Supplemental Materials

Cultural context moderates neural pathways to social influence

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Methods

Confederate manipulation (driving session)

For each condition the confederate arrived to the study appointment late and then gave an excuse as to why they were late. The risk-averse confederate stated, "Sorry I was a little late getting here. I tend to drive slower, plus I hit every yellow light." Whereas, the risk-accepting confederate stated, "Sorry I was a little late getting here. Normally I drive way faster, but I hit like every red light." Next, before the passenger drive the participant and confederate watched two short driving videos (low and high risk driving; randomly ordered) together consisting of expressway driving behaviors. After each video finished, the participant and then confederate were asked to rate on a 10-point scale, "How similar is your driving to the driver in the video?" (1=not at all similar and 10=highly similar); and "How likely would you be to ride with the person in this video?" (1=not at all likely and 10=highly likely). The confederate responded in a way that was consistent with the assigned condition. In addition, participants that were recruited as part of the second cohort were exposed to an additional social norms manipulation that took place during the passenger drive. During the passenger drive, the confederate provided directions to the concert, which included fixed points where risk-accepting or risk-averse norms expressed (e.g., noting high or low speed limits). Confederates did not comment on how to drive (e.g., drive faster or slower). In the current analysis, to increase power to detect interaction effects, we have combined both cohorts (study 1 and study 2), and controlled for cohort in all statistical models.

Region of interest (ROI) definitions

Anatomical regions of interest (ROIs) were defined using the Wake Forest University Pickatlas toolbox within SPM (Maldjian et al., 2003), combining gross definitions from the Automated Anatomical Labeling Atlas (AAL; (Tzourio-Mazoyer et al., 2002), intersected with x, y, and z boundaries to restrict sub-regions.

Consistent with our past work in this area (Falk et al., 2014), the social pain ROI included the union of the dACC, AI, and subACC (figure 3). The dACC ROI was defined as the union of Brodmann areas 24 and 32 (dilated to 2mm), as well as the anterior, middle, and posterior cingulate masks from the AAL atlas. We then subtracted Brodmann areas 8 and 9 from this mask. Finally, we restricted this ROI to the voxels bounded by (x=-16 to 16, y=0 to 33, and z=6 to 52). The AI ROI was defined as all voxels within the left and right insula masks provided by PickAtlas that were anterior to the y=0 plane. The subACC ROI was manually traced to include regions of the cingulate and paracingulate cortices ventral to the body of the corpus callosum and posterior to the genu.

In addition, the mentalizing ROI included the union of the rTPJ and DMPFC (figure 4). The rTPJ included all voxels within Brodmann areas 22, 39, and 40 intersected with a box-shaped mask centered at (x=60, y=-52, z=30) and extending x=40, y=16, and z=24 mm. The DMPFC ROI included all voxels within Brodmann areas 8 and 9 intersected with a box-shaped mask centered at (x=0, y=52, z = 50) and extending x=40, y=44, and z=48 mm. For each ROI, percent signal change scores were extracted for further analysis.

Finally, the reward sensitivity ROI included the union of the VS and VMPFC (figure 5). The reward sensitivity network was constructed based on figure 9 from a meta-analysis on valuation by Bartra, McGuire, & Kable, 2013.

Data Acquisition and Analysis

Functional images were recorded using a reverse spiral sequence (TR=2000ms, TE=30ms, flip angle=90°, 43 axial slices, FOV=220mm, 3mm thick; voxel size=3.44x3.44x3.0mm). We also acquired in-plane T1-weighted images (43 slices; slice thickness=3mm; voxel size=.86x.86x3.0mm) and high-resolution T1-weighted images (SPGR; 124 slices; slice thickness=1.02x1.02x1.2mm) for use in coregistration and normalization. Behavioral responses (i.e. Cyberball throws) were executed using a scanner-compatible five-finger response box.

Functional data were pre-processed and analyzed using Statistical Parametric Mapping (SPM8, Wellcome Department of Cognitive Neurology, Institute of Neurology, London, UK). To allow for the stabilization of the BOLD signal, the first four volumes (eight seconds) of each run were discarded prior to analysis. Functional images were despiked using the 3dDespike program as implemented in the AFNI toolbox. Next, data were corrected for differences in the time of slice acquisition using sinc interpolation; the first slice served as the reference slice. Data were then spatially realigned to the first functional image. We then co-registered the functional and structural images using a two-stage procedure. First, in-plane T1 images were registered to the mean functional image. Next, T1 images were registered to the in-plane image. After coregistration, high-resolution structural images were skull-stripped using the VBM8 toolbox for SPM (http://dbm.neuro.uni-jena.de/vbm), and then normalized to the skull-stripped MNI template provided by FSL (“MNI152_T1_1mm_brain.nii”). Finally, functional images were smoothed using a Gaussian kernel (8 mm FWHM).