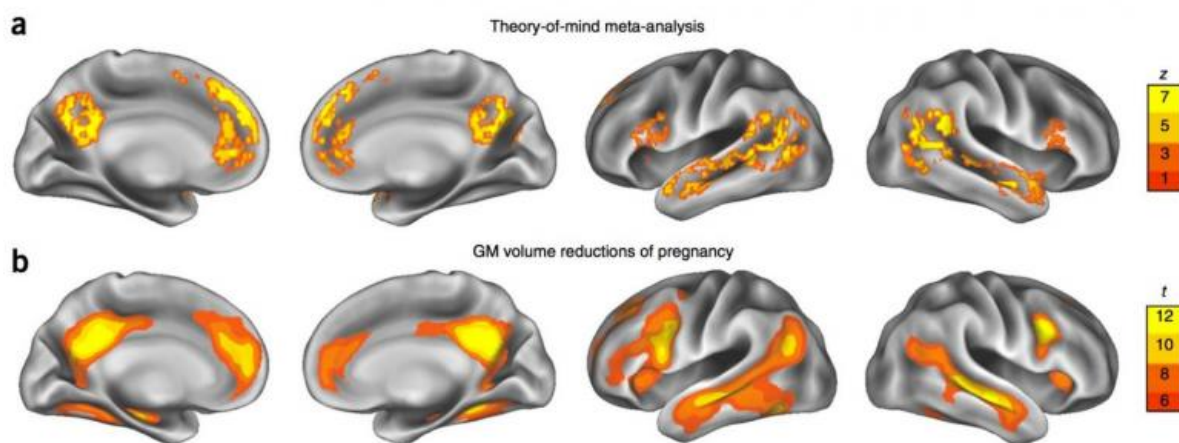


Opinion: Research suggests motherhood has changed my brain

March 23 2017, by Olivia Carter



A) Regions of the brain previously shown to be important in social cognition and theory of mind. B) Regions of the brain found to have reduced grey matter volume after pregnancy. Adapted from Hoekzema et al (2017) *Nature Neuroscience* 20,287–296.

"Mum is it winter soon?"

Yesterday this simple question sent my brain into meltdown. As I tried to work out if summer was over yet, I realised I couldn't even remember if we should be entering Spring or Autumn.

Feeling defeated, I deflected the question to my 8-year-old daughter

Susie. She happily rattled off the answer to the question along with the starting dates of all of the seasons, just in case her younger brother wanted to know that too.

I have never had a brain for details (I realise some would argue that "season of the year" shouldn't count as a detail). However, in the chaos and sleep deprivation associated with life with a young family of three kids, I do wonder if I am more forgetful now than I used to be. People talk about "baby brain" but there has been very little evidence, to date, of any real changes to the brain associated with pregnancy.

Of course, we all have our anecdotes. Like the time I spent 20 minutes looking for my car keys only to find that I had put them in my son's lunch box in the before-school morning panic (the kids were late to school that day). But anecdotes don't amount to evidence.

So I was very intrigued when I first heard reports of a [paper published recently in the prestigious journal *Nature Neuroscience*](#). The study claimed to provide the first good evidence that pregnancy leads to long-lasting brain changes in a mother's brain. Most surprisingly these changes were still detectable two years after the birth of their child.

The study was unique in that it went to the extra effort of collecting [brain scans](#) from women and their partners prior to the woman falling pregnant with the couple's first child. The researchers then re-scanned these same men and women within a few months after the birth. These brain images were then compared to women and men of a similar age who did not have children during an equivalent time frame.

The study claimed to identify pronounced reductions in the mother's brain regions involved in [social cognition](#) and the capacity to infer other people's emotions and beliefs termed "[theory of mind](#)". These types of changes in brain structure identified are believed to reflect a reduction in

[grey matter](#) (the dense mass of neurons and synapses that make up the cortex).

The interesting and counter intuitive finding was that the brain reductions were not associated with any impairments in basic measures of cognitive function (such as working memory). Rather the reduced brain volumes correlated with *greater* self-reported maternal attachment to their babies and increased brain activation associated with viewing their babies images. Importantly, in this study no significant changes in [brain structure](#) were seen in the fathers.

The strength of the mother-child attachment was assessed using the [Maternal Postnatal Attachment Scale](#). This measure requires parents to indicate the extent to which they feel statements such as the following are true for them: "When I am caring for the baby, I get feelings of annoyance or irritation" or "When I am with the baby and other people are present, I feel proud of the baby".

In other words, the greater the *reduction* of volume in areas believed to be important in social connections and empathy, the greater the reported *strength* of the personal connection and bonding that mothers showed with their child.

Eleven of the mothers who had not had another child returned two years later for another set of brain scans. In this follow-up, the researchers found some evidence of brain volume recovery in the hippocampus (an area important in long-term memory). However, all other brain regions that were initially identified as becoming smaller after pregnancy remained reduced two years later.

The fact that fathers did not show similar brain changes was interpreted by the authors as evidence that the brain reductions were likely to be the consequence of the large changes in hormone levels during pregnancy

rather than simply due to parenthood itself.

The authors point to adolescence as another period of life associated with hormone related changes in grey matter volume and suggest that a similar form of rewiring may occur with pregnancy.

The authors speculate that during pregnancy the female brain undergoes a further maturation or specialisation of the neural network subserving social cognition. This could help strengthen the "theory of mind" networks and enhance a mother's ability to recognise her child's needs or to identify threats posed by individuals around her.

I was very impressed with this research and the effort they put into controlling for different factors. However, reflecting on my own experience during pregnancies and early stages of caring for my babies, I certainly didn't feel like I gained extra powers of social deduction or empathy.

I was undoubtedly more socially isolated than I had been previously. I was also spent less time thinking about myself, but this presumably had a lot to do to the fact that I was spending more time caring for my screaming child.

More research might be required to tease apart the cause and effect relationship here. Does the mother's brain naturally become more specialised to focus on their immediate family and closest friends by pruning away synapses involved in maintaining broader social processing? Or does the enforced isolation and the massive shift in attentional focus away from one's self to one's new screaming baby lead to gradual loss of those social [brain regions](#)?

This is a very hard question to answer and would probably require scanning the brains of mothers raising adopted children or those

delivered with a surrogate. Alternatively, the researchers could hunt down those elusive (some might say mythical) perfect parents that manage to maintain large social networks and have perfect babies that never cry or demand attention. It would be interesting to see "if" such women can be found, whether their brains show similar reductions in [brain volume](#).

As for me, I really am not sure if my children have made me more empathetic or just turned me into their personal slave. I am also not sure if any of this explains why I can't remember what season we are in or why I accidentally packed my car keys into my son's lunch box.

On a more positive note though it might give me an extra reason to catch up more with distant friends now that my kids are getting older. It might help me re-grow my social [brain](#)!

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