Interaction of cognitive processing and emotional stimulation in fMRI

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Introduction
According to recent theories of emotion1,2, we wanted to investigate the interaction of cognitive functions and emotional stimulation. Therefore we developed a new paradigm combining emotional stimulation with a cognitive task.

Methods
In an fMRI event-related design, 7 healthy subjects (all male) were shown positive, negative or neutral emotional valenced pictures from the International Affective Picture System (IAPS). Briefly thereafter, a neutral word was shown, which had to be classified as abstract or concrete. Pictures were presented blockwise sorted by emotions. This was done to ensure a reliable level of the specific emotional stimulation.

Images were taken with a Magnetom Symphony scanner using a single-shot EPI sequence with 1953 Hz/pixel bandwidth and parameters TE/TR/FA 50/2500 ms/90°, 3 mm slice thickness with 3 mm gap, FoV 192 mm, matrix 64x64, resulting in a resolution of 3x3x6 mm. We took 21 images covering the whole brain, and performed two runs with 209 volumes per run. Volumes were motion corrected and normalized to a standard brain for group analysis. Analysis was done by Statistical Parametric Mapping (SPM, Wellcome Institute of Neurology, London).

Results
Main effects for picture representation and decision task showed occipital activation for both events and predominantly left hemispheric activation for the decision task. A main effect for emotion for the combined activity of picture presentation and decision task was found in bilateral gyrus fusiformis. Neutral stimulation showed activation in right dorso-lateral pre-frontal cortex as well as left and right inferior frontal areas. Negative stimulation elicited activation in the right amygdala and left parahippocampal area.

Discussion
We conclude that there is an effect of emotional stimulation in cognitive processing depending on the valence of the stimuli. This is in line with theoretical considerations about the interaction of cognition and emotion and previous findings with neuroimaging methods.

References