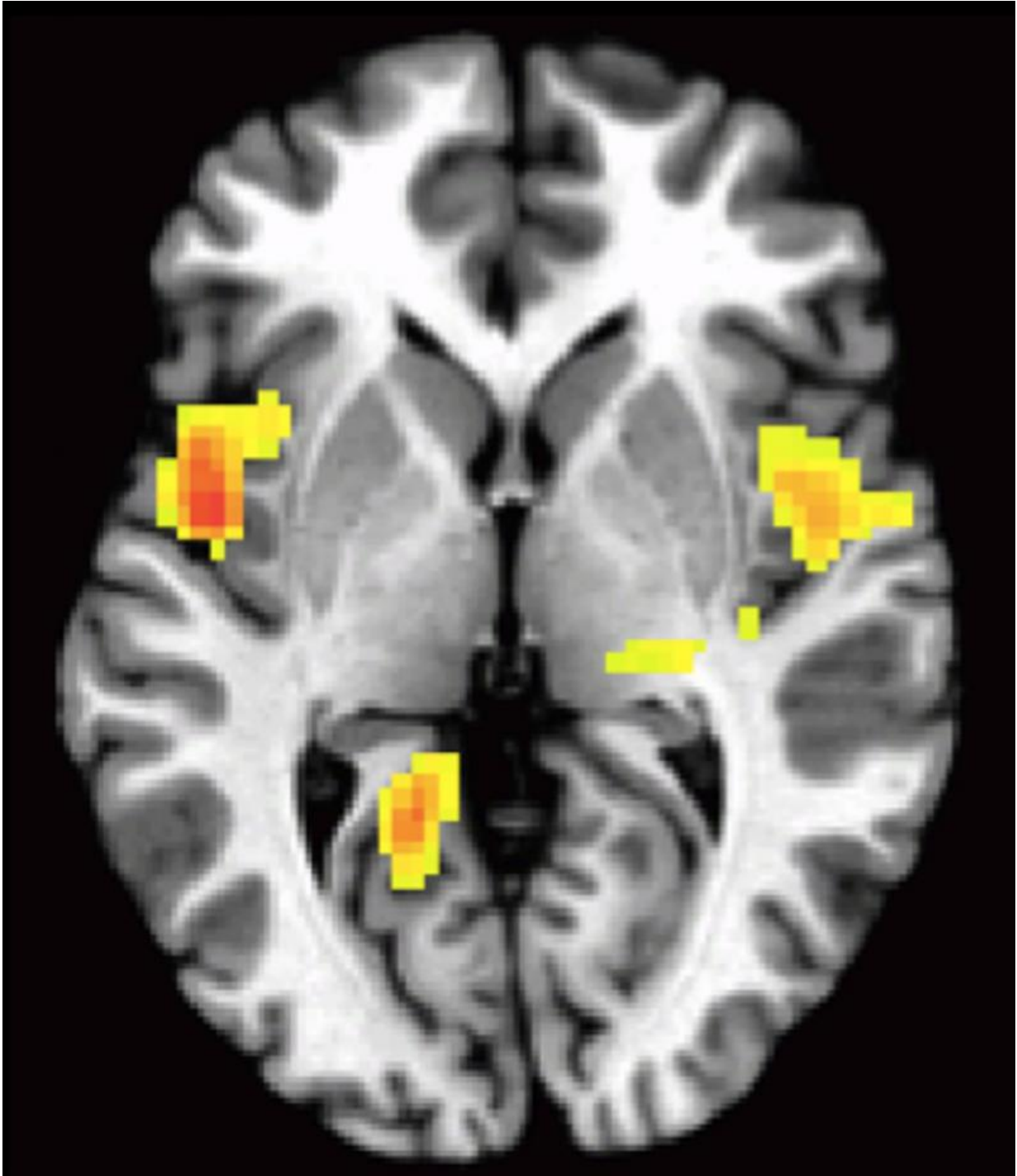


Withdrawn children display predictable brain activity during social interactions

May 10 2016



In a brain scanning study of children with high social reticence, high activity is displayed in the left and right insula, brain regions implicated in processing salience and distress.

A study using functional-MRI brain scanning reveals certain areas of the brain have higher activity in children who are socially withdrawn or reticent compared to children who are not withdrawn. Led by Stony Brook University psychologist Johanna M. Jarcho, PhD, the study involved fMRI of the children while they experienced a "cartoon classroom" that featured themselves as the new student in the school involved in various social interactions. The findings, published online first in *Psychological Science*, provide a better understanding of the brain activity of socially withdrawn children and could help form a foundation to teach children how to think differently about social interactions and thus prevent further socially withdrawn behavior or social anxiety.

Social reticence is expressed as shy, anxiously avoidant behavior in early childhood. Some mental health professionals believe that social reticence in childhood and pre-teen years is a precursor to more socially withdrawn behavior and social anxiety that develops through the teen years and adulthood.

In the paper titled "Early-Childhood Social Reticence Predicts Brain Function in Preadolescent Youths During Distinct Forms of Peer Evaluation," Dr. Jarcho, an Assistant Professor in the Department of Psychology at Stony Brook University and colleagues evaluated 53 [children](#) by way of fMRI. The children were part of a study beginning at 2 years of age with follow-ups at multiple ages to age 11. Thirty of the children were evaluated as those functioning with high social reticence; 23 were considered to have low social reticence.

The research team created a novel interactive paradigm around a virtual classroom in a cartoon form. Each of the 11-year-old children created an avatar character of himself or herself and completed an online personality profile. The experimenters created other characters for the child to interact with, such as the "unpredictable kid," "bully," or "nice student." While undergoing fMRI, social interactions inside the

classroom were played out, with each child reacting to these social interactions with their avatar character.

"Few techniques have been able to test the effects of such nuanced social landscape on [brain function](#) during real-time, ongoing, peer-based interactions where peers embody distinct social qualities," said Dr. Jarcho. "This paradigm proved very effective in mapping [brain](#) activity of pre-teens who are socially reticent and appears to be a valuable tool for ongoing research."

The scanning revealed that high (but not low) social reticence predicted greater activity in the dorsal anterior cingulate cortex and left and right insula, brain regions implicated in processing salience and distress. High social reticence was also associated with negative functional connectivity between insula and ventromedial prefrontal cortex, a region commonly implicated in affect regulation. Also, participants with high social reticence showed increased amygdala activity but only during feedback from the "unpredictable" peers in the cartoon classroom.

The findings provide scientists with a measure of brain functioning of pre-teens with high social reticence. A critical next step is to isolate neural circuits that promote risk for or resilience against expressions of psychopathology related to high social reticence.

Dr. Jarcho and colleagues are currently conducting interviews with the same group of 53 participants who are now approaching their teens. The idea is to determine if the pattern of brain function that differentiated pre-teens with high and low childhood social reticence also predicts expression of [social anxiety](#) symptoms.

More information: J. M. Jarcho et al. Early-Childhood Social Reticence Predicts Brain Function in Preadolescent Youths During Distinct Forms of Peer Evaluation, *Psychological Science* (2016). [DOI:](#)

[10.1177/0956797616638319](https://doi.org/10.1177/0956797616638319)

Provided by Stony Brook University

Citation: Withdrawn children display predictable brain activity during social interactions (2016, May 10) retrieved 4 May 2024 from

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