Do Children With ADHD Have Deficits in Set Shifting Abilities?

Irwin, L. N., Wells, E. L., Soto, E. F., & Kofler, M. J.
Department of Psychology, Florida State University, Tallahassee, Florida

Introduction

- The phenotypic behavioral presentation of ADHD may be driven by deficits in executive function(s) (Thierry, 1997; Rapport et al., 2009; Kasper et al., 2012; Chee et al., 2014)
- Set Shifting is a core executive function (EF) involving the ability to flexibly shift back and forth between tasks or mental sets (Miyake et al., 2012)
- Set Shifting is associated with:
  - Academic Performance (Benedetto-Nasho & Tannock, 1999)
  - Social Competence (Kofler et al., 2015)

Set Shifting in ADHD

- Meta-analysis suggests that set shifting may be impaired in ADHD (d = .46-.55; Willcutt et al., 2012)
- Potentially due to:
  - Construct Invalidation (WCST & TMT-B; Snyder et al., 2015)
  - Task Impurity (Alderson et al., 2010, 2017; Karalunas et al., 2012; Kofler et al., 2013; Raiker et al., 2017)

Current Study

- Examined set shifting in children with ADHD using an experimental design that provided robust control for non-shifting processes involved in completing set shifting tasks
- We hypothesized that shift costs would be significantly larger in the ADHD group (i.e., ADHD-related impairments in set shifting)

Participants

- 8-13 year old children
- Carefully diagnosed ADHD
- ADHD (n = 33) vs. Non-ADHD (n = 32)

Tasks

- **Global-Local – Set Shifting condition**
  - Controls for ADHD-related impairments on choice response tasks (Kofler et al., 2013)
  - Controls for inhibition demands due to prepotent fixation on global (relative to local) stimulus features (Poirel et al., 2011)

Dependent Variables

- Speed shift cost = RTshift – RTno-shift
- Accuracy shift cost = Errorsshift – Errorsno-shift

Method

- Carefully diagnosed ADHD
- 8-13 year old children
- Global-local task elicited greater speed shift costs than did the control conditions

Results

Speed Shift Costs

- 2x3 ANOVA revealed that the experimental manipulation was successful (task main effect, p < .001, ω² = .13)
- Global-local task elicited greater speed shift costs than did the control conditions

Accuracy Shift Costs

- 2x3 ANOVA revealed a significant group by task interaction (p = .018; ω² = .07)
- ADHD group demonstrated significantly more errors than the Non-ADHD group, but only during the shifting task (p = .015; ω² = .018)

Conclusion

- These results indicate that children with ADHD exhibit impairments in accuracy but not speed when required to flexibly shift between two competing rule sets
- Finding a significant interaction for accuracy, but not speed, indicates that poor performance on set shifting tasks is attributable to impaired working memory and/or inhibitory control abilities despite intact set shifting abilities
- i.e., children with ADHD have difficulty consistently maintaining competing rule sets and/or inhibiting prepotent responses, but are able to shift as quickly as their peers when these prerequisites are met