

Brave brains: Neural mechanisms of courage

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A fascinating new study combines snakes with brain imaging in order to uncover neural mechanisms associated with "courage." The research, published by Cell Press in the June 24 issue of the journal *Neuron*, provides fascinating insight into what happens in the brain when an individual voluntarily performs an action opposite to that promoted by ongoing fear and may even lead to new treatment strategies for those who exhibit a failure to overcome their fear.

Although there is a substantial body of research examining brain mechanisms associated with [fear](#), far less is known about the brain mechanisms associated with courage, defined here as action in the face of ongoing fear. "By gauging properly defined actions of either overcoming fear or succumbing to it in an acute controllable fearful situation, one can render certain neural substrates of courage amenable to investigation in a brain research laboratory setting," explains senior study author, Dr. Yadin Dudai from the Weizmann Institute of Science in Rehovot, Israel.

To study the [neural mechanisms](#) associated with moments of real-life courage, Dr. Dudai, Uri Nili, and their colleagues devised an experimental paradigm where participants had to choose whether to advance an object closer or farther away from them while their brain was scanned with [functional magnetic resonance imaging](#) (fMRI). The objects used in the study were either a toy bear or a live corn snake. Prior to the study, participants were categorized as "fearful" or "fearless" depending on how they responded to a validated snake-fear questionnaire.

As might be expected, the researchers observed that both high subjective fear and high somatic arousal were associated with succumbing to fear and moving the snake farther away. However, somewhat surprisingly, bringing the snake closer was associated with either high somatic arousal (assessed by skin conductance response) accompanied by low subjective fear (assessed by fear self-ratings) or high subjective fear accompanied by low somatic arousal.

Brain imaging during the task revealed that activity in a brain region called the subgenual anterior cingulate cortex (sgACC) correlated positively with the level of subjective fear when choosing to act courageously but not when choosing to succumb to fear. Further, activity in a series of temporal lobe structures was decreased when the level of fear increased and the individual chose to overcome their fear.

"Our results propose an account for [brain](#) processes and mechanisms supporting an intriguing aspect of human behavior, the ability to carry out a voluntary action opposite to that promoted by ongoing fear, namely courage," concludes Dr. Dudai. "Specifically, our findings delineate the importance of maintaining high sgACC activity in successful efforts to overcome ongoing fear and point to the possibility of manipulating sgACC activity in therapeutic intervention in disorders involving a failure to overcome fear."

More information: Nili et al.: "Fear Thou Not: Activity of Frontal and Temporal Circuits in Moments of Real-Life Courage." Publishing in *Neuron* 66, 949-962, June 24, 2010. [DOI 10.1016/j.neuron.2010.06.009](https://doi.org/10.1016/j.neuron.2010.06.009)

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