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Sluggish Cognitive Tempo Predicts Academic Fluency, Beyond Contributions of Core Academic Skills, Attention, and Motor Speed

Lisa A. Jacobson^{1,2}, E. Mark Mahone^{1,2}

¹Johns Hopkins School of Medicine, Baltimore, MD, USA

²Kennedy Krieger Institute, Baltimore, MD, USA

Abstract

Objective: Sluggish Cognitive Tempo (SCT) is a distinct behavioral phenotype characterized by such symptoms as being slow to complete tasks, appearing drowsy or sleepy, and lacking initiative. Subcomponents of SCT appear differentially associated with inattention symptoms and child outcomes. Much of the work in this area has examined associations between SCT symptoms and ratings of behavior; few studies have examined associations with child performance.

Method: We examined associations between SCT and timed reading and math skills in 247 referred youth (M age = 11.55, range = 6–20; 67.6% male), controlling for the untimed academic skills, inattention, and graphomotor speed.

Results: SCT consistently predicted timed academic fluency, after controlling for other component skills, for both reading (SCT $R^2 = .039$, $p = .001$) and math ($R^2 = .049$, $p = .001$).

Conclusion: Results provide initial evidence for the unique association of SCT with timed academic performance. Understanding associations of SCT with actual child performance may allow for greater specificity in targeting interventions to address speed of performance.

Keywords

ADHD; children; reading; neurocognitive measures; math

Sluggish Cognitive Tempo (SCT) comprises a distinct behavioral phenotype that partially overlaps with core symptoms of ADHD (Barkley, 2012; Skirbekk, Hansen, Oerbeck, & Kristensen, 2011). SCT is characterized by such behaviors as being slow to complete tasks, easily confused, or mentally foggy; appearing drowsy, sleepy, or frequently lost in thought;

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Corresponding Author: Lisa A. Jacobson, Department of Neuropsychology, Kennedy Krieger Institute, 1750 E. Fairmount Avenue, Baltimore, MD 21231, USA. jacobson@kennedykrieger.org.

Authors' Note

A portion of this work was presented at the APSARD Annual Conference in Washington, DC, January 2018. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. With IRB approval, a waiver of consent was obtained as all data represent de-identified clinical data obtained in the course of routine care.

Declaration of Conflicting Interests

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and/or lacking initiative (Becker & Langberg, 2013; Carlson & Mann, 2002; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). Signs of SCT can be reliably assessed (Becker et al., 2016) and appear to persist over time (Leopold et al., 2016), suggesting the potential for longstanding impact upon day to day functioning as well as acquisition and application of academic skills. In addition, factor analytic work has revealed distinct subcomponents of SCT that appear present regardless of rater (Smith et al., 2017), with subcomponents differentially associated with ADHD inattention symptoms (Hartman, Willcutt, Rhee, & Pennington, 2004; Jacobson et al., 2012).

Caregiver reports of SCT symptoms have been linked to overall reports of academic impairment, with a generally moderate effect size (Becker et al., 2016). Specifically, SCT is associated with reported academic impairment ratings from parents or teachers (Bauermeister, Barkley, Bauermeister, Martinez, & McBumett, 2012; Jacobson et al., 2012; Langberg, Becker, & Dvorsky, 2014; Smith & Langberg, 2017; Watabe, Owens, Evans, & Brandt, 2014), with associations inconsistently remaining after controlling for inattention and/or intellectual ability/IQ. Nevertheless, existing evidence is inconsistent, with some work suggesting that SCT ratings are not associated with reported academic impairment beyond ADHD symptoms (e.g., Becker & Langberg, 2013; Carlson & Mann, 2002; Marshall, Evans, Eiraldi, Becker, & Power, 2014) or that only some but not all SCT dimensions show association with reported academic impairment (e.g., Slow SCT; Tamm et al., 2016) or grade point average (e.g., SCT Slow factor associated with reduced grades, while the Daydreamy factor was associated with higher grades; Smith & Langberg, 2017).

Only a few studies have examined actual child *performance* to determine whether caregiver SCT ratings are predictive of academic function as measured by standardized test scores. These initial findings have been inconsistent. Some evidence suggests that caregiver SCT ratings are weakly (but significantly) associated with performance-based academic skills in word reading, reading comprehension, math, and written language (Willcutt et al., 2014), even after controlling for ADHD symptoms. Conversely, other studies have observed SCT associations in reading but not math (Hartman et al., 2004; Tamm et al., 2016), or with math skills but not reading (Bauermeister et al., 2012). In contrast, other work has not shown a consistent association between SCT ratings and child academic performance (Langberg et al., 2014; Marshall et al., 2014), with Bauermeister et al. (2012) finding stronger associations between achievement and inattention than between achievement and SCT. A complicating factor may be that children with diagnosed learning disabilities (LD) may be more likely to manifest behaviors associated with SCT symptoms than those without LD diagnoses (Comprodon-Rosanas et al., 2016).

Given these inconsistent associations, further work is needed to clarify the nature of the relationship between SCT and academic achievement. Examining actual academic performance, rather than ratings of academic impairment, helps mitigate the effect of method variance on these associations, while controlling for inattention symptoms in models will help to identify unique contributions of SCT to academic performance, beyond the known associations between inattention and academic achievement (e.g., Sesma, Mahone, Levine, Eason, & Cutting, 2009). Importantly, given the emphasis on slowed processing in the construct of SCT, no studies to date have examined the relation between SCT and

performance on timed academic outcomes (e.g., fluency measures); it is possible that SCT may be more strongly associated with academic fluency than with untimed skills. Furthermore, there is some evidence suggesting an independent association between SCT and processing speed (Jacobson, Geist, & Mahone, 2017), although this relationship may be age-, sample-, or measure dependent (e.g., Bauermeister et al., 2012; Willcutt et al., 2014). To date, it is also noteworthy that no published studies have attempted to control for processing or graphomotor speed when examining academic functioning, timed or otherwise. Motor speed may be particularly critical when examining timed academic skills that require a written response (e.g., fluency measures).

The goal of the present study was to examine whether caregiver ratings of children's SCT predict performance measures of academic fluency in a mixed clinical sample, controlling for contributions of attention and core academic skills. As all of the academic fluency outcomes under investigation involve pencil and paper responses, a secondary set of analyses included a measure of graphomotor speed as an additional predictor in the hierarchical model. We hypothesized that the SCT subscales would account for a significant proportion of variance in academic fluency, even after measures of untimed component academic skills and attention ratings were included in the model. We further hypothesized that SCT would remain a significant predictor of academic fluency, over and above core academic skills and attention, even after controlling for graphomotor speed.

Method

Procedures

As part of routine clinical practice at a large outpatient psychological/neuropsychological assessment center, parents of children referred to the clinic were asked to complete a set of behavioral rating scales including the Penny et al. (2009) SCT Scale and the ADHD Rating Scale-IV/-5 (ADHDRS; DuPaul, Power, Anastopoulos, & Reid, 1998, 2016) through a secure web link prior to the assessment appointment. All data are then entered into a clinical database. Data from routine clinical assessments are also entered into this database by department clinicians via the hospital electronic health record, and these data are securely maintained by the hospital's Information Systems Department. All data were collected from unique patient visits.

Following approval from the hospital's Institutional Review Board, the de-identified clinical database was queried, and a limited data set was constructed of patients between the ages of 6 and 20 years for whom parent ratings were available on the ADHDRS and the SCT Scale, and to whom specific performance-based measures (listed below) were administered as part of their clinical evaluation. There were no additional exclusionary criteria beyond complete data on these measures.

Measures

SCT.—The SCT Scale (Penny et al., 2009) is a 14-item parent-report rating scale of symptoms that correspond to the SCT construct. Ratings are made on a 4-point scale (0 = *never or rarely*; 1 = *sometimes*; 2 = *often*; 3 = *very often*). The scale demonstrated excellent

internal consistency in this sample ($r\alpha = .86$). Total composite score for the SCT Scale is the sum of the ratings on all 14 items; in the present study, factor analytic methods supported the previously identified three-factor structure of the measure (e.g., Sleepy-Sluggish, Slow, Daydreamy). These factor-derived subscales were used in subsequent analyses, as specified below.

Attention.—Attention was assessed via caregiver ratings on the ADHDRS (DuPaul et al., 1998, 2016). The ADHDRS is an 18-item measure, reflecting the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association [APA], 1994)/*Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; APA, 2013) diagnostic criteria for ADHD. Items were rated based on the child's behavior over the past 6 months, using a 4-point scale (0 = *not at all*; 1 = *sometimes*; 2 = *often*; 3 = *very much*). The Inattention subscale score was obtained by adding corresponding item ratings (range = 0-27). The ADHDRS has been shown to demonstrate adequate reliability and validity (DuPaul et al., 2016); in the current sample, subscale internal consistency for the Inattention scale was excellent ($r\alpha = .84$).

Untimed verbal knowledge.—For the purposes of the present study, untimed verbal knowledge was measured by the Vocabulary subtest scaled score from the age-appropriate version of the Wechsler measures (Wechsler Intelligence Scale for Children, Fourth or Fifth Edition [Wechsler, 2003, 2014]; Wechsler Adult Intelligence Scale, Fourth Edition [WAIS-IV; Wechsler, 2008]).

Reading skills.—*Untimed* reading ability was assessed via standard scores on measures of single word reading from either the Woodcock-Johnson Test of Academic Achievement, Third Edition (Letter-Word Identification, $n = 202$; Woodcock, McGrew, & Mather, 2001), the Wechsler Individual Achievement Test, Third Edition (Word Reading subtest, $n = 41$; Wechsler, 2009), or the Kaufman Test of Educational Achievement, Third Edition (KTEA-3; Letter and Word Recognition, $n = 4$; Kaufman & Kaufman, 2014). *Timed* reading fluency was assessed via respective measures from the Woodcock-Johnson Test of Academic Achievement, Third Edition (Reading Fluency, $n = 239$; Woodcock et al., 2001), the KTEA-3 (Silent Reading Fluency, $n = 4$; Kaufman & Kaufman, 2014), or the Wechsler Individual Achievement Test, Third Edition (Oral Reading Fluency, $n = 4$; Wechsler, 2009). Notably, correlations among corresponding reading measures are reported as strong (.76 to .80 for core reading measures; KTEA-3 Technical Manual, Kaufman & Kaufman, 2014).

Math skills.—*Untimed* math computation ability was measured via standard scores on relevant subtests from either the Woodcock-Johnson Test of Academic Achievement, Third Edition (Calculation, $n = 203$; Woodcock et al., 2001), the Wechsler Individual Achievement Test, Third Edition (Numerical Operations, $n = 40$; Wechsler, 2009), or the KTEA-3 (Math Computation, $n = 4$; Kaufman & Kaufman, 2014). *Timed* math fluency was assessed via timed performance on either the Math Fluency subtest of the Woodcock-Johnson Test of Academic Achievement, Third Edition (Woodcock et al., 2001; $n = 238$), the Math Fluency-Addition subtest of the Wechsler Individual Achievement Test, Third Edition (Wechsler, 2009; $n = 5$), or the Math Fluency subtest of the KTEA-3 (Kaufman & Kaufman, 2014; $n =$

4). Correlations among corresponding math measures are reported as strong (.70 to .80 for core math measures; KTEA-3 Technical Manual, Kaufman & Kaufman, 2014).

Graphomotor speed.—In addition, graphomotor speed (pencil and paper speed) was measured with the Coding subtest scaled score from the age-appropriate version of the Wechsler scales (Wechsler, 2003, 2008, 2014).

Analysis Plan

First, an initial exploratory factor analysis was conducted to confirm structure of the SCT subscales. Second, zero-order correlations among SCT subscales, reading and math performance, and graphomotor speed were examined to assess relative contributions of SCT to untimed versus timed academic skills. Third, a series of hierarchical linear regression analyses were conducted to examine predictions of timed academic fluency from SCT ratings, controlling for the respective untimed skill and inattention symptom severity. Finally, an additional step was added to the regressions that included a proxy for graphomotor speed (Wechsler Coding score) in the model. SCT subscales (Sleepy-Sluggish, Slow, Daydreamy) were entered together as a block, after inattention and untimed academic performance were already in the model, with subscale coefficients examined for unique contributions to achievement. The last set of analyses included an exploratory examination of potential age moderation in these associations, given prior work suggesting that SCT may be differentially associated with timed outcomes in younger versus older children.

Results

Participants

The total sample included 247 participants (M age = 11.6 years, SD = 2.8, range = 6.9–20.4) referred for psychological or neuropsychological assessment in a large outpatient neuropsychology clinic (see Table 1). The majority of the sample were male (67.6%) and Caucasian (63.2%); 20.6% were African American, 4.9% multiracial, 3.2% Asian American, and 3.6% were of unknown racial background, while 3.6% were reportedly of Hispanic ethnicity. Overall, the sample was generally of average verbal ability, as measured by untimed expressive vocabulary knowledge (Table 1). The majority of the sample (64.8%) was referred for assessment due to behavioral or emotional concerns (e.g., 46% diagnosed with ADHD; 7.7% with anxiety; 2.0% depression), with 35% of the sample referred due to medical disease or disorder (e.g., epilepsy 9.7%, pediatric cancer 9.3%, spina bifida and/or hydrocephalus 5.2%, genetic disorders 1.6%, etc.).

Exploratory Factor Analysis

Initial factor analysis using principal axis factoring and Promax rotation identified three SCT factors, accounting for 55.5% of the variance. Item-factor loadings are shown in Table 2. SCT subscales were subsequently created by calculating the mean score of all items loading on the subscale (unit-weighting). All three resulting subscales showed good internal consistency in the present sample (Sleepy-Sluggish α = .89, Slow α = .78, Daydreamy α = .78). In addition, comparison of item-factor loadings in the current study with those in the initial validation sample (Penny et al., 2009) reveals a high degree of consistency. Twelve of

the items loaded on similar factors across the two studies, with the two remaining items (“apathetic” and “unmotivated”) loading onto Factor 1 (“Sleepy-Sluggish”) in the current analysis.

SCT subscales were used in subsequent correlations and regression analyses examining academic performance. Examining zero-order correlations, the Slow subscale consistently showed significant negative associations with all academic outcomes, including both timed and untimed measures (see Table 3). The Sleepy-Sluggish scale was significantly associated with graphomotor speed, but not academic performance, while the Daydreamy scale was significantly associated only with math fluency. In the present sample, inattention severity was not associated with timed or untimed reading ability and only weakly associated with math skills.

Reading Fluency

A series of hierarchical linear regressions were conducted to examine the unique contributions of the SCT scales to predictions of child academic performance. Although untimed word reading ability (predictably) accounted for a substantial proportion of variance in children’s reading fluency performance ($R^2 = .43$, $p < .001$), inattention severity ($p > .05$) did not contribute significantly. SCT accounted for a small but significant additional amount of variance in fluency ($R^2 = .04$, $p = .001$), even after caregiver ratings of inattention were included in the model (see Table 4; total model $R^2 = .468$). Specifically, among SCT subscales, the Slow subscale was a significant predictor of reading fluency. After including graphomotor speed as an additional predictor in the model, SCT remained a small but significant predictor of reading fluency ($R^2 = .04$, $p < .001$). With graphomotor speed in the model, each of the SCT scales (but not inattention severity; $p > .05$) contributed significantly to reading fluency performance (total model $R^2 = .587$).

Math Fluency

Untimed math calculation skills accounted for substantial variance in math fluency ($R^2 = .35$, $p < .001$); however, SCT remained a significant additional predictor of math fluency over and above core math skills and inattention ($R^2 = .04$, $p = .001$, total model $R^2 = .40$; see Table 5). Inattention severity did not contribute significantly to math fluency ($p > .05$). In contrast to prediction of reading fluency, all three SCT scales contributed significantly to math fluency. After including graphomotor speed in the model, SCT remained a significant predictor of math fluency ($R^2 = .049$, $p < .001$, total model $R^2 = .52$), again with all three SCT scales predictive of speeded math performance.

Age and SCT

Across the entire sample, age was significantly and directly correlated only with the SCT Sleepy-Sluggish scale (Table 2). However, there was a significant interaction of Daydreamy SCT with age on Reading Fluency ($p = .039$), and a trend toward a similar interaction on Math Fluency ($p = .069$), such that there was a stronger effect of SCT on fluency in younger children, with children rated by parents as showing greater SCT earning lower fluency scores. Splitting the sample at an approximate median split of 10 years (consistent with methods reported in Jacobson et al., 2017), the pattern of associations between SCT and

academic fluency was explored across age groups. Specifically, the correlation between the Daydreamy SCT scale and Math Fluency was significantly stronger in younger (less than 10 years) versus older youth (10-20 years; $r = -.45$ and $-.10$, respectively, $p < .01$). Likewise, the relationship of Daydreamy SCT with Reading Fluency differed by age (younger $r = -.30$; older $r = .08$, $p < .01$). In contrast, the association between Slow SCT and academic fluency was significant for both reading and math, but not different by age (Reading Fluency: younger $r = -.32$, older $r = -.26$, $p > .05$; Math Fluency: younger $r = -.31$, older $r = -.28$, $p > .05$). None of the zero-order associations between Sleepy-Sluggish SCT and academic fluency were significant or different by age.

Discussion

The present study is the first to our knowledge to examine associations between caregiver ratings of SCT and actual timed academic performance in a pediatric clinical sample. Importantly, even after controlling for untimed component academic skills, inattention, and graphomotor speed, SCT remains a small but significant unique predictor of child performance on timed academic tasks. Specifically, the Slow SCT scale was a consistent predictor of reading fluency, with the Sleepy-Sluggish and Daydreamy components also adding to prediction of reading fluency after controlling for untimed word reading, inattention, and graphomotor speed. With regard to timed math performance, all three SCT scales contributed significantly to predictions of math fluency, with and without inclusion of graphomotor speed in the model. Exploratory analyses also suggest that these associations may vary by age, with stronger associations between SCT and academic fluency in younger children, albeit with differing patterns among SCT scales.

These findings replicate and extend the existing body of evidence suggesting that SCT may not be a unitary construct. Prior work suggests presence of multiple subscales in most longer (i.e., more than four items; Becker, 2013) SCT measures, and finds that the subscales show differential associations with ADHD symptoms (e.g., Hartman et al., 2004; Jacobson et al., 2012). The present study corroborates these findings in a new sample and extends our understanding of the relation of SCT components to important functional child outcomes. Although evidence has been limited and somewhat inconsistent with regard to the associations between SCT and untimed academic performance (Hartman et al., 2004; Langberg et al., 2014; Marshall et al., 2014; Tamm et al., 2016; Willcutt et al., 2014), the present work adds to accumulating evidence for the validity of the SCT construct, indicating that caregiver ratings do predict actual child academic *performance*, not just *ratings* of performance (i.e., multimethod convergence). Furthermore, as hypothesized, given the emphasis on speed in the SCT construct, the present study demonstrated that SCT ratings significantly predicted *timed* academic outcomes, even after controlling for the relevant untimed component skills and motor processing speed.

This association between SCT and academic fluency (beyond that attributable to inattention, core academic abilities, and motor output speed) suggests that caregiver ratings of SCT may be capturing elements of the construct that are more directly relevant to fluency than are more general ratings of inattention. The nature of the Slow SCT items in particular (e.g., *is slow or delayed in completing tasks, needs extra time for assignments, lacks initiative*) may

map directly onto the construct of fluency in a way that inattention symptoms (e.g., *easily distracted, difficulty organizing, fails to give close attention to details*) do not. However, the limited association between ratings of inattention and academic performance in the present sample is unexpected. It may be that the pattern of associations among constructs presumed to be related—such as inattention, processing speed, and academic ability (e.g., McGrath et al., 2011), differs substantively within a clinically referred sample, compared to a community sample. More likely, however, these associations may differ by age, especially within a referred sample, as some recent research suggests that the association between SCT and performance-based measures of processing speed differs by child age (Jacobson et al., 2017). Notably, the associations of SCT and academic outcomes appeared to differ in the present sample by age and SCT scale, with a stronger relation of Daydreamy SCT to academic fluency in younger versus older youth but no significant differences by age for associations of fluency with Slow or Sleepy-Sluggish SCT. Ultimately, it may be that the impact of SCT on actual speeded performance is more relevant to younger children who are in the process of solidifying basic academic skills.

Limitations of the present study include the clinical nature of the sample, many of whom were likely referred due to concerns about school performance and potential impact of specific clinical diagnoses on academic functioning. While this was not a sample selected specifically for attentional symptoms, many children seen in this clinic are typically diagnosed with ADHD; as noted earlier, 46% of the sample was clinically diagnosed with ADHD. Thus, findings may not generalize to a purely community or school-based sample and further examination of the SCT and academic fluency association should be conducted within such settings. In addition, as these data were acquired in the course of clinical evaluations, academic outcome measures vary; although subtest demands are quite similar across corresponding measures, future studies should strive to maintain uniform outcomes measures to clarify contributions of SCT to academic performance. Furthermore, as clinical assessments are often conducted with children taking any daily medication as prescribed, it would be helpful to know how many of the children diagnosed with ADHD were already prescribed and taking stimulant medication. Such medications may have specific impact upon speed of task completion (Marraccini, Weyandt, Rossi, & Gudmundsdottir, 2016); unfortunately, however, these data were not available for analysis. In the present study, ratings of SCT were obtained from caregivers and the pattern of associations may differ when assessing SCT via teacher- or potentially by self-report. In addition, it is important to note that the measure used to control for graphomotor (e.g., pencil and paper) speed, Wechsler Coding, assesses motor responding as well as cognitive components of response preparation, stimulus manipulation and processing, and response initiation (e.g., Jacobson et al., 2011). As such, Coding may reflect speeded cognitive processing as well as motor output speed and thus, provides a potential “over-control” in analyses; however, findings attributable to SCT remain significant even after controlling for performance on Coding. Finally, mood symptoms have also been shown to be associated with both SCT (Becker et al., 2016; Jacobson et al., 2017; Penny et al., 2009) and performance speed (Bora, Harrison, Yücel, & Pantelis, 2013); although it would have been interesting to examine whether the association of SCT with academic fluency differed in youth identified with depression, the

sample included too few youth with a mood disorder diagnosis to permit meaningful subanalyses.

Overall, findings from the present study add to the growing body of research suggesting that the construct of multidimensional SCT has important implications for understanding meaningful outcomes in children with and without ADHD diagnoses. Furthermore, these data extend prior work by showing that caregiver ratings of SCT may be meaningfully associated with actual child performance on timed measures of academic skills, above and beyond inattention, component academic skills, and motor speed. These data suggest the importance of considering academic accommodations such as extra time for task completion for children with behaviors characterized by SCT. In particular, children who exhibit these behaviors may require additional support at home and in school for developing the automaticity with basic facts that underlies academic fluency as well as reliance on untimed rather than timed classroom assessment strategies. These findings are important for establishing the phenotype of SCT in children to examine brain–behavior associations via neuroimaging, investigate potential genetic bases of these symptoms, and develop potential directions for intervention or support.

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Biography

E. Mark Mahone, PhD, ABPP, is a board certified neuropsychologist, director of neuropsychology at the Kennedy Krieger Institute, and professor of psychiatry and behavioral sciences at the Johns Hopkins University School of Medicine. His research emphasizes investigation of brain-behavior relationships in children with neurodevelopmental disorders using multimodal neuroimaging and neurobehavioral assessment to better characterize neurobehavioral development and to identify biomarkers in these disorders.

Lisa A. Jacobson, PhD, ABPP, is a board certified neuropsychologist at the Kennedy Krieger Institute (KKI) and associate professor of psychiatry and behavioral sciences at the Johns Hopkins University School of Medicine. She is also research director in the KKI Department of Neuropsychology, where she oversees the neuropsychology clinical database and associated informatics operations.

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Table 1.

Sample Demographic and Behavioral Characteristics.

	M	SD
Sex (% male)	67.6	
Caucasian (%)	63.2	
Black/African American (%)	20.6	
Age	11.55	2.79
Vocabulary ability (ScS)	9.61	3.0
Untimed reading skills (SS)	97.00	12.41
Reading fluency (SS)	88.69	15.62
Untimed math skills (SS)	95.22	18.45
Math fluency (SS)	88.69	15.62
Inattention severity (raw)	14.66	6.26
SCT severity (raw)	15.19	7.98

Note. Vocabulary ScS = Wechsler Vocabulary subtest scaled score, $M = 10$, $SD = 3$; SS = standard score, $M = 100$, $SD = 15$; SCT = Sluggish Cognitive Tempo.

Table 2.

Exploratory Factor Analysis of SCT Scale Items.

	Factor 1: Sleepy/sluggish	Factor 2: Slow	Factor 3: Daydreamy
Lethargic	.849		
Drowsy	.849		
Apathetic	.820		
Underactive	.818		
Sluggish	.737		
Yawning	.735		
Unmotivated	.391		
Slow/delayed		.733	
Needs extra time		.661	
Lacks initiative		.654	
Effort fades		.592	
Lost in thoughts			.751
Daydreams			.716
In own world			.607

Note. Factor loadings below .25 suppressed. SCT = Sluggish Cognitive Tempo.

Table 3.

Correlations Among SCT, Achievement, and Graphomotor Speed.

	SCT Slow	SCT Sluggish	SCT Daydreamy	Reading ability	Reading fluency	Math ability	Math fluency	Inattention	Graphomotor speed
Age	-.107	.193 [*]	-.082	-.104	-.038	-.090	.050	-.096	-.136 [*]
SCT Slow		.305 ^{**}	.421 ^{**}	-.219 ^{**}	-.264 ^{**}	-.249 ^{**}	-.286 ^{**}	.785 ^{**}	-.138 [*]
SCT Sluggish			.399 ^{**}	.020	.066	-.063	-.013	.341 ^{**}	-.148 [*]
SCT Daydreamy				.062	-.029	-.088	-.195 ^{**}	.586 ^{**}	-.044
Reading Ability					.655 ^{**}	.574 ^{**}	.395 ^{**}	-.073	.191 ^{**}
Reading Fluency						.432 ^{**}	.570 ^{**}	-.065	.464 ^{**}
Math Ability							.594 ^{**}	-.138 [*]	.333 ^{**}
Math Fluency								-.176 ^{**}	.514 ^{**}
Inattention									-.064

Note. SCT = Sluggish Cognitive Tempo

^{*} $p < .05$.^{**} $p < .01$.

Table 4.

Prediction of Reading Fluency by SCT, Controlling for Untimed Word Reading, Inattention, and Graphomotor Speed—Analysis 2.

	$R^2/$ R^2	β	p
Analysis 1: Reading Fluency			
Untimed word reading	.429	.655	<.001
Inattention	.000	-.017	.719
SCT	.039		.001
Slow		-.242	.001
Sleepy Sluggish		.099	.061
Daydreamy		-.111	.065
Analysis 2: Reading Fluency			
Untimed word reading	.429	.655	<.001
Graphomotor speed	.119	.352	<.001
Inattention	.000	.000	.992
SCT	.039		<.001
Slow		-.197	.002
Sleepy Sluggish		.154	.001
Daydreamy		-.111	.037

Note. SCT = Sluggish Cognitive Tempo.

Table 5.

Prediction of Math Fluency by SCT, Controlling for Untimed Math Calculation Skills, Inattention, and Graphomotor Speed—Analysis 2.

	$R^2/$	R^2	β	p
Analysis 1: Math Fluency				
Untimed calculation skills	.352		.594	<.001
Inattention	.009		-.096	.064
SCT	.040			.001
Slow			-.165	.027
Sleepy Sluggish			.142	.012
Daydreamy			-.171	.007
Analysis 2: Math Fluency				
Untimed calculation skills	.352		.594	<.001
Graphomotor speed	.113		.356	<.001
Inattention	.008		-.089	.059
SCT	.049			<.001
Slow			-.132	.048
Sleepy Sluggish			.196	<.001
Daydreamy			-.182	.001

Note. SCT = Sluggish Cognitive Tempo.