Profiles of Executive Functions and their Relationship to Longitudinal Reading Achievement

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INTRODUCTION

Executive functions are cognitive processes related to goal-directed activities (Brocki & Bohlin, 2004).

Recent research has demonstrated a relationship between executive functions and the development of reading and writing skills (Altemeier, Jones, Abbott, & Berninger, 2006; Waber, Gerber, Turcios, Wagner, & Forbes, 2006). However, this relationship needs to be further examined longitudinally among low-income children.

PURPOSE

The current study examines the effects of executive functions (inhibition, cognitive flexibility, and planning) on reading achievement longitudinally among low-income elementary school students.

METHODS

Participants

• Southeastern site of National Head Start Transition Project

• N = 259 students

• 53% female

• 74% Black, 16% Hispanic, 9% White

Measures

• Children were assessed on their executive functions in the spring of first grade using 3 executive function tasks.

• Children's reading achievement was assessed in the spring of first, second and third grade using the WJR Broad Reading Scale (Woodcock & Johnson, 1990).

EXECUTIVE FUNCTIONS TASKS

• *Inhibition Task:* Consisted of 20 items, each containing 3 pictures. Children were asked to look at the target picture (top) and choose a picture (bottom) that shared a categorical rather than a functional link.

• *Flexibility Task:* Consisted of 33 items. Children were shown 3 pictures and asked to identify the odd one out. On each trial, the criterion for selecting the odd one out changed, forcing children to switch strategies.

• *Sequencing Task:* Consisted of 9 series of pictures that could be put in order to tell a story. Each series depicted a common activity and was comprised of 3-4 pictures.

DATA ANALYSIS

• First step: Participants were divided into profiles using latent profile analysis.

• Second step: Growth in reading was analyzed using structural equation modeling.

• Third step: Dummy coded vectors representing executive function profiles were added to the growth model along with gender.

RESULTS

• Latent profile analysis revealed 3 profiles:

Figure 1. EF Latent Profiles
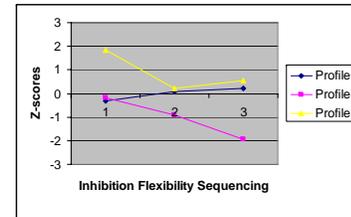
Profile 1 (n = 219) was characterized by moderate scores on all 3 EF tasks.
Profile 2 (n = 36) had average inhibition but low flexibility and planning.
Profile 3 (n = 44) had high inhibition and average flexibility and planning.
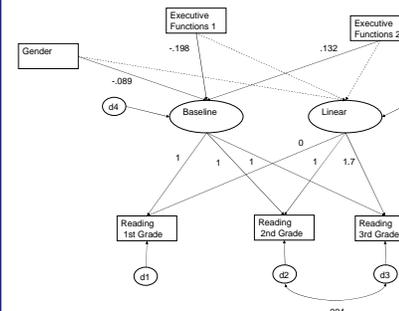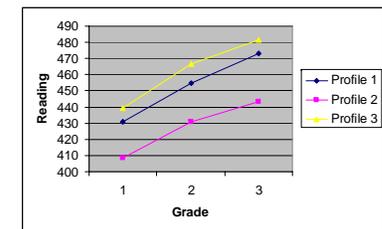
Figure 2. SEM Model

Figure 3. Reading Growth by EF Profiles

• Model fit: $\chi^2(1)$=3.929, p=.048; CFI=.99; TLI=.99; RMSEA=.11; SRMR=.03

• Gender was significantly related to first grade reading scores; girls scored approximately 9 pts higher than boys.

• EF profiles were significantly related to first grade reading scores. Profile 3, with high inhibition, performed better than profiles with average inhibition. Profile 2, with low flexibility and planning, performed more poorly than other profiles.

• EF profiles and gender were not significantly related to growth in reading.

CONCLUSIONS AND IMPLICATIONS

• EF profiles differ in reading achievement. Children with high inhibition have higher reading achievement than children with average inhibition. Children with poor flexibility and planning skills have lower reading achievement.

• Profiles were not related to growth in reading ability.

• Further research should explore ways of improving executive functions at early ages for low-income, at-risk populations.