

# Executive functions in children with internalizing or ADHD symptoms



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## INTRODUCTION

### Background

- Executive functions (EFs) are cognitive processes that coordinate and support goal-directed behaviors
- EFs are clustered into four main factors: inhibitory control, switching, working memory, and updating (Zelazo, Blair & Willoughby, 2016)
- Childhood EFs are correlated with academic, social, and health outcomes.
- Attention-deficit/hyperactivity disorder (ADHD) is associated with impaired EFs, especially inhibitory control and working memory (Barkley & Murphy, 2010). Anxiety and depression are associated with impaired EFs, especially switching and working memory (Emerson, Mollet and Harrison, 2005)
- However, prior research is mixed as to how these disorders relate to EF abilities

### Objective

To examine the relationship between executive function performance and symptoms of ADHD and internalizing disorders in children and adolescents.

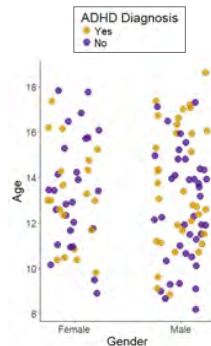
### Approach

As part of a larger study, parents and children completed surveys about the child's internalizing and ADHD symptoms. Children then completed several computer tasks designed to measure their EF abilities.

## METHODS

### Participants

- Participants were 120 children ages 8-18 years
  - 47 girls
  - 54 children had an existing ADHD diagnosis
  - 13 children had an existing internalizing diagnosis (anxiety and/or depression)
- Children with an ADHD diagnosis had significantly greater parent- and self-reported attention and hyperactivity/impulsivity symptoms compared to children without an ADHD diagnosis



### Measures

#### Symptom Burden

- ADHD parent report:** Conners 3 attention and hyperactivity/impulsivity scales
- ADHD self report:** Conners 3 attention and hyperactivity/impulsivity scales
- Internalizing parent report:** Child Behavior Checklist internalizing scale
- Internalizing self report:** Multidimensional Anxiety Scale for Children

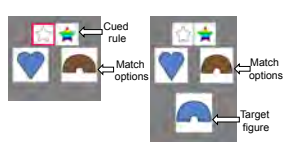
#### Executive Function

- Stop-signal task:** Inhibit learned behavior in response to stop signal
- CogFlex task:** Switch flexibly between responding to different facets of stimuli
- N-back task:** Identify shapes that appeared one or two stimuli earlier

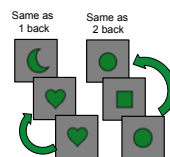
#### Stop-signal task



#### CogFlex task

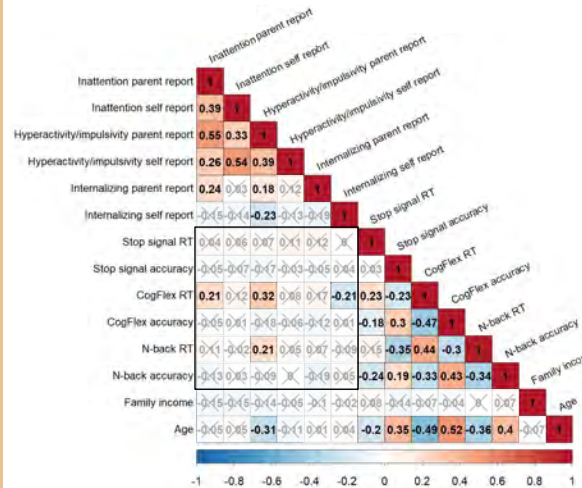


#### N-back task



## SYMPTOM BURDENS, EF SCORES, AND AGE

Data were analyzed using pairwise Pearson correlations between parent- and self-reported symptom burdens, scores on all EF tasks, and age.

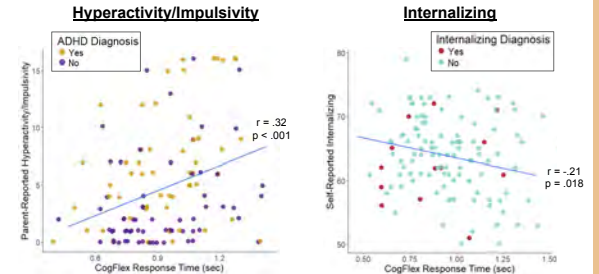


Insignificant correlations ( $p > .05$ ) indicated by X over correlation coefficient, uncorrected for multiple comparisons

Black box indicates correlations between symptoms and EF scores

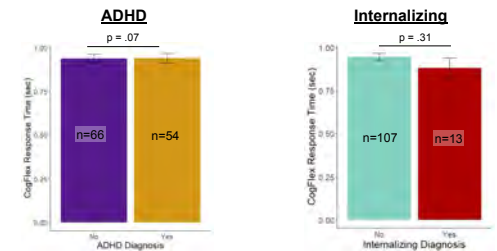
## SWITCHING TASK SCORES AND SYMPTOMS

Faster response times on the switching task (CogFlex) correlated with higher self-rating of internalizing symptoms and lower parent-rating of ADHD symptoms.



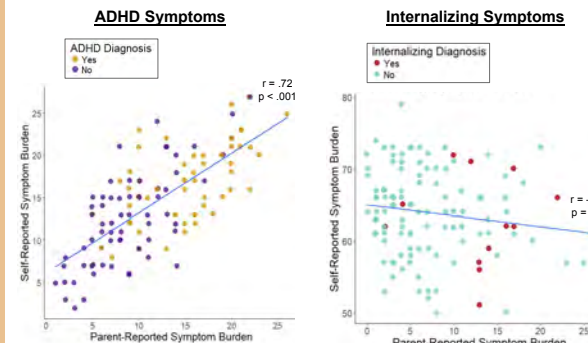
## SWITCHING TASK SCORES AND DIAGNOSES

Response times on the switching task (CogFlex) did not differ significantly between children with and without an ADHD diagnosis or with and without an internalizing diagnosis.



## PARENT- AND SELF-REPORTED SYMPTOMS

Parent and self reports of ADHD symptoms were correlated, while parent and self reports of internalizing symptoms were not correlated.



## SUMMARY & CONCLUSIONS

- Parent and child reports of internalizing symptoms were not in agreement. Child reports may be more accurate given the internal nature of the symptoms.
- The switching task response time score was most associated with symptom burdens.
- Continuous measures of symptoms may capture relationships with EF scores that diagnoses alone do not.
- Next steps**
  - Examine parent and child agreement of internalizing symptoms using consistent rating scales across parents and children
  - Examine relationship between symptoms and EFs using additional EF tasks

### References

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Emerson, C., Mollet, G., & Harrison, D. (2005). Anxious-depression in boys: an evaluation of executive functioning. *Archives of Clinical Neuropsychology*, 20(4), 539-546.  
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### Acknowledgements

Jessica A. Church-Lang, PhD  
Theresa Jones, PhD  
Ariel Handy  
Laura Engelhardt  
Tehila Nugiel  
Mackenzie Mitchell  
Church Lab

Supported by: NARSAD Young Investigator Grant; UT Startup Funds  
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