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Sluggish Cognitive Tempo in Adolescents with and without ADHD: Differentiation from Adolescent-reported ADHD Inattention and Unique Associations with Internalizing Domains

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Abstract

A growing number of studies support the internal and external validity of youth self-reported sluggish cognitive tempo (SCT) symptoms. However, no study has examined SCT in adolescents without ADHD, examined whether adolescent self-reported SCT is distinct from adolescent self-reported ADHD inattention (ADHD-IN), or evaluated whether links between SCT and internalizing problems differ for adolescents with or without ADHD. The present study is the first to (1) determine the convergent and discriminant validity of self-reported SCT and ADHD-IN symptoms in both adolescents with and without ADHD, (2) test the invariance of SCT and ADHD-IN symptoms across ADHD and comparison groups, (3) examine SCT as uniquely related to a range of internalizing-relevant domains, and (4) evaluate if the association between SCT with internalizing correlates differs for adolescents with or without ADHD. Participants were adolescents (M_{age}=13 years) with (n=162) and without (n=140) ADHD. Adolescents and parents completed measures of internalizing symptoms and emotion dysregulation; adolescents completed measures of rumination and suicidal ideation. Analyses indicated that 13 of the 15 SCT items demonstrated convergent and discriminant validity from ADHD-IN, and SCT and ADHD-IN demonstrated invariance across the ADHD and comparison groups and across sex. SCT, but not ADHD-IN, was uniquely associated with greater adolescent-reported internalizing symptoms and suicidal ideation. Both SCT and ADHD-IN were uniquely associated with adolescent-reported

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[1]A total of 270 of the 302 adolescents had a score of 0 on the suicidal ideation scale. The associations of SCT and ADHD-IN with suicidal ideation should take into consideration the restriction of the range for this measure.

emotion dysregulation and parent-reported internalizing symptoms. Only ADHD-IN was uniquely associated with parent-reported emotion dysregulation. Findings support the differentiation of adolescent-reported SCT and ADHD-IN and demonstrate associations between SCT and increased internalizing problems in adolescents with and without ADHD.

Keywords

adolescence; anxiety; attention-deficit/hyperactivity disorder; depression; emotion regulation; invariance; rumination; sluggish cognitive tempo; suicide

Sluggish cognitive tempo (SCT) refers to a constellation of behavioral symptoms characterized by mental confusion and fogginess, slowed behavior and thinking, and lethargy and drowsiness, and excessive daydreaming. Although distinct, there is a strong association between SCT and ADHD inattention (ADHD-IN) symptoms (Becker, Leopold, et al., 2016), and a growing body of research has examined whether SCT and ADHD-IN are differentially related to functional outcomes. However, no research to date has confirmed the distinction between youth self-reported SCT and ADHD-IN, nor has it compared whether adolescents with and without ADHD show invariance on SCT symptoms. Although SCT symptoms are associated with internalizing symptoms of anxiety and depression (Becker & Barkley, 2018), very few studies have examined SCT in adolescence. Further, despite growing indication of the importance of self-report in the assessment of SCT (Sáez, Servera, Burns, & Becker, 2019; Smith, Eadeh, Breaux, & Langberg, 2019), few studies have examined adolescent self-reported SCT symptoms and no study has examined self-reported SCT in adolescents without ADHD or whether SCT and ADHD-IN are distinct when adolescent self-report ratings are used. The present study examines adolescent self-reported SCT symptoms in relation to a range of internalizing and emotional functioning domains in a large sample of adolescents with and without ADHD.

SCT in Relation to Internalizing Symptoms and Emotional Functioning

Anxiety and depression

SCT may be conceptualized as part of the internalizing spectrum of psychopathology (Becker & Willcutt, 2019). Among studies examining external correlates of SCT that exist above and beyond ADHD symptom severity, perhaps the most consistent finding across studies of school-aged children with and without ADHD is an association between SCT and increased internalizing symptoms (Bauermeister, Barkley, Bauermeister, Martinez, & McBurnett, 2012; Becker, Luebbe, Fite, Stoppelbein, & Greening, 2014; Bernad, Servera, Becker, & Burns, 2016; Carlson & Mann, 2002; Khadka, Burns, & Becker, 2016; Lee, Burns, Snell, & McBurnett, 2014; McBurnett et al., 2014; Sáez, Servera, Becker, & Burns, 2018). Longitudinal studies have also found SCT symptoms to predict later internalizing symptoms in school-aged children (Bernad et al., 2016; Bernad, Servera, Grases, Collado, & Burns, 2014; Servera, Bernad, Carrillo, Collado, & Burns, 2016). Of note, there is recent evidence that SCT predicts increases in internalizing symptoms rather than the reverse, especially for depressive symptoms (Becker, Webb, & Dvorsky, 2019).

Fewer studies have examined the association between SCT and internalizing symptoms in adolescence, which is surprising since both SCT symptoms and internalizing psychopathology increase during this developmental period (Becker & Fogleman, 2019; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Leopold et al., 2016). An initial study in this area documented a significant association between parent-reported SCT symptoms and composite measures of internalizing symptoms in a sample of 57 young adolescents (ages 10–14 years) with ADHD (Becker & Langberg, 2013). In a sample of 262 adolescents (ages 10–15 years) with ADHD, Smith and Langberg (2017) found adolescent self-reported SCT symptoms to be associated with higher anxiety and depressive symptoms, whereas parent-reported SCT symptoms were associated with *lower* anxiety symptoms and were unassociated with depressive symptoms. The one longitudinal study examining childhood SCT symptoms in relation to adjustment in adolescence found parent-reported SCT in early childhood, but not ADHD-IN, to be uniquely associated with higher anxiety/depressive symptoms in a large, community-based twin sample (Becker, Burns, Leopold, Olson, & Willcutt, 2018). Thus, extant research suggests SCT symptoms are associated with increased internalizing symptoms in adolescence, though findings may differ across informants and specific anxiety and depression dimensions.

Rumination

Rumination is clearly associated with internalizing psychopathology (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Olatunji, Naragon-Gainey, & Wolitzky-Taylor, 2013), and there are conceptual links between SCT and ruminative processes. For instance, the nature of SCT, which includes excessive daydreaming and getting lost in one's thoughts, has led researchers to ask, "Might SCT be in part caused by elevated sensitivity to even mild loss and a tendency to ruminate or 'get stuck' when such events occur?" (Becker & Willcutt, 2019, p. 606). This echoes earlier assertions that SCT may reflect, at least in part, maladaptive mind wandering (Adams, Milich, & Fillmore, 2010; Barkley, 2014). It has further been hypothesized that rumination or maladaptive mind wandering may be one mechanism linking SCT to increased internalizing symptoms (Barkley, 2014; Becker, Webb, & Dvorsky, 2019). A first step in this line of inquiry is to examine whether SCT symptoms are associated with rumination.

In addition, within response styles theory, rumination includes two subtypes: brooding and reflection (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Brooding rumination refers to a tendency to dwell on negative situations or consequences, whereas reflection rumination refers to actively trying to understand the reasons for problems and negative mood (Treynor et al., 2003). Brooding rumination is often considered more maladaptive than reflection rumination, and brooding is more strongly associated with anxiety and depressive symptoms (Olatunji et al., 2013). Given the strong links between SCT and internalizing symptoms, it may be that SCT symptoms are more strongly associated with brooding than reflection rumination. In addition, ADHD-IN is associated with brooding rumination in adults (Jonkman, Markus, Franklin, & van Dalfsen, 2017), yet no study has examined whether ADHD-IN symptoms remain associated with rumination when SCT symptoms are simultaneously considered. SCT and ADHD-IN may differentially be attributable to internal

or external distractors, respectively, in which case SCT symptoms would be expected to be more clearly associated than ADHD-IN symptoms with rumination.

Emotion dysregulation

It has been hypothesized that emotion dysregulation is one mechanism linking SCT to social impairment, including withdrawal and isolation specifically (Willcutt et al., 2014). A cross-sectional study of college students supported emotion dysregulation as a mediator of the relation between SCT symptoms and social impairment (Flannery, Becker, & Luebbe, 2016). Other studies conducted with adults have also demonstrated SCT symptoms to be uniquely associated with emotion dysregulation, with SCT often more strongly associated than ADHD symptoms with adult self-reported emotion dysregulation (Barkley, 2012; Becker, Burns, Garner, et al., 2018; Jarrett, Rapport, Rondon, & Becker, 2017). However, very few studies have examined SCT in relation to emotion dysregulation in youth, with mixed findings reported. A school-based study found child-reported SCT symptoms to be uniquely associated with poorer emotion regulation (Becker, Luebbe, & Joyce, 2015). Similarly, Araujo Jiménez and colleagues (Araujo Jiménez, Jané Ballabriga, Bonillo Martin, Arrufat, & Serra Giacobo, 2015) found parent-reported SCT symptoms, but not ADHD-IN symptoms, to be uniquely associated with poorer parent-rated emotional control in a sample of children and adolescents with ADHD. In contrast to these studies, in two nationally representative samples of youth, ADHD-IN symptoms were more strongly associated than SCT symptoms with parent-reported emotion regulation deficits (Barkley, 2013; Burns & Becker, 2019). These findings, coupled with the findings from studies with adults, raise the possibility that the association between SCT and emotional dysregulation is more clearly evident when emotion regulation is assessed using self-report as opposed to parent-report. The current study is the first to directly test this possibility.

In addition, we are aware of only one study that has examined different facets of emotion regulation. Specifically, Becker et al. (2015) found child-reported SCT symptoms to be uniquely associated with emotional inhibition (masking or suppressing emotional expression), dysregulated emotional expression (culturally inappropriate emotional expression), and emotion regulation coping (ability to appropriately cope with and control emotional experiences). The largest effect was found for dysregulated emotional expression (Becker et al., 2015), which fits with the idea that children with SCT have a difficult time navigating the rapid influx of complex information encountered in everyday situations (Flannery et al., 2016; Willcutt et al., 2014).

Suicidal ideation

Suicidal ideation and behaviors increase in adolescence (Shain & Committee on Adolescence, 2016), with rates among adolescents increasing (Twenge, Joiner, Rogers, & Martin, 2018). A recent meta-analysis showed that ADHD is associated with an increase in suicidal ideation and behaviors (Septier, Stordeur, Zhang, Delorme, & Cortese, 2019). Also, two studies used non-ADHD-specific samples to examine SCT symptoms in relation to suicidal behaviors (Becker, Holdaway, & Luebbe, 2018; Becker, Withrow, et al., 2016), drawing largely from the hypothesis that SCT symptoms are associated with key aspects of the interpersonal model of suicide that are known to increase suicide risk (e.g., social

withdrawal, loneliness, lowered self-esteem). There may also be key aspects of SCT that increase risk for suicidal thoughts in vulnerable individuals (e.g., daydreaming about death). The first study found parent-reported SCT symptoms to be significantly associated with both parent- and child-reported suicide risk in a large sample of psychiatrically hospitalized children (Becker, Withrow, et al., 2016). Another study found self-reported SCT symptoms to be associated with increased suicide risk, above and beyond other psychopathology dimensions, in a large sample of college students (Becker, Holdaway, & Luebbe, 2018). Given recent interest in suicidal behaviors in individuals with ADHD (James, Lai, & Dahl, 2004; Septier et al., 2019), as well as the increase in suicidal ideation in adolescents specifically (Twenge et al., 2018), it is particularly important to examine whether SCT symptoms are related to suicidal ideation in adolescents with and without ADHD.

Assessing SCT Using Youth Self-Report

If, as posited, SCT falls within the internalizing spectrum of psychopathology (Becker & Willcutt, 2019), it is especially important to assess adolescent's own ratings of SCT symptoms given the importance of self-report for assessing internalizing psychopathology. To date, we are aware of nine studies that have examined youth self-reported SCT. These studies were drawn from a small school-based sample (Becker, 2014; Becker et al., 2015; Becker, Webb, & Dvorsky, 2019; Holdaway & Becker, 2018), a large community sample of Spanish children (Sáez et al., 2019), or a large sample of adolescents diagnosed with ADHD (Smith et al., 2018; Smith, Breaux, Green, & Langberg, 2019; Smith, Eadeh, et al., 2019; Smith & Langberg, 2017). These studies have shown that child self-reported SCT symptoms are distinct from adult-reported ADHD-IN (Becker et al., 2015) and self-reported internalizing symptoms (Becker et al., 2015; Smith, Eadeh, et al., 2019). These studies have also found self-reported SCT symptoms to be uniquely associated with higher internalizing symptoms, academic impairment, and social difficulties (Becker, 2014; Becker et al., 2015; Holdaway & Becker, 2018; Sáez et al., 2019; Smith, Breaux, et al., 2019; Smith & Langberg, 2017).

However, there are several limitations to the extant literature base. First, all existing studies examining youth self-reported SCT symptoms were derived from three samples, including school-based samples of school-aged children *or* adolescents diagnosed with ADHD. No study has examined self-reported SCT in adolescents with and without ADHD. This is important since it has been suggested that SCT may function differently in ADHD vs. non-ADHD samples (Barkley, 2013, 2014), and the current study is the first to test whether SCT is differentially related to functioning in adolescents with and without ADHD. Second, one study has demonstrated youth self-reported SCT symptoms to be distinct from adult-reported ADHD-IN symptoms (Becker et al., 2015), but no study has examined whether youth self-reported SCT is distinct from youth self-reported ADHD-IN. This is especially important to ensure that the distinction between child self-reported SCT and adult-reported ADHD-IN in the previous study was not attributable to different informants providing ratings. The current study is the first to test whether SCT and ADHD-IN symptoms are distinct when both constructs are rated by adolescents themselves. A third limitation of previous research is a limited examination of internalizing and emotional functioning domains. The current study includes an assessment of anxiety and depressive symptoms,

emotion dysregulation domains, brooding and reflection rumination, and suicidal ideation to advance what is known regarding the external validity of adolescent self-reported SCT.

The Present Study

Compared to school-aged children, far fewer studies have examined SCT in adolescence, a developmental period that is associated with substantial changes in socioemotional and academic functioning. Even fewer studies have examined self-reported SCT in adolescence, and extant studies have all relied on ADHD samples. Accordingly, objectives of the current study were to (1) determine the convergent and discriminant validity of self-reported SCT and ADHD-IN symptom in both adolescents with and without ADHD, (2) test the invariance of SCT and ADHD-IN symptoms across sex and across ADHD and comparison groups, (3) examine SCT as uniquely related to a range of internalizing-relevant domains, and (4) explore whether the association between SCT with internalizing correlates differs for adolescents with or without ADHD. The following hypotheses were made for the four study objectives:

1. Based on previous research with parent and teacher ratings (see Becker, Leopold et al., 2016, for a meta-analytic review), as well as adult self-report ratings (Barkley, 2012; Becker, Burns, Garner, et al., 2018; Becker, Langberg, Luebbe, Dvorsky, & Flannery, 2014; Leopold, Bryan, Pennington, & Willcutt, 2015), we hypothesized that adolescent self-reported SCT would demonstrate convergent validity and discriminant validity from adolescent self-reported ADHD-IN.

2. Previous studies have demonstrated the invariance of SCT across sex (Becker, Burns, Schmitt, Epstein, & Tamm, 2019; Bernad et al., 2014; Lee, Burns, Beauchaine, & Becker, 2016; Smith, Eadeh, et al., 2019). We hypothesized that adolescent self-reported SCT and ADHD-IN would be invariant across sex as well as across adolescents with and without ADHD.

3. Given theoretical (Becker & Willcutt, 2019) and empirical (Becker, Leopold, et al., 2016) support linking SCT to internalizing psychopathology, we hypothesized that SCT symptoms would be uniquely associated with greater internalizing symptoms, rumination, and suicidal ideation, and that SCT symptoms would be more strongly associated than ADHD-IN symptoms with these internalizing domains. More mixed findings have been reported for emotion regulation, with potentially differing findings when assessing emotion regulation using either self-report (Becker et al., 2015) or parent-report (Araujo Jiménez et al., 2015; Barkley, 2013; Burns & Becker, 2019). We therefore hypothesized that adolescent self-reported SCT symptoms would be uniquely associated with self-reported emotion dysregulation but not parent-reported emotion dysregulation.

4. The pattern of findings linking SCT to internalizing psychopathology appears to be consistent across ADHD-defined and community-based samples (Becker, Leopold, et al., 2016). In the present study we empirically tested whether SCT is differentially related to internalizing adjustment in adolescents with or without ADHD, though we did not expect to find evidence of differential associations.

Methods

Participants

Participants were 302 adolescents (ages 12–14 years) in eighth grade who were recruited from local schools across two sites in the Southeastern and Midwestern United States. Approximately half (n = 162) of the sample was diagnosed with DSM-5 ADHD (120 with predominantly inattentive presentation and 42 with combined presentation), with remaining participants (n = 140) comprising a comparison sample without ADHD. Further description of the sample and comparisons between the ADHD and comparison groups can be found in Table 1.

Procedures

Adolescents in eighth grade and their parents were recruited across two consecutive years for a prospective longitudinal study examining sleep in adolescents with and without ADHD (see Becker, Langberg, Eadeh, Isaacson, & Bourchtein, 2019 and Langberg et al., 2019 for additional details). Given primary study aims to follow adolescents across the transition from middle school to high school, only eighth grade student were recruited; longitudinal data collection is ongoing thus only baseline data is used in the present study. The study was approved by the Virginia Commonwealth University and Cincinnati Children's Hospital Medical Center Institutional Review Boards. Families meeting screening criteria were invited to receive a comprehensive assessment. At the in-person assessment, parents and adolescents provided informed consent and assent, respectively. After providing consent/assent, adolescents and their parents were administered study measures.

Inclusion criteria included: (1) enrolled in eighth grade; (2) estimated Full Scale IQ ≥ 80 based on the Wechsler Abbreviated Scale of Intelligence, Second Edition (WASI-II; Wechsler, 2011); and (3) enrolled in regular education classes. Exclusion criteria were: (1) meeting criteria for autism spectrum disorders, bipolar disorder, a dissociative disorder, or a psychotic disorder; (2) previous diagnosis of an organic sleep disorder (e.g., obstructive sleep apnea, narcolepsy, restless leg syndrome, periodic limb movement disorder) according to parent report during the initial phone screen, and (3) not meeting criteria for either the ADHD or comparison groups as described below. See Becker, Langberg et al. (2019) for additional details and a flow diagram.

ADHD diagnosis

All potential participants underwent a comprehensive ADHD diagnostic evaluation in accordance with the Fifth Edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM-5) criteria. Participants met criteria for ADHD on the basis of the parent version of Children's Interview for Psychiatric Syndromes (P-ChIPS; Weller, Weller, Rooney, & Fristad, 1999). To be eligible for participation in the ADHD group, adolescents were required to meet all DSM-5 criteria for either the ADHD Combined Presentation or Predominantly Inattentive Presentation on the P-ChIPS. Specifically, participants were included in the ADHD group if parents reported ≥6 symptoms of inattention at clinically significant levels; presence of ADHD symptoms prior to age 12 years, presence of ADHD symptoms in two or more settings (e.g., home, school), evidence that symptoms contribute

to home, academic, and/or social impairment; and symptoms of ADHD were not better explained by another mental disorder. Participants meeting criteria for ADHD Predominantly Hyperactive-Impulsive Presentation (n = 2) were not included given the low prevalence of this presentation in adolescence and ongoing concerns about its validity after early elementary school (Willcutt, 2012; Willcutt et al., 2012). Participants were included in the comparison group if the parent endorsed <4 symptoms of ADHD in both domains (i.e., inattention, hyperactivity/impulsivity) on the P-ChIPS. Additionally, both parent and adolescent report on the P-ChIPS and ChIPS were used to determine common mental health diagnoses (i.e., mood and anxiety disorders, disruptive behavior disorders, obsessive compulsive disorder).

Measures

Child Concentration Inventory, Second Edition (CCI-2)

Self-report of SCT was measured using the CCI-2 (Becker, 2015). The CCI-2 consists of 15 items rated on a four-point scale (0 = *never* to 3 = *always*), with higher scores indicating higher frequency of SCT symptoms. In previous studies, the CCI-2 has shown strong internal consistency (αs = .80 – .95) (Becker, Epstein, et al., 2019; Sáez et al., 2019), moderate correlations with parent- and teacher-reported SCT (rs = .29 – .36) (Sáez et al., 2019), and moderate-to-strong correlations with self-reported loneliness and preference for solitude (Sáez et al., 2019). The factor loadings for all 15 items were strong and showed discriminant validity from parent-reported ADHD-inattentive symptoms (Sáez et al., 2019). Internal consistency for the present study was excellent (α = .93).

ADHD Self-Report Scale (ASRS)

The ASRS is a self-report measure of the 18 DSM ADHD symptoms (Kessler et al., 2005). Items reflect symptoms of inattention and hyperactivity-impulsivity, and in this study all items were rated by adolescents on a four-point scale (0 = *never*; 3 = *very often*). Previous studies using this measure with adolescents have shown strong internal consistency (αs = .92 – .96) and strong associations with interview-assessed ADHD symptoms (Adler et al., 2012; Sonnby et al., 2015). Internal consistencies for this study were good, including ADHD inattentive symptoms (α=.86), ADHD hyperactive/impulsive symptoms (α = .84), and total ADHD symptoms (α = .91).

Revised Child Anxiety and Depression Scales (RCADS)

The RCADS (Chorpita, Moffitt, & Gray, 2005) is a 47-item self-report measure that assesses DSM-based anxiety and depression symptoms on a four-point scale (1 = *never*, 4 = *always*). The RCADS has been validated for use with students in third through twelfth grade. Designed for youth self-report, previous studies using the RCADS have demonstrated strong internal consistency (αs = .75 – .90) and convergence with other measures of internalizing symptoms in clinical and school-based samples (Chorpita et al., 2005; Esbjørn, Sømhovd, Turnstedt, & Reinholdt-Dunne, 2012; Mathyssek et al., 2013) and in youth with ADHD specifically (Becker, Schindler, et al., 2018). Internal consistencies for this study were excellent for depression (α=.85), anxiety (α=.96), and total score (α=.96).

Ruminative Response Scale (RRS)

The RRS (Nolen-Hoeksema & Morrow, 1991) is a 22-item self-report measure of rumination on a four-point scale (1 = *almost never*, 4 = *almost always*). The RRS measures the constant revisiting of negative issues and consistent worries about their possible causes or outcomes. In previous studies with adolescents, the RRS has shown strong internal consistency (αs = .71 – .91) (Cox, Funasaki, Smith, & Mezulis, 2012; Roelofs et al., 2009). In the present study, αs=.82 for both brooding and reflection rumination.

Depressive Symptom Index – Suicidality Subscale (DSI-SS)

The DSI-SS (Joiner, Pfaff, & Acres, 2002) is a four-item self-report questionnaire designed to identify the frequency and intensity of suicidal ideation and impulses over the past two weeks. It is rated on a four-point scale (0 = *no thoughts/impulses to kill myself*, 3 = *I always think/have impulses about killing myself*) with higher scores reflecting greater severity of suicidal ideation. The DSI-SS has shown strong internal consistency (αs = .77 – .90) and strong associations with depressive symptoms (r = .60) in previous research with adolescents (Joiner et al., 2002). In the present study, α=.88.

Difficulties in Emotion Regulation Scale (DERS)

Adolescents completed the DERS-18 (Victor & Klonsky, 2016), a short version of the well-validated measure of emotion dysregulation (Gratz & Roemer, 2004). The DERS-18 consists of 18 items rated on a five-point scale (1 =*almost never*; 5 = *almost always*) and consists of six subscales (each subscale has three items) measuring limited access to emotion regulation strategies, non-acceptance of emotional responses, impulse control difficulties, difficulties engaging in goal-directed behavior, lack of emotional awareness, and lack of emotional clarity. In two adolescent samples reported in Victor and Klonsky (2016), the DERS subscales demonstrated adequate internal consistency (αs = .69 – .91). Each subscale had adequate reliability in the present study: strategies (α=.69), non-acceptance (α=.65), impulse (α=.65), goals (α=.60), awareness (α=.75), clarity (α=.79), and total score (α=.88).

Emotion Regulation Checklist (ERC)

The ERC (Shields & Cicchetti, 1997) is a 24-item parent-report measure that is answered on a four-point scale (1 = *never*, 4 = *always*). The ERC asks parents about the frequency of certain behaviors and emotional states. It consists of two subscales, emotional lability/negativity (8 items) and emotion regulation (15 items), and a total score, which have demonstrated acceptable internal consistency (αs = .83 – .96) (Shields & Cicchetti, 1997). In the present study, αs = .78 for emotional lability/negativity, .88 for emotion regulation, and . 90 for the total score.

Analytic Strategy

Estimation and model fit

The analyses used the Mplus statistical software (Version 8.1; Muthén & Muthén, 1998–2018). For the factor analyses, the SCT and ADHD-IN items were treated as categorical indicators with the use of the robust weighted least squares estimator (WLSMV). Global

model fit was evaluated with the comparative fit index (CFI, acceptable fit ≥ .90 and close fit ≥ .95), the root-mean-square error of approximation (RMSEA, acceptable fit ≤ .08 and close fit ≤ .05), and the standardized root-mean-square residual (SRMR, acceptable fit ≤ .08 and close fit ≤ .05; Little, 2013).

Convergent and discriminant validity of adolescent self-reported SCT and ADHD-IN symptoms

An exploratory two-factor model was applied to the adolescent self-reported 15 SCT and 9 ADHD-IN symptoms (also referred to as an exploratory confirmatory factor analysis, see Asparouhov & Muthén, 2009). The SCT symptoms were allowed to cross-load on the ADHD-IN factor and the ADHD-IN symptoms to cross-load on the SCT factor. This analysis allowed us to determine if the 15 SCT symptoms had high loadings on the SCT factor in conjunction with low loading on the ADHD-IN factor. The analysis allowed us to evaluate the ADHD-IN symptoms in a similar manner. The purpose was to identify SCT and ADHD-IN symptoms with convergent and discriminant validity.

Invariance of adolescent self-reported SCT and ADHD-IN symptoms across comparison and ADHD groups and across sex

An exploratory CFA was used to determine the invariance of the SCT and ADHD symptom ratings across the comparison and ADHD groups (i.e., the invariance of like-symptom loadings and like-symptom thresholds across adolescents with and without an ADHD diagnosis). The analysis also determined if were significant differences on the SCT and ADHD-IN factor means across the two groups. In the invariance analyses, the cross-loadings were not restricted to zero (Asparouhov & Muthén, 2009). Similar analyses were conducted to examine invariance of adolescent self-reported SCT and ADHD-IN symptoms across sex.

Associations of SCT and ADHD-IN measures with external correlate measures

The Mplus statistical software (Muthén & Muthén, 1998–2018) was used to determine the correlations and partial regression coefficients of the self-report SCT and ADHD-IN measures with the adolescent self-report (anxiety, depression, reflection, brooding, suicidal ideation, and emotional dysregulation) and parent-report (anxiety, depression, emotional lability, and emotional dysregulation) measures. The purpose was to determine the first order (correlations) and unique (partial regression coefficients) associations of SCT and ADHD-IN measures with the external correlate measures. The Mplus model constraint procedure was also used to test for statistically significant differences in the magnitude of the first order correlations of the SCT and ADHD-IN dimensions in relation to the external correlate measures. These analyses treated the measures as manifest variables and used the Mplus robust maximum likelihood estimator (MLR). The sample size was not large enough to treat the measures as latent variables.

Missing information

Covariance coverage was 100% for the factor analyses (i.e., none of these items had missing information) with covariance coverage being 99% or higher for the regression analyses, thus

little missing information. The regression analyses used the MLR estimator with no cases thus being eliminated from these analyses.

Moderation of SCT with external correlates relationship by ADHD diagnostic status

This analysis first determined if the association of the adolescent-reported SCT measure with the external correlates was moderated by diagnostic status (ADHD vs. comparison). If there was no support for moderation, then the external correlates were regressed on SCT and diagnostic status to determine if SCT still predicted the external correlate measures after controlling for diagnostic status.

Results

Convergent and Discriminant Validity of Adolescent Self-reported SCT and ADHD-IN Symptoms

An exploratory two-factor model was applied to the 15 SCT and 9 ADHD-IN symptoms. This analysis indicated that two of the SCT symptoms did not have strong loading on the SCT factor (loadings of .48 and .37 for *I am slow at doing things* and *I am not very active,* respectively), indicating low convergent validity. The *I am slow at doing things* SCT symptom also had a high cross-loading of .33, indicating weak discriminant validity. These two SCT symptoms were eliminated, with the SCT construct defined by the remaining 13 SCT symptoms. Table 2 lists these 13 SCT symptoms.

An exploratory two-factor model was applied to the 13 SCT and 9 ADHD-IN symptoms. This model yielded an acceptable to close fit, $\chi^2(188) = 431$, $p < .001$, CFI = .972, SRMR = .050, and RMSEA = .065 [.057, .074]. The mean loading of the 13 SCT symptoms on the SCT factor was .78 ($SD = .12$, range = .68 to 1.05) with the mean loading of the SCT symptoms on the ADHD-IN factor being .02 ($SD = .12$, range = −.16 to .15). For the nine ADHD-IN symptoms, the mean loading on the ADHD-IN factor was .61 ($SD = .09$, range = .51 to .77) with the mean loading on the SCT factor being .13 ($SD = .11$, range = −.05 to .25). The correlation of the SCT with ADHD-IN factors was .67 ($SE = .13$, $p < .001$).

Invariance of Adolescent Self-Reported SCT and ADHD-IN Symptoms across Diagnostic Groups

An a priori exploratory two-factor model was applied to the 13 SCT and 9 ADHD-IN symptoms across comparison and ADHD groups. This model yielded an acceptable to close fit, $\chi^2(376) = 598$, $p < .001$, CFI = .970, SRMR = .056, and RMSEA = .062 [.053, .072]. The exploratory two-factor model with constraints on like-symptom loadings and like-symptom thresholds (scalar invariance; see Brown, 2015, ch. 7) did not result in a decrement in model fit indices, $\chi 2\ (457) = 651$, $p < .001$, CFI = .974, SRMR = .054, and RMSEA = .053 [.043, .062]. The Mplus diff test also indicated that the model with the constraints did not result in a statistically significant decrement in fit relative to the model without the constraints, $\chi^2(81) = 103$, $p = .05$. The SCT and ADHD-IN factor correlation was the same for both groups (comparison: $r = .63$, $SE = .08$, $p < .001$; ADHD: $r = .63$, $SE = .08$, $p < .001$). As expected, the ADHD group had significantly higher scores on the SCT and ADHD-

IN factors than the comparison group, SCT: Cohen's latent $d = 0.63$, $SE = .14$, $p < .001$; ADHD-IN: Cohen's latent $d = 1.22$, $SE = .18$, $p < .001$, respectively.

Invariance of Adolescent Self-Reported SCT and ADHD-IN Symptoms across Sex

An a priori exploratory two-factor model was applied to the 13 SCT and 9 ADHD-IN symptoms across girls and boys. This model yielded an acceptable to close fit, $\chi^2(376) = 660$, $p < .001$, CFI = .969, SRMR = .055, and RMSEA = .071 [.062, .080]. The exploratory two-factor model with constraints on like-symptom loadings and like-symptom thresholds did not result in a decrement in model fit indices, $\chi 2\ (458) = 700$, $p < .001$, CFI = .973, SRMR = .060, and RMSEA = .059 [.050, .068]. The Mplus diff test also indicated that the model with the constraints did not result in a statistically significant decrement in fit relative to the model without the constraints, $\chi^2(82) = 104$, $p = .05$. The SCT and ADHD-IN factor correlation was the same for both groups (girls: $r = .71$, $SE = .07$, $p < .001$; boys: $r = .69$, $SE = .07$, $p < .001$). Girls had a significantly higher mean on the SCT factor than boys (latent $d = .30$, $SE = .13$, $p = .02$). Although boys had a higher mean on the ADHD-IN factor than girls, the difference was not significant (latent $d = .29$, $SE = .16$, $p = .08$). The sex differences on the SCT and ADHD-IN factors represents small effects. The sample was not large enough to repeat the invariance analysis across boys and girls separately for the ADHD and comparison groups. However, examination of sex differences in the manifest SCT variable in the two groups indicated that the effect size was larger in the ADHD group ($d = .57$, $p < .0001$) than the comparison group ($d = .32$, $p = .06$). In contrast, the manifest ADHD-IN variable had nonsignificant ps > .25) sex effects in both the ADHD and comparison groups.

Correlation of SCT and ADHD-IN with External Correlates

Table 3 shows the correlations of the self-report SCT and ADHD-IN measures with the external correlate measures (see Table 4 for intercorrelations and descriptive statistics of all study variables). Higher scores on SCT and ADHD-IN were associated with significantly (all ps < .05) higher scores on all the external correlate measures. Using the model constraint procedure, SCT had a significantly stronger positive association than ADHD-IN with the self-report measures of depression ($p < .001$), anxiety ($p < .001$), reflection ($p < .001$), brooding ($p = .04$), and the lack of emotional clarity ($p < .008$). In contrast, self-reported ADHD-IN had a stronger positive association than SCT with parent-reported emotional dysregulation ($p = .02$), but not with emotional lability ($p = .06$). Adolescent self-reported SCT and ADHD-IN did not differ in their positive associations with self-report measures of suicidal ideation, parent-report ratings of depression and anxiety, or the adolescent self-report emotion dysregulation domains of limited access to emotion regulation strategies, nonacceptance of emotional responses, impulse control difficulties, difficulties engaging in goal-directed behavior, or lack of emotional awareness.

Unique Relationship of SCT and ADHD-IN with External Correlates

Table 5 shows partial standardized regression coefficients for the unique associations of SCT and ADHD-IN measures with the external correlate measures. Higher scores on SCT were still significantly (all ps < .01) associated with higher scores on the self-report measures of depression, anxiety, reflection, brooding, suicidal ideation, and five of the six emotion

dysregulation dimensions after controlling for ADHD-IN (SCT was not uniquely associated with lack of emotional awareness after controlling for ADHD-IN). In contrast, ADHD-IN was no was no longer significantly (all *p*s > .10) associated with self-reports of depression, anxiety, reflection, brooding, suicidal ideation, and lack of emotional clarity after controlling for SCT. Higher scores on ADHD-IN, however, were still significantly (*p*s < .05) associated with higher scores on the other five self-reported emotion dysregulation dimensions after controlling for SCT.

When examining the parent-reported external correlates, higher adolescent self-reported ADHD-IN scores were still associated with significantly (*p*s < .01) higher parent rating scores on depression, anxiety, emotional lability, and emotional regulation after controlling for adolescent self-reported SCT. In contrast, higher scores on adolescent-reported SCT were only still associated with significantly ($p < .05$) higher scores of parent-reported depression after controlling for ADHD-IN.[1]

All of these regression analyses were repeated controlling for adolescents' sex, race (White vs. other), family income, and parent-reported ODD/CD symptoms. For these analyses, the predictors (SCT and ADHD-IN) and outcomes (ten external correlate measures) were regressed on the four covariates (Little, 2013). All the significant and non-significant partial regression coefficients remained the same for SCT. Six of the significant partial regression coefficients became non-significant for ADHD-IN (i.e., parent rating of adolescent depression, anxiety, and emotional lability along with adolescent self-report of impulse control difficulties, difficulties engaging in goal-directed behavior, and lack of emotional awareness).

Moderation of SCT with External Correlates Relationship by Diagnostic Status

There was no evidence that the relationship of SCT with the external correlate measures was moderated by diagnostic status. The SCT by diagnostic status interaction was non-significant for the fifteen external correlate measures. The focus of the analysis thus became if SCT would still be associated with the external correlate measures after controlling for ADHD diagnostic status. Table 6 shows the partial standardized regression coefficients for the unique associations of SCT and diagnostic status (0 = comparison, 1 = ADHD) measures with the external correlate measures. Higher scores on SCT were still associated with significantly ($p < .05$) higher scores on 14 of the 15 of the correlate measures even after controlling for diagnostic status (lack of emotional awareness was the one exception). These conclusions remained the same even after also controlling for adolescents' sex, race, ODD/CD symptoms, and family income, with two exceptions (i.e., SCT was no longer related to parents' ratings of adolescent anxiety [$p = .07$] or emotional lability [$p > .10$]).

Discussion

The present study extends the literature examining the internal and external validity of youth self-reported SCT in several ways. The findings indicate that SCT is distinct from ADHD-IN even when both constructs are rated by adolescents themselves. Findings further indicate that adolescent-reported SCT and ADHD-IN symptoms are invariant across adolescents with and without ADHD, as well as across sex. The current study also replicated and extended

previous research demonstrating SCT symptoms to be uniquely associated with internalizing functioning domains, whereas ADHD-IN symptoms were not consistently uniquely associated with internalizing functioning. Finally, this study provides the first evidence that the association between SCT and internalizing adjustment does not differ for individuals with or without ADHD. Each of these key findings is discussed in turn.

Internal Validity and Invariance of SCT in Adolescents with and without ADHD

Although a meta-analysis found clear support for the empirical differentiation between SCT and ADHD-IN (Becker, Leopold, et al., 2016), the vast majority of studies were conducted with parent or teacher ratings of SCT. Recent studies have demonstrated youth self-reported SCT to be distinct from youth self-reported internalizing symptoms (Becker et al., 2015; Smith, Eadeh, et al., 2019) and teacher-reported ADHD-IN (Becker et al., 2015). However, likely because many studies do not include youth self-report of ADHD symptoms, no previous study examined whether SCT and ADHD-IN are distinct when youth self-report is used to assess both constructs. This is important to ensure that findings demonstrating empirical differentiation are due to *construct* differentiation and not *informant* differentiation. As SCT research advances, and studies increasingly use adolescent self-report of ADHD symptoms (Adler & Newcorn, 2011; Adler et al., 2012), our findings provide important support for the convergent and discriminant validity of these constructs for adolescents with and without ADHD.

The invariance of self-reported SCT and ADHD-IN symptoms between adolescents with and without ADHD addresses an important question regarding whether SCT presents differently in youth with and without ADHD. Previous studies have found SCT and ADHD-IN to be invariant across mother and father ratings (Burns, Becker, Servera, Bernad, & García-Banda, 2017), across parent and teacher ratings (Burns et al., 2017), across sex (Becker, Burns, et al., 2019; Bernad et al., 2014; Lee et al., 2016; Smith, Eadeh, et al., 2019), across younger and older adolescents (Smith, Eadeh, et al., 2019), across ADHD presentations (Smith, Eadeh, et al., 2019), and across time (Burns, Becker, Geiser, Leopold, & Willcutt, 2019; Leopold et al., 2016). Our findings add to this body of research by further demonstrating the invariance of SCT (and ADHD-IN) symptoms across adolescents with and without ADHD. This finding indicates that researchers and clinicians can assess these constructs using self-report and have reasonable confidence that the underlying construct is equivalent for adolescents who do and do not have ADHD. This is the first test of SCT symptom invariance between youth with and without ADHD and contrasts with speculation that SCT may have a unique etiology when co-occurring with ADHD (Barkley 2013, 2014).

External Validity of SCT in Adolescents with and without ADHD

Findings from this study provide clear support for an association between SCT symptoms and increased internalizing symptoms, and further extend findings to other relevant domains including rumination, suicide risk, and emotion dysregulation. The association between SCT and internalizing symptoms is well-documented (Becker, Leopold, et al., 2016), including in adolescents with ADHD (Becker & Langberg, 2013; Smith & Langberg, 2017). Our study shows that adolescent self-reported SCT symptoms are uniquely related to adolescent-reported anxiety and depression as well as parent-reported depression, whereas self-reported

ADHD-IN symptoms were uniquely associated with parent-reported anxiety and depression but not self-reported internalizing symptoms.

Similarly, self-reported SCT symptoms were uniquely associated with self-reported but not parent-reported emotion dysregulation. These findings underscore the importance of considering informant when designing studies and interpreting findings. This may be especially important for emotion regulation, as previous studies have also found SCT to associated with youth self-reported emotion regulation difficulties (Becker et al., 2015) but less clearly or strongly associated with parent-reported emotion regulation difficulties (Araujo Jiménez et al., 2015; Barkley, 2013; Burns & Becker, 2019). Of note, the association between self-reported SCT symptoms and lack of emotional clarity had the largest regression coefficient, suggesting that SCT symptoms may be especially associated with difficulty making sense of feelings and identifying how one feels. This association fits with the nature of SCT, which is characterized in part by mental confusion, and our finding indicates that this confusion also extends to the affective domain. Interestingly, ADHD-IN symptoms were not significantly uniquely associated with lack of emotional clarity. However, ADHD-IN symptoms, but not SCT symptoms, were uniquely associated with lack of emotional awareness. These findings indicate that aspects of emotion regulation may be important when distinguishing between SCT and ADHD, with the former associated with a lack of emotional *clarity* and the latter associated with a lack of emotional *awareness.*

Especially novel to the current study are the findings linking SCT to rumination and suicidal ideation. Given the introspective, daydreaming nature of SCT, it has been hypothesized that SCT may be related to rumination (Becker & Willcutt, 2019), yet no previous study has examined this association empirically. We found SCT symptoms to be associated with both brooding and reflective rumination. Rumination has been identified as a possible mechanism linking SCT to internalizing symptoms (Becker, Webb, & Dvorsky, 2019), and future studies using a longitudinal design should test this possibility, as well as whether brooding rumination in particular helps explain the link between SCT and increased internalizing psychopathology. Relatedly, rumination should be examined as a possible cause or contributor to SCT symptoms, ideally in longitudinal studies to understand possible bidirectional associations.

Previous studies of psychiatrically hospitalized children (Becker, Withrow, et al., 2016) and college students (Becker, Holdaway, & Luebbe, 2018) have documented a unique association between SCT symptoms and increased suicide risk, based on theorized associations drawn from the interpersonal model of suicide (Van Orden et al., 2010). We extend these findings to a school-based sample of adolescents with and without ADHD. A recent meta-analysis confirms a significant association between ADHD and suicidal spectrum behaviors (Septier et al., 2019), and inattentive symptoms specifically has recently been identified as a correlate of suicidal ideation in adolescents (Sarkisian, Van Hulle, & Hill Goldsmith, 2019). Findings from the current study join the previous two studies (Becker, Holdaway, & Luebbe, 2018; Becker, Withrow, et al., 2016) in underscoring the importance of considering SCT symptoms among studies examining attention regulation in relation to suicidal ideation.

Given its history, most early studies examining SCT did so in the context of ADHD-defined samples (Carlson & Mann, 2002; McBurnett, Pfiffner, & Frick, 2001), before an intentional shift towards examining SCT in school- and community-based samples (Barkley, 2013; Lee et al., 2014). As studies continue to use a range of samples, there has been a lingering question of whether SCT may operate differently in samples with or without ADHD (or whether the presence of ADHD may 'mask' the ability to find SCT-specific effects). We did not find any evidence for the association between SCT symptoms and internalizing outcomes to be moderated by ADHD status, indicating that SCT does not operate differently in ADHD and non-ADHD samples, at least in terms of the domains examined in this study. Future studies should further examine this possibility in regard to other areas of functioning (e.g., neurocognition and executive functioning, academic and social impairment).

Limitations and Future Directions

Strengths of the study include the large sample of adolescents diagnosed with and without ADHD, as well as the inclusion of multiple informants and multiple measures of internalizing and emotional functioning. Several limitations are also important to note. First, the cross-sectional design of the study precludes making causal claims, and longitudinal studies are sorely needed as noted above. Second, rating scales were used in this study and there is the possibility of mono-method bias. It would be beneficial for future studies to include behavioral tasks and other methods that assess affective functioning and suicidal ideation and behaviors. Third, the suicidal ideation scale had a restricted range, and additional studies will need to replicate our findings with more clinically severe samples. Fourth, although the sample was recruited from schools at two sites in the United States, the recruited sample had a high household income and was predominantly non-Hispanic White; it will be important to evaluate whether findings generalize to samples with more income, education, racial, and ethnic diversity. Finally, 74% of the ADHD subsample in the present study had ADHD Predominantly Inattentive Presentation, which is very close to the 72% found in prevalence studies of ADHD (Willcutt, 2012). Findings may vary in other samples with a lower percentage of children with ADHD Predominantly Inattentive Presentation, particularly if participants with ADHD Predominantly Hyperactive-Impulsive Presentation are included given such participants, by definition, would not have clinically elevated ADHD inattentive symptoms.

Conclusion

The current study makes a substantial contribution to the study of SCT, particularly regarding SCT in adolescence and the internal and external validity of youth self-reported SCT. Findings indicate that adolescent self-reported SCT symptoms can be differentiated from adolescent self-reported ADHD-IN symptoms, with invariance across adolescents with and without ADHD. Findings further highlight the unique association between SCT symptoms and internalizing symptoms, as well as novel findings regarding self-reported rumination, emotion dysregulation, and suicidal ideation. Additional studies are needed to examine the longitudinal interrelations of these constructs across development, with an important goal to identify predictors, mechanisms, and moderators of associations that can guide prevention and intervention work.

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Table 1

Sample Characteristics

	Total Sample (*N*=302)	ADHD Group (*n*=162)	Comparison Group (*n*=140)	Group Differences
	M*±*SD	***M*±*SD***	***M*±*SD***	
Age	13.17±0.40	13.17±0.41	13.18±0.40	t=0.26, p=.80
Primary Household Income ($USD)	93,073±34,856	84,875±35,864	102,500±31,213	t=4.56, p<.001
	N(%)	*N*(%)	*N*(%)	
Female	135 (44.7)	57 (35.2)	78 (55.7)	X^2=12.80, p<.001
Race				X^2=9.17, p=.06
White	247 (81.8)	129 (79.6)	118 (84.3)	
Black	16 (5.3)	12 (7.4)	4 (2.9)	
Asian	14 (4.6)	4 (2.5)	10 (7.1)	
American Indian/Alaskan	1 (0.3)	1 (0.6)	0 (0)	
Bi/Multiracial	24 (7.9)	16 (9.9)	8 (5.7)	
Hispanic/Latinx	14 (4.6)	7 (4.3)	7 (5.0)	X^2=0.08, p=.78
Highest Maternal Education				
HS degree or less	14 (4.3)	10 (6.2)	4 (2.9)	X^2=7.82, p=.05
Partial college/vocational	56 (18.5)	33 (20.4)	23 (16.4)	
College graduate	126 (41.7)	73 (45.1)	53 (37.9)	
Graduate/professional degree	106 (35.1)	46 (28.4)	60 (42.9)	
Medication Use				
ADHD (any)	96 (31.8)	96 (59.3)	0 (0)	X^2=121.63, p<.001
Methylphenidate	48 (15.9)	48 (29.6)	0 (0)	X^2=49.32, p<.001
Amphetamine[a]	47 (15.6)	47 (29.0)	0 (0)	X^2=48.10, p<.001
Non-stimulant[b]	20 (6.6)	20 (12.3)	0 (0)	X^2=18.51, p<.001
Other Psychiatric (any)	29 (9.6)	22 (13.6)	7 (5)	X^2=6.37, p=.01
Antidepressant	24 (7.9)	18 (11.1)	6 (4.3)	X^2=4.78, p=.03
Antianxiety	2 (0.7)	1 (0.6)	1 (0.7)	X^2=0.01, p=1.00[e]
Antipsychotic	3 (1.0)	3 (1.9)	0 (0)	X^2=2.62, p=.25[b]
Other psychiatric diagnoses[c]	107 (35.4)	74 (45.7)	33 (23.6)	X^2=16.04, p<.001
Any externalizing (ODD/CD)	41 (13.6)	35 (21.6)	6 (4.3)	X^2=19.20, p<.001
Any anxiety	73 (24.2)	46 (28.4)	27 (19.3)	X^2=3.40, p=.07
Any depression	24 (7.9)	16 (9.9)	8 (5.7)	X^2=1.78, p=.18

Note. ADHD=attention-deficit/hyperactivity disorder. ODD/CD=oppositional defiant disorder/conduct disorder. Any anxiety=presence of generalized anxiety disorder, social phobia, obsessive-compulsive disorder, and/or posttraumatic stress disorder (PTSD). Any depression=presence of major depression or dysthymia.

[a]Includes amphetamine and mixed amphetamine salts.

[b]Includes guanfacine, atomoxetine, and clonidine.

[c]Presence of comorbid mental health diagnosis based on parent or adolescent report (only parents were administered ODD and PTSD modules) during the diagnostic interview.

Table 2

SCT Symptoms with Convergent Validity on the SCT Factor and Discriminant Validity with the ADHD-Inattention Factor

1. My mind feels like it is in a fog
2. I stare off into space
3. I feel sleepy or drowsy during the day
4. I daydream
5. I lose my train of thought
6. I get lost in my own thoughts
7. I get tired easily
8. I forget what I am going to say
9. I feel confused
10. I zone or space out
11. My mind gets mixed up
12. My thinking seems slow or slowed down
13. I have a hard time putting my thoughts into words

Note. The sluggish cognitive tempo item “I am slow at doing things” had a low (< .50) loading on the SCT factor and a high (> .30) loading on the ADHD-IN factor. The sluggish cognitive tempo item “I am not very active” had a low (< .38) loading on the SCT factor. Given the lack of validity for these two items, these two items were not used to define the SCT construct. ADHD-IN = attention-deficit/hyperactivity disorder-inattention; SCT = sluggish cognitive tempo.

Table 3

Correlations of SCT and ADHD-IN Measures with External Correlate Measures

External Correlate Measures	SCT		ADHD-IN	
	r	*SE*	*r*	*SE*
	Adolescent Self-Report			
Internalizing Symptoms				
Depression	.76**a	.03	.57**b	.05
Anxiety	.70**a	.03	.49**b	.05
Rumination				
Reflection	.39**a	.06	.20*b	.06
Brooding	.50**a	.05	.40**b	.05
Suicidal Ideation	.35**a	.06	.30**a	.05
Emotion Dysregulation				
Limited Access to Emotion Regulation Strategies	.50**a	.04	.47**a	.04
Non-Acceptance of Emotional Responses	.45**a	.05	.42**a	.05
Impulse Control Difficulties	.43**a	.05	.38**a	.05
Difficulties Engaging in Goal-Directed Behavior	.46**a	.05	.42**a	.05
Lack of Emotional Awareness	.13*a	.06	.21**a	.06
Lack of Emotional Clarity	.47**a	.06	.33**b	.06
	Parent Rating of Adolescent Behavior			
Internalizing Symptoms				
Depression	.34**a	.06	.37**a	.05
Anxiety	.23**a	.05	.24**a	.05
Emotion Dysregulation				
Emotional Lability	.21**a	.05	.30**a	.05
Emotional Dysregulation	.28**a	.06	.40**b	.05

Note. For all measures, higher scores indicate poorer functioning. Row correlations with different superscripts differ significantly at $p < .05$. ADHD-IN = attention-deficit/hyperactivity disorder-inattention; SCT = sluggish cognitive tempo.

* $p < .05$

** $p < .01$.

Table 4

Means, Standard Deviations, and Bivariate Correlations of Study Variables

Variable	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1. Group	−.21**	.26**	.47**	.13*	.20**	.11	.07	−.01	.12*	.25**	.19**	.15*	.17**	.13*	.31**	.11	.29**	.39**	.23**	.52**	.38**	.52**
2. Sex	--	.15**	−.06	.21**	.14*	.22**	.04	.15**	.08	−.10	−.11	−.07	−.08	−.06	−.07	−.03	.12*	.002	.15**	−.13*	−.12*	−.11
3. SR SCT		--	.68**	.74**	.76**	.70**	.49**	.38**	.35**	.55**	.50**	.45**	.43**	.46**	.14*	.48**	.28**	.34**	.23**	.28**	.21**	.28**
4. SR ADHD-IN			--	.52**	.57**	.49**	.39**	.19**	.30**	.51**	.48**	.42**	.38**	.42**	.21**	.33**	.29**	.37**	.24**	.40**	.30**	.40**
5. SR Total INT				--	.85**	.99**	.60**	.51**	.40**	.61**	.48**	.51**	.52**	.56**	.09	.58**	.45**	.39**	.43**	.24**	.15**	.26**
6. SR Depression					--	.77**	.54**	.43**	.46**	.59**	.47**	.46**	.46**	.51**	.18**	.55**	.48**	.52**	.42**	.31**	.25**	.29**
7. SR Anxiety						--	.58**	.51**	.36**	.58**	.46**	.49**	.52**	.55**	.06	.56**	.42**	.33**	.41**	.21**	.12*	.23**
8. SR Brooding							--	.66**	.27**	.71**	.64**	.67**	.69**	.69**	.03	.51**	.18**	.25**	.14*	.24**	.16**	.24**
9. SR Reflection								--	.21**	.52**	.47**	.53**	.53**	.52**	−.12*	.48**	.15**	.18**	.13*	.09	.05	.10
10. SR Suicide									--	.20**	.14*	.13*	.09	.20**	.11	.23**	.33**	.36**	.29**	.17**	.16**	.15**
11. SR DERS Total										--	.85**	.87**	.88**	.86**	.30**	.69**	.25**	.31**	.20**	.32**	.24**	.32**
12. SR DERS Strat.											--	.82**	.81**	.76**	−.01	.45**	.17**	.25**	.13*	.27**	.18**	.28**
13. SR DERS Nonacc.												--	.79**	.77**	.03	.50**	.14*	.18**	.11*	.20**	.12*	.22**
14. SR DERS Impul.													--	.81**	.02	.54**	.18**	.23**	.15*	.27**	.18**	.28**
15. SR DERS Goal.														--	.004	.56**	.21**	.26**	.17**	.26**	.20**	.26**

Variable	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
16. SR DERS Aware.															--	.08	.13*	.17**	.11	.21**	.19**	.19**
17. SR DERS Clar.																--	.26**	.28**	.23**	.21**	.18**	.20**
18. PR Total INT																	--	.82**	.98**	.56**	.44**	.55**
19. PR Depression																		--	.68**	.61**	.54**	.57**
20. PR Anxiety																			--	.49**	.37**	.50**
21. PR ERC Total																				--	.84**	.95**
22. PR ERC EL																					--	.63**
23. PR ERC ED																						--
Mean	--	0.88	1.04	0.53	0.53	0.53	8.17	7.80	0.27	2.00	1.93	2.01	1.67	1.90	2.77	1.73	0.36	0.41	0.34	1.71	1.80	1.66
SD	--	0.58	0.56	0.44	0.45	0.46	2.96	3.03	0.92	0.62	0.87	0.87	0.78	0.81	1.01	0.78	0.29	0.39	0.29	0.41	0.48	0.44

Note. For group, 0 = comparison, 1 = ADHD. For sex, 0 = male, 1 = female. ADHD-IN = attention-deficit/hyperactivity disorder inattention. Aware. = lack of emotional awareness. Clar. = lack of emotional clarity. DERS = Difficulties in Emotion Regulation Scale. ED = emotion dysregulation. EL = emotional lability. ERC = Emotion Regulation Checklist. Goal. = difficulties engaging in goal-directed behavior. Impul. = impulse control difficulties. INT = internalizing. Nonacc. = non-acceptance of emotional responses. PR = parent-report. SCT = sluggish cognitive tempo. SR = adolescent self-report. Strat. = limited access to emotion regulation strategies.

* $p < .05$.

** $p < .01$.

Table 5

Partial Standardized Regression Coefficients for the Associations of SCT and ADHD-IN Measures with External Correlate Measures

External Correlate Measures	SCT		ADHD-IN	
	β	*SE*	*β*	*SE*
	Adolescent Self-Report			
Internalizing Symptoms				
Depression	.71**	.05	.09ns	.06
Anxiety	.68**	.06	.02ns	.06
Rumination				
Reflection	.47**	.07	−.12ns	.07
Brooding	.42**	.08	.11ns	.08
Suicidal Ideation	.28**	.10	.11ns	.10
Emotion Regulation Strategies				
Limited Access to Emotion Regulation Strategies	.33**	.08	.25*	.08
Non-Acceptance of Emotional Responses	.30**	.08	.22*	.08
Impulse Control Difficulties	.31**	.08	.17*	.08
Difficulties Engaging in Goal-Directed Behavior	.32**	.07	.20*	.07
Lack of Emotional Awareness	−.02ns	.08	.22*	.08
Lack of Emotional Clarity	.46**	.09	.02ns	.08
	Parent Rating of Adolescent Behavior			
Internalizing Symptoms				
Depression	.17*	.08	.25**	.07
Anxiety	.12+	.07	.16*	.07
Emotion Dysregulation				
Emotional Lability	.01ns	.08	.29**	.08
Emotional Dysregulation	.03ns	.08	.38**	.08

Note. For all measures, higher scores indicate poorer functioning. ADHD-IN = attention-deficit/hyperactivity disorder-inattention; SCT = sluggish cognitive tempo.

+ $p < .10$

* $p < .05$

** $p < .01$.

Table 6

Partial Standardized Regression Coefficients for the Associations of SCT and Diagnostic Status (Comparison vs. ADHD) with External Correlates

	SCT		ADHD Diagnosis	
External Correlates	***β***	***SE***	***β***	***SE***
	Adolescent Self-Report			
Internalizing Symptoms				
Depression	.76**	.03	−.00ns	.04
Anxiety	.71**	.03	−.08ns	.04
Rumination				
Reflection	.41**	.05	−.12*	.05
Brooding	.51**	.05	−.06ns	.05
Suicidal Ideation	.34**	.06	.03ns	.05
Emotional Dysregulation				
Limited Access to Emotion Regulation Strategies	.49**	.05	.07ns	.05
Non-Acceptance of Emotional Responses	.44**	.05	.03ns	.05
Impulse Control Difficulties	.41**	.06	.07ns	.05
Difficulties Engaging in Goal-Directed Behavior	.46**	.05	.01ns	.05
Lack of Emotional Awareness	.06ns	.06	.30**	.06
Lack of Emotional Clarity	.48**	.06	−.02ns	.05
	Parent Rating of Adolescent Behavior			
Internalizing Symptoms				
Depression	.27**	.06	.33**	.05
Anxiety	.18**	.06	.18**	.05
Emotion Dysregulation				
Emotional Lability	.12*	.05	.35**	.05
Emotional Dysregulation	.16**	.06	.49**	.05

Note. For ADHD Diagnosis, comparison group = 0; ADHD group = 1; ADHD-IN = attention-deficit/hyperactivity disorder-inattention; SCT = sluggish cognitive tempo.

* $p < .05$

** $p < .01$.