What is the relationship between an index of general intelligence and the shape or size of the cerebral cortex in a large cohort of children?” asks co-author Jason Lerch, from the Hospital for Sick Children in Toronto.

In a study designed and led by Philip Shaw, from the National Institutes of Health in the United States, Lerch and colleagues used magnetic resonance imaging (MRI) to create images of the brains of 307 children and adolescents. They then used the images to measure the thickness of each child’s cerebral cortex. All the children had their brains scanned at least once, 178 received two brain scans, and 92 received three or more brain scans. The average time between scans was two years. The researchers then looked at the relationship between the thickness of the cerebral cortex and the children’s intelligence, as measured by standard IQ tests.

**BIGGER ISN’T NECESSARILY BETTER**

It turns out that the relationship between the size and shape of the cerebral cortex and intelligence is more complex than might be expected. “When it comes to cortical thickness, there is no simple relationship of bigger equals better,” says Lerch. The story is more complex: “the way intelligence relates to cortical thickness is to be found in the time course and not necessarily at any one point of development. In fact, the young children in this study had an unexpected relationship between cortical thickness and IQ: the higher the IQ, the thinner the cortex. The thickening of the cortex was, however, more rapid over the next few years for these subjects.” In other words, the most intelligent children had thin cortices at a young age, but these thickened rapidly over time.

It’s important to understand, says Lerch, that these findings cannot be used to determine a specific child’s intelligence with an MRI scan of the brain. Rather, the data demonstrate a pattern of brain development that helps further the understanding of how intellectual ability develops at a neuro-anatomical level. “One key lesson for parents and healthcare professionals from this study would be to look at the dynamic time course of neuro-anatomical development,” says Lerch. “The large number of subjects in this study allowed us to draw inferences about the developmental time course of the thickness of the cortex and how it relates to intellectual ability. The key is that a more dynamic developmental pattern set apart the children with the highest IQs.”

The research also highlights the fact that from very young ages right through adolescence, children are undergoing rapid changes in their cerebral cortex, and that the development of optimal intellect is probably at least partially dependent on these changes happening smoothly. As this could be a critical and vulnerable period for the development of intellect, it is important for children to receive good care, including proper nutrition and exposure to activities that stimulate thinking, to develop their intellects as fully as possible.

• BY ALISON PALKHIVALA