



How executive function impacts the growth of reading achievement: A stepwise approach

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Problem

Students start school with a wide spectrum of academic and cognitive skills. As they move through elementary school, how do these cognitive skills influence their reading ability? More longitudinal research needs to be completed to understand how executive function contributes to the growth of reading for students with and without a reading disability. Understanding the contributions of executive function on reading over time could influence reading instruction and intervention.

Background

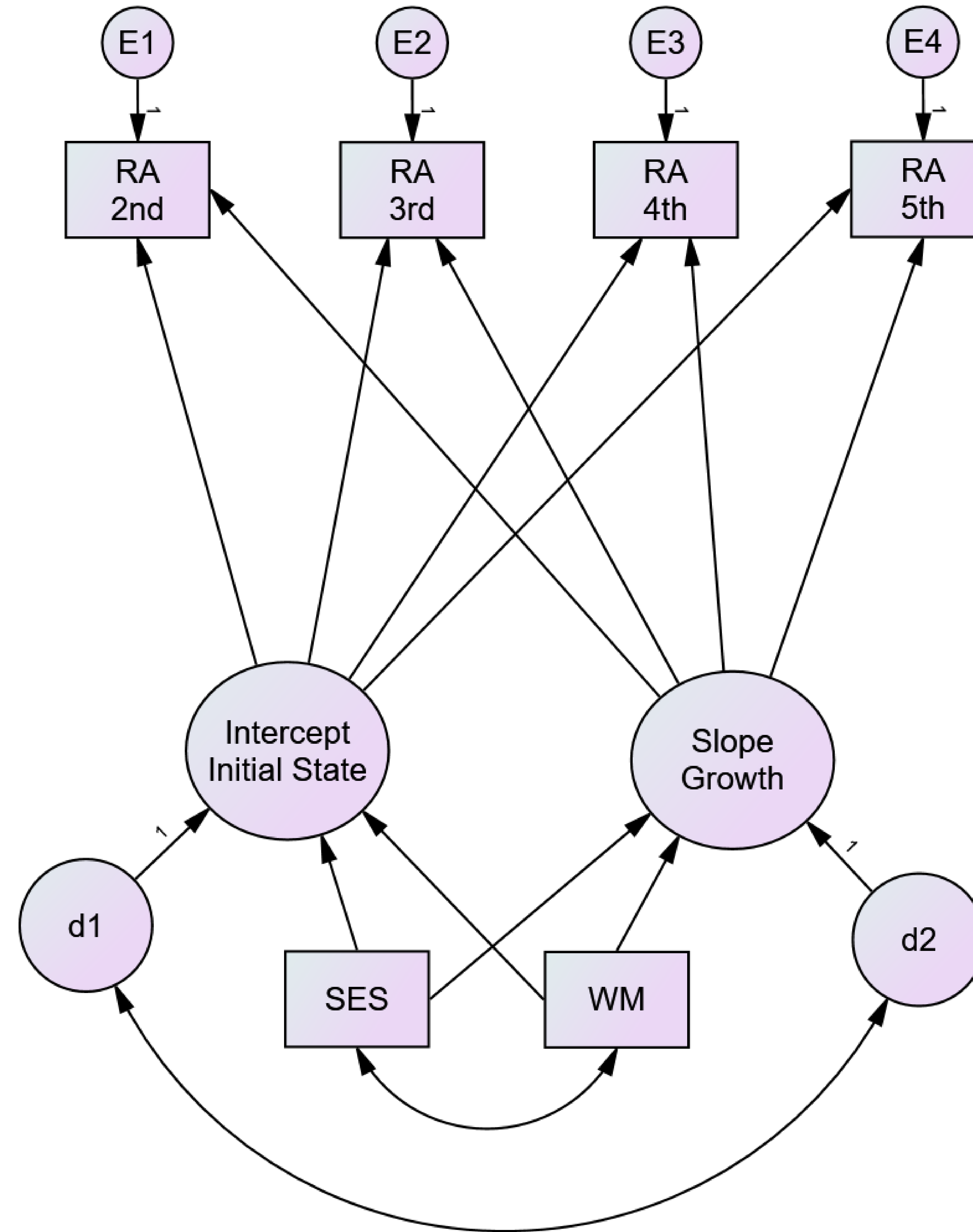
Executive functions are cognitive skills that help achieve a goal, and has three main components: working memory, cognitive flexibility, and inhibition (Miyake et al., 2000). These three components share similarities between each other but are three separate components, which Miyake and colleagues call the unity and diversity of executive function.

- Working memory is a multicomponent process in which a limited amount of information is temporarily stored in the mind while manipulating it (Baddeley, 2003).
- Cognitive flexibility refers to being able to view something in multiple or new ways (Zelazo et al., 2016) and being able to change, or shift, attention between multiple tasks (Miyake et al., 2000).
- Inhibition is the ability to deliberately suppress a prepotent, or dominate, response.

Executive function is important for early literacy learning and has been associated with reading comprehension and fluency (Blair & Razza, 2007; Cartwright, Marshall, Huemer, & Payne, 2019). Unfortunately, there is a great amount of variability in elementary students' executive function and few longitudinal studies have examined the impact of specific executive function skills on the growth of reading ability (Jerman, Reynolds, & Swanson, 2012). Fewer studies have investigated the relationship disability status (reading disability vs no disability) has on the impact on reading growth.

Research Questions

- How does working memory and SES impact the growth of reading ability from second until fifth grade?
- Does working memory and SES have a greater impact on the growth of reading ability with students with a reading disability compared to those without a reading disability?



References

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Proposed Methods

Restricted data from the Early Childhood Longitudinal Study, Kindergarten class of 2010-2011 (ECLS-K:2011) will be utilized to examine the research question. ECLS contains a nationally represented sample of students that were followed from kindergarten until the end of fifth grade. The total sample size is 18,174 and includes public and private school students

Because of the change in how cognitive flexibility was measured after first grade, participants will be measured from second to fifth grade. Starting in second grade also allows time for children to be identified as having a reading disability.

The sample will be analyzed using linear mixed modeling with maximum likelihood (ML) estimation (Raudenbush & Bryk, 2002). We will examine individual change over time, shape of reading growth curves, systematic differences in change, and the effects of potential predictors/mediators (i.e., working memory and SES) on group differences (reading disability v. no reading disability) in the initial status and the rate of reading growth over a four year timespan (i.e., second through fifth grade).

Working memory (WM) was measured through the Numbers Reversed subtest of the Woodcock Johnson. Socioeconomic status (SES) was a composite score comprised of household income, parental education, and parental occupation prestige score. Reading was measured through an assessment based on the NAEP assessment.

Implications

Reading is a cognitive process, and understanding how executive function impacts the growth of reading could lead to a better understanding of what needs to be done to support and intervene with struggling readers. Additionally, research on executive function could lead to early warning systems for students who show deficits in executive function. This would allow for school systems to add executive function into their school readiness assessments. This piece of data could assist in the identification of students at risk for educational disabilities under Child Find, which would lead to early interventions.

Next Steps

After this analysis, cognitive flexibility will be added to the model to determine how it also impacts the growth of reading between those with and without a reading disability. Then, additional analyses will look at the growth of working memory and cognitive flexibility between those with and without a reading disability.