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Fearful emotional processing enhances activation of temporal cortices

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Background

The amygdala plays a central role in fear-related learning and activation during the processing of fearful facial expressions is a consistent finding from several functional neuroimaging studies. However, perception of fearful facial expressions also elicits greater activation of the vision-related regions of the temporal cortex. It has been proposed that the enhanced neuronal activation of temporal visual cortices may arise via its connectivity with the amygdala and represent an amygdala-mediated system to increase perceptual sensitivity for the threat-related facial expressions. We examined the functional connectivity between task-induced amygdala and temporal visual cortices activation, using functional imaging.

Materials and methods

We acquired fMRI data on a GE signa 1.5 T system in nine healthy volunteers, while subjects were performing a covert facial emotional processing task. Subjects were required to make a gender discrimination decision while viewing fearful, sad or neutral faces, presented in an event-related design. Data were analyzed using the standard XBAM software (Institute of Psychiatry, London).

Results

Processing fearful faces demonstrated activation of bilateral amygdalae. We also observed activation within the right fusiform gyrus and the right superior temporal gyrus during the processing of fearful, sad as well as neutral faces when contrasted with the non-face baseline condition. Moreover, we observed greater activation of these regions when examining the fearful vs. neutral faces. We observed a significant correlation between the activation within the right amygdala and the ipsilateral temporal visual cortices during the processing of fearful faces only.

Discussion

The data support the proposition that temporal visual cortices response during fearful face processing is enhanced by ipsilateral amygdala activation. This functional connectivity pattern appears to be specific to processing fearful faces and may be the basis of enhanced perceptual analysis of the threat-related stimulus, which is so crucial for survival.