Executive Function: Generational and Environmental Influences
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Introduction

Background
Executive function (EF) is an extremely important component of a person's mental health.

- People with executive dysfunction tend to possess disorders such as ADHD, ASD, schizophrenia, and depression (Davis & Nolen-Hoeksema, 2000; Pennington & Ozonoff, 1996; Barkley 2011; Bernard et al., 2008).
- EF has also been shown to contribute to a wide variety of poor economic and social outcomes (Moffitt et al., 2011).

The preschool years of a child's life have been shown to be a critical time for the development of EF (Anderson & Reidy, 2012).

There is evidence for generational factors that influence EF between parents and offspring (Jester et al., 2009).

Environmental factors also play a pivotal role.
- Children in homes of low SES tend to display lower EF (Sarsour et al., 2011).
- Children raised in a punitive environment display stunted EF development (Talwar & Carlson, 2011).
- Maternal factors such as stress and depression have been shown to produce negative outcomes on child EF (Rhoades et al., 2011).

The various generational and environmental factors that influence the development of EF in children during the critical preschool years is rarely explored, but is of profound importance.

Hypotheses:
1. Mothers who display more symptoms of depression will be more likely to display higher deficits in EF
2. Mothers with lower levels of EF will have children who display lower levels of EF
3. Mothers with higher levels of depression will have children with inhibited EF
4. Children raised in households of lower SES will have lower levels of EF.

Method

Participants
- Participants were 90 mother-child dyads recruited from the Columbus area. 56.7% of households earned near the Ohio average salary of $48,246. 22.2% of households earned $20,000 or less, and 13.3% earned over $90,000.

Mothers
- 31 of the mothers tested of the mothers had depressive symptoms above the clinical cutoff of the Centers for Epidemiological Studies Depression Scale (CESD), the average age was 30.2 years old (SD=5.08), and the sample was well educated with 54.2% of the mothers holding at least a bachelor's degree

Children
- Children were an average of 3.23 years old (SD=.18). 50 of the children (55.6%) were female, while 40 children (44.6%) were male.

Measures

Mother's EF
- Maternal EF was assessed using the number of perseverative errors committed by the mother on the Wisconsin Card Sort Test (WCST; Heaton et al., 1993) as a measure of executive function error (EF error).

Child's EF
- Child EF was on two dimensions; attentional flexibility and inhibitory control. Attentional flexibility was assessed using the Dimensional Change Card Sort Task (DCCS; Zelazo et al., 2003). Child inhibitory control was assessed using three measures, the Bear and Dragon Task (Murray & Kochanska, 2002), Shapes Task (Murray & Kochanska, 2002), the Day and Night Task (Kochanska et al., 2007).

Environmental Assessments
- Household income as assessed via questionnaire was used as a proxy for SES
- Maternal depressive symptoms were assessed using the CESD (Radloff, 1977)

Results

There was a significant relationship between maternal depression and maternal EF errors (r=.24, p<0.05).

Regression models revealed an association between inhibitory control tasks, maternal EF, and maternal depression.
- Mothers who displayed more EF errors had children who tended to perform worse on the Shapes task and Bear and Dragon task
- Children of depressed mothers typically performed worse on the Day and Night task

Models revealed no significant association between SES and child inhibitory control. Additionally, child attentional flexibility was not shown to have a significant relationship with any of the independent variables.

<table>
<thead>
<tr>
<th>Environmental Assessments</th>
<th>Attentional Flexibility</th>
<th>Inhibitory Control</th>
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<tbody>
<tr>
<td></td>
<td>DCCS</td>
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<tr>
<td></td>
<td>Bear and Dragon Task</td>
<td>Shapes Task</td>
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<td></td>
<td>Day and Night Task</td>
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<tr>
<td>Mother Depression</td>
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<td>t</td>
</tr>
<tr>
<td>Child Age</td>
<td>.030</td>
<td>.272</td>
</tr>
<tr>
<td>Household Income</td>
<td>.185</td>
<td>1.51</td>
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<tr>
<td>Mother Depression</td>
<td>.060</td>
<td>0.474</td>
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<tr>
<td>Maternal EF Errors</td>
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<td>.867</td>
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<tr>
<td>R²</td>
<td>.037</td>
<td>.130*</td>
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Note: *p<0.05, **p<0.01

Discussion

- The results of the study are that maternal EF and depression are associated with child inhibitory control. The study also replicated previous findings that there is a relationship between depression and EF level.
- Despite the lack of findings regarding SES, these data show that there are environmental and generational influences acting on the development of EF in preschool aged children. These influences can profoundly change the lives of children, and better understanding them can vastly improve early interventions for those at-risk for EF deficits.