Executive Functioning as a Mediator of Effects on Kindergarten Learning Behaviors One Year After the Head Start REDI Intervention

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Introduction:
- Developed in partnership with Head Start programs, the REDI (Research-based, Developmentally-Informed) enrichment intervention was designed to complement and strengthen the impact of existing Head Start experiences on high risk children's school readiness. REDI included research-based curriculum components and teaching practices designed to promote child competencies in the dual domains of language/emergent literacy skills and social-emotional functioning.
- Although REDI was not designed to specifically target executive functioning (EF) skills, it is possible that through its emphasis on supporting socio-emotional and language skills, REDI created a classroom climate that was less stressful for children, which may have helped children maintain more optimal levels of emotional arousal, thus setting the stage for using EF skills to direct their learning.
- This hypothesized pathway by which REDI may possibly have affected EF is based on research showing that EF is related to math and reading achievement, EF likely also promotes school engagement and self-directed learning.
- To address this hypothesis, in this study we investigate whether the gains in EF that children made as a result of participating in the Head Start REDI intervention account for differences in kindergarten learning behaviors.

Methods:
- Participants
  - 44 Head Start classrooms in 3 Pennsylvania counties, stratified on center and student demographic characteristics and randomly assigned to intervention or "usual practice."
  - 356 children (58% European American; 17% Latino; 25% African American; 54% girls)
  - Transitioned into 204 kindergarten classrooms, with 94% of sample completing follow-up assessments.

- Intervention
  - REDI curriculum components included: (1) a dialogic reading program with vocabulary props, (2) sound games to build phonological awareness, (3) print center activities to support letter identification skills, and (4) a social-emotional learning program, Preschool PATHS (Domitrovich, Greenberg, Kusche, & Cortes, 2005). In addition, the program targeted classroom teaching practices, including positive classroom management, rich and complex language use, emotion coaching, and support for social problem-solving skills.
  - Teachers received 4 days of workshop training and weekly professional development support provided by REDI mentors.

- Measures
  - Teacher report of kindergarten learning behaviors: School Readiness Questionnaire (developed for this study, 14 items, such as "This child can work independently," α > .96).
  - EF: Task Orientation: Assessor global report of child's sustained attention to the tasks (α > .90). Dimensional Change Card Sort (DCCS; Frye et al., 1995).

Analysis and Results:

<table>
<thead>
<tr>
<th>Measures</th>
<th>Intervention</th>
<th>Control</th>
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<tbody>
<tr>
<td>K Learning Behaviors</td>
<td>4.75 (.11)</td>
<td>4.49 (1.11)</td>
</tr>
<tr>
<td>DCCS: Fall HS</td>
<td>.50 (.45)</td>
<td>.52 (.46)</td>
</tr>
<tr>
<td>DCCS: Spring HS</td>
<td>.71 (.39)</td>
<td>.63 (.45)</td>
</tr>
<tr>
<td>Task Orientation: Fall HS</td>
<td>2.50 (.60)</td>
<td>2.58 (.48)</td>
</tr>
<tr>
<td>Task Orientation: Spring HS</td>
<td>2.72 (.49)</td>
<td>2.61 (.49)</td>
</tr>
</tbody>
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Test of Mediation
- Estimated three multi-level models to account for nesting within Head Start classrooms, always controlled for sex, race, age, site, and cohort.
  - Effect of REDI on Spring of HS DCCS, controlling for Fall of HS DCCS.
  - Effect of REDI on Spring of HS Task Orientation, controlling for Fall HS Task Orientation.
  - Effect of REDI, Spring of HS DCCS and Spring of HS Task Orientation on Kindergarten Learning Behaviors, controlling for Fall of HS DCCS and Task Orientation.

Conclusions: Although this analysis was post hoc, it provides some evidence that EF skills at the end of the intervention may have partially mediated intervention effects on kindergarten learning behaviors. REDI, however, was not specifically designed as an intervention to improve EF. Although EF was a focus of potential program effects, so too were emotion regulation, socio-emotional competence, and language development. The development of these skills may be reciprocally related to the development of EF such that they could contribute to EF development or EF development could contribute to them, however, socio-emotional competence, and language skills are also important unique influences on school achievement. Thus, while EF is one possible mechanism by which early childhood interventions such as REDI could have an impact on future school success, it is likely that socio-emotional and language skills play important roles as well.