Brain changes accompany development of metamemory from childhood to adolescence

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Being able to assess our own memories helps us to avoid errors and prompts us to collect more information to fill the gaps. Psychologists know that this ability is present in elementary school-age children. Now a new study shows how this "metamemory" improves from childhood

through adolescence, with accompanying changes in brain structure. The work is published this week in the *Proceedings of the National Academy of Sciences*.

"We did not know that this capacity continues to improve into adolescence, and virtually all previous evidence came from cross-sectional studies comparing children at different ages instead of testing the same children over time," said co-author Simona Ghetti, professor of psychology at the Center for Mind and Brain at the University of California, Davis.

Ghetti, postdoctoral researcher Yana Fandakova and colleagues studied 145 children aged between the ages of seven and 15 three times, with each time point a bit over a year apart. The children carried out some memory tasks assessing the actual accuracy of their memories and their ability to reflect on the accuracy of memories, and measurements of brain structures were made with magnetic resonance imaging (MRI). They also looked at a control group of 31 adults.

They found that the ability to introspect on memories continuously improves into adolescence. By analyzing changes in individual children over time, they could show that decreases in thickness in the insular cortex and increases in thickness in the ventromedial cortex predicted improvements in metamemory over time.

"These regions are important for our capacity to detect errors, reflect, and regulate our behaviors, and their thickness changes at different rates. We showed that their unique pattern of change is important for introspection and memory improvements during a period of tremendous learning opportunities," Ghetti said.

The team also measured the children's IQ at the first and last time point. Better metamemory predicted increases in IQ over time and vice versa.

A better understanding of how metamemory develops may be useful in education and fostering new skills, Ghetti said.

More information: Yana Fandakova et al, Changes in ventromedial prefrontal and insular cortex support the development of metamemory from childhood into adolescence, *Proceedings of the National Academy of Sciences* (2017). DOI: 10.1073/pnas.1703079114

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