

## Dad's brain becomes more 'maternal' when he's primary caregiver: study

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Credit: George Hodan/public domain

Fathers who spend more time taking care of their newborn child undergo changes in brain activity that make them more apt to fret about their baby's safety, a new study shows.

In particular, fathers who are the primary caregiver experience an increase in activity in their amygdala and other emotional-processing

systems, causing them to experience parental emotions similar to those typically experienced by mothers, the researchers noted.

The findings suggest there is a neural network in the brain dedicated to parenting, and that the network responds to changes in parental roles, said study senior author Ruth Feldman, a researcher in the department of psychology and the Gonda Brain Sciences Center at Bar-Ilan University in Israel.

"Pregnancy, childbirth and lactation are very powerful primers in women to worry about their child's survival," said Feldman, who also serves as an adjunct professor at the Yale Child Study Center at Yale University. "Fathers have the capacity to do it as well as mothers, but they need daily caregiving activities to ignite that mothering network."

To compare the differences in fathers' and mothers' brains, Feldman and her colleagues studied 89 first-time parents as they interacted with their children.

The study included 20 primary-caregiving heterosexual mothers and 21 secondary-caregiving heterosexual fathers. To draw a tighter focus on how the parenting roles of fathers affect their [brain activity](#), the researchers also studied 48 homosexual fathers who are raising infants as primary caregivers in a committed relationship.

"It's not something you can find in the animal world, and it's not something you could find in humans until very recently—two committed fathers raising a child," Feldman said. This arrangement forces one man to take the lead role in caring for their child.

The researchers observed the parents' behavior and performed brain scans to see which regions would activate when shown videotapes of interactions between parent and child.

They found clear differences between the brains of women who had taken a lead role in raising a child and men who had taken a supporting role.

The mothers showed more activity in the amygdala and other emotion-processing structures than fathers—in fact, their amygdala activity was five times that of the fathers who had taken a secondary role in child-rearing.

"They are the worriers," Feldman said. "They are much more primed by pregnancy and childbirth to be aware of infant danger signals."

On the other hand, the fathers showed more activity in their superior temporal sulcus, a region of the brain involved in logical tasks related to social interaction. It is crucial to processing social cues, reading facial expressions and processing speech.

"In fathers, their parenting is guided much more by understanding and empathizing in a cognitive way," Feldman said.

But when a man takes on the primary caregiving role—in this case, as part of a committed homosexual relationship—both "parenting" regions of the brain become highly active, researchers found.

"They have the father's cognitive structures, but the amygdala is sensitive to child-care experiences and it can activate to the level of mothers," Feldman said.

The degree of connectivity between the two brain regions in all fathers correlated with the amount of time spent taking care of the child, suggesting that fathers' brains adapt to a more active parenting role.

"The more [fathers](#) are involved in active caregiving, the more the

fathering network will activate the mothering network," Feldman said.

Jeannie Bertoli, a relationship and family counselor based in Woodland Hills, Calif., noted that the research did not include any families where the father was the primary caregiver and the mother had assumed a secondary role.

She hopes that follow-up research will look at whether mothers can lose the amygdala-driven bond established through childbirth after they've rejoined the workforce.

It also will be important to test whether brain changes occur in men who are primary caregivers in a heterosexual relationship, Bertoli added.

In addition to the [amygdala](#) finding, the researchers also linked activity in all parts of the [brain](#)'s parenting network to the release of oxytocin, which Feldman said serves as the "love" and "bonding" hormone that rewards togetherness and caring.

"Oxytocin levels were about the same among all [parents](#)," whether male or female and whether primary or secondary caregiver, she said.

The findings are published May 26 in the *Proceedings of the National Academy of Sciences*.

**More information:** Father's brain is sensitive to childcare experiences, *PNAS*, [www.pnas.org/cgi/doi/10.1073/pnas.1402569111](http://www.pnas.org/cgi/doi/10.1073/pnas.1402569111)

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