

# revcor2016

July 6, 2016

## 1 Supplementary Materials

### 1.0.1 *The dorsal medial prefrontal cortex responds preferentially to social interactions during natural viewing.*

Wagner, D.D., Kelley, W.M., Haxby, J.V., Heatherton, T.F. (2016). The dorsal medial prefrontal cortex responds preferentially to social interactions during natural viewing. *Journal of Neuroscience*. 36(26):6917-6925. [\[pdf\]](#)

Link to download this Jupyter notebook as a [pdf](#).

### 1.1 Video of scenes resulting from the reverse correlation analysis.

*Supplementary Movie 1.* This video clip demonstrates the movie scenes corresponding to the top ten ranking peaks based on each region's response profile. All scenes are from the film Matchstick Men (Scott et al. 2003).

## 1.2 Supplementary Methods

### 1.2.1 Schematic of steps involved in generating response profile video clips for regions of interest.

```
In [1]: from IPython.display import Image
        Image("assets/revcor2016_FigS1.jpg")
```

```
Out [1]:
```

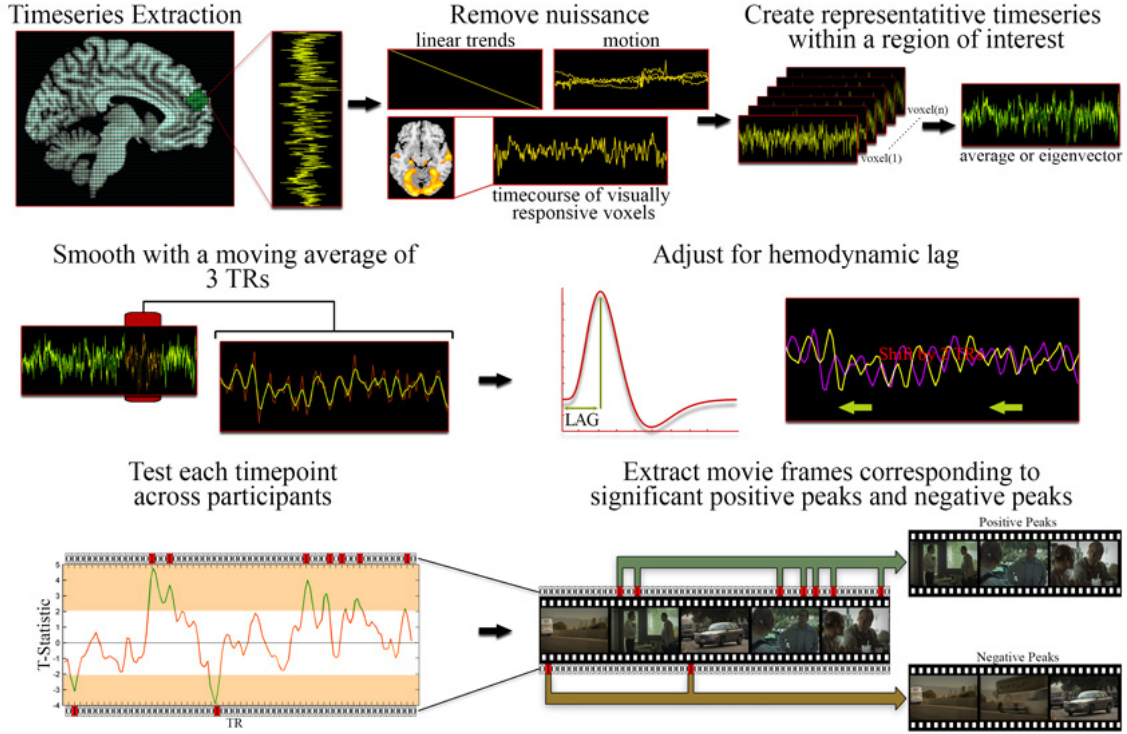


Figure S1. Schematic of the steps involved in generating response profile video clips for regions of interest (ROI). First, a set of BOLD signal time series are extracted for each voxel within an ROI and adjusted for confounds (motion, linear trends, session means and the mean time course across visually responsive voxels). Next, a representative time series is created for each ROI and temporally smoothed by a moving window of 3-TR width. The time series is then adjusted for temporal lag introduced by the hemodynamic response profile and a t-test is performed on each time point across subjects. The resulting vector of t-values is used to define statistical peaks and troughs (FDR corrected,  $q < 0.05$ ). These time points are then used to extract frames from the film thereby creating a region specific movie of scenes evoking positive and negative responses in each region's time series. FDR = False discovery rate; TR = Repetition time.

### 1.2.2 Adjustment of significant peaks and troughs based on the overall frequency of each category

Significant peaks and troughs corresponding to each scene category were adjusted for the overall frequency of each category across the movie in the following manner:

$$Adjusted_i = \frac{(O_i/E_i)}{\sum_{i=1}^n \frac{O_i}{E_i}}$$

$$\text{Where } E_i = \frac{Category_i \cdot \sum_{i=1}^n O_i}{\sum_{i=1}^n Category_i}$$

Where O is the observed number of significant reverse correlation time points for the  $i$ th category (i.e., social, single person, person absent) and E is the expected number of significant reverse

correlation time points for the  $i$ th category based on the known distribution of categories over the entire film as defined by Total (i.e., the total number of time points in the movie per category  $i$ ).

### 1.3 Supplementary Results from an Alternative Regions-of-Interest Set

#### 1.3.1 Alternative regions-of-interest selection

In addition to the meta-analytic regions-of-interest (ROI) that are reported in the main manuscript, we also examined a separate set of three 6mm spherical ROIs in similar anatomical regions (i.e., dorsal medial prefrontal cortex, lateral & medial fusiform gyrus) that were derived from our prior work using different categories of visual scenes (i.e., Wagner, Kelley & Heatherton, 2011 [pdf]) utilizing the same MRI scanner, acquisition parameters and general preprocessing pipeline. These regions were defined on the basis of a whole-brain ANOVA across four visual scene categories (i.e., animal, vegetable, mineral and human social scenes). The MNI stereotaxic coordinates for each ROI are listed in Table S1.

#### 1.3.2 Scene categories present in the response profile vectors for the full movie in the alternative ROI set.

Table S1. Percentage of each scene category type present in the complete response profile vector of peaks and troughs for each region in an alternative set of regions-of-interest derived from our prior work.

| Brain Region                        | Social | Single | Person Absent |
|-------------------------------------|--------|--------|---------------|
| <b>Peaks</b>                        |        |        |               |
| Dorsal MPFC (-3,63,18)              | 100%   | 0%     | 0%            |
| Right Lateral Fusiform (42,-57,-24) | 39.1%  | 38.6%  | 22.3%         |
| Right Medial Fusiform (27,-45,-12)  | 12.6%  | 23.7%  | 63.7%         |
| <b>Troughs</b>                      |        |        |               |
| Dorsal MPFC (-3,63,18)              | 6.4%   | 44.1%  | 49.5%         |
| Right Lateral Fusiform (42,-57,-24) | 22.5%  | 21.6%  | 55.9%         |
| Right Medial Fusiform (27,-45,-12)  | 77.2%  | 21.4%  | 1.4%          |

*Note:* Scene category types are based on a manual segmentation of the movie. Percentages are adjusted for the overall frequency of each scene category type in the full movie. Center coordinates for each region of interest are in Montreal Neurological Institute stereotaxic space.

#### 1.3.3 Visualization of reverse-correlation response profiles from the alternative ROI set.

Figure S2. The upper right plot for each region demonstrates the volume-wise t-statistic for a one-sample t-test across subjects used to calculate significant positive (peaks in red) and negative (troughs in blue) responses. Motion picture frames extracted from the ten highest peaks and troughs ( $p < 0.05$  FDR corrected) for each region are presented in rank order. The ROIs in this supplementary figure were defined based on our prior work using static visual scenes (see supplementary methods above). Overall, the findings from this method of defining regions are highly

concordant with the set of ROIs defined in the main manuscript. All coordinates are in Montreal Neurological Institute stereotaxic space.

#### 1.3.4 References

- Scott, R., Starkey, S., Bailey, S., Rapke, J., Griffin, T. (Producers), & Scott, R. (Director). (2003). *Matchstick Men* [Motion picture]. USA: Warner Bros. Entertainment.
- Wagner, D. D., Kelley, W. M., & Heatherton, T. F. (2011). Individual Differences in the Spontaneous Recruitment of Brain Regions Supporting Mental State Understanding When Viewing Natural Social Scenes. *Cerebral Cortex*, 21(12), 2788–2796. [\[pdf\]](#)