



# Early Cognitive Predictors of Academic Skills in Grades 1 to 3

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## Introduction

- There is no strict cut off between typical and atypical language, reading, and math learning.
- Cognitive predictors reported to be important in school learning.<sup>1,2</sup>
  - vocabulary, sentence recall
  - phonological awareness, letter-sound identification, rapid naming
  - number comparison, number line estimation, addition/subtraction
- There is considerable overlap in the cognitive predictors associated with learning in different academic domains.<sup>3,4</sup>
- Studying learning profiles and predictors across a wide range of skills might provide a more robust estimate of these complex relationships.
- Investigating cognitive predictors related to a range of academic skills might identify key factors supporting learning generally and specifically.
- Understanding important cognitive predictors of later school learning has the potential to inform early interventions.

## Research Question

What cognitive skills best predict learning outcomes in language, reading, and math across grades 1 to 3, and are these relationships stable?

## Methods

### Phase I: Kindergarten Screening

**Participants:** 610 kindergarten children

### Standardized Measures:

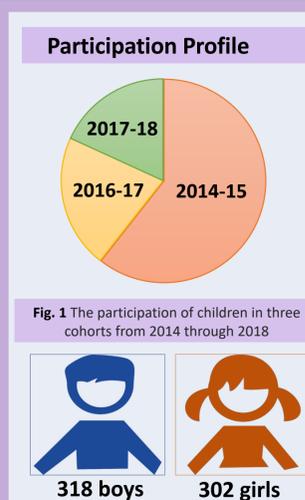
- Measures of vocabulary, sentence recall, phonological awareness, letter-sound naming, number naming, rapid automatic naming, magnitude comparison, number line estimation, addition and subtraction in a single 20-minute assessment.

### Phase II: Follow up Grades at Grade 1, 2 & 3

**Participants:** 359 of original Phase 1 participants.

### Measures:

- Academic grades for oral language, reading, math (all participants).



## Results

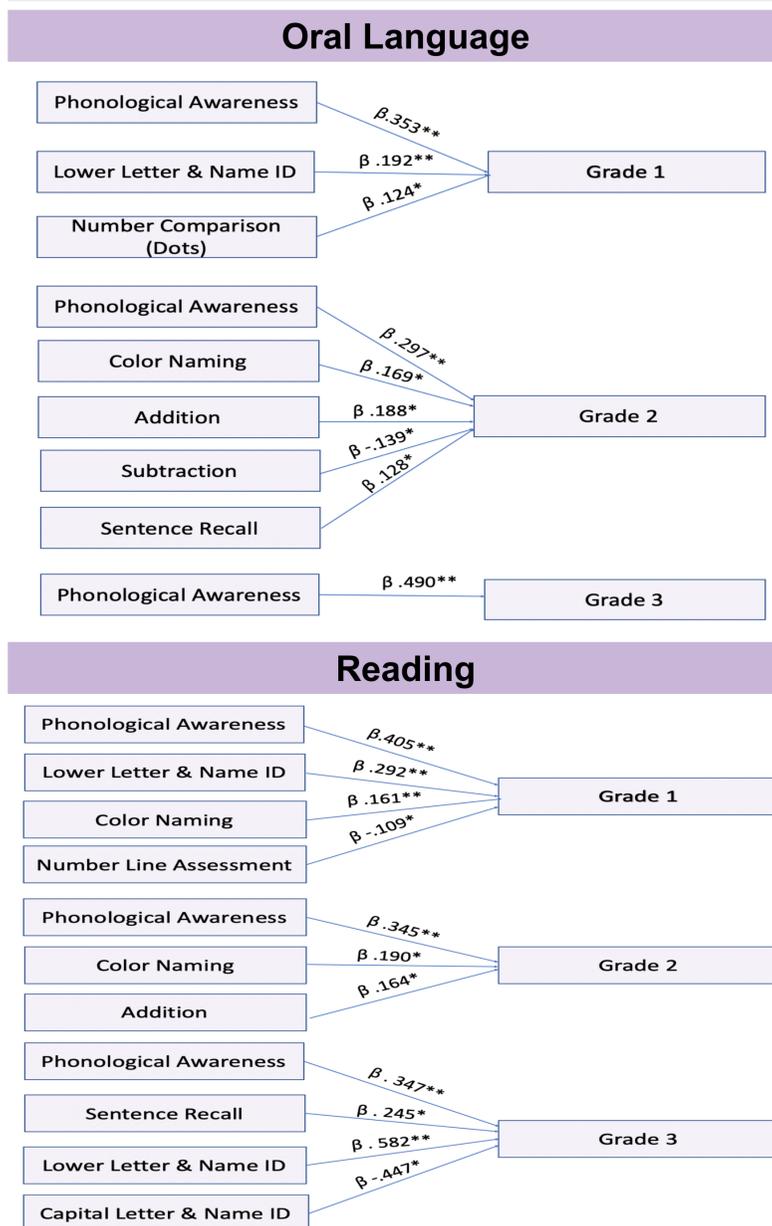
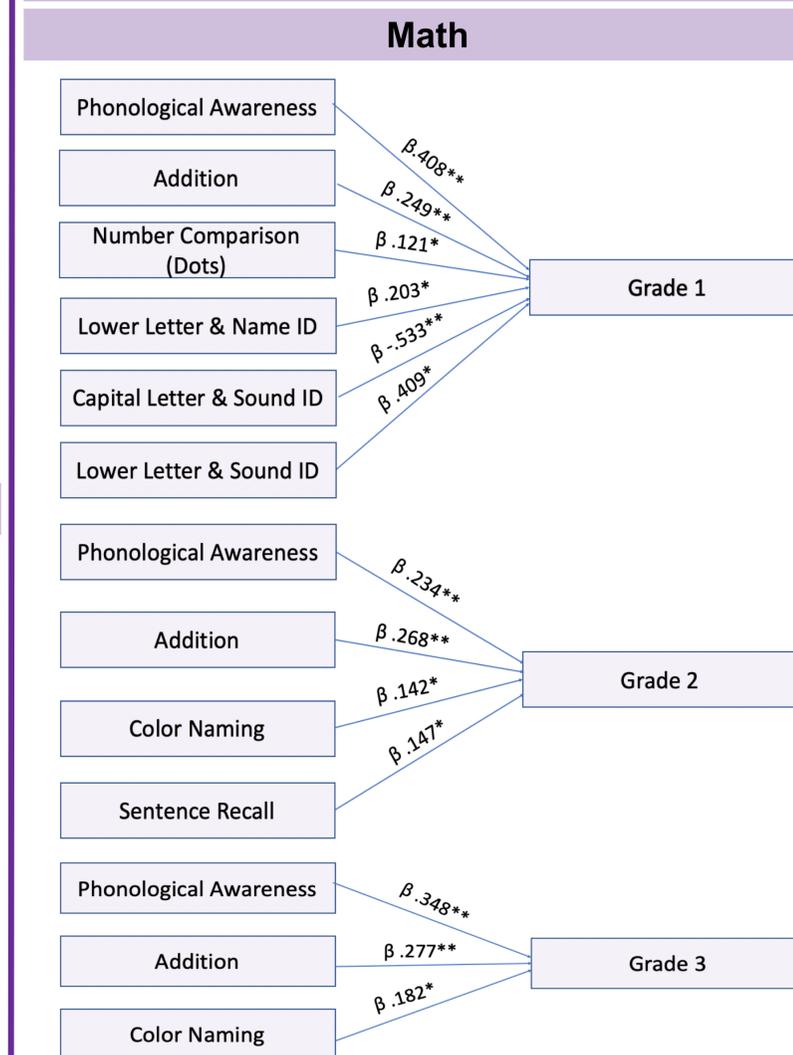


Fig. 2: Diagrams of cognitive predictors predicting learning outcomes for Oral Language, Reading, and Math grades in grade 1, 2 & 3 for Kindergarten children.  
\*  $p < .01$ , \*\*  $p < .001$

## Analysis

Stepwise multiple regression was conducted using SPSS 25.0.



## References

- 1 Archibald, L., Cardy, J., Ansari, D., Olino, T., & Joanisse, M. (2019). The consistency and cognitive predictors of children's oral language, reading, and math learning profiles. *Learning and Individual Differences*, 70, 130-141.
- 2 DeSmedt, B., Taylor, J., Archibald, L., & Ansari, D. (2010). How is phonological processing related to individual differences in children's arithmetic skills?. *Developmental science*, 13(3), 508-520.
- 3 Peterson, R., Boada, R., McGrath, L., Willcutt, E., Olson, R., & Pennington, B. (2017). Cognitive prediction of reading, math, and attention: Shared and unique influences. *Journal of learning disabilities*, 50(4), 408-421.
- 4 Archibald, L., Cardy, J., Joanisse, M., & Ansari, D. (2013). Language, reading, and math learning profiles in an epidemiological sample of school age children. *Plos One*, 8(10), e77463.

## Summary of the Results

- Both consistent and varying pattern in relationships between cognitive predictors and academic outcomes
  - **Phonological Awareness** predicted later grades in all areas and had the strongest effect across all measures.
  - **Letter naming & Sound ID** were important predictors of Grade 1 grades.
  - **Color Naming** predicted gr. 1&2 but not gr. 3 grades.
  - **Addition & Subtraction** predicted gr. 2 grades.