

Is There a Functional Relation Between Set Shifting and Hyperactivity in Children With Attention-Deficit/Hyperactivity Disorder?

Irwin, L. N., Moltisanti, A., Wells, E. L., Soto, E. F., Ferretti, N., & 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) (Barkley, 1997; Rapport et al., 2009)
- 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 in ADHD

- Meta-analysis suggests that set shifting may be impaired in ADHD ($d = 0.46-0.55$; Willcutt et al., 2005)
- Evidence for a relation between this impairment and ADHD behavioral symptoms is limited

Current Study

- We experimentally evaluated the relation between set shifting demands and activity level in children with and without ADHD
- We hypothesized that set shifting demands would elicit significantly greater levels of activity in the ADHD group compared to the Non-ADHD group

Method

Participants

- 8-13 year old children
- Carefully diagnosed ADHD
- ADHD ($n = 43$) vs. Non-ADHD ($n = 30$)

Tasks

- Global-Local* – Set Shifting
- Global-Global* – Control 1
 - Controls for ADHD-related impairments on choice response tasks (Kofler et al., 2013)
- Local-Local* – Control 2
 - Controls for inhibition demands due to prepotent fixation on global (relative to local) stimulus features (Poirel et al., 2011)

Activity Level

- Basic Motionlogger[®] actigraphs (Ambulatory Monitoring, 2004)
- Sampled activity 16 times per second during each task
- 3 sites: 2 ankle, 1 nondominant hand

Dependent Variables

- Shift cost = $RT_{\text{shift}} - RT_{\text{no-shift}}$
- Total Hyperactivity Scores (THS) = summing activity level across three actigraph sites

Results

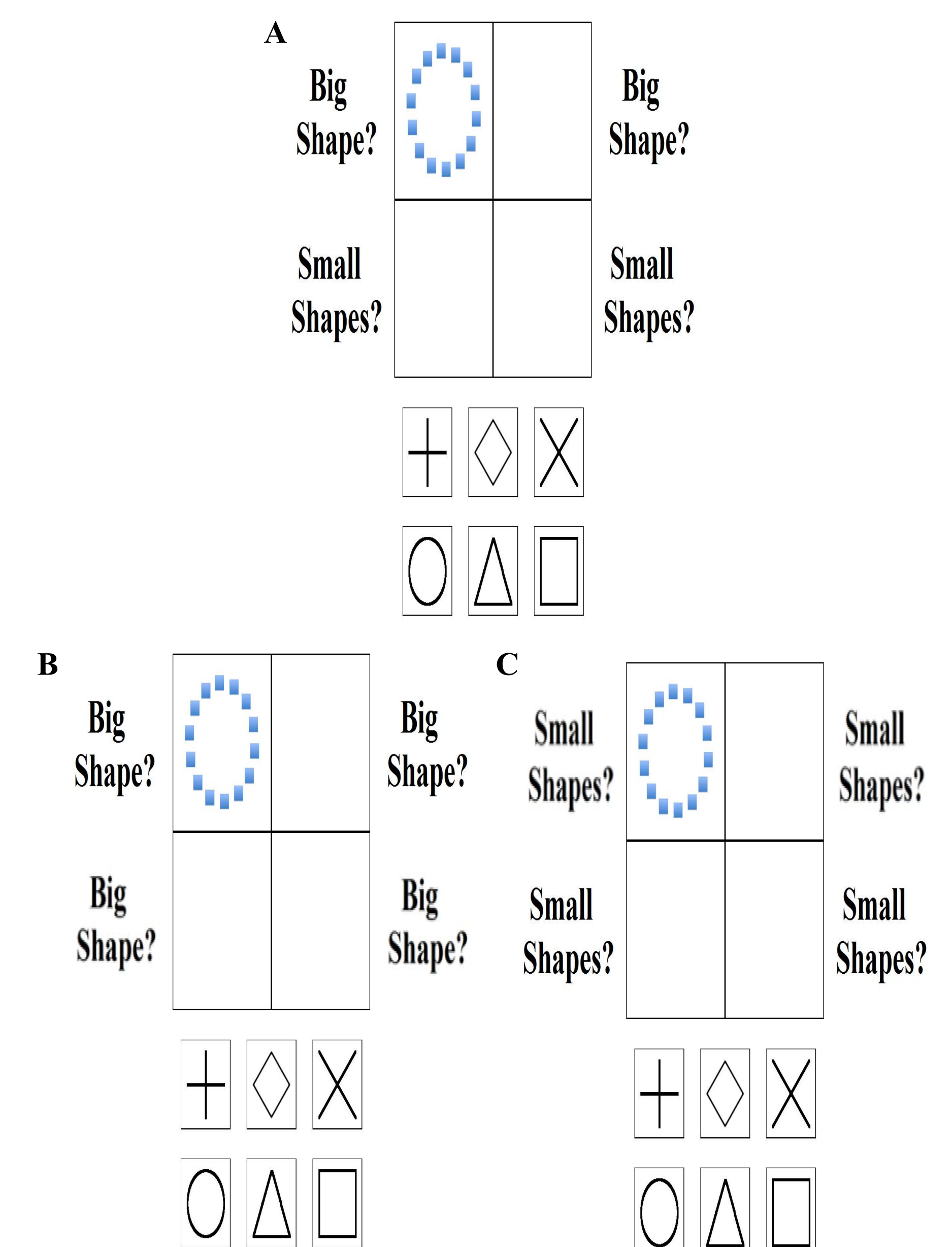
Shift Costs

- 2x3 ANOVA revealed that the experimental manipulation was successful (task main effect, $p < .001$, $\omega^2 = 0.19$)
- Post-hoc comparisons:
 - Global-Local task elicited greater shift costs than the control conditions (Global-Global, $p < .001$; Local-local, $p < .001$)
 - Global-Global elicited greater shift costs than Local-Local ($p = .04$)

Hyperactivity

- 2x3 ANOVA revealed a significant main effect of task ($p = .005$, $\omega^2 = 0.02$). Imposed set shifting demands significantly increased THS.
 - No main effect of group ($p = .09$)
 - No significant group x task interaction ($p = .56$)
- Manipulation did not disproportionately increase hyperactivity in ADHD

Figure 1. A sample trial from the Global-Local task (A), Global-Global task (B), and Local-Local task (C).



Conclusion

- These results indicate that set shifting demands increase activity level in children
- Set shifting demands do not differentially affect children with ADHD
- Set shifting is unlikely to play an etiological role in eliciting/maintaining hyperactive behavior in ADHD

Figure 2. A graph of total mean shift costs for both groups during the Global-Global, Local-Local, and Global-Local tasks (manipulation check).

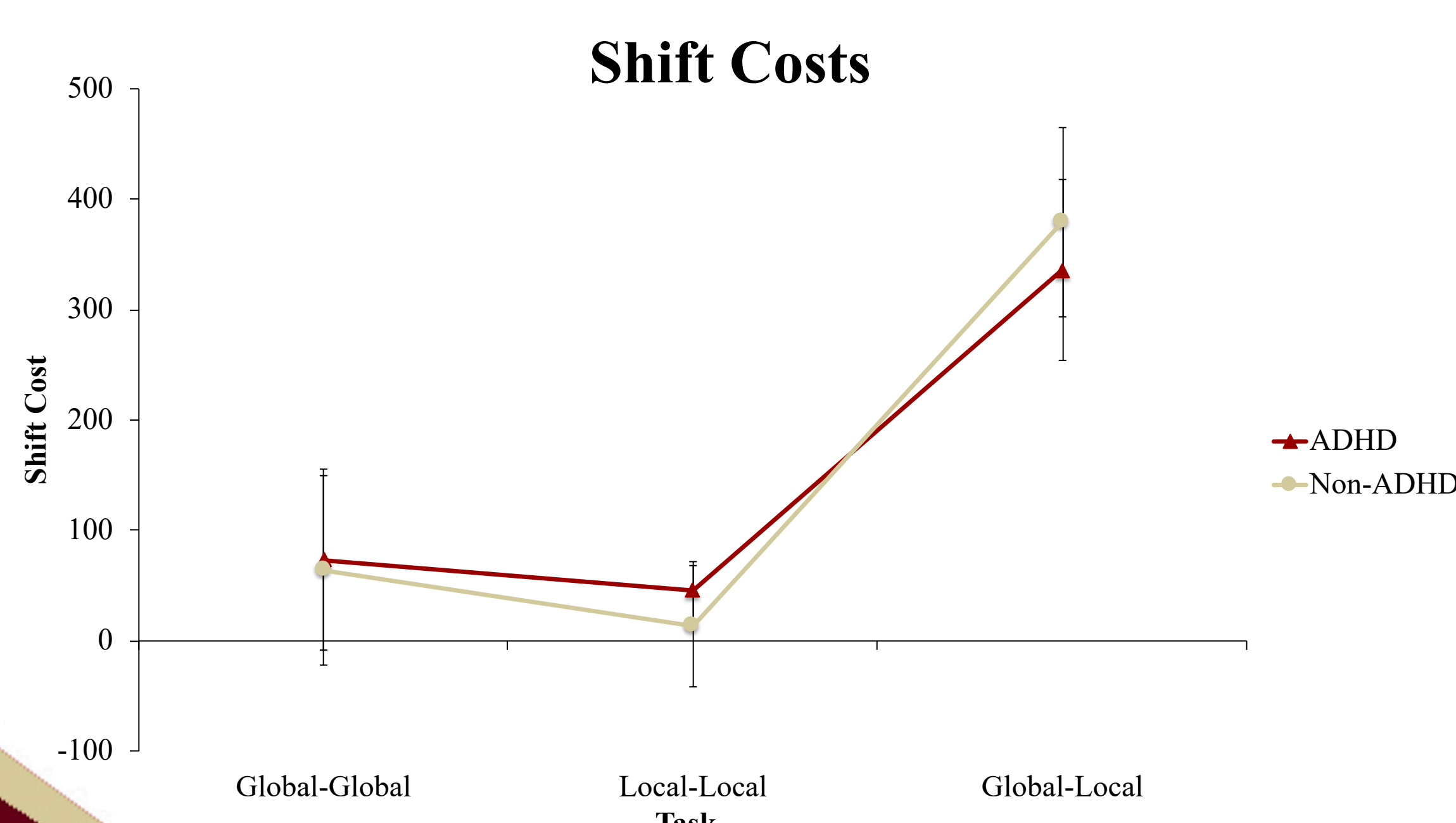


Figure 3. A graph of Total Hyperactivity Scores (THS) for the ADHD and Non-ADHD groups during the Global-Global, Local-Local, and Global-Local tasks.

