

LATERALITY DIFFERENCES IN THE AMYGDALA DURING REGULATION OF THE RESPONSE TO AFFECTIVE PICTURES

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Introduction:

Previous neuroimaging studies of emotion have reported asymmetric effects in the amygdala without testing the asymmetry, but instead based on the finding that voxels in one hemisphere exceeded statistical threshold while homologous voxels in the opposite hemisphere did not. In order to determine whether true laterality differences exist, we used event-related fMRI in a trial design to measure the BOLD response of the left and right amygdala during voluntary regulation of the response to affective pictures. Based on previous findings of left-sided or bilateral amygdalar activation in response to unpleasant compared to neutral pictures, we predicted greater response in the left than the right amygdala.

Methods:

5 healthy females with no history of psychopathology were studied.

90 unpleasant/negative and 90 neutral pictures were presented visually during acquisition of whole-brain fMRI images. Pictures were presented for a total of 6 s followed by an 8 s delay, at that point subjects were asked to indicate how they currently felt on a 1-4 scale on a responsepad. Subjects were instructed prior to each picture presentation to either “maintain” the emotional response produced by the picture through the delay or to “passively view” the picture.

Imaging was performed using a 1.5 T GE Signa. A total of 180 gradient echo echoplanar images per slice (TR = 2000 ms, TE = 50 ms; 21 contiguous 5-mm axial slices) were obtained in each of 15 scans (12 trials/scan) at a resolution of 64 x 64 pixels in a 24 cm field of view. Offline data processing was performed using VoxBo software (www.voxbo.org).

ROIs of the left and right amygdala were drawn separately for each subject. Averaged time series for all voxels that met a threshold of 1.65 *t* greater signal in response to the pictures compared to baseline were used to calculate effect sizes for specific contrasts during both the picture and delay components of the trial. Within subject t-tests were performed on these statistical effect sizes between each subject's left and right amygdala.

Results:

We found increased amygdalar activation during the picture presentation in response to the negative compared to the neutral pictures. When each hemisphere was analyzed separately, only the response in the left amygdala was significant and it was significantly greater than in the right amygdala. We also found increased amygdalar activation during the delay in the maintain-negative compared to the passive-negative condition. Although this result was also significant in the left amygdala only or when the two amygdalae were averaged together, only a marginally significant left greater than right asymmetry was found.

Conclusions:

These results suggest that laterality differences exist in the response of the left and right amygdala to affective stimuli. Specifically, there is a larger hemodynamic response in the left than the right amygdala in response to unpleasant compared to neutral pictures. In addition, the conscious voluntary regulation of emotion is associated with modulation of the hemodynamic response in the amygdala, however further investigations of laterality differences in the amygdala due to emotion regulation are needed.