
A distributed cortico-limbic network decodes the emotional tone of a voice

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Abstract

The superior temporal and inferior frontal cortex as well as medial limbic brain regions have been previously shown to respond to the emotional tone of a voice. We supposed that this neural network not only consists of this tripartite cortico-limbic network with strong inter-regional connections, but also of several intra-regional subnetworks including subregions with different functional roles during the decoding of emotional cues from voices. Here, we used high spatial resolution brain scans covering the superior temporal, inferior frontal and medial limbic brain regions to determine the exact location and connectivity within this inter- and intra-regional emotional voice network. We additionally manipulated the level of attentional processing to determine the influence of explicit (attention directed towards the emotional feature) and implicit processing (attention directed to a non-emotional voice feature) on functional activations and connectivity patterns. The analysis revealed, first, several regions in right superior temporal gyrus (STG) and bilateral inferior frontal gyrus (IFG) sensitive to emotional cues from voices. Second, we found a posterior-to-anterior gradient in right STG and a left-right differentiation for explicit processing of emotional cues. The left amygdala was only active during explicit processing of emotional voices, and a subsequent region specific analysis activity was located in selected subnuclei of the bilateral amygdaloid complex. Finally, connectivity analyses revealed that activity in the distributed temporo-fronto-limbic network differentially generates inter- and intra-regional connections depending on the level of processing.

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