
Phasic cross-modal sensory boosting: visual emotion enhances auditory processing

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Abstract

Previous studies have proved preferential sensory processing in a threatening context. When something in the environment indicates potential danger, novelty sounds trigger an enhanced brain response and distraction. The sequence and subjacent neural circuit of this modulation however, remain unknown. This study aims at investigating a possible phasic effect of emotional processing on auditory perception at behavioral and electrophysiological levels. Source localization algorithms were performed in order to localize the brain sources of the differential auditory processing. We registered the EEG of 21 young women (64 channels, 512 Hz) while responding to a discrimination task of faces with neutral or frightened expressions (400ms on screen). A complex tone (75ms duration), which the subjects were instructed to ignore, was displayed simultaneously, but with different onset intervals respective to the image. Event-related potential analyses of early auditory components revealed an increased brain response in presence of emotional pictures. Importantly, this effect occurred when the tone followed the picture onset by 50, 100, 150 and 200ms, but not when stimuli onsets were simultaneous. By means of Variable Resolution Electromagnetic Tomography (VARETA) we localized the differential activity in the emotionally negative condition at the superior temporal gyrus (STG), prefrontal and superior parietal areas. These results provide evidence for a phasic, fast operating effect of emotion on cross-modal sensory processing, resulting in a facilitation for emotion on concomitantly presented stimuli at the level of primary sensory cortices, even in another sensory modality and without paying attention.

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