



# Development of operation-specific lexical consistency effect in arithmetic word problem solving

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## Introduction

- Word problems: arithmetic questions demonstrated in narratives.
- Adults showed operation-specific lexical consistency effect in response fluency of word problem solving, suggesting that the processing of linguistic and numerical factors interact during word problem solution (Ng et al., 2021).
- We investigated age-related changes in word problem solving for school-age children and adolescents.

## Experiment Design

- We used the same experimental paradigm as in the previous study.
- Independent variables
  - Arithmetic Operation × Lexical Consistency
    - ▶ Consistent: addition-more; subtraction-less
    - ▶ Inconsistent: addition-less; subtraction-more

### addition

consistent Sam has 8 books, and Kiki have 2 books **more** than Sam. How many books does Kiki have?

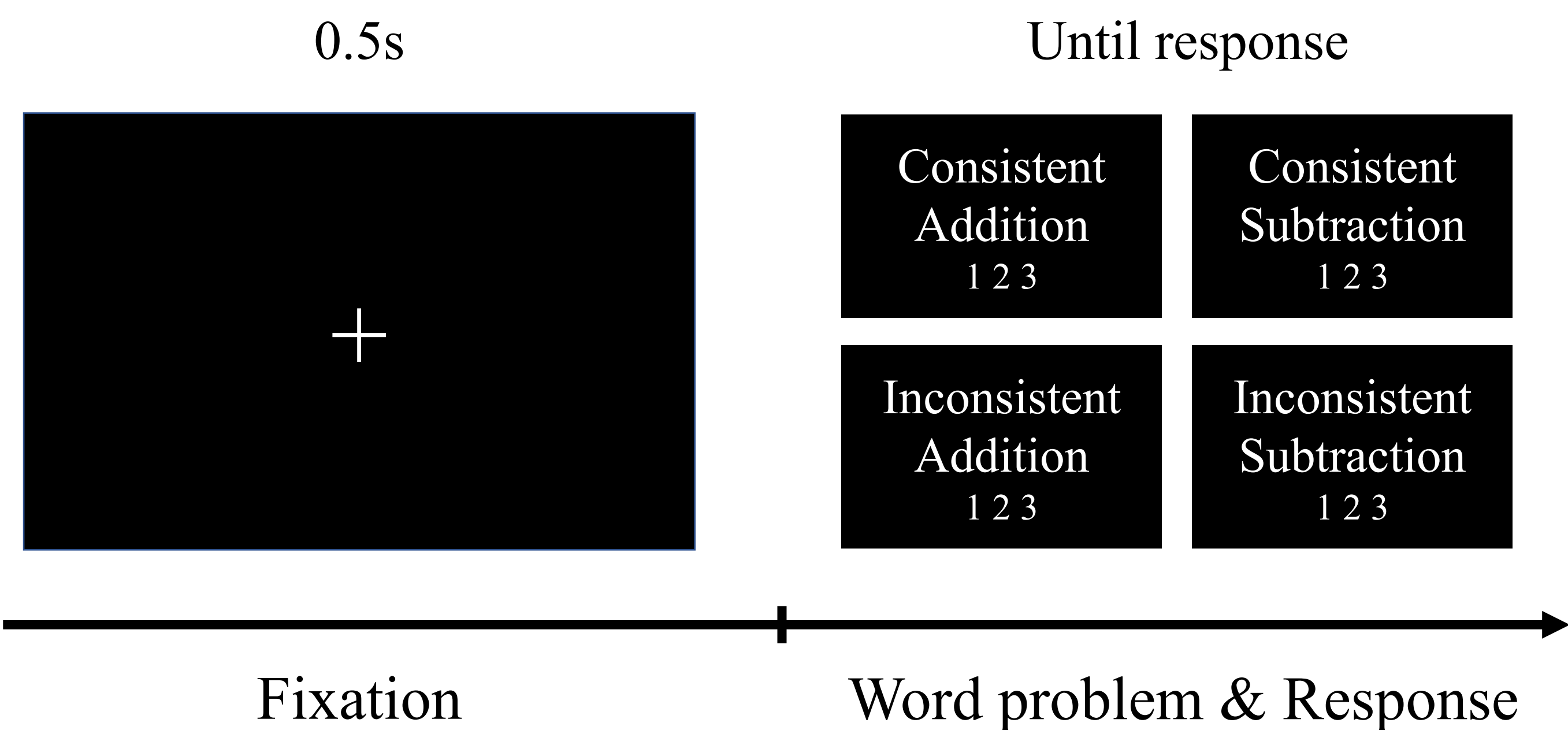
inconsistent Sam has 8 books, and Sam has 1 book **less** than Kiki. How many books does Kiki have?

### subtraction

consistent Sam has 8 books, and Kiki have 3 books **less** than Sam. How many books does Kiki have?

inconsistent Sam has 8 books, and Sam has 2 book **more** than Kiki. How many books does Kiki have?

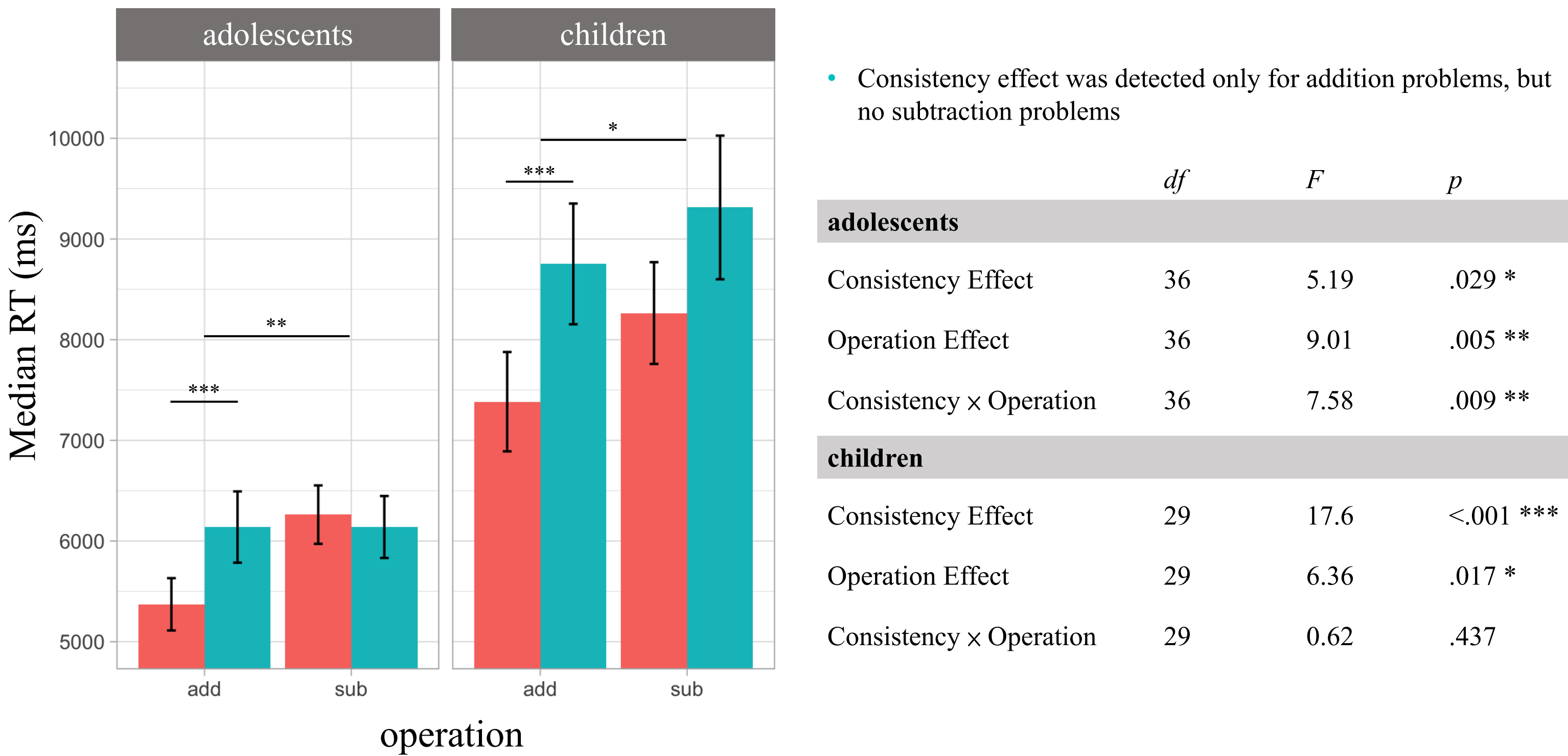
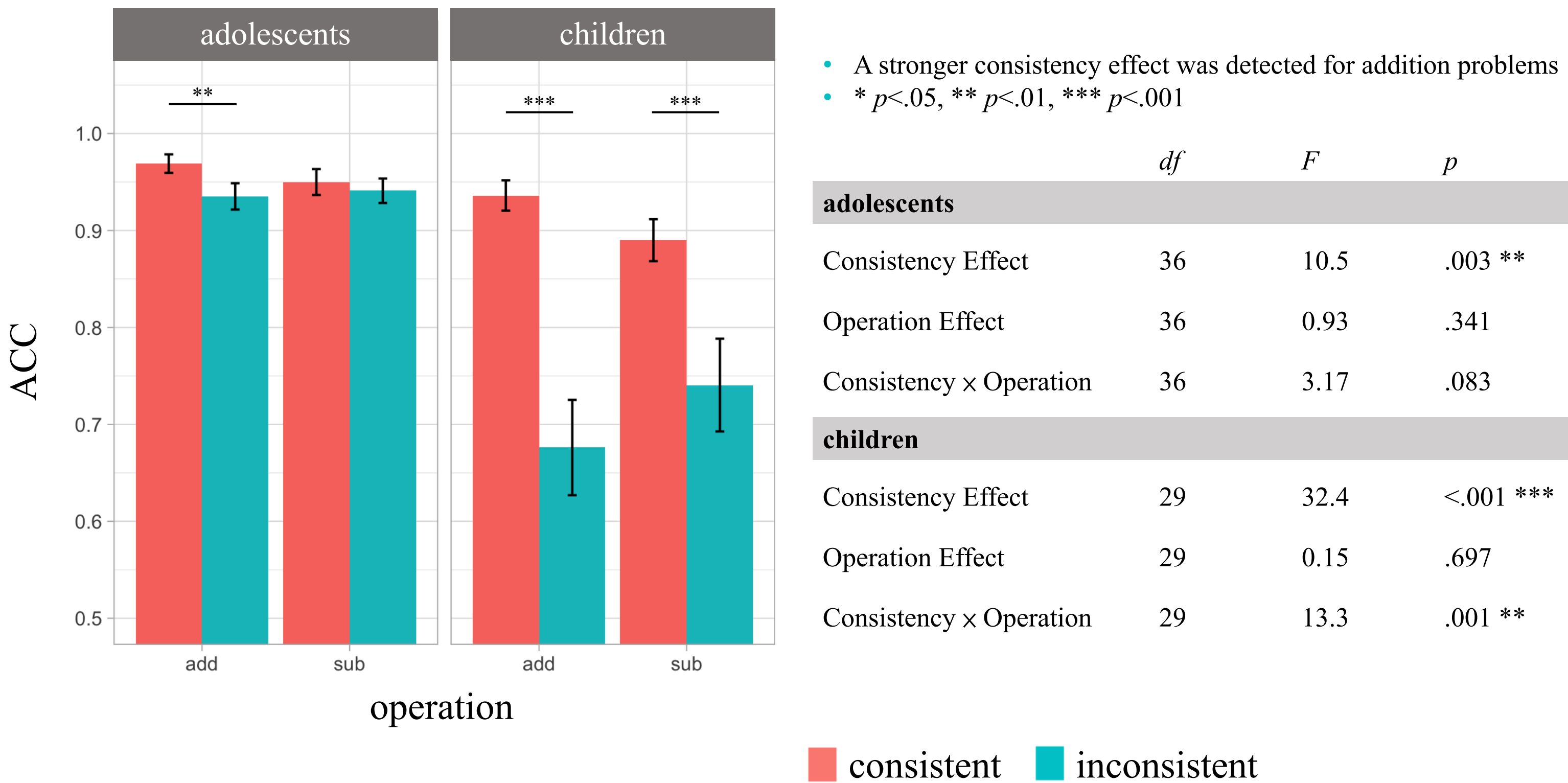
- Dependent variables
  - Task accuracy & Response time



## Participants

- 30 children (F15, M15)
  - Range: 8-12; Mean: 9.76; Standard deviation: 1.22
- 37 adolescents (F19, M18)
  - Range: 12-18; Mean: 14.64; Standard deviation: 1.97

## Results



## Discussion

- Children and adolescents displayed distinct operation and lexical consistency effect during word problem solution
  - a developmental shift from childhood to adolescence in word problem solution
- Lexical consistency may affect numerical processing regarding response precision in the younger age
- With maturation of word problem skills, adolescents demonstrated adult-like interaction effect between linguistic and numerical factors in response fluency

## Reference

- Ng, C. T., Lung, T. C., & Chang, T. T. (2021). Operation-Specific Lexical Consistency Effect in Fronto-Insular-Parietal Network During Word Problem Solving. *Frontiers in Human Neuroscience*, 15, 631438.