likely due to the restricted range of executive functioning scores for this group (i.e., M=85.25+13.82; Range 55-99). Additionally, metamemory did not significantly differ between diagnostic groups. Children with ADHD may have comparable metamemory knowledge to TD children as a result of executive functioning instruction and support they have received. Rather, there may be group differences in the application of metamemory judgement and strategies.

Categories: ADHD/Attentional Functions
Keyword 1: executive functions
Keyword 2: metamemory
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41 Adaptive Implementation of Cognitive Control in School-Aged Children with ADHD: A Diffusion-Model Analysis

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Objective: Because cognitive resources are limited, models of cognitive control predict that additional control is engaged only if it improves task performance. Increased response caution, which occurs when individuals increase the threshold of information needed before making a decision, is one example of cognitive control adaptation. While previous studies have measured increased response caution via increased reaction time, the diffusion model can be used to derive a boundary separation parameter that directly indexes response caution and eliminates capturing alternative influences on reaction time. This study aims to determine if school-aged children, either with or without ADHD, show adaptive changes in response caution during a set-shifting task. These groups have demonstrated mixed results when analyzing reaction time, so this study utilizes diffusion modeling to measure response caution more directly. The set-shifting task presents switches in a random order such that they cannot be predicted; therefore, increasing response caution is only adaptive following errors, called post-error slowing (PES), but not following switch trials. It is predicted that children will show increased response caution only when adaptive. If child with ADHD adapt their response caution fundamentally differently, then there will be individual differences in change in boundary separation.
Participants and Methods: Children ages 8-12 with (n=193) and without (n=70) ADHD completed the Navon set-shifting task. Participants saw one of four global shapes made up of local shapes and were asked to identify one or the other based upon the background color. Of the 144 trials, 70 presented a switch between global and local. Trials were presented in the same randomized order for all participants, self-paced, and followed by feedback on correctness. The diffusion model parameters boundary separation (a), drift rate (v), and nondecision time (Ter) were estimated by condition, including a) post-error versus after correct and b) post-switch versus post-same. For PES analyses, only participants with a sufficient number of errors for modeling were included (ADHD n=113, control n=19).
Results: Participants were slower on trials immediately following errors ($F(1, 130)=119.76$, $p<.001$, $\eta2=.48$) and switches ($F(1, 261)=154.93$, $p<.001$, $\eta2=.37$). In PES, slowing was attributable to increased boundary separation, $F(1, 130)=16.11$, $p<.001$, $\eta2=.11$, as well as slower drift rate and longer nondecision time (both $p<.01$, $\eta2 >.05$). However, as predicted, post-switch slowing was only attributable slower drift rate and longer nondecision time (both $p<.001$, $\eta2 >.10$), not increased boundary separation, $F(1, 261)=0.77$, $p=.38$, $\eta2<.01$. Overall, children with ADHD had slower drift rates ($F(1, 261)=4.63$, $p<.001$, $\eta2=.10$) and narrower boundary separation ($F(1, 261)=10.56$, $p=.001$, $\eta2=.04$). However, there were no ADHD x trial-type interactions for PES or post-switch (both $p>.33$, $\eta2<.01$).
Conclusions: School-aged children demonstrated increased response caution following errors, but not following switches. This demonstrates an adaptive use of cognitive control. The diffusion model was crucial in determining this, as reaction time slowed following switches for reasons unrelated to cognitive control. Additionally, although children with ADHD demonstrated slower drift rates and narrower boundary separation overall, they showed no differences when adapting response caution.

Categories: ADHD/Attentional Functions
Keyword 1: cognitive control

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42 Behavioral Correlates of Action-Control in Children with Attention-Deficit/Hyperactivity Disorder

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Objective: Children with attention/deficit-hyperactivity disorder (ADHD) exhibit motivational and cognitive impairments that affect daily life functioning. These impairments may reflect a deficit in action-control; the process by which voluntary actions are selected and executed based on prior reinforcement learning. It consists of parallel opposing processes; goal-direction and habit formation. Using the outcome-devaluation paradigm, we previously showed that children with ADHD rely on reflexive habitual, at the expense of goal-directed, behavior to deploy their actions. The current study investigates action-control using a contingency degradation paradigm, which involves outcome overvaluation as opposed to outcome devaluation. We hypothesize that children with ADHD will display a habitual behavior, while healthy controls (HC) will use goal-directed behavior to control their actions.
Participants and Methods: We tested 19 ADHD and 14 HC participants (age 6-10 years) for this study. Children with ADHD were recruited from Children's Specialized Hospital and underwent a structured clinical diagnosis. All participants were screened for ADHD and other neurologic or psychiatric conditions that could contribute to attention impairment using the SNAP-IV rating scale. Participants completed a set of the Woodcock-Johnson® IV assessments. They were tested using an outcome-overvaluation computer-based task. During learning, participants acquired stimulus-reward associations in the acquisition phase, as well as the overvaluation phase. In the latter, one of the rewards was delivered in a similar contingency to the acquisition phase (valued), while the other reward was randomly accompanied by an extra reward in 10% of the trials (overvalued). After the overvaluation phase, participants were presented with two stimuli (associated with a valued, and an overvalued outcome) and were asked to choose one stimulus in extinction. Choosing the overvalued at a higher rate was assigned as goal-directed behavior, while choosing both stimuli at the same rate was assigned as habitual behavior.
Results: Independent-samples t-test showed that children with ADHD scored significantly higher than HC in the following measures: ADHD_inattention, ADHD_hyperactive/Impulsive, ADHD_combined, inattention/overactivity, Conner's index, inattention domain, hyperactive/impulsive domain, and general anxiety disorder screening (P-value for all is <0.001). Results from the computer-based task showed that both groups acquired action-outcome associations during the first two phases of the task. During the extinction phase, HC, as compared to ADHD, responded at a higher rate on the stimuli that were associated with the overvalued outcome ($t(31)=2.1$, $p=0.043$); indicating higher tendency to show goal-directed behavior. Further, paired-samples t-test showed that there was no significant difference between response rate on the valued vs. overvalued stimuli in the ADHD group ($t(18)=1.027$, $p=0.318$), while there was a difference trending towards significance in response rate in the HC group ($t(13)=-2.00$, $p=0.067$). These results show that ADHD responded habitually, while HC responses were goal-directed.
Conclusions: Our results indicate that children with ADHD are less likely than HC to engage in goal-directed behavior as opposed to habitual responding. This is consistent with our previous research highlighting a deficit in action-control in ADHD.

Categories: ADHD/Attentional Functions
Keyword 1: attention deficit hyperactivity disorder
Keyword 2: motivation
Keyword 3: learning