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

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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 (Poirer 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 = RTshift – RTno-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 disproportionally increase hyperactivity in ADHD

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