

Brain Activation During Alternation Learning in Social Anxiety Disorder: An fMRI Study

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Introduction: The progress in functional brain imaging methodologies and techniques enables now the research of complex activities including cognitive functions in health and in various mental disorders. Social anxiety disorder (SAD) is a very common psychiatric condition. However, the dysfunctional neural network involved in SAD remains to be elucidated. There are, though, several indications that structures related to the temporal lobe, and the orbitofrontal cortex (OFC) underlie some of the manifestations of this disorder. Alternation learning was repeatedly shown to involve the OFC in both human and subhuman species (1).

Purpose: Our aims were to study brain activation during different stages of practice in the alternation task in SAD patients and to correlate the activation with the performance of the task and the severity of SAD symptoms.

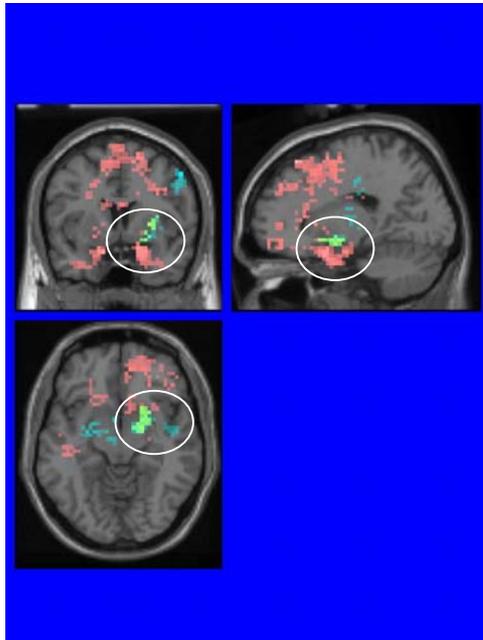
Patients and Methods: We implemented a version of alternation learning specifically designed for fMRI. The measurements were carried out on a 3 Tesla MRI system (GE) using a BOLD contrast, T2* weighted gradient echo EPI sequence, TR/TE/FA 3000ms/25ms/90°, 36 slices, 3.4x3.4x3.4 mm³ resolution. The alternation learning paradigm consisted of finding a ball hidden underneath one of two cups by discovering the rule of alternating between the cups. A fixed criterion, an automatic response task served as a control task. Processing and statistical analysis was performed using the SPM2 toolbox of MATLAB. Brain activation of nine SAD patients during performance of the task was mapped with statistical p value of 0.01, uncorrected.

Results: Frontal activation encompassing the OFC was observed during alternation learning, but not during a fixed criterion, an automatic response task. Intraparietal activation was also present during alternation learning. The flow of activation between several brain areas during the performance of the task was monitored. The activation shows correlations between the severity of SAD symptoms and the performance of an alternation learning task (Fig. 1).

Conclusions: Correlations between brain activation and symptom severity relate alternation learning to SAD neural substrate. The present results add support to the well documented SAD neural circuit: amygdala-ventral striatum-cingulum-OFC.

Fig. 1:
Convergence of
Severity symptoms
and poor performance
of alternation learning
Task:
Uncus, amygdala,
ventral striatum.

Poor performance ■
Avoidance ■
Anxiety ■



References:

- 1) Isseroff R, Sasson Y, Voet H, Hendler T, Luca-Haimovici K, Kandel-Sussman H, Zohar J. "Alternation learning in obsessive-compulsive disorder" *Biol Psychiatry* (1996) 15;39(8):733-8.