Longitudinal predictors of early mathematics: Number-specific versus domain-general mechanisms?

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Introduction

What is a good basis for developing mathematical competencies? While some authors propose that number-specific abilities primarily contribute to early math development, other authors suggest that domain-general abilities are key.

- The number-specific perspective emphasizes the role of nonverbal and symbolic number sense for math development [1, 2].
- The domain-general perspective emphasizes the role of domain-general mechanisms such as working memory, language processing, processing speed and abstract reasoning in early math and development [3-5].

Hypothesis

Number-specific and domain-general abilities both contribute to kindergarten numeracy and Grade 1 math development. However these underlying mechanisms might contribute differentially to early numeracy and math outcomes.

Aim

This longitudinal study investigates the concurrent contributions of number-specific and domain-general abilities as assessed in kindergarten on individual differences in early numeracy (kindergarten) and in math competencies (Grade 1).

Method

2 measurement waves

In kindergarten:
- n=165
- Mean age = 6 years, 3 months; SD = 4 months
- Girls: 50.9% boys

In grade 1:
- N=151
- Mean age = 7 years, 2 months; SD = 4 months
- Girls: 50.9% boys

Individual testing (2 sessions, see measures in table 1)

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Results

1. WM is key for developing early numeracy

2. Early numeracy, fluid intelligence and processing speed predict arithmetic in grade 1

3. Early numeracy and receptive vocabulary predict problem solving in grade 1

4. Early numeracy and fluid intelligence predict symbolic number sense (number line) in Grade 1

Conclusions

The present results emphasize:
(a) the influence of WM on early numeracy skills [5, 6]
(b) the predictive power of early numeracy skills for Grade 1 math outcomes [1, 7]
(c) the importance of verbal processing for problem solving [4]
(d) the predictive power of fluid intelligence for arithmetic and symbolic number sense
(e) the role of processing speed for arithmetic performance

References


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