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Letter to the Editor

Commentary on "The neurocognitive nature of children with ADHD comorbid sluggish cognitive tempo: Might SCT be a disorder of vigilance?"

Sluggish cognitive tempo (SCT) symptoms include slowness, low motivation, and daydreaming. There has been an increasing amount of research on the subject, providing evidence for SCT validity as a clinical construct throughout the lifespan and as being closely related but distinct from attention-deficit hyperactivity disorder (ADHD) symptoms, especially inattention symptoms (Becker et al., 2016). Since the close relationship between SCT and ADHD and the well-documented associations between ADHD and multiple cognitive skills, a recent wave of research is investigating if SCT symptoms uniquely contribute to cognitive skills after controlling for ADHD symptoms and if combined SCT and ADHD symptoms increase the burden on cognitive functioning.

The study published by Baytunca et al. (2018) aimed at answering the second question in children, by comparing cognitive functioning on a brief computerized battery (CNS Vital Signs) in a group of children with ADHD and high levels of SCT symptoms (ADHD + SCT), a group of children with ADHD only, and a control group. In this commentary, I would like to focus on the results of the group with ADHD + SCT and the group with ADHD only. CNS Vital Signs cognitive flexibility domain scores were significantly lower in the group with ADHD + SCT compared to the group with ADHD only whereas there were no significant differences between groups on the other domain scores (composite verbal and visual memory, psychomotor speed, reaction time, and complex attention). Groups were also compared on three CNS Vital Signs subtests which are part of the complex attention and the cognitive flexibility domain scores: the Stroop test, the shifting attention test (SAT), and the continuous performance test (CPT). In comparison to the group with ADHD only, the group with ADHD + SCT had 1) significantly slower CPT reaction time scores but not significantly lower reaction time scores on SAT and Stroop subtests, and 2) a higher number of commission errors on both Stroop and CPT subtests as well as more errors on the SAT.

Baytunca et al. (2018) thereafter discussed the significant differences between the two groups on cognitive flexibility and sustained attention (CPT subtest), and compared their findings to previous studies showing significant associations between SCT symptoms and sustained attention after controlling for ADHD symptoms in selected (Willcutt et al., 2014) and unselected (Wåhlstedt and Bohlin, 2010) samples of children. They then proposed that SCT is mainly related to vigilance and orientation rather than to executive functioning. I would like to question and further discuss the interpretation of these findings.

First, as explained by the authors, cognitive flexibility represents the ability to follow a set of rules and switch answers in a quick and accurate fashion. By showing a higher number of errors on the shifting task compared to the group with ADHD only, the results suggest that children with ADHD + SCT had a harder time to adjust their behaviour according to the changing demands of the task. Importantly and contrary to the authors' conclusions, this result suggests that combined ADHD + SCT difficulties could be associated with more challenges on executive functioning in comparison to ADHD only, cognitive flexibility being one of the core executive functions (i.e. "top-down control processes used when going on automatic or relying on instinct or intuition would be ill-advised, insufficient, or impossible"; Diamond, 2013, p.136). Nevertheless, this result has to be replicated in future studies, as this is one of the few studies testing SCT and cognitive flexibility (SAT subtest) in school-age children with ADHD.

Second, differences between both groups were observed on CPT reaction time and commission errors but not on omission errors. Previous studies in school-age children showing significant associations between SCT and sustained attention (controlling for ADHD symptoms) have used omission errors (CPT task: Willcutt et al., 2014) and an aggregate of omissions and reaction time (slow condition on the go/no-go task: Wåhlstedt and Bohlin, 2010) as sustained attention measures. Moreover, commission errors have been used as measures of inhibition (i.e., executive function defined as the ability to inhibit pre-potent responses) in both Willcutt et al. (2014; CPT and stop-signal tasks) and Wåhlstedt and Bohlin (2010; Stroop and go/no-go tasks) and were not significantly associated with SCT symptoms after controlling for ADHD symptoms. Therefore, in contrast to Baytunca et al.' interpretation, the higher number of commission errors on the Stroop and the CPT subtests is not consistent with these previous studies and suggests more elevated inhibition difficulties in the group with ADHD + SCT.

In light of these results, it seems too premature to conclude that SCT is exclusively a disorder of vigilance. The disparities between studies also stress the importance to conduct future research in order to better understand how SCT symptoms affect cognition in school-age children. Accordingly, I would like to share some final reflections about why results might diverge and future research avenues. A first thought relates to the clinical sample of children with ADHD + SCT. Strict exclusion criteria were used to select patients free of comorbid conditions such as mental health diagnoses or neurodevelopmental disorders. Despite these criteria and since co-occurring difficulties are common in children with ADHD and SCT symptoms, it would be informative in future studies to document subclinical levels of learning difficulties and internalizing/externalizing symptoms, clinical and subclinical levels of sleep difficulties, and investigate if SCT remains associated with cognitive functioning (especially executive functions) after controlling for these cofounding factors. A second thought relates to the cognitive battery used. Given its brevity and its use as a screening tool in clinical populations, it would be relevant for future studies to include CNS Vital Signs and traditional neuropsychological measures evaluating cognitive flexibility, inhibition, and also working memory (another executive function not measured in CNS Vital Signs) to see if these results can be replicated in different measures of the same constructs. Finally, I agree with the authors that future studies in children using a dimensional approach, prioritizing a longitudinal design, and incorporating questionnaires about executive functioning are warranted.

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