

Don't underestimate the developing brains of children

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Detail of the cover of Michelle Achterberg's dissertation. Credit: Leiden University

Children's brains react in the same way to social feedback as adults' brains. But handling frustration or aggression after being rejected is a different matter, developmental psychologist Michelle Achterberg has discovered. Using fMRI techniques, the development of the child brain has now been studied for the first time in a large sample study.

You often receive [social feedback](#) on yourself, both positive and negative, via social media. That can make you sad or angry. Why is it that some children are very sensitive to this, and others not? According

to Michelle Achterberg, the architecture of the brain is already fixed in childhood. She explains: "Developments in the child brain can be predictive of behavior in adolescence. That's why we need to put more energy into mapping [brain activity](#), the connections between different areas of the brain and brain development in childhood."

New experiment

Achterberg has developed a new experiment, the Social Network Aggression Task, to study how children handle social emotions. She asked children who were positioned in an MRI scanner a number of questions, such as, "What do you wish for most?" and "What is your favorite subject?" They then received [feedback](#) on their answers from similarly aged children whom they didn't know. The young participants in the scanner were then asked how hard they wanted to blast a noise into the ear of the person giving the feedback.

Brain region for feedback

With both positive and negative feedback, the child brain is active in the same regions as adults. Achterberg showed that the activity following [negative feedback](#) had less to do with mental pain stimuli, but rather that the brain emitted the signal: Hey, watch out, there's something going on here. "It's logical that the brain area involved, the insula, is active in childhood. That's how children know something is important and that they need to pay attention to it. We are the first researchers to show this in children between seven and nine years old," says Achterberg.

Brain region for self-control

But the child brain works differently when handling feelings of aggression following a rejection. The development of the brain area

involved in self-control, the dorsolateral prefrontal cortex (DLPFC) is different for each child. Children whose development in this area is stronger over a period of two years exhibit a greater reduction in aggressive behavior. "So, already in childhood—even before the start of adolescence—children regulate negative behavior following a rejection. But the activity in the DLPFC is less strong than we found in adults," Acherberg stresses.

Connections in the child brain

Besides the specific brain regions, Acherberg also studied the functional connections between these brain regions. "The brain is a network of connections. We don't yet know a lot about this in children, because it's difficult to carry out experiments with children in an MRI scanner. Children move differently from adults in the scanner, and they also move more. Our [longitudinal research](#) on twins, Samen Uniek, is the first MRI research using a very large group of 500 children from seven to nine years old. This group is big enough to split up and to repeat the study (replication) to gain a good image of the connections in the child [brain](#)."

Watching *Frozen* 200 times for science

But how well can we actually scan children? Is the ability to lie still hereditary? This has possible consequences for the conclusions based on qualitative scans. "Our research on twins shows clearly how hereditary the connections are. Strong movements do seem to be hereditary, but if you check that children don't move too much outside the nominal curve, there's no impact on the results. What you're left with isn't hereditary. So, the conclusion you draw from this is that the movement that is left over is influenced by the environment. That's why we let [children](#) keep a stamp card for example, or take a soft toy in the scanner and watch a nice film while the scan is taking place. I think I must have seen *Frozen*

at least 200 times," Achterberg laughs.

Provided by Leiden University

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