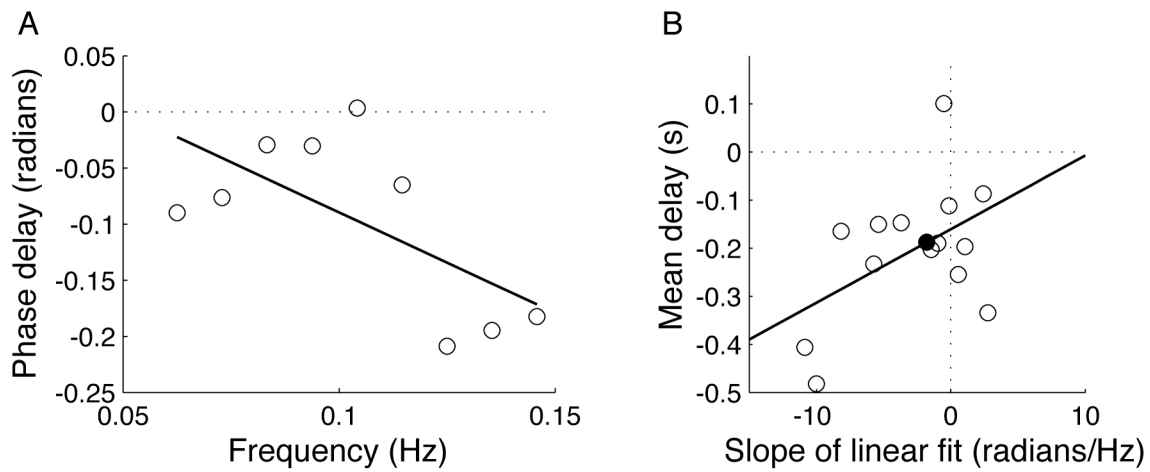[5]Department of Psychology and Center for Neural Science, New York University, New York, NY

Figure S1: Relationship between the delay calculated as mean of the absolute phase values across frequency bands and as a linear fit of the slope of phase-frequency plot. (A) Example of linear fit of phase versus frequency plot. Coherency phase differences (attention – fixation) for V3B and V3 from the average of four subjects (Figure 4F) are shown. Higher frequencies are associated with larger phase delays (expressed in radians), resulting in a negative slope of the linear fit of this plot. A linear relationship between phase and frequency would be expected if the temporal delay between two areas (expressed in units of time) was constant across all measured frequency bands. (B) Scatter plot of mean delay (temporal delays averaged across frequency bands) versus slope of the linear fit of the phase versus frequency plots. All pairs of areas exhibiting significant differences (attention – fixation) in temporal delay are shown. Most areas that had negative temporal differences (top-down connectivity associated with attention) also exhibited negative slopes of the linear fit of the phase versus frequency plot. In addition, the linear fit of this scatter plot indicates a positive correlation between mean delay and slope of the linear fits of the phase versus frequency plots. The black data point is the example shown in panel A.
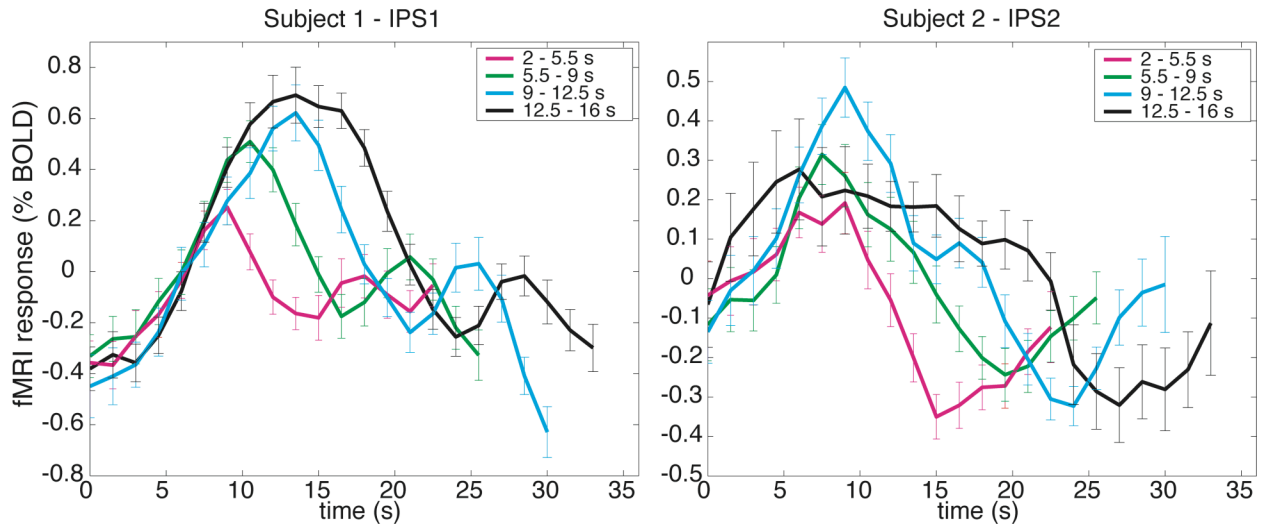
Figure S2: Sustained delay-period activity in IPS1 and IPS2 (example data from two subjects). Functional MRI responses were aligned at the beginning of each trial and binned into four groups (magenta, green, cyan, black curves) based on delay period duration. Responses were measured in the portions of the visual field representations in IPS1 and IPS2 that corresponded to the attended visual field locations. Response increases were time locked to the beginning of the delay period, but they returned to baseline at different times depending on the delay-period duration.
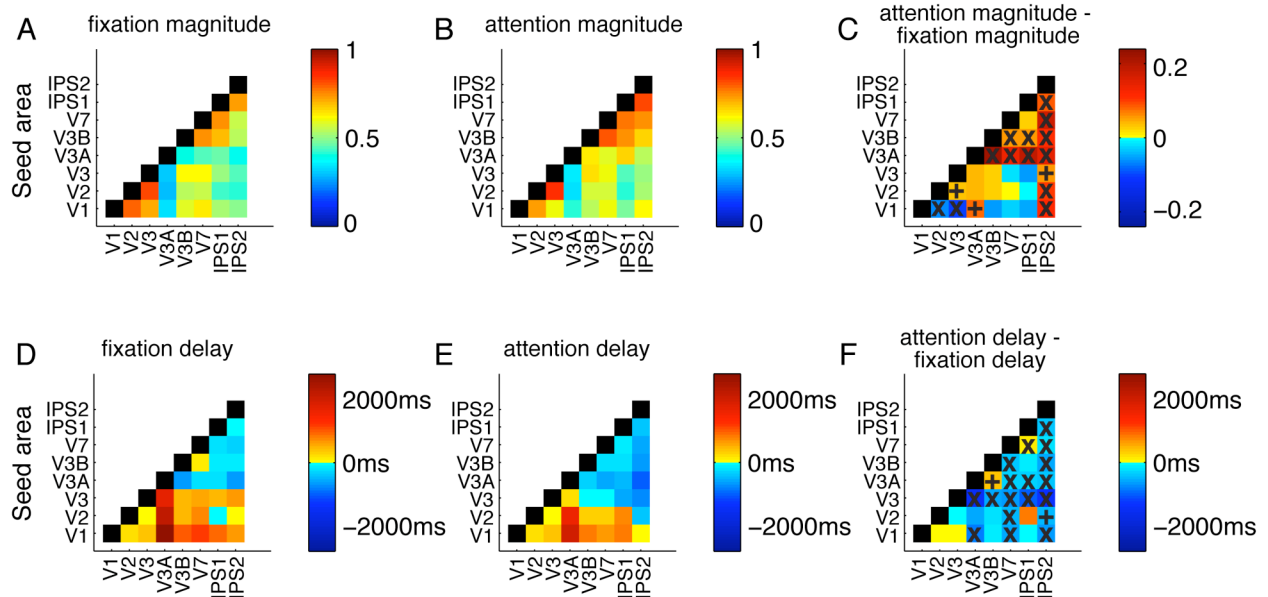

Figure S3: Full coherency and coherency difference matrices for Subject 2. Conventions are identical to those in Figure 2.
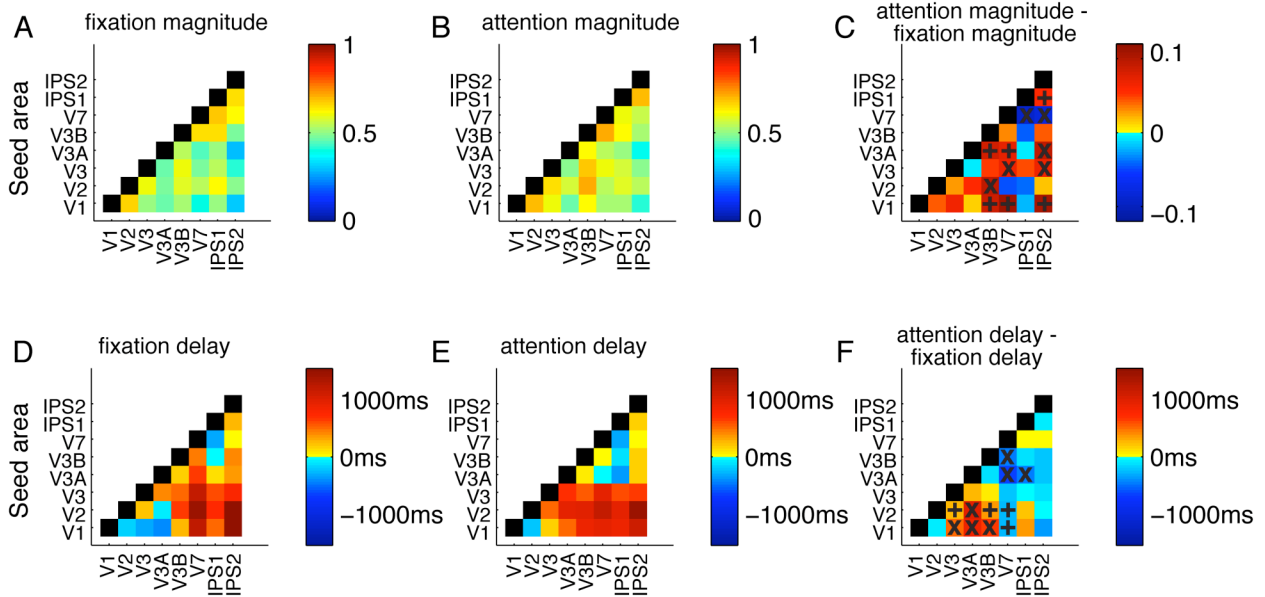
Figure S4: Full coherency and coherency difference matrices for Subject 3. Conventions are identical to those in Figure 2.
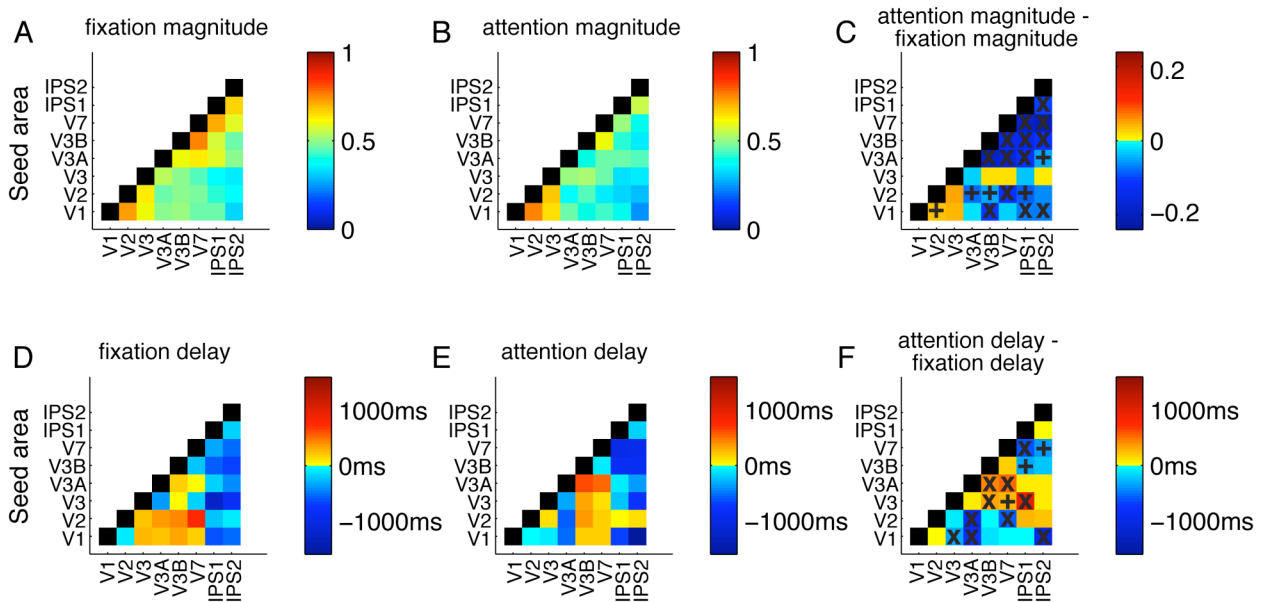

Figure S5: Full coherency and coherency difference matrices for Subject 4. Conventions are identical to those in Figure 2.
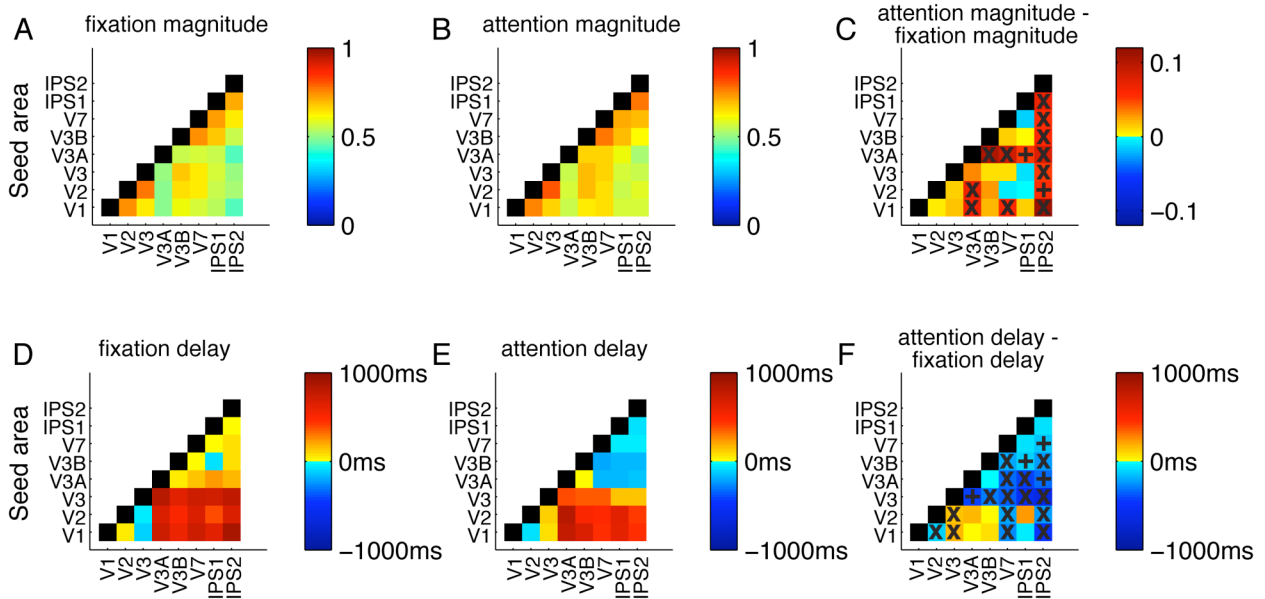
Figure S6: Full coherency and coherency difference matrices for the average of Subjects 1, 2 and 3. Conventions are identical to those in Figure 2.
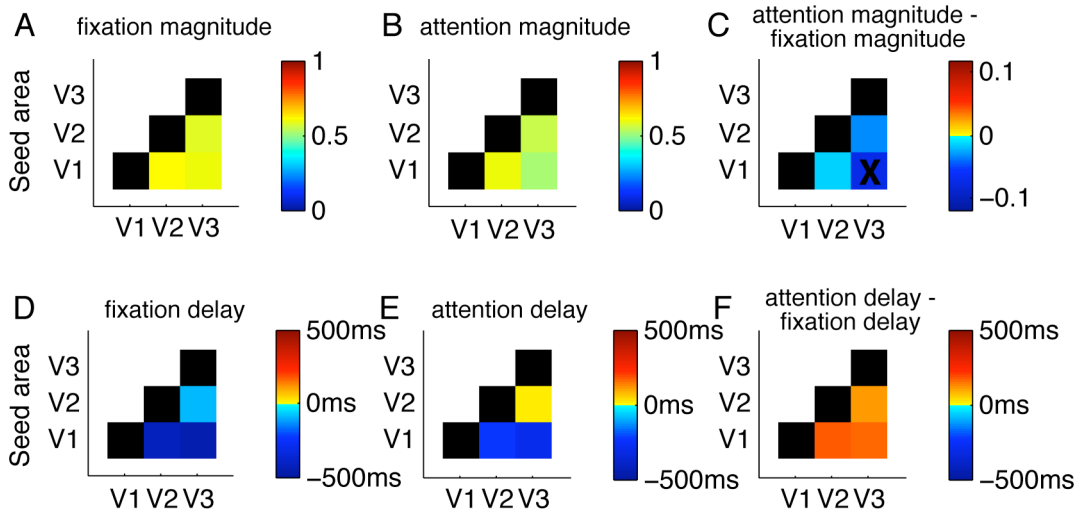

Figure S7: Full coherency and coherency difference matrices for portions of cortical areas V1, V2, and V3 representing unattended peripheral visual field locations. Conventions are identical to those in Figure 2, but only relationships among V1, V2, and V3 are shown. Matrix values indicate the average of all four subjects. x, $p<0.01$, corrected for multiple comparisons.