NEW YORK (AP) -- Very smart children, despite their reputation for being ahead of their peers mentally, actually lag behind other kids in development of the "thinking" part of the brain, a new study says.

The brain's outer mantle, or cortex, gets thicker and then thins during childhood and the teen years. The study found that in kids with superior intelligence, the cortex reaches its thickest stage a few years later than in other children.

Nobody knows what causes that or how it relates to superior intelligence. But researchers said the finding does not rule out a role for environment -- such as intellectual stimulation -- in affecting a child's level of intelligence.

In fact, the brain's delay in thickening may promote higher intelligence because it means a child is older and processing more complex experiences while the cortex is building up, said study co-author Dr. Judith Rapoport.

Rapoport, with researcher Dr. Philip Shaw and others at the National Institute of Mental Health in Bethesda, Maryland, followed development of the cortex in 307 children. They used repeated magnetic resonance imaging (MRI) scans from childhood to the latter teens.

Results appear in Thursday's issue of the journal Nature. Researchers also found that despite the delayed schedule, the cortex thickens and thins faster in brilliant kids than in other children.

The overall findings are especially strong for cortex development in the front part of the brain and in a strip over the top of the head, areas where complex mental tasks are done, Shaw said.

One analysis found the cortex in kids with the highest IQs -- 121 to 149 -- didn't reach maximum thickness until age 11. Children who were just slightly less bright reached that point at age 9, and those with average intelligence at around 6. In all cases, the
cortex later thinned as the children matured.

Nobody knows what's happening within the cortex to make it get thicker or thinner, Shaw said, so it's impossible to say why those changes would be related to intelligence. Brain development is influenced by intellectual stimulation, so that probably plays a role, he said.

The study findings are "certainly not a recipe for how to change intelligence," he said. Nor do they suggest that MRI scans can reveal how intelligent an individual child is, he said.

Elizabeth Sowell of the University of California, Los Angeles, who has studied cortex thickness in children, said she found the results convincing.

While the findings show that the pattern of cortex development is related to high intelligence, they can't show which is causing the other, she said.

She also said that by tracing out patterns of normal development, such studies help scientists understand what goes wrong in children with brain disorders.

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