Executive Functions in Children with Internalizing and Externalizing Symptoms

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Outline

• Key terms: executive functions (EFs), internalizing, externalizing
• Background: EFs in children with ADHD, anxiety, depression
• Research question and hypothesis
• Study design
  • Measures: EF tasks, symptom questionnaires
• Data analysis
• Expected results
Key Terms

• Executive functions (EFs): attentional processes that allow us to problem solve and work toward goals—linked to life outcomes
  • Inhibitory control
  • Cognitive flexibility
  • Working memory
  • Updating

• Externalizing symptoms: behavior problems directed outward toward others, including attention and hyperactivity problems (ADHD)

• Internalizing symptoms: problematic behaviors directed inward toward oneself, including anxiety and depression symptoms

(Blair & Diamond, 2008; Engelhardt et al., 2015)
Background

• ADHD is associated with poor inhibitory control and working memory
• Anxiety and depression are associated with poor cognitive flexibility and working memory
• But lots of kids have both ADHD and anxiety/depression
• Studies of children with these comorbid disorders are mixed
  • Some say EFs in kids with ADHD + anxiety > ADHD only
  • Some say EFs in kids with ADHD + anxiety < ADHD only

(Barkley & Murphy, 2010; Alderson et al., 2015; Wilcutt et al., 2005; Ozonoff & Jensen, 1999; Emerson, Mollet & Harrison, 2005; Favre et al., 2009; (Achenbach & Rescorla, 2000; Angold, Costello, & Erkanli, 1999; Yurtbasi et al., 2015; Schatz & Rostain, 2006)
Background

- Why the mixed results?
  - Studies use diagnoses to group kids and study differences between groups, but these groups have some arbitrariness!
  - ADHD is heterogeneous (3 subtypes)
  - Diagnostic criteria evolving and more kids getting diagnosed
- Diagnosis is based on symptoms crossing clinical threshold

This study examines symptom burden (severity and frequency) in relation to EFs, rather than grouping kids by diagnoses

(APA, 1968; 1980; 2013; Visser et al., 2014)
Hypothesis

- Internalizing symptoms will predict cognitive flexibility
- Attention and hyperactivity symptoms will predict inhibitory control
- Internalizing and externalizing symptoms will predict working memory

- No interactions—effects will be additive in children with high internalizing and externalizing symptom burdens
Study Design

- Part of ongoing Church lab study
- 156 children have participated
  - 64 girls, 92 boys
  - 65 children with ADHD diagnoses
  - Ages 8-18 (mean=12.9)
  - 100 families
- Measures: scores on computer EF tasks, self-reported internalizing and externalizing symptoms, parent-reported internalizing and externalizing symptoms
EF Measures

- Inhibitory control: Stop Signal Task
- Cognitive flexibility: CogFlex
- Working memory/updating: N-Back

(Verbruggen, Logan, & Stevens, 2008; Baym et al., 2008; Jaeggi et al., 2010)
**Child Self-Report Measures**

### Multidimensional Anxiety Scale for Children

<table>
<thead>
<tr>
<th>Item</th>
<th>Never true about me</th>
<th>Rarely true about me</th>
<th>Sometimes true about me</th>
<th>Often true about me</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel tense or uptight</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I worry about other people laughing at me</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Conners 3 Self-Report Short

<table>
<thead>
<tr>
<th>Item</th>
<th>Not true at all (never, seldom)</th>
<th>Just a little true (occasionally)</th>
<th>Pretty much true (often, quite a bit)</th>
<th>Very much true (very often, very frequently)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I blurt out the first thing that I think of</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>It is hard for me to sit still</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

(March et al., 1997; Conners, 2008)
# Parent Report Measures

## Child Behavior Checklist

For each item that describes your child *now or within the past 6 months*, please circle [the appropriate number].

<table>
<thead>
<tr>
<th>Item</th>
<th>Not true (as far as you know)</th>
<th>Somewhat or sometimes true</th>
<th>Sometimes true about me</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is very little he/she enjoys</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Cries a lot</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

## Conners 3 Parent Short

Please tell us about your child and what he/she has been like in the *past month*.

<table>
<thead>
<tr>
<th>Item</th>
<th>Not true at all (never, seldom)</th>
<th>Just a little true (occasionally)</th>
<th>Pretty much true (often, quite a bit)</th>
<th>Very much true (very often, very frequently)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forgets to turn in completed work</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Fidgets or squirms in seat</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

(Achenbach & Rescorla, 2000; Conners, 2008)
Data Analysis

• Multiple linear regression
  • Predictors: self-reported internalizing and externalizing symptoms, parent-reported internalizing and externalizing symptoms, age, gender, family relatedness, SES, processing speed
  • Predicting: EF factors (one model for each EF factor)
  • Examining which symptoms (if any) are the best predictors for each EF factor
Expected Results

• Higher attention and hyperactivity symptom burdens will predict poor inhibitory control and working memory
• Higher internalizing symptom burden will predict poor cognitive flexibility and working memory
• No interactions; effects of symptom burdens are additive
• Alternative: attention and hyperactivity symptom burdens predict different EF factors
• Alternative: no difference in the best predictors of the EF factors
• Alternative: anxiety + attn/hyperactivity > attn/hyperactivity alone