

NEWS

Cognition and behavior: Reward circuit abnormal in autism

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The reward center of the brain is less active in children with autism compared with controls in response both to praise and monetary rewards, according to a study published 11 April in *Social Cognitive and Affective Neuroscience*¹.

The results suggest that there is an overall deficit in the brain's reward circuitry in autism and that it is not specific to social stimuli.

This finding is in contrast to a 2010 study showing that children with autism have less brain activity than do controls in areas of the brain that process a sense of reward, and that this effect is especially pronounced **in response to social**, as opposed to monetary, rewards.

Another study showed that children with autism are better able to **improve their speed and accuracy** on a computerized cognitive test when promised money than when rewarded with praise, whereas controls improve equally in response to both rewards.

However, last fall, researchers reported an abnormal brain response to both social and monetary rewards in children with autism, as measured by electroencephalography (EEG), which can detect large groups of neurons working together².

In the new study, researchers used functional magnetic resonance imaging to look at the reward center of the brain, which includes the amygdala, the nucleus accumbens and the anterior cingulate cortex. The researchers scanned 15 children with autism and 17 typically developing controls, a number of whom had also participated in the EEG study.

The children performed a cognitive task that tested their ability to respond to and hold off on responding to a visual cue. Participants were instructed to press a button in response to a cue, such as a black square, but only when it was preceded by an upward-facing arrow; a downward-facing arrow indicates that they should hold off. The test randomly alternated between these 'go' and 'no-go' scenarios, but included a larger proportion of 'go' tests.

At the outset, the test also indicated to the children whether they would be rewarded with a smiling face, money or nothing at all if they performed the task correctly. Both children with autism and typical controls said that they felt more motivated by money than by happy faces, the study found. However, both groups performed better in response to either reward than to no reward at all, with no difference between the two reward types.

Despite this, children with autism show less activity compared with controls in reward regions of the brain in response to both reward types, the study found. In particular, they have diminished activity in the amygdala and the anterior cingulate cortex.

Children with autism also have less activity in the nucleus accumbens compared with controls in response to monetary, but not social, rewards.

More experiments are needed to confirm the relative role of social and monetary rewards in autism, as previous studies used verbal praise in addition to images of faces, the researchers say.

Differences in reward circuitry in individuals with autism could explain why they often have an interest in atypical stimuli, as exhibited in the restricted interests that are a feature of the disorder, at the expense of typical environmental and social cues, the researchers suggest.

References:

1: Kohls G. *et al. Soc. Cog. Affect. Neurosci.* Epub ahead of print (2012) [PubMed](#)

2: Kohls G. *et al. J. Autism Dev. Disord.* **41**, 1523-1533 (2011) [PubMed](#)