

# Perinatal substance use may shape how strongly mothers feel toward infants

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Substance use during pregnancy and postpartum may impact areas of the brain associated with what psychologists and neuroscientists call "affective empathy," or the emotional response experienced as a result of others' emotions, a new study suggests.

Researchers exposed both mothers who used substances during the

perinatal period [start of pregnancy until one year after birth], and those who didn't, to pictures of happy and sad infant faces and sounds of crying babies. The types of substances used among the former group of mothers varied, but the most common substance was tobacco (70%), followed by alcohol (30%), cannabis (20%), and cocaine (20%).

Mothers were presented with these stimuli while undergoing [functional magnetic resonance](#) imaging (fMRI), which measures [brain activity](#). fMRI revealed that brain regions associated with affective empathy were less activated in response to the infant stimuli in mothers who used substances than in mothers who did not.

The researchers [published their findings](#) in the *Journal of Psychiatric Research* in March 2024.

"Moms who use substances deserve support and help," says Li Yan McCurdy, Ph.D., postdoctoral fellow in Yale's Department of Radiology & Biomedical Imaging and the study's first author. "Being able to identify these similarities and differences is important for helping us find ways to support these moms in caregiving."

## **Cognitive empathy versus affective empathy**

Empathy can be divided into subcategories including cognitive empathy and affective empathy. Cognitive empathy refers to one's ability to identify emotions that others are experiencing. This type of empathy is linked to brain regions such as the medial prefrontal cortex.

Affective empathy, on the other hand, refers to the emotions one feels in response to various cues. "This is a measure of how emotional you personally feel in response to someone's emotions, for example how happy you feel when looking at someone who's happy," McCurdy explains. The brain regions associated with affective empathy include

the inferior frontal gyrus, insula, and amygdala.

## **Mothers rate emotional intensity of infant cues and own feelings in response**

McCurdy's team used previously published data from a 2020 study led by Helena Rutherford, Ph.D., associate professor in the Yale Child Study Center, who is also the new study's principal investigator. The dataset included 39 mothers who had used substances during the perinatal period and 42 who did not.

All of the participants looked at images of happy and sad infants and listened to sounds of infants crying while undergoing fMRI. Half of the cues were from unknown infants and half were the mother's own baby. After the scan, researchers asked the participants to provide a "think" and a "feel" rating.

For the "think" rating, the researchers asked the participants to evaluate how happy or sad they thought the infant was feeling for each cue. This was a proxy for measuring the mother's cognitive empathy. The researchers also asked the mothers to rate how strongly each cue made them feel. This was the "feel" rating, which was a proxy for affective empathy.

## **Maternal substance use associated with less affective empathy**

McCurdy's team reanalyzed this dataset to better understand how maternal [substance use](#) during the perinatal period might impact mothers' cognitive empathy and affective empathy.

Based on the subjective ratings and neural activity, levels of cognitive

empathy did not significantly differ between groups—the mothers' perceptions of how strongly each infant was feeling were comparable. And the brain regions associated with cognitive empathy showed similar activation.

On the other hand, mothers who used substances reported feeling less intensely in response to the infants, especially toward sad cues. "When they heard an infant cry or when they saw a picture of a sad infant face, they reported their affective empathy as being less intense," McCurdy explains. The fMRI scans also showed that brain regions associated with affective empathy were less activated in this group.

Interestingly, however, when the cue was an image of the participant's own smiling infant, there was no significant difference in affective [empathy](#) ratings between the two groups.

"It seems there's something quite unique about seeing your own happy baby that makes moms who use substances feel equally happy compared to moms who don't," says McCurdy. "In terms of developing interventions, perhaps seeing your smiling baby can be a source of reward and motivation."

McCurdy highlights that the data only include measures of how mothers feel and think about infant stimuli and does not directly measure maternal behavior. "Future studies are needed to link these responses to infant stimuli with caregiving abilities," she says.

"Based on these data alone, we also cannot ascertain whether these differences in maternal responses observed are a result of the substance use or are simply associated with it," says Rutherford. "It's possible that feeling less intensely particularly towards sad infant stimuli may actually be adaptive as it allows mothers who use substances to not feel overwhelmed when interacting with their crying baby."

McCurdy hopes these insights will help inform efforts to support mothers struggling with substance use. "There's a lot of stigma around substance use, and this stigma is unfortunately amplified for [mothers](#) who use substances," says McCurdy.

"It's important that we continue studying this population because understanding how to best support their caregiving and maternal behavior is immensely important in helping them be the best moms they can be."

**More information:** Li Yan McCurdy et al, Neural correlates of altered emotional responsivity to infant stimuli in mothers who use substances, *Journal of Psychiatric Research* (2024). [DOI: 10.1016/j.jpsychires.2024.01.024](#)

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