Neural mechanisms linked with vulnerability to anxiety

9 February 2011

New research examines the anxious brain during a fear conditioning task and provides insight into why some individuals may be more or less prone to anxiety disorders. The study, published by Cell Press in the February 10 issue of the journal *Neuron*, reveals neural mechanisms that may contribute to resilience against pathological fear and anxiety. The findings may help to direct therapeutic strategies for individuals who suffer from chronic anxiety as well as strategies that could help "at risk" individuals avoid developing anxiety disorders.

Previous studies have implicated a brain structure called the amygdala in the acquisition and expression of conditioned fear, this occurring when a stimulus (the conditioned stimulus, CS) becomes associated with an aversive object or event (the unconditioned stimulus, UCS). Another brain region, the ventromedial prefrontal cortex (vmPFC), has been shown in both animals and humans to help inhibit conditioned fear after extinction training, during which the CS is repeatedly presented without the UCS. However, it is not clear how certain personality characteristics, like a tendency or vulnerability towards anxiety, influence these mechanisms.

"We were interested in examining why it is that some of us can overcome the discrete fears and nonspecific anxiety that we experience in our lives more easily than others," explains senior study author, Dr. Sonia J. Bishop from the University of California, Berkeley. "Or, in other words, what differences in brain function might confer increased vulnerability for chronic fear and anxiety disorders ?"

Dr. Bishop and colleagues performed a neuroimaging study to examine fear conditioning in human subjects who had been classified as having varying levels of "trait anxiety," a tendency to experience anxiety across a range of everyday situations. The researchers observed that subjects who had a high level of trait anxiety were more likely to have an enhanced amygdala response to CS fear cues and to show faster acquisition of learned "fear" of these cues. Individual differences in amygdala reactivity were independent of the second dimension of risk, this involving the vmPFC. Recruitment of this region during conditioned fear expression prior to extinction was linked with greater reduction in fear responses and was more pronounced in fear-resilient individuals.

The findings suggest that individual differences in amygdala and vmPFC function are independently associated with vulnerability to anxiety, with the amygdala potentially influencing the development of cue-specific fears (or phobias) and the vmPFC impacting the ability to downregulate both phasic fears and generalized anxiety. "An understanding of the neurocognitive mechanisms by which trait vulnerability to pathological anxiety is conferred may aid not only in explaining the variability in symptoms, but also in informing choice intervention and prediction of treatment response," concludes Dr. Bishop.

Earlier this month, Dr. Bishop attended an awards ceremony at NIH in recognition of her receipt of one of twelve prestigious Biobehavioral Research Awards for Innovative New Scientists given to enable her further pursuit of this important line of research.

Provided by Cell Press