

**Math Achievement Is Associated with Behavioral and Brain Measures  
of Logical Reasoning in Children**

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Children who struggle with math generally show poor academic achievement and are more likely to leave the school system early. It is thus critical to determine the factors associated with math acquisition. One of these factors may be logical reasoning. The goal of the present study was to determine the link between math skill and behavioral and brain measures of logical reasoning.

Twenty-four right-handed, typically-developing children aged 9-12.5 were included in this fMRI study. Children completed standardized cognitive tests, math tests and a logical reasoning task in a scanner. The task required participants to listen to stories, each containing a logical argument followed by a question. In half of the stories, the premises of the logical argument had to be integrated to correctly answer the question (integrable stories). The other half of the stories (non-integrable stories) did not require logical reasoning and were aimed to control for comprehension.

After controlling for age, we found that math skill was positively correlated to accuracy to questions following integrable, but not non-integrable stories. We further found more brain activity in the bilateral Intraparietal sulcus (IPS) for integrable versus non-integrable stories. Finally, math skill positively correlated with brain activity in the right IPS.

Overall, we found a behavioral and a neural link between logical reasoning abilities and math achievement. Because young children use deductive skills in daily life even before the beginning of math learning (for example when they listen to stories), these findings might have implications for the early detection of math difficulties.