

ASSOCIATIONS BETWEEN EXECUTIVE FUNCTIONS AND  
MATHEMATICS ACROSS THE FIRST THREE YEARS OF  
ELEMENTARY SCHOOL: LONGITUDINAL CROSS-LAGGED  
ANALYSIS

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# Background

- EFs is an umbrella term for higher order cognitive skills that are particularly important for mathematics gain.
- EFs serve as cognitive supports for mathematics learning
- E.g. learning multiplication
- A lot of longitudinal studies indicated that preschoolers' beginning EFs predict gain in mathematics at the end of the year.
- Educators suggest adopting interventions that focus on promoting children's EFs.

# Another perspective

- EFs and mathematics in fact develop simultaneously and EFs may not be prerequisite for mathematics gain
- In stead, skills in both domains are co-mutually supportive of each other's development as they share common cognitive resources.
- Studies indicated that there are bidirectional longitudinal associations between EFs and mathematics among preschoolers.
- Educators suggest engaging children in high-quality mathematics curriculum to have the dual benefit of learning mathematics and developing EFs.

# What the power needs to know..

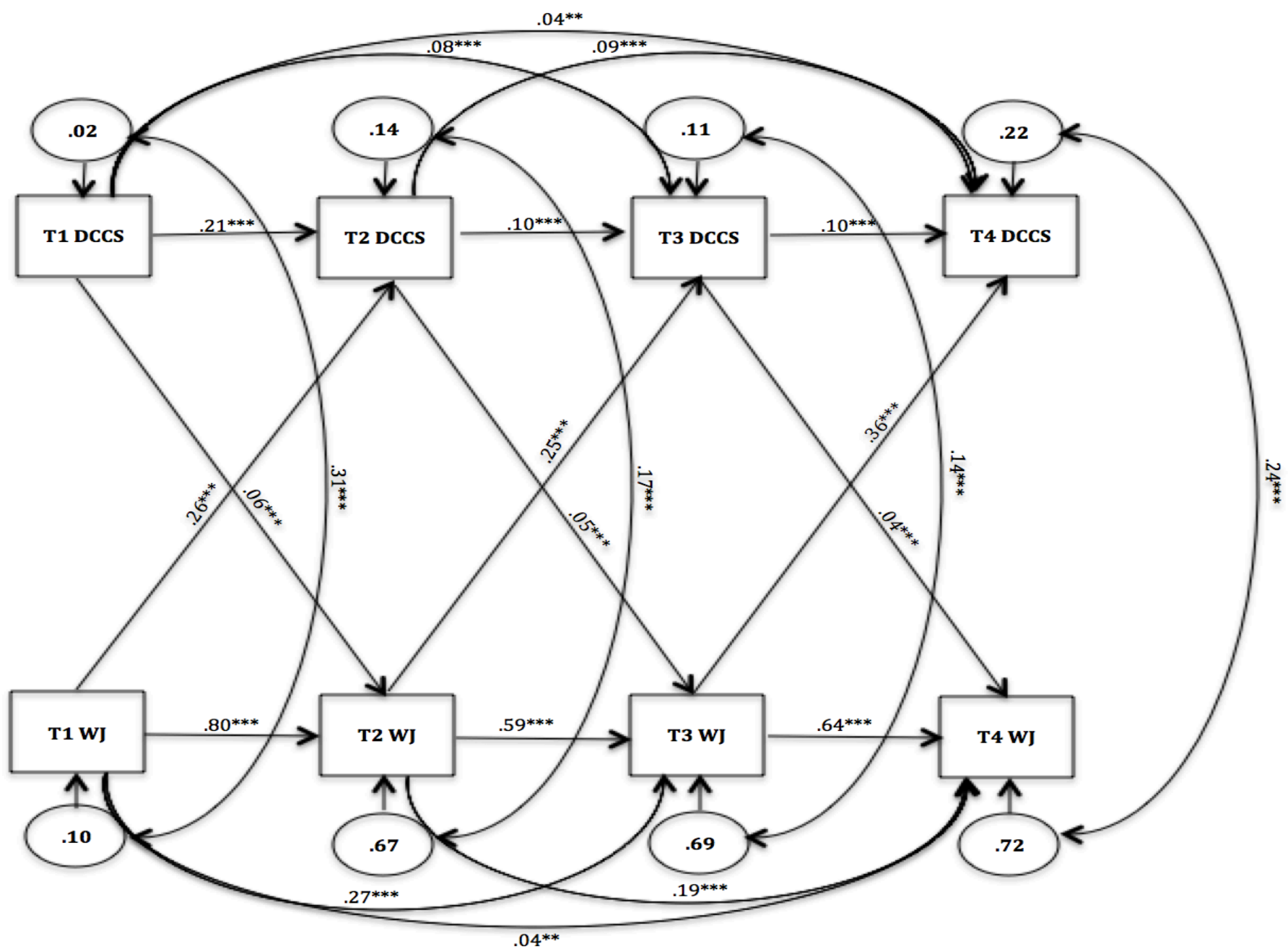
- The two perspectives on the direction of the longitudinal associations between EFs and mathematics were tested on preschoolers.
- Which perspective can be generalized to upper grades (i.e., kindergarten, first, and second grade)?
- Exploring the direction of longitudinal associations between EFs and mathematics across the first three years of elementary school is important particularly given the implications for intervention.

# Sample from ECLS

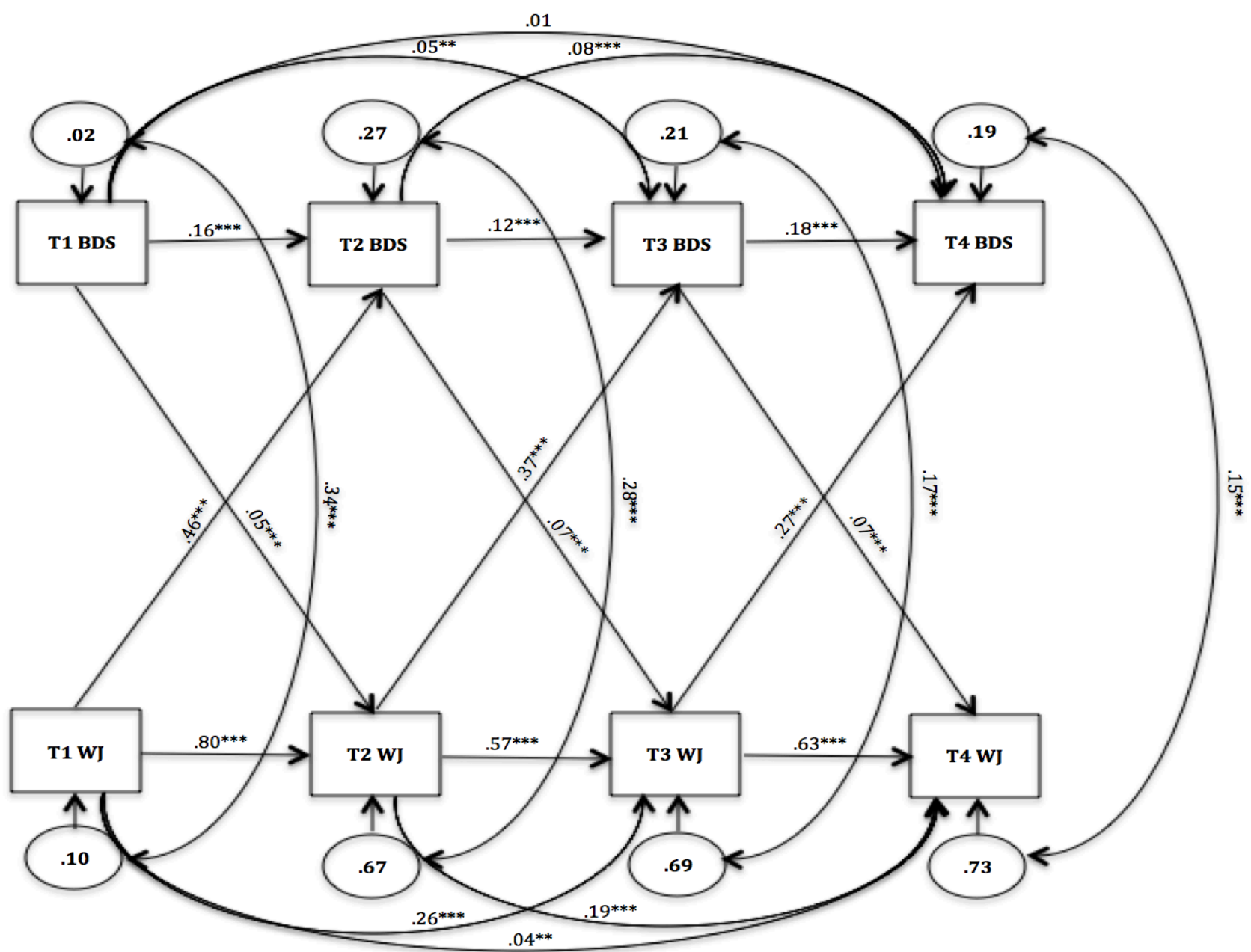
- There were 2,315 first-time kindergarteners who were followed longitudinally from kindergarten through the second grade.
- I focused only on the assessments of EFs (cognitive flexibility and working memory) and mathematics, which students completed at only four time points: in fall and spring of kindergarten and the spring of the first and second grade.

# Measures

- **Dimensional Change Card Sort (DCCS ; Zelazo, 2006 ).**
- **Backward Digit Span (BDS; Woodcock, McGrew, & Mather, 2001).**
- **Woodcock–Johnson III (WJ; Woodcock, McGrew, & Mather, 2001).**



$\chi^2(7) = 52.65, p < .001, CFI = 1.00, RMSEA = .05, RMSR = .03.$



$\chi^2(7) = 36.42, p < .001, CFI = 1.00, RMSEA = .04, RMSR = .02.$

# Limitations

- They did not specify whether these BAs between EFs and mathematics are causal.
- The simultaneous development of EFs and mathematics may mean that the two domains interact but not necessarily that either is influencing the developmental trajectory of the other.
- Thus, it is recommended to conduct experimental studies to investigate whether the BAs between EFs and mathematics are causal before any investment in intervention is made .

Thank you for you attention!