Logical Reasoning and Mathematics Skills in Children and Adults

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1 Summarized Publications

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2 Summary

It has long been suggested that mathematics skills and logical reasoning are intrinsically linked. Nevertheless, the reasons for this link are not well-researched or well-understood. For example, it is unclear what types of logical reasoning are related to mathematics, whether these links are stable across development, and if the link between maths and logic is mediated by general cognitive factors, such as intelligence, working memory or some other basic processes that are known to be involved in mathematics, such as the processing of order information or comparison skills. In this talk, I will present two studies (one with children and one with adults) that aimed to investigate these questions. The studies focused on transitive inferences and conditional reasoning problems, because previous work has found these forms of logical reasoning to be related to mathematics skills. The studies confirmed that the relation between mathematics and logical reasoning skills was present in the case of both children and adults, and it was not mediated by working memory or intelligence. Additionally, these links were specific to the type of inference (for example, only conditional reasoning was related to arithmetic skills, and only transitive inferences were related to performance on a number line task, although both types of logical inference were related to performance on complex mathematics word problems). The ability to process order information appeared to be important for both logical reasoning and mathematics. Overall, these studies suggest that, although explicit reasoning processes might be important for some types of mathematics tasks, logical reasoning and mathematics also share some basic building blocks (e.g., the requirement to process order information). These findings go beyond the idea that links between high-level thinking processes mostly exists due to their shared connections with intelligence and working memory. These results could also inform the development of educational interventions.