

Abstract

Phylogenetic threats such as spiders evoke our deepest primitive fears. When close or looming, such threats engage evolutionarily conserved monitoring systems and defense reactions that promote self-preservation. With the use of a modified behavioral approach task within functional MRI, we show that, as a tarantula was placed closer to a subject's foot, increased experiences of fear coincided with augmented activity in a cascade of fear-related brain networks including the periaqueductal gray, amygdala, and bed nucleus of the stria terminalis. Activity in the amygdala was also associated with underprediction of the tarantula's threat value and, in addition to the bed nucleus of the stria terminalis, with monitoring the tarantula's threat value as indexed by its direction of movement. Conversely, the orbitofrontal cortex was engaged as the tarantula grew more distant, suggesting that this region emits safety signals or expels fear. Our findings fractionate the neurobiological mechanisms associated with basic fear and potentially illuminate the perturbed reactions that characterize clinical phobias.

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