Article

Differential Diagnosis of Sluggish Cognitive Tempo Symptoms in College Students

Journal of Attention Disorders
1–9

DOI: 10.1177/1087054719896856
journals.sagepub.com/home/jad
SAGE

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Abstract

Objective: Sluggish cognitive tempo (SCT) refers to a set of symptoms that prior research has found to be related to several different psychological disorders, especially the predominantly inattentive presentation of ADHD. This study collected evidence relevant to the question of whether SCT is a distinct disorder. **Method:** College students ($N = 910$) completed measures of SCT, ADHD, depression, anxiety, sleep quality, and substance misuse. **Results:** Students reporting clinically high SCT (reporting at least five symptoms often or very often) had significantly higher levels and rates of other types of psychopathology. Moreover, when students reporting clinically significant levels of ADHD, depression, and anxiety symptoms, poor sleep quality, or hazardous levels of alcohol or cannabis use were removed, very few students reporting high SCT remained (only 4.8% of the original high-SCT group). **Conclusion:** SCT may be best thought of as a symptom set common to many types of psychopathology, and it may be caused by sleep problems or substance misuse as well. *(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

sluggish cognitive tempo, diagnostic validity, diagnostic issues

Sluggish cognitive tempo (SCT) refers to a set of symptoms[1] comprising mental slowness and sleepiness, confusion, and related phenomena (e.g., Barkley, 2015). SCT emerged out of research on relationships between the different symptom subtypes seen in populations with ADHD (Lahey et al., 1988) and played a role in the debate over whether the predominantly inattentive type (or "presentation") of ADHD is a distinct disorder. For instance, Milich et al. (2001) argued that, while hyperactive children have attention problems due to impulsive responding and distractions from environmental stimuli, nonhyperactive children with ADHD tend to lack focus due to daydreaming and lethargy—in a sense, the opposite problem of the hyperactive children.

After only occasional mention of SCT through most of the 1990s and 2000s, the past decade has seen a tremendous growth in empirical research on SCT symptoms. Some of that research has gone toward developing assessment tools. Penny et al. (2009) developed the first widely used measure for SCT symptoms in children (a rating scale for parents and teachers), Becker et al. (2015) revised Penny et al.'s measure into the Child Concentration Inventory (CCI), and Becker and his colleagues (2018) later developed the Adult Concentration Inventory (ACI) as well. Finally, Barkley (2011) published an ADHD symptom rating scale for adults that contained nine SCT items as well as the 18 *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994) ADHD items (with general population norms for SCT symptom levels), and he more recently published a separate norm-referenced measure of SCT symptoms in children (Barkley, 2018). All of these measures boast scores with good internal consistency reliability (i.e., total SCT score reliability coefficients of 0.85 or above), suggesting that SCT symptoms "hang together." Recent longitudinal studies with SCT measures have also shown good test–retest reliability over short intervals, with mixed results for stability over longer intervals (e.g., Leopold et al., 2016; Preszler et al., 2019; Vu et al., 2019).

SCT as a Diagnostic Category

Since the recognition of SCT as a set of related symptoms, the question of whether it is a separate type of ADHD—or

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even perhaps its own disorder apart from ADHD—has been in the background. After *DSM-IV* (American Psychiatric Association, 1994) had formalized the three-subtype scheme of predominantly inattentive, predominantly hyperactive-impulsive, and combined types of ADHD, McBurnett et al. (2001) presented factor analyses suggesting that SCT symptoms were distinct from the *DSM-IV* inattention items. McBurnett et al. concluded that their findings "challenge the elegant two-factor organization of *DSM-IV* ADHD subtypes," and the investigators encouraged further research on SCT, suggesting that depending on the results of that research, the *DSM-IV* conception of subtypes "may eventually have to be revisited" (p. 212). During the lengthy revision process for *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013), proposals for SCT as a distinct disorder were considered, and it initially appeared that the American Psychiatric Association would include a "restrictive inattentive" subtype of ADHD that was similar to SCT (Frick & Nigg, 2012; Tannock, 2013), but ultimately neither this subtype nor SCT was included (American Psychiatric Association, 2013; see also Mahone & Denckla, 2017).

Despite the lack of official nosologic recognition (as of yet), Barkley (2015) has marshaled the evidence in support of SCT being a distinct disorder—one that he calls concentration deficit disorder (CDD; see Barkley, 2014, for more on the different names). Regardless of the label name, Barkley (2015) points to research examining relationships between SCT and demographic variables, other dimensions of psychopathology, real-world functional impairment, and performance on neuropsychological tests—all research that would help to establish the "external validity" of the symptom cluster. Barkley (2015) proposed that "diagnostic taxonomies, such as the *DSM*" should list both ADHD and SCT ("CDD") "as separate, semi-distinct conditions" (p. 449), and he proposed provisional diagnostic criteria. Becker and colleagues (2016) conducted a similar review of literature on SCT, but those scholars concluded that "it is simply too early to tell" (p. 175) whether SCT should be considered a separate disorder, after finding that none of eight domains of "diagnostic validity" contained "overwhelming evidence" to support SCT (p. 174).

In their consideration of SCT as a full-fledged disorder, both Barkley (2015) and Becker et al. (2016) pointed to a number of studies like that of McBurnett et al. (2001), in which SCT symptoms were entered into a factor analysis along with symptoms of ADHD—and sometimes symptoms of other disorders as well. Becker et al. (2016) identified 13 SCT symptoms that consistently showed higher loadings on a separate (SCT) factor than on an ADHD factor (such as inattention). In addition, SCT scholars have noted that although the correlations between SCT and other disorder dimensions are sometimes very strong (e.g., correlations with depression symptoms at about $r = .50$, and with ADHD inattention at about $r = .60$–$.70$), these correlations are far from perfect, and they have been interpreted as leaving room for SCT to be distinct. However, such factor analytic and correlational evidence is insufficient to add a new disorder to the current taxonomy. Indeed, even the eight domains of diagnostic validity identified by Becker et al. (2016) do not thoroughly address *clinical utility*, which is acknowledged to be a major consideration when revising diagnostic taxonomies (e.g., First, 2010). Admittedly, Becker et al. (2016) do hint at this issue when they propose, as a question for future research, "can individuals with SCT be identified and distinguished from individuals who meet diagnostic criteria for ADHD, depression, anxiety, and sleep disorders?" (p. 175). Similarly, in their seminal treatment of diagnostic validity, Robins and Guze (1970) had described "delimitation from other disorders" as a key piece of evidence, proposing that studies of diagnostic validity should exclude individuals with other disorders as well as "borderline cases and doubtful cases."

The Present Study

The present study was designed to answer, in a preliminary way, Becker et al.'s (2016) question about whether individuals who only have SCT can be identified. Although high rates of comorbidity between psychiatric disorders is well-known, particularly in neurodevelopmental disorders (for review, see Dewey, 2018), proposed new disorders that *only* exist in comorbid cases should be considered cautiously. If some people who have different disorders all share a supplemental symptom cluster, that cluster is best thought of as an accompanying feature (of many disorders) rather than a disorder in and of itself, unless the cluster is also found alone, and is tied (even in those cases where it is alone) to substantial functional impairment. (As Becker et al., 2016, note, this "accompanying feature" would be similar to a specifier in the *DSM*.) As new psychiatric categories do not generally refer to newly discovered behavior or experiences (the mental equivalent of discovering a new structural lesion or an infectious agent), there should be a practical clinical reason for adding to the list of disorders. In the present study, we aimed to identify the prevalence of clinically high SCT levels in individuals who did *not* have clinically significant levels of ADHD symptoms, anxiety symptoms, or depression symptoms, as these are all part of well-established disorders that have often been found to relate to SCT in prior research (e.g., Fredrick et al., 2019; Skirbekk et al., 2011).

In addition to determining if SCT could be identified when already well-validated disorders are absent, we were interested in whether SCT was ever a *primary* condition—that is, not secondary to another condition. We were specifically interested in three potential causes of high SCT symptom levels: poor sleep, alcohol misuse, and cannabis

misuse. A sizable literature has already found SCT to be associated with sleep problems (e.g., Becker et al., 2014), and SCT symptoms overlap conceptually with the symptoms of acute intoxication by both alcohol and cannabis. Medicine often distinguishes between primary (also termed "essential" or "idiopathic") forms of a disorder and those that are secondary to another identifiable condition. If SCT is only ever a secondary condition, this also would seem to argue against it being considered a distinct disorder. Admittedly, in some areas of medicine, secondary forms of a disorder—such as hypertension—are nonetheless listed as disorders. However, if a set of psychiatric symptoms were *only* found as an outcome of poor sleep or substance misuse (or along with other disorders; see above), it would not typically be considered a disorder itself.

In the present study, we measured symptoms of SCT, symptoms of other mental health conditions, and sleep and substance use problems in our participants. We then split our sample at Barkley's (2011) recommended cutoff for clinically high SCT—namely, experiencing at least five SCT symptoms often or very often. We addressed our research aims through three types of analyses. First, we compared our high and lower SCT groups on each of the other variables, to see if individuals with clinically high SCT levels had higher levels of other types of problems. Second, we identified relevant clinical cut-points for the non-SCT measures and used categorical data analyses to determine if individuals with clinically high SCT levels had higher *rates* of clinical levels of other problems. Finally, we examined the frequency of SCT once students with other problems were excluded, to determine if SCT was ever a sole condition in our sample. (Although this could not directly address whether SCT was secondary to another disorder, we would know whether SCT at least had a chance of being a primary condition, if it were present in the absence of other conditions.) We focused the present study on college students, a population in which initial diagnoses of ADHD and internalizing disorders are often made, and where sleep problems and substance misuse are also common (Forquer et al., 2008; Primack et al., 2012).

Method

Participants

We analyzed data from 910 undergraduate students at a large private university in the Northeastern United States. Most (64.9%) were female and were either first-year (43.5%) or second-year (22.1%) students. Most (60.7%) were White, with smaller proportions identifying as Asian (14.5%), Hispanic/Latino (10.4%), African American (7.7%), or Multiracial (4.9%). Consistent with national figures for college students (Kimball et al., 2016), some students reported prior diagnoses of disability conditions, including ADHD (5.5%), anxiety (1.6%), depression (1.5%), or multiple diagnoses (7.0%).

Participants were recruited from individual undergraduate psychology classes as well as a departmentwide online subject pool. (Students were able to access extra credit or partial course credit for participation in research studies.) Students were eligible to participate if they were between the ages of 18 and 24 years of age, fluent in English, and able to read and respond to survey items on a computer. A total of 984 students met these criteria, but 74 students were later excluded due to either failing to complete major parts of the survey or failing to correctly answer any of four screening questions (such as "If you are reading this question, select yes") designed to detect invalid responding.

Measures

Barkley Adult ADHD Rating Scale, Fourth Edition (BAARS-IV). We used the current symptoms portion of the BAARS-IV, which consists of 27 symptoms (18 of ADHD and nine of SCT) that participants reported having experienced either "not at all," "sometimes," "often," or "very often" over the prior 6 months (Barkley, 2011). The scale generates scores with good reliability (Cronbach's α is .90 for the inattention score, .80 for the hyperactive-impulsive score, and .90 for the SCT score). In addition, validation evidence includes overlap with *DSM* symptoms of ADHD (i.e., content validity) as well as significant prediction of executive function problems and life impairment.

We used symptom counts (i.e., the number of symptoms experienced at least often) from the BAARS-IV, as formal ADHD diagnostic criteria are based on these. As mentioned above, we used the cutoff of five SCT symptoms to divide our sample into high and low(er) SCT groups. For the two ADHD symptom areas (inattention and hyperactivity/impulsivity), we used the cutoff of four symptoms, following Barkley's recommendation—which is supported by the BAARS-IV norms that place four symptoms in either area at the 95th percentile for the general population (Barkley, 2011).

Depression, Anxiety, and Stress Scale (DASS). We used the depression and anxiety portions of the DASS, each portion consisting of 14 symptoms rated on a 0 to 3 scale from not applying to the respondent "at all" to applying "very much, or most of the time" over the past week (Lovibond & Lovibond, 1995). Reliability is excellent, with Cronbach's alpha being .93 for the anxiety score and .95 for the depression score in college samples (Zlomke, 2009). In addition, validation evidence for the DASS includes strong relationships ($r > .7$) between the DASS scores and scores from other measures of these traits (Crawford & Henry, 2003).

We used the total anxiety and depression symptom scores for our continuous variable analyses, and for the

Table 1. Comparison of High- and Low-SCT Groups' Other Problems.

	High-SCT group (n = 124)	Low-SCT group (n = 786)		
Variable	*M* (*SD*)	*M* (*SD*)	*t*	*d*
Inattention	3.92 (2.62)	0.77 (1.43)	13.09***	1.49
Hyperactivity/impulsivity	2.47 (2.41)	0.78 (1.34)	7.60***	0.86
Depression	13.71 (11.20)	4.31 (6.30)	9.13***	1.04
Anxiety	10.92 (8.38)	3.88 (4.78)	9.13***	1.03
Sleep quality	1.41 (0.77)	1.08 (0.64)	4.63***	0.48
AUDIT	8.62 (6.39)	7.12 (5.22)	2.49*	0.26
CUDIT	7.02 (6.16)	6.10 (5.38)	1.10	0.16

Note. Analyses are based on full *n*s except for the CUDIT, which was only completed by 387 participants (63 from the high-SCT group). Some participants did not answer any items on the CUDIT; others reported having never used cannabis, which would make other items irrelevant. SCT = sluggish cognitive tempo; AUDIT = Alcohol Use Disorders Identification Test; CUDIT = Cannabis Use Disorders Identification Test.
*$p < .05$. **$p < .01$. ***$p < .001$.

categorical analyses, we set a cut-point at 1.5 standard deviations above the mean. This is a common cut-point for clinically significant symptoms on rating scales (e.g., Barkley et al., 2008) and corresponds to approximately the 93rd percentile. Although the DASS scores do not map precisely onto *DSM* definitions of particular anxiety or mood disorders, we used these cutoffs as rational and common thresholds for experiencing very substantial anxiety and depression symptoms.

Pittsburgh Sleep Quality Index (PSQI). The PSQI is a common self-report questionnaire for measuring different aspects of sleep functioning (Buysse et al., 1989). We used the overall sleep quality item from the scale, "During the past month, how would you rate your sleep quality overall," which has four response options: "very good," "fairly good," "fairly bad," and "very bad." These options are scored as 0 through 3, respectively (higher scores on the PSQI indicate more sleep *problems*). The PSQI has excellent reliability (Cronbach's $\alpha = .93$) and has shown good convergent and divergent validity for young adults (de la Vega et al., 2015). In our categorical analyses, we treated either "bad" sleep response as indicative of overall poor sleep that could contribute to SCT symptoms.

Substance misuse measures. The second edition of the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) and the revised version of the Cannabis Use Disorders Identification Test (CUDIT; Adamson et al., 2010) were used to identify problematic levels of substance misuse symptoms. Both scales are self-report questionnaires about frequency of substance use and problems experienced from use. The scales have good reliability (Cronbach's α is .80 for the AUDIT and .92 for the CUDIT) and considerable validity evidence (see, for example, Allen et al., 1997, for review). For our categorical analyses, we used the scales' recommended cutoff score (8 on each scale) for "hazardous" levels of substance misuse symptoms, which could contribute to SCT symptoms.

Procedure

Participants completed all measures through Qualtrics, an online survey program. After reviewing an electronic letter of informed consent, participants were asked to find a quiet location in which to complete the survey individually on their computer and to answer all questions as accurately and honestly as possible. Typically, students took 20 to 25 min to complete the entire questionnaire battery.

Results

Of our 910 participants, 124 (13.6%) reported clinically high levels of SCT symptoms, and this was our high-SCT group, whereas the remaining 786 participants formed the low-SCT group. Table 1 displays the group comparisons on continuous measures of ADHD symptoms, depression and anxiety symptoms, sleep quality, and alcohol and cannabis misuse symptoms. In each case, the high-SCT group had higher levels of other problems. Independent groups *t* tests found all comparisons to be significant (most at the .001 level), except for cannabis misuse symptoms. Effect sizes were in the large range for all areas of psychopathology, and in the small-to-moderate range for sleep and substance use behaviors.

To ensure that the group comparisons above were not unduly affected by higher—but still subclinical—levels of other problems, we also calculated the proportion of each group (high and low SCT) who met the categorical thresholds for other measures noted earlier. Table 2 displays these analyses. Over half of the high-SCT students met the threshold for clinically significant inattention, as well as for hazardous levels of alcohol use, and more than 30% of the high-SCT students met the threshold for significant levels

Table 2. Proportions of High- and Low-SCT Groups Meeting Categorical Cutoffs for Other Problems.

	High-SCT group (n = 124)	Low-SCT group (n = 786)		
Variable	% (n)	% (n)	χ^2	ϕ
Inattention	52.42 (65)	6.62 (52)	200.55***	.47
Hyperactivity/impulsivity	30.65 (38)	5.60 (44)	81.95***	.30
Depression	33.87 (42)	5.09 (40)	108.21***	.35
Anxiety	38.71 (48)	8.78 (69)	85.64***	.31
Sleep quality	41.94 (52)	20.87 (164)	26.27***	.17
AUDIT	52.42 (65)	44.78 (352)	2.51	.05
CUDIT	39.68 (25)	30.25 (98)	2.17	.08

Note. Analyses are based on full *n*s except for the CUDIT, which was only completed by 387 participants (63 from the high-SCT group). Some participants did not answer any items on the CUDIT; others reported having never used cannabis, which would make other items irrelevant. SCT = sluggish cognitive tempo; AUDIT = Alcohol Use Disorders Identification Test; CUDIT = Cannabis Use Disorders Identification Test.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 3. Results of Stepped Procedure to Eliminate Potential Explanations of High SCT.

	n
All high-SCT participants	124
Did not meet clinical threshold for ADHD	48
Did not meet clinical threshold for anxiety or depression	28
Reported good sleep and no hazardous substance use	6[a]

Note. SCT = sluggish cognitive tempo.
[a]Of these six participants, one reported diagnoses of anxiety and depression, and another reported taking eight medications, many of them associated with lupus.

of each other problem. The high-SCT group always had higher levels of each problem area, and these differences were generally significant at the .001 level, except for substance misuse. Phi coefficients were used to quantify the size of associations between high levels of SCT and high levels of other problems, and these coefficients generally showed associations of moderate strength, with the exception of inattention (where the association was strong, ϕ = .47) and substance misuse (where the associations were weak, $\phi < .10$).

Finally, to determine if SCT could be found as an isolated disorder, we followed the general analytic approach of Sibley et al. (2017) in their investigation of late-onset ADHD cases. Table 3 displays our results. We started with the 124 students who reported clinically high levels of SCT and then systematically removed cases where other disorders or explanations of SCT were present. The order of removal started with the disorder that has been thought to be closest to SCT (i.e., ADHD), followed by other established areas of psychopathology (anxiety and depression), followed by lifestyle factors. Table 3 displays this analysis. Of the 124 high-SCT students, 76 reported clinically significant levels of inattention and/or hyperactivity/impulsivity, leaving 48 whose SCT symptoms could not be accounted for by ADHD. Of those 48, 20 reported anxiety and/or depression symptoms at or above the clinical threshold, leaving 28 students who did not. Finally, of those 28 students, 22 reported either bad sleep or hazardous levels of alcohol or cannabis; the remaining six students (4.8% of the original 124 with high SCT levels) included one who reported diagnoses of mood and anxiety disorders (despite not scoring above clinical thresholds on the DASS), and one who reported taking eight prescription medications—a particular combination of drugs associated with lupus and other severe autoimmune conditions.

Discussion

The present study aimed to investigate the diagnostic validity of SCT by focusing on the differential diagnosis of SCT symptoms. We found that college students with high levels of SCT symptoms (at or above a proposed threshold for clinical significance) also had higher levels and rates of anxiety, depression, ADHD symptoms, and poor sleep. Prior research studies with college students have found similar results, through a somewhat different analytic strategy, treating SCT symptomatology as a continuous variable and finding substantial correlations between SCT and levels of symptoms of anxiety, depression, and ADHD (e.g., Becker et al., 2014), as well as poorer sleep quality (Becker et al., 2014). Our findings suggest that using an empirically derived, proposed clinical cut-point for SCT symptoms

(Barkley, 2011) does not eliminate the relationships between SCT and other, established disorders.

In addition, we found that the vast majority (95.2%) of students with high levels of SCT symptoms also reported clinically significant levels of anxiety, depression, or ADHD symptoms, poor sleep, or hazardous levels of alcohol or cannabis usage—all factors that could possibly explain the SCT symptoms. At most, only six of 910 students had high levels of SCT symptoms independent of other problems. Past research has not used this analytic strategy or, in particular, explored the relationships between substance use and SCT, but these findings are predicted by the known overlap between SCT symptoms and the effects of poor sleep, substances, and established disorders.

Limitations and Clinical Implications

We consider the limitations and clinical implications of these findings together, as they are closely connected. One limitation of the present study was that although we included measures of internalizing disorder symptoms, ADHD symptoms, sleep problems, and substance misuse in our analyses, these are obviously only a subset of the much larger number of factors that could explain the high levels of SCT symptoms reported by some students. It is likely that if more such potential explanations were included (e.g., concussions, systemic medical conditions, transient stressors) and were considered to be exclusionary criteria (as in Robins & Guze, 1970), this would push the proportion of isolated SCT cases even lower, perhaps to 0. Isolated SCT appears to be rare based on the present analyses (six out of 910 participants, or 0.66%), but even that is likely an overestimate given the possible explanations left out. At the very least, then, clinicians should not expect to see isolated SCT often.

This relates to a second limitation: We could not determine definitively, based on the data in the present study—whether the co-occurring potential explanatory factors actually *caused* the high levels of SCT symptoms that participants reported. Given the format of the study, we could not conduct clinical evaluations on the participants or conduct any interviews aimed at determining this. However, we nonetheless view our findings as casting doubt on the diagnostic validity of SCT in this population. Creating a new diagnostic category requires the identification and study of a group of individuals who are clinically impaired despite not having other already-recognized, relevant conditions (again, see Robins & Guze, 1970). Admittedly, it is possible for an individual client to have multiple comorbid disorders, and so some might argue that our findings simply show that SCT is often comorbid. However, when a proposed disorder is almost always present alongside established conditions that could logically explain the symptoms of the proposed disorder (as is the case with SCT), there are preferable alternatives to creating a new diagnostic category. For instance, SCT could be considered an "associated feature" or "subtype" of some disorders, a clinically relevant personality trait dimension, or a risk factor for various disorders.

A final limitation concerns the nature of our sample. We only studied college students attending a private 4-year university, and it is possible that isolated SCT is more common in other populations. Indeed, if SCT symptoms cause significant functional impairment, it may be expected that individuals with high SCT levels would be less likely to be present in the setting where we conducted our study. However, we would note that in this study and others (e.g., Wood et al., 2017), college students have actually shown higher rates of high SCT than the general population does. Therefore, we actually had access to a greater number of high-SCT cases (out of a sample of 910 participants), leaving open more possibilities for isolated SCT. Our findings suggest that, particularly among college students, having high SCT symptom levels will be fairly common (13.6% in the present sample) but rarely if ever alone.

Future Research Directions and Conclusions

The limitations of the present study lead naturally to directions for future work. Future studies on the differential diagnosis of SCT should add additional potential explanatory factors, include detailed interviews that are designed to tease apart issues of causality, and use participants beyond college populations (noncollege young adults, as well as other age groups). Clinical settings—particularly ADHD specialty clinics—would be well-matched to these types of studies. Although clinical settings would prevent measurement of the population prevalence of high SCT, these settings would allow for use of detailed clinical interviews that cover a variety of potential explanatory factors, and sample from a wide population of referred clients. Treatment studies could also be done in clinical settings, to determine if SCT symptoms go away after other, well-established clinical conditions are treated; this would be an elegant demonstration of causality. Finally, longitudinal studies could address causality indirectly by determining whether putative explanations/causes of SCT actually precede the onset of high SCT symptom levels.

Of course, much more research—beyond differential diagnosis studies—is needed to validate SCT as a diagnostic construct. As many have noted, our understanding of SCT remains limited at the present time. We agree with Becker and Willcutt's (2019) recent suggestion that the optimal conceptualization of SCT should be examined with reference to both categorical and dimensional models of traits, including determining if SCT is best thought of as a "transdiagnostic" construct. The Research Domain Criteria (RDoC; Insel et al., 2010) model has recently

attained prominence, and it contains separate elements for attention and arousal, two areas that are related to SCT. Transdiagnostic models of psychopathology are especially helpful at determining how a given risk factor (such as rumination, stimulation-seeking, or perhaps an SCT trait) can lead to different disorder outcomes (see Nolen-Hoeksema & Watkins, 2011, for discussion). The multiple levels of analysis in the RDoC framework—including many biological levels—could be particularly helpful in illuminating the mechanisms behind SCT.

Ultimately, diagnostic validation of SCT will require not only the sort of evidence outlined in Becker et al.'s (2016) comprehensive review (e.g., reliability of symptoms, relationship with functional impairment) but also clinical utility evidence that is assessed in part by surveys and other techniques showing that practitioners find the new category label to be helpful (First, 2010). Categorical models of psychopathology in particular are best thought of as pragmatic guides rather than as necessarily identifying a set of completely distinct disorder entities. We would suggest that any clinical utility analyses, then, also measure the relative utility (as perceived by practicing clinicians) of a competing approach, where a condition such as SCT is considered to be a specifier, associated feature, or risk factor, to see if yet another disorder category is truly needed.

Although this needed research remains undone, assessing SCT levels is still of clinical interest, and practitioners should particularly ask about SCT symptoms when seeing clients who may have disorders (such as ADHD) typically associated with SCT. This is relevant not only to assessment contexts but intervention contexts too. Understanding a client's experiences, including SCT-related experiences, is key to showing empathy and building a therapeutic relationship more generally. But when a college student's initial complaints involve SCT symptoms, these are almost certainly going to be accompanied by other clinical conditions and lifestyle behaviors that have been studied extensively and have validated interventions associated with them. We recommend that these other problems should be the *primary* focus of diagnosis and treatment, at least until empirical research shows otherwise.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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Note

1. We use the term "symptoms" here as a reference to behaviors and experiences that have been *associated with* disorders. We do not wish to imply that SCT is necessarily a disorder—an issue that remains an open question, as we discuss.

References

Adamson, S. J., Kay-Lambkin, F. J., Baker, A. L., Lewin, T. J., Thornton, L., Kelly, B. J., & Sellman, J. D. (2010). An improved brief measure of cannabis misuse: The Cannabis Use Disorders Identification Test-Revised (CUDIT-R). *Drug and Alcohol Dependence*, *110*(1), 137–143.

Allen, J. P., Litten, R. Z., Fertig, J. B., & Babor, T. (1997). A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism: Clinical and Experimental Research*, *21*(4), 613–619.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.).

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). *The Alcohol Use Disorders Identification Test*. World Health Organization.

Barkley, R. A. (2011). *The Barkley Adult ADHD Rating Scale-IV*. Guilford.

Barkley, R. A. (2014). Sluggish cognitive tempo (concentration deficit disorder?): Current status, future directions, and a plea to change the name. *Journal of Abnormal Child Psychology*, *42*(1), 117–125.

Barkley, R. A. (2015). Concentration deficit disorder (sluggish cognitive tempo). In R. A. Barkley (Ed.), *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (4th ed., pp. 435–452). Guilford.

Barkley, R. A. (2018). *Barkley Sluggish Cognitive Tempo Scale-children and adolescents*. Guilford.

Barkley, R. A., Murphy, K. R., & Fischer, M. (2008). *ADHD in adults: What the science says*. Guilford.

Becker, S. P., Burns, G. L., Garner, A. A., Jarrett, M. A., Luebbe, A. M., Epstein, J. N., & Willcutt, E. G. (2018). Sluggish cognitive tempo in adults: Psychometric validation of the Adult Concentration Inventory. *Psychological Assessment*, *30*(3), 296–310.

Becker, S. P., Langberg, J. M., Luebbe, A. M., Dvorsky, M. R., & Flannery, A. J. (2014). Sluggish cognitive tempo is associated with academic functioning and internalizing symptoms in college students with and without attention-deficit/hyperactivity disorder. *Journal of Clinical Psychology*, *70*(4), 388–403.

Becker, S. P., Leopold, D. R., Burns, G. L., Jarrett, M. A., Langberg, J. M., Marshall, S. A., . . . Willcutt, E. G. (2016). The internal, external, and diagnostic validity of sluggish cognitive tempo: A meta-analysis and critical review. *Journal of the American Academy of Child & Adolescent Psychiatry*, *55*(3), 163–178.

Becker, S. P., Luebbe, A. M., & Joyce, A. M. (2015). The Child Concentration Inventory (CCI): Initial validation of a child self-report measure of sluggish cognitive tempo. *Psychological Assessment*, *27*(3), 1037–1052.

Becker, S. P., Luebbe, A. M., & Langberg, J. M. (2014). Attention-deficit/hyperactivity disorder dimensions and sluggish cognitive tempo symptoms in relation to college students' sleep functioning. *Child Psychiatry & Human Development*, *45*(6), 675–685.

Becker, S. P., & Willcutt, E. G. (2019). Advancing the study of sluggish cognitive tempo via DSM, RDoC, and hierarchical models of psychopathology. *European Child & Adolescent Psychiatry*, *28*(5), 603–613.

Buysse, D. J., Reynolds, C. F., III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiatry Research*, *28*(2), 193–213.

Crawford, J. R., & Henry, J. D. (2003). The Depression Anxiety Stress Scales (DASS): Normative data and latent structure in a large non-clinical sample. *British Journal of Clinical Psychology*, *42*(2), 111–131.

de la Vega, R., Tomé-Pires, C., Solé, E., Racine, M., Castarlenas, E., Jensen, M. P., & Miró, J. (2015). The Pittsburgh Sleep Quality Index: Validity and factor structure in young people. *Psychological Assessment*, *27*(4), e22–e27. https://doi.org/10.1037/pas0000128

Dewey, D. (2018). What is comorbidity and why does it matter in neurodevelopmental disorders? *Current Developmental Disorders Reports*, *5*(4), 235–242.

First, M. B. (2010). Clinical utility in the revision of the Diagnostic and Statistical Manual of Mental Disorders. *Professional Psychology: Research and Practice*, *41*(6), 465–473.

Forquer, L. M., Camden, A. E., Gabriau, K. M., & Johnson, C. M. (2008). Sleep patterns of college students at a public university. *Journal of American College Health*, *56*(5), 563–565.

Fredrick, J. W., Luebbe, A. M., Mancini, K. J., Burns, G. L., Epstein, J. N., Garner, A. A., . . . Becker, S. P. (2019). Family environment moderates the relation of sluggish cognitive tempo to attention-deficit/hyperactivity disorder inattention and depression. *Journal of Clinical Psychology*, *75*(1), 221–237.

Frick, P. J., & Nigg, J. T. (2012). Current issues in the diagnosis of attention deficit hyperactivity disorder, oppositional defiant disorder, and conduct disorder. *Annual Review of Clinical Psychology*, *8*, 77–107.

Insel, T., Cuthbert, B., Garvey, M., Heinssen, R., Pine, D. S., Quinn, K., . . . Wang, P. (2010). Research domain criteria (RDoC): Toward a new classification framework for research on mental disorders. *The American Journal of Psychiatry*, *167*(7), 748–751.

Kimball, E. W., Wells, R. S., Ostiguy, B. J., Manly, C. A., & Lauterbach, A. A. (2016). Students with disabilities in higher education: A review of the literature and an agenda for future research. In M. B. Paulen (Ed.), *Higher education: Handbook of theory and research* (pp. 91–156). Springer.

Lahey, B. B., Pelham, W. E., Schaughency, E. A., Atkins, M. S., Murphy, H. A., Hynd, G., . . . Lorys-Vernon, A. (1988). Dimensions and types of attention deficit disorder. *Journal of the American Academy of Child & Adolescent Psychiatry*, *27*(3), 330–335.

Leopold, D. R., Christopher, M. E., Burns, G. L., Becker, S. P., Olson, R. K., & Willcutt, E. G. (2016). Attention-deficit/hyperactivity disorder and sluggish cognitive tempo throughout childhood: Temporal invariance and stability from preschool through ninth grade. *Journal of Child Psychology and Psychiatry*, *57*(9), 1066–1074.

Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the Depression Anxiety Stress Scales* (2nd ed.). Psychology Foundation.

Mahone, E. M., & Denckla, M. B. (2017). Attention-deficit/hyperactivity disorder: A historical neuropsychological perspective. *Journal of the International Neuropsychological Society*, *23*(9–10), 916–929.

McBurnett, K., Pfiffner, L. J., & Frick, P. J. (2001). Symptom properties as a function of ADHD type: An argument for continued study of sluggish cognitive tempo. *Journal of Abnormal Child Psychology*, *29*(3), 207–213.

Milich, R., Balentine, A. C., & Lynam, D. R. (2001). ADHD combined type and ADHD predominantly inattentive type are distinct and unrelated disorders. *Clinical Psychology: Science and Practice*, *8*(4), 463–488.

Nolen-Hoeksema, S., & Watkins, E. R. (2011). A heuristic for developing transdiagnostic models of psychopathology: Explaining multifinality and divergent trajectories. *Perspectives on Psychological Science*, *6*(6), 589–609.

Penny, A. M., Waschbusch, D. A., Klein, R. M., Corkum, P., & Eskes, G. (2009). Developing a measure of sluggish cognitive tempo for children: Content validity, factor structure, and reliability. *Psychological Assessment*, *21*(3), 380–389.

Preszler, J., Burns, G. L., Litson, K., Geiser, C., Servera, M., & Becker, S. P. (2019). How consistent is sluggish cognitive tempo across occasions, sources, and settings? Evidence from latent state–trait modeling. *Assessment*, *26*(1), 99–110.

Primack, B. A., Kim, K. H., Shensa, A., Sidani, J. E., Barnett, T. E., & Switzer, G. E. (2012). Tobacco, marijuana, and alcohol use in university students: A cluster analysis. *Journal of American College Health*, *60*(5), 374–386.

Robins, E., & Guze, S. B. (1970). Establishment of diagnostic validity in psychiatric illness: Its application to schizophrenia. *American Journal of Psychiatry*, *126*(7), 983–987.

Sibley, M. H., Rohde, L. A., Swanson, J. M., Hechtman, L. T., Molina, B. S., Mitchell, J. T., . . . Stehli, A. (2017). Late-onset ADHD reconsidered with comprehensive repeated assessments between ages 10 and 25. *American Journal of Psychiatry*, *175*(2), 140–149.

Skirbekk, B., Hansen, B. H., Oerbeck, B., & Kristensen, H. (2011). The relationship between sluggish cognitive tempo, subtypes of attention-deficit/hyperactivity disorder, and anxiety disorders. *Journal of Abnormal Child Psychology*, *39*(4), 513–525.

Tannock, R. (2013). Rethinking ADHD and LD in DSM-5: Proposed changes in diagnostic criteria. *Journal of Learning Disabilities*, *46*(1), 5–25.

Vu, A., Thompson, L., Willcutt, E., & Petrill, S. (2019). Sluggish cognitive tempo: Longitudinal stability and validity. *ADHD Attention Deficit and Hyperactivity Disorders*, *11*(4), 463–471. https://doi.org/10.1007/s12402-019-00287-7

Wood, W. L., Lewandowski, L. J., Lovett, B. J., & Antshel, K. M. (2017). Executive dysfunction and functional impairment associated with sluggish cognitive tempo in emerging adulthood. *Journal of Attention Disorders*, *21*(8), 691–700.

Zlomke, K. R. (2009). Psychometric properties of internet administered versions of Penn State Worry Questionnaire (PSWQ) and Depression, Anxiety, and Stress Scale (DASS). *Computers in Human Behavior*, *25*(4), 841–843.

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