

Supplemental Material S2. fMRI data processing and analysis.

fMRI data were analyzed using SPM12 (Wellcome Department of Imaging Neuroscience, Institute for Neurology, University College London) running in Matlab (R2018b The Math Works, Inc., Natick, MA). Each participant's functional and structural data were converted from DICOM to NIFTI format. Functional scans were corrected for slice acquisition timing and realigned to the mean of all images. The functional images were coregistered to the individual high resolution anatomical scan. Next, the anatomical image was used to determine the spatial normalization parameters, and the images were normalized to the Montreal Neurological Institute (MNI-ICBM) 152-subject template brain. The functional volumes were normalized using the same transformations and were spatially smoothed using 8 mm (FWHM) isotropic Gaussian kernel.

The preprocessed data were entered into a whole-brain general linear model (GLM) in SPM12 for a first-level analysis. A high-pass filter 1/128s was implemented to suppress the effect of low frequency scanner drift. For each run, the six movement parameters (x,y,z transformation, pitch, roll, yaw) obtained during the motion correction step of preprocessing were entered as user defined regressors in the design matrix, to co-vary out effects correlated with head movement in the scanner. For each participant the events were modelled for each trial of homophone, synonym and letter string tasks. Statistical maps were computed containing contrast estimates quantifying differences between the experimental and control conditions for each task. Functional MRI activity related to phonological and semantic processing was evaluated for each participant by contrasting the experimental task conditions (homophones, synonyms) against their respective control conditions (orthographic controls, unrelated controls).

Resulting activation maps were thresholded at the voxel wise level $p = 0.001$, and subsequently corrected for multiple comparisons by controlling the family-wise error (FWE) at the cluster level $p = 0.05$ (Flandin & Friston, 2016; Woo et al., 2014).

Davis, C. J. (2005). N-watch: A program for deriving neighborhood size and other psycholinguistic statistics. *Behavior Research Methods*, 37(1), 65–70.
<https://doi.org/10.3758/bf03206399>

Flandin, G., & Friston, K. J. (2019). Analysis of family-wise error rates in statistical parametric mapping using random field theory. *Human Brain Mapping*, 40(7), 2052–2054.
<https://doi.org/10.1002/hbm.23839>

Woo, C. W., Krishnan, A., & Wager, T. D. (2014). Cluster-extent based thresholding in fMRI analyses: Pitfalls and recommendations. *Neuroimage*, 91, 412–419.
[doi:10.1016/j.neuroimage.2013.12.058](https://doi.org/10.1016/j.neuroimage.2013.12.058)

Zuccolotto AP, Roush RE, Eschman A, Schneider W. Getting Started Guide EPRIME.