

Weaving the (neuronal) web: Fear learning in spider phobia

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Abstract

Theories of specific phobias consider classical conditioning as a central mechanism in the pathogenesis and maintenance of the disorder. Although the neuronal network underlying human fear conditioning is understood in considerable detail, no study to date has examined the neuronal correlates of fear conditioning directly in patients with specific phobias. Using functional magnet resonance imaging (fMRI) we investigated conditioned responses using phobia-relevant and non-phobia-relevant unconditioned stimuli in patients with specific phobias (n = 15) and healthy controls (n = 14) by means of a differential picture–picture conditioning paradigm: three neutral geometric figures (conditioned stimuli) were followed by either pictures of spiders, highly aversive scenes or household items (unconditioned stimuli), respectively. Enhanced activations within the fear network (medial prefrontal cortex, anterior cingulate cortex, amygdala, insula and thalamus) were observed in response to the phobia-related conditioned stimulus. Further, spider phobic subjects displayed higher amygdala activation in response to the phobia-related conditioned stimulus than to the non-phobia-related conditioned stimulus. Moreover, no differences between patients and healthy controls emerged regarding the non-phobia-related conditioned stimulus. The results imply that learned phobic fear is based on exaggerated responses in structures belonging to the fear network and emphasize the importance of the amygdala in the processing of phobic fear. Further, altered responding of the fear network in patients was only observed in response to the phobia-related conditioned stimulus but not to the non-phobia-related conditioned stimulus indicating no differences in general conditionability between patients with specific phobias and healthy controls.

Key Words: Specific phobia; Classical conditioning; fMRI; Fear learning; Amygdala; Medial prefrontal cortex