

## Motivation

- How does the environment influence executive function (EF) development?
- Entry into formal school (age 5-7) is a nearly ubiquitous environmental change
- Coincides with a period of increased behavioral and cognitive growth (for processes both taught *and* not explicitly taught Dhuey, 2016)
- Are these changes due to maturation or experience (*schooling effect*)?

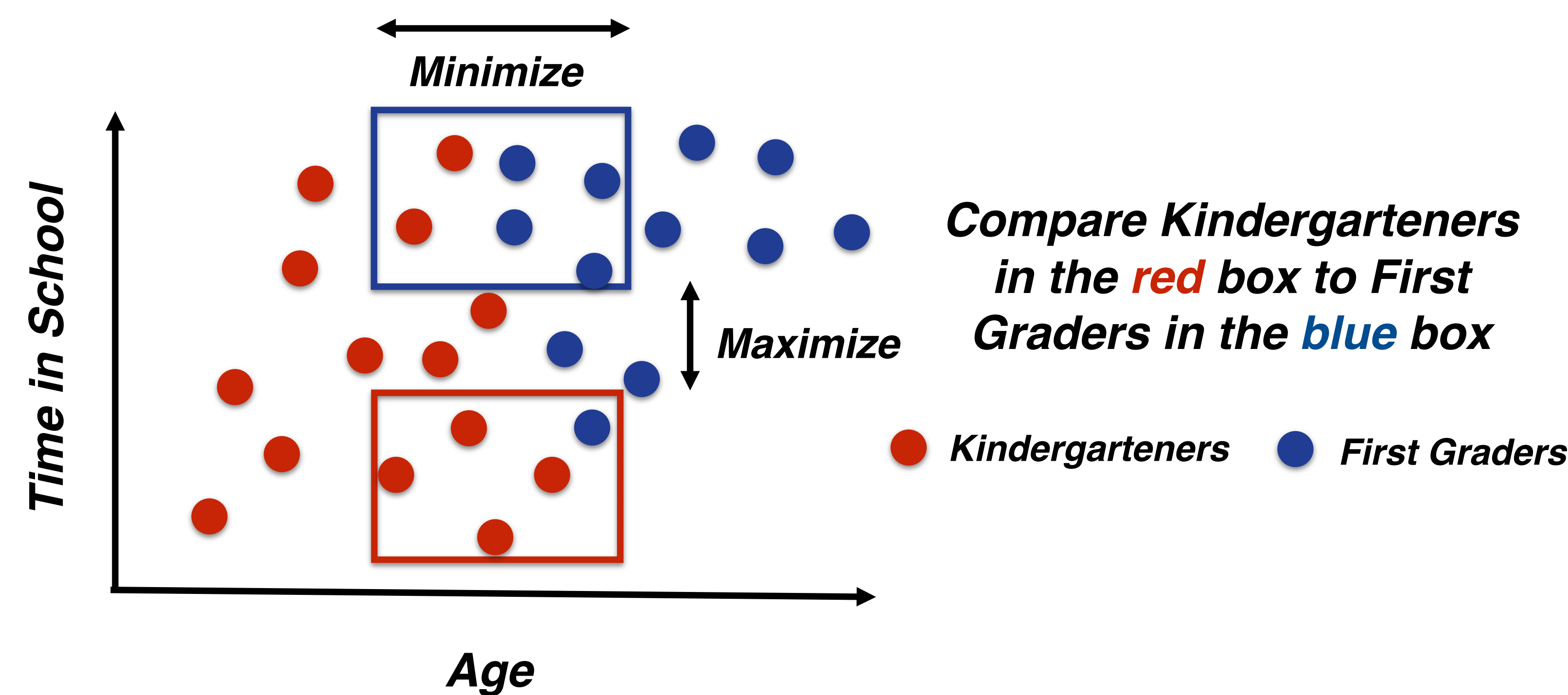
We conducted secondary data analysis to examine the effect of school, independent of age, on three core measures of EF.

## Introduction

### Traditional Cutoff Design

Exploits school entry *cutoff date* to generate **two same-age groups** that **differ in amount of school** they have experienced

### Approximating a cutoff design with 'real' data



### Existing evidence for the schooling effect

'Academic' schooling effect is well-established:

- Early exposure to formal schooling leads to increased competence in literacy and math (Morrison et al., 2019)

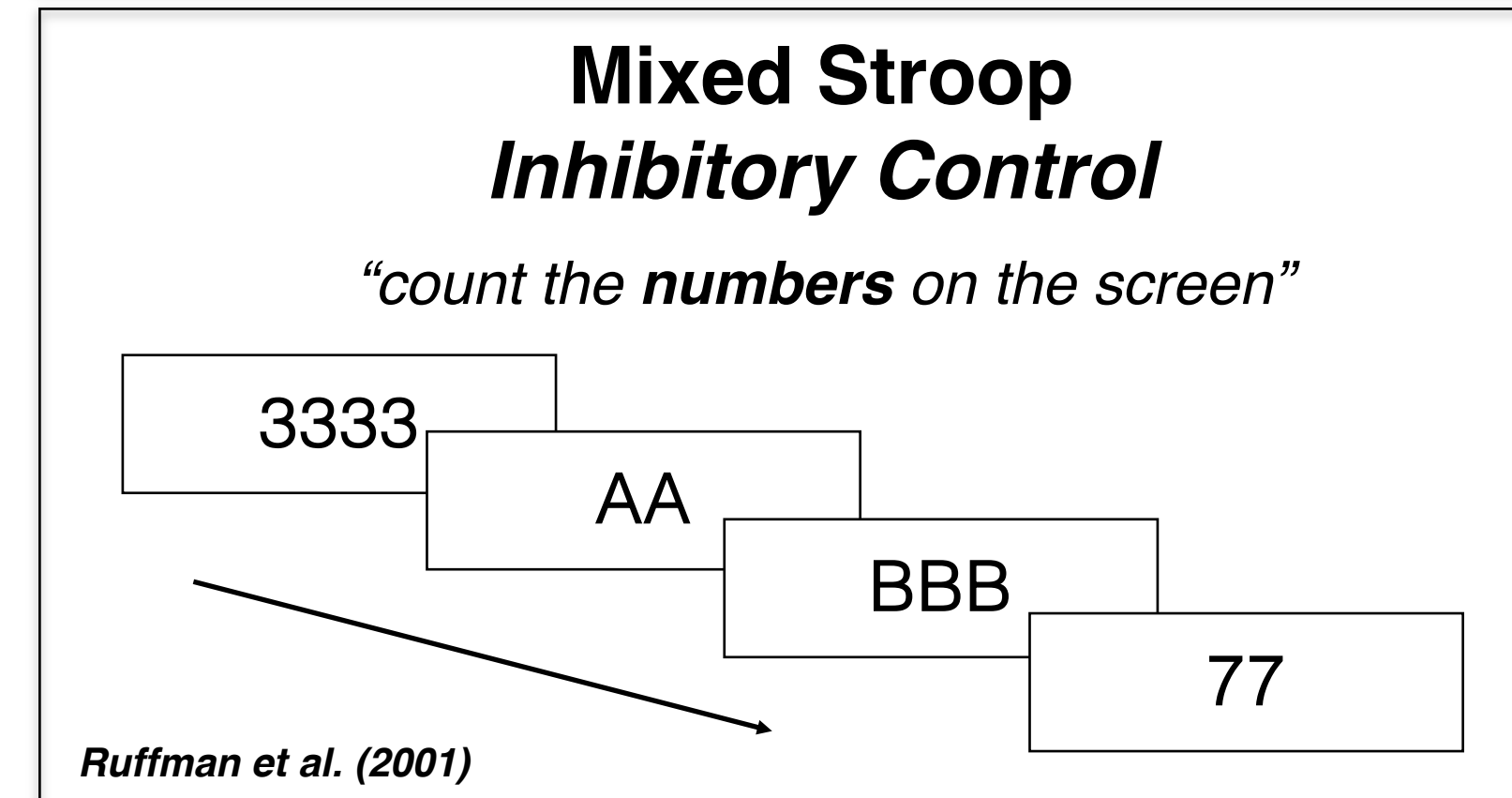
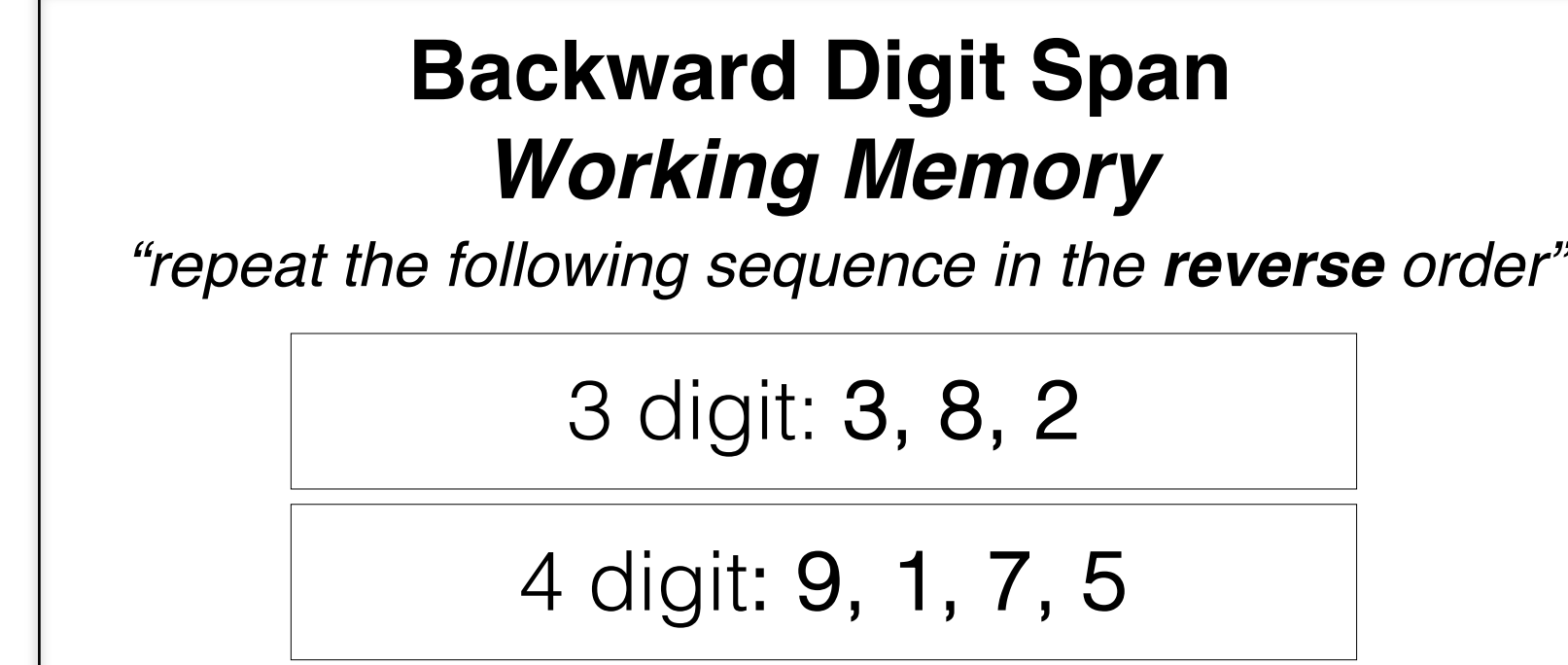
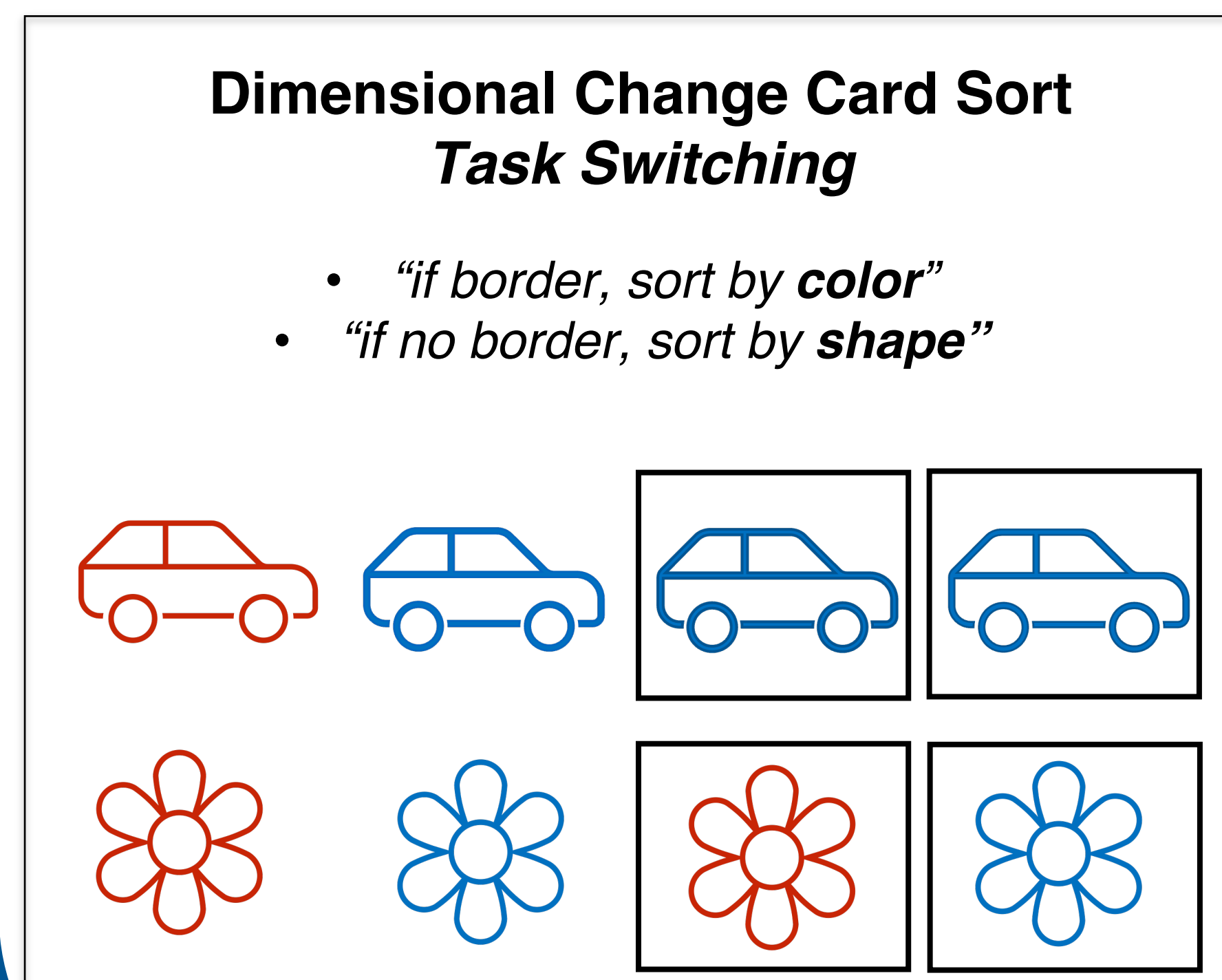
### EF schooling effect is not as well-established:

- Some evidence for WM, inhibitory control-specific effects across PK – first grade, not as much for task switching (Morrison et al. 2019)

## Secondary Data

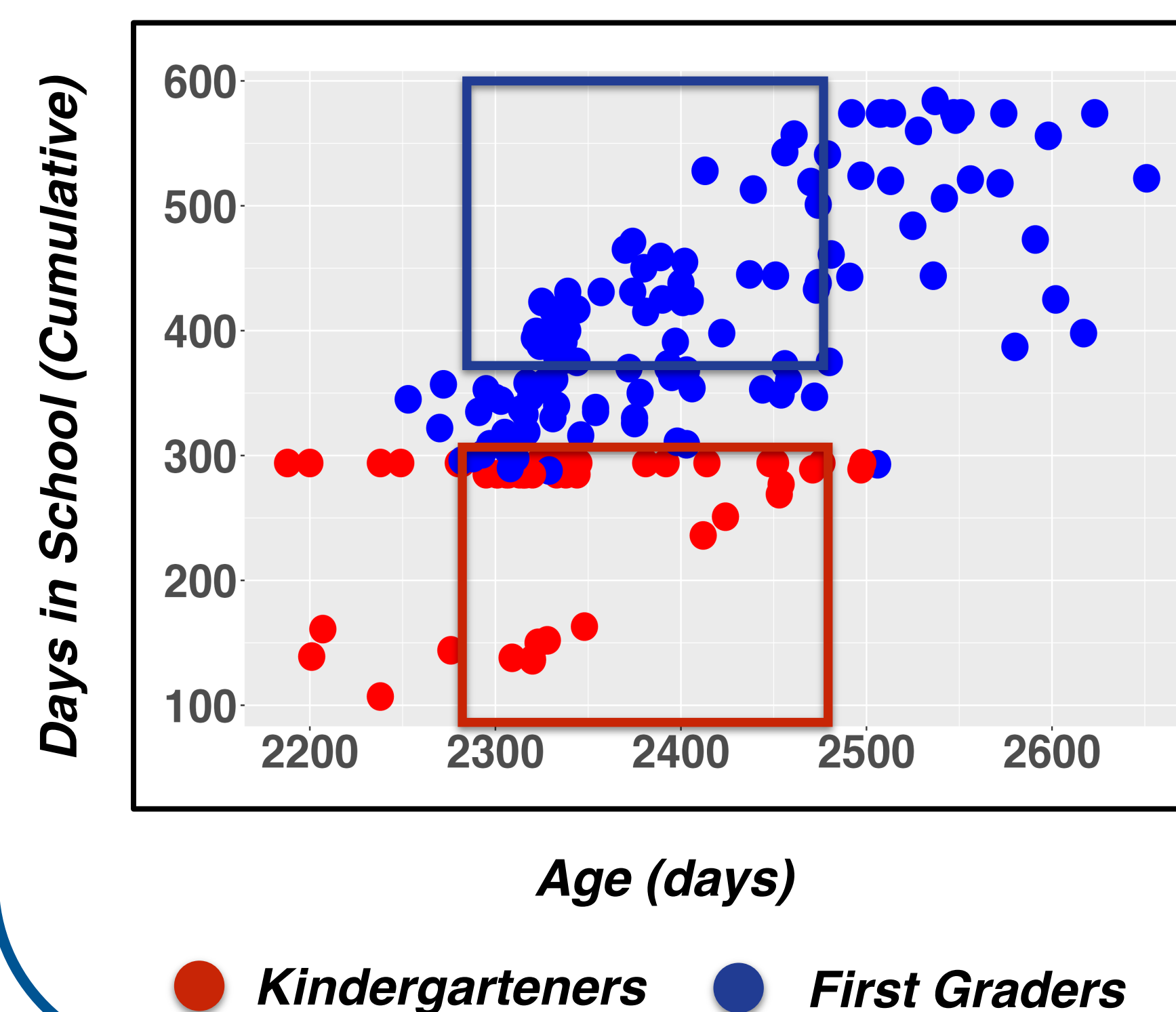
- Large, longitudinal study from Southeastern USA, early-mid 2010s (Broomell & Bell, 2022);  $n = \sim 200$  six-year-olds across Kindergarten, 1<sup>st</sup>, 2<sup>nd</sup>

### Outcomes of Interest (core EFs)



## Group Selection

- Minimize difference in age
- Maximize difference in school experience
- Roughly-equal group size



## Group Demographics

- Total  $n = 86$ , age 6.3 – 6.8 years
  - 42 kindergarteners
  - 44 first-graders
- Time in school
  - < 300 days kindergarteners
  - > 375 days first-graders

### Gender and Race

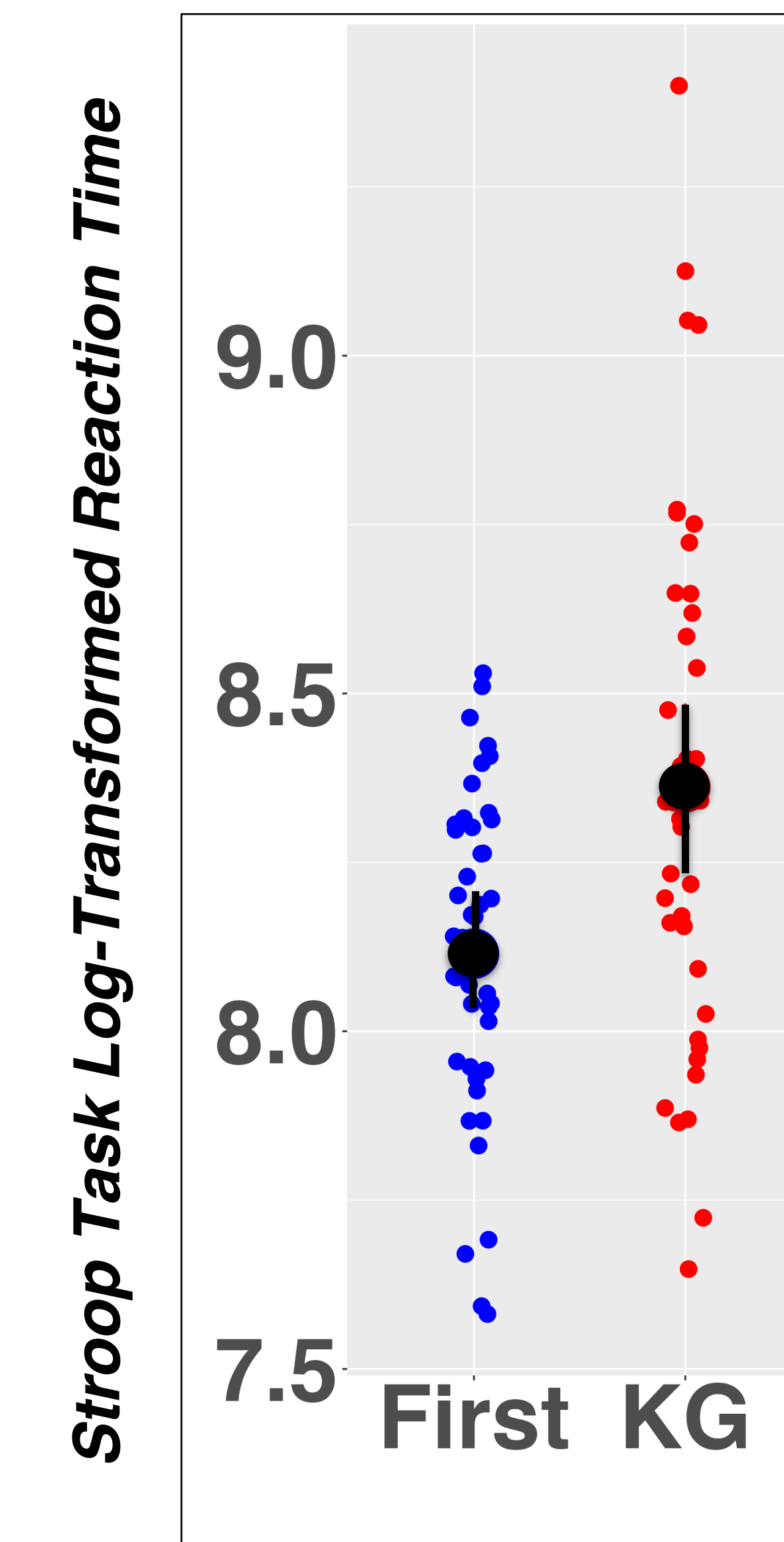
	Kindergarteners $n = 42$	First Graders $n = 44$
<b>GENDER</b>		
Female	22	21
Male	20	23
<b>RACE</b>		
Indigenous American	0	0
Asian	0	0
Black or African American	3	11
White	36	31
"Other" Race	3	2

## References

- Broomell, A. P. R., & Bell, M. A. (2022). Longitudinal development of executive function from infancy to late childhood. *Cognitive Development*, 63, 101229.
- Dhuey, E. (2016). Age at school entry: How old is old enough? IZA World of Labor. <https://doi.org/10.15185/izawol.247>
- Morrison, F. J., Kim, M. H., Connor, C. M., & Grammer, J. K. (2019). The causal impact of schooling on children's development: Lessons for developmental science. *Current Directions in Psychological Science*, 28(5), 441–449.
- Ruffman, T., Rustin, C., Garnham, W., & Parkin, A. J. (2001). Source monitoring and false memories in children: Relation to certainty and executive functioning. *Journal of Experimental Child Psychology*, 80, 95–111. doi:10.1006/jecp.2001.2632

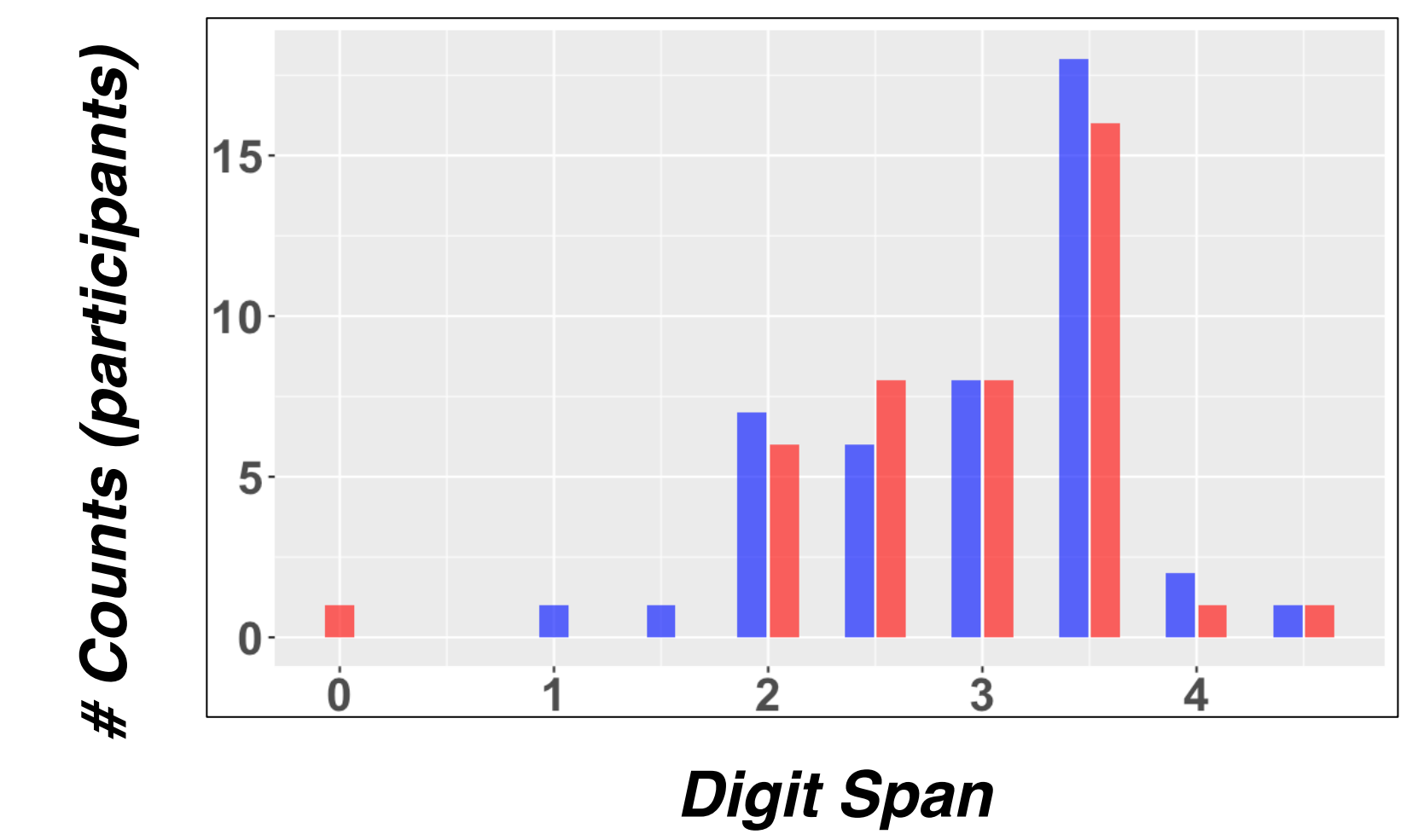
## Results

### First Graders Respond Faster in the Stroop Task



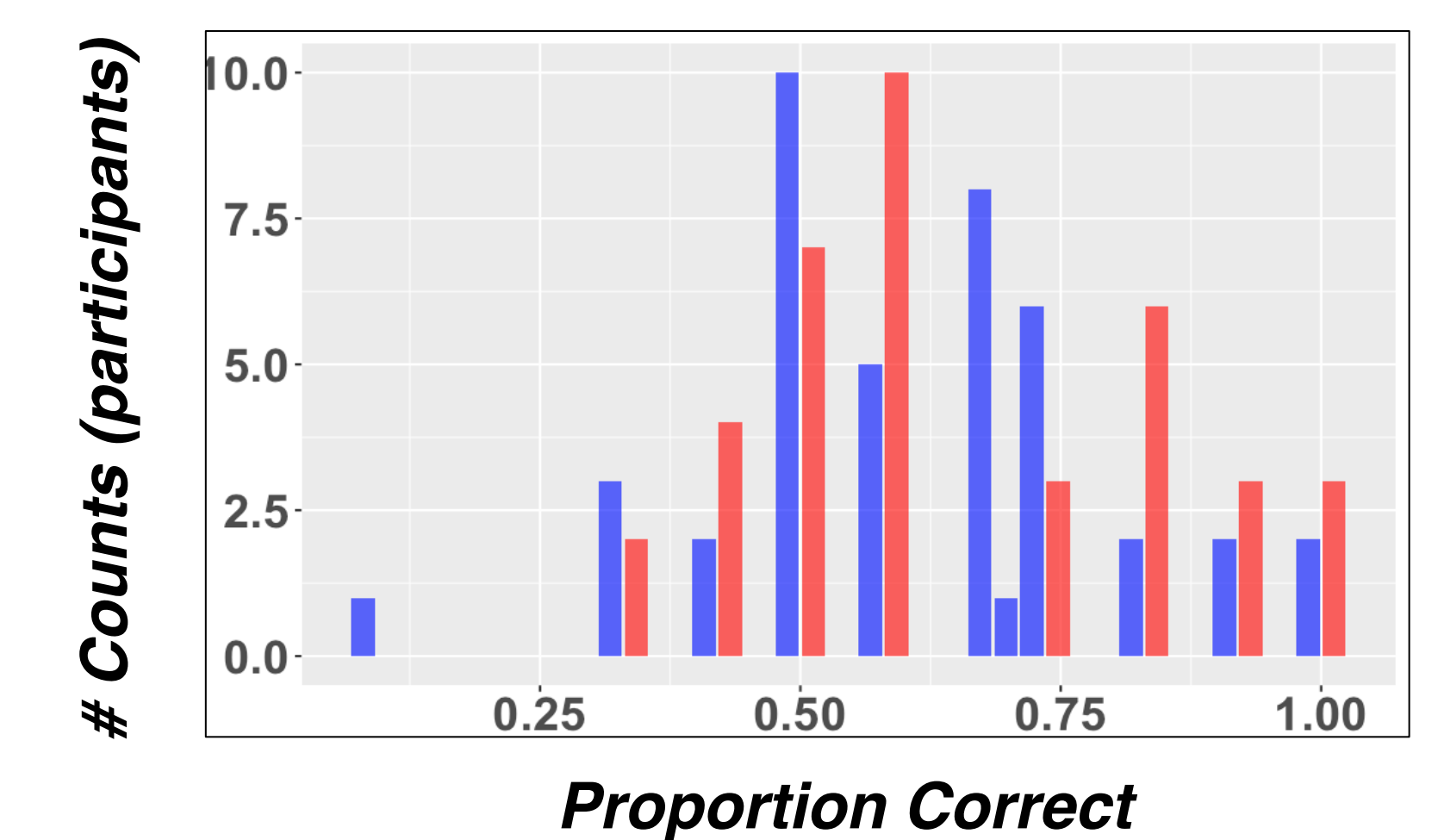
$t(65) = -3.46, p < 0.001$   
Cohen's  $d = 0.76$

### No Difference in Backward Digit Span Task ( $n = 85$ )



Fisher's exact test result:  $p = 0.98$   
Cramér's V approximation: 0.21

### No Difference in Dimensional Change Card Sort Task ( $n = 82$ )



Fisher's exact test result:  $p = 0.27$   
Cramér's V approximation: 0.38

## Discussion

- In a sample that was not collected to test the schooling effect, schooling increases inhibitory control as evidenced by Stroop task reaction time
- There was no evidence that schooling increases working memory or task-switching skills
  - May be related to lack of power, proportion data
- Find an approach that uses more of the available data (i.e.,  $n = 200$  vs.  $n = 86$ )

