Topical Review: Sluggish Cognitive Tempo: Research Findings and Relevance for Pediatric Psychology

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Objective To summarize recent research on sluggish cognitive tempo (SCT) and consider the potential relevance of SCT for the field of pediatric psychology. Methods Literature review. Results Recent empirical evidence shows SCT symptoms consisting of sluggish/sleepy and daydreamy behaviors to be distinct from Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) Attention-Deficit/Hyperactivity Disorder (ADHD) symptoms. SCT is associated with psychosocial functioning in children and adolescents, including internalizing symptoms, social withdrawal, and, possibly, academic impairment. Conclusions The recent findings reviewed suggest that SCT is an important construct for pediatric psychologists to be aware of and may also be directly useful for the research and practice of pediatric psychology.

Key words ADHD; attention deficit disorder; attention-deficit/hyperactivity disorder; executive functioning; pediatrics; SCT; sluggish cognitive tempo.

There has recently been a sharp increase in the number of studies examining sluggish cognitive tempo (SCT) in children and adolescents. SCT refers to a cluster of sluggish, daydreamy, and apathetic behaviors and has historically been studied in tandem with attention-deficit/hyperactivity disorder (ADHD), first emerging in the literature in the mid-1980s (initially termed “slow tempo” or “sluggish tempo”; see Becker, Marshall, & McBurnett, in press, for a historical overview). Although most studies continue to examine SCT in conjunction with ADHD, recent research demonstrates broader relevance of SCT for the fields of clinical child and abnormal psychology. Given the convergence of studies linking SCT to psychosocial adjustment, pediatric psychologists may benefit from knowledge of recent SCT findings and an incorporation of SCT in their own research and clinical endeavors. Therefore, this review (1) provides pediatric psychologists with a brief summary of the accumulating empirical evidence showing SCT to be distinct from ADHD and related to various psychosocial impairments, and (2) considers the potential relevance of SCT for the field of pediatric psychology (beyond pediatric ADHD).

SCT: Behavioral Symptoms and Relation to ADHD

Few studies have examined prevalence rates of SCT, which is not surprising, as validated measures of SCT have only recently become available, and SCT is not currently included as a diagnosis in any nosological system (and thus, there are no established diagnostic criteria for SCT). However, a recent study with a large sample representative of U.S. youth found that ~6% had elevated SCT (defined as scoring ≥94th percentile; Barkley, 2013). SCT is defined by a range of behaviors, with the descriptors most commonly used being daydreams, sluggish, confused, stares, and unmotivated (Lee, Burns, Snell, & McBurnett, 2013). Table 1 provides a more complete list of symptoms frequently used to characterize SCT. Although SCT was initially identified as potentially useful for identifying a subset of children with ADHD Predominantly Inattentive Type (ADHD-I) (McBurnett, Pifflner, & Frick, 2001), more recent research indicates that SCT and ADHD may be best conceptualized as distinct symptom domains.
Studies using exploratory and confirmatory factor analysis with various developmental ages and across clinical and nonclinical samples are generally consistent in demonstrating SCT to be statistically distinct from both DSM-IV ADHD inattention and hyperactivity–impulsivity (Willcutt et al., 2012). Still, SCT and ADHD frequently co-occur, as ~60% of youth with SCT also have ADHD and 40% of youth with ADHD have SCT (Barkley, 2013). In addition, SCT is not isolated to individuals with ADHD-I, but is also present in a number of youth with ADHD Combined Type (Willcutt et al., 2012).

Further, as summarized in Table I, SCT is likely multidimensional, evincing separate sluggish/sleepy and daydreamy components (Barkley, 2013; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). Initiative/motivation items have also been included in descriptions of SCT, but these symptoms appear to be more closely related to ADHD inattention that to a separable SCT construct (Barkley, 2013; Jacobson et al., 2012; Lee, Burns, Snell, & McBurnett, 2013; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). Thus, sluggish/sleepy and daydreamy behaviors of SCT appear to be most meaningful for identifying an attention problem different from ADHD inattention.

Although SCT is theorized to represent an attention problem distinct from the attention impairment captured by DSM-IV ADHD, the precise attentional differences remain to be elucidated. This is a critical area for empirical investigation (e.g., research using Posner’s [Posner & Rothbart, 2007] three-network model of attention). Studies to date have not shown SCT to be related to a distinct neuropsychological profile (Hinshaw, Carte, Sami, Treuting, & Zupan, 2002), although some evidence has been found for an association between SCT and measures of sustained and selective attention (Huang-Pollock, Nigg, & Carr, 2005; Wåhlstedt & Bohlin, 2010). Importantly, studies examining SCT and neuropsychological functioning to date have used brief measures of SCT that lacked established psychometrics and did not tap the multidimensional aspects of SCT described above. Future research should use recently developed SCT measures to examine cognitive/neuropsychological processes, with a need for studies conducted with typically developing children as well as children with high SCT (with and without co-occurring ADHD).

In addition, laboratory-based tests and rating scales of executive functioning (EF) in daily life do not tap the same underlying mental constructs (Toplak, West, & Stanovich, 2013). Two studies with youth have examined SCT in relation to EF ratings. SCT may be associated with EF deficits in self-organization and problem-solving (Barkley, 2013; Becker & Langberg, 2013), although it is important to note that ADHD appears to be much more strongly and pervasively associated with both laboratory-based and daily life EF deficits than SCT (Barkley, 2013; Hinshaw, Carte, Sami, Treuting, & Zupan, 2002). Developmental studies examining the association between SCT and EF are needed, as are studies that simultaneously include both tests and ratings of EF.

### Psychosocial Correlates of SCT

Studies have also sought to examine whether SCT is related to youth adjustment. The most consistent finding is that of a significant association between SCT and internalizing...
symptoms, an association that remains after controlling for ADHD symptoms (Bauermeister, Barkley, Bauermeister, Martínez, & McBurnett, 2012; Becker & Langberg, 2012; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). Importantly, SCT does not simply overlap with anxiety and depression but is statistically distinct from internalizing dimensions just as it is distinct from ADHD (Becker, Luebbe, Fite, Stoppelbein, & Greening, 2013; Lee, Burns, Snell, & McBurnett, 2013). Preliminary evidence is mixed in terms of whether the separate SCT dimensions relate similarly to internalizing symptoms (Penny, Waschbusch, Klein, Corkum, & Eskes, 2009) or whether the sluggish/sleepy and initiative/motivation items are more strongly related to internalizing than the daydreamy items (Jacobson et al., 2012). Also, although SCT is associated with anxiety (Becker, Luebbe, Fite, Stoppelbein, & Greening, 2013; Skirbekk, Hansen, Oerbeck, & Kristensen, 2011), SCT is more strongly associated with depression (Barkley, 2013; Becker, Luebbe, Fite, Stoppelbein, & Greening, 2013; Garner, Mrug, Hodgens, & Patterson, 2012; Jacobson et al., 2012). All of these studies are cross-sectional, however, and there is a clear need for longitudinal developmentally informed research in this area.

As might be expected given its association with internalizing symptoms, SCT is also linked to children’s social problems (Bauermeister, Barkley, Bauermeister, Martínez, & McBurnett, 2012; Becker & Langberg, 2012; Lee, Burns, Snell, & McBurnett, 2013), likely owing to increased peer withdrawal (Carlson & Mann, 2002; Marshall, Evans, Eiraldi, Becker, & Power, 2013). For instance, SCT is associated with a poorer perception of subtle social cues (Mikami, Huang-Pollock, Pfiffner, McBurnett, & Hangai, 2007), less observed behavioral dysregulation (Becker, Luebbe, Fite, Stoppelbein, & Greening, 2013), and lower rates of leadership, relational aggression, and overt aggression (Marshall, Evans, Eiraldi, Becker, & Power, 2013). These findings suggest that children with SCT may be more likely to experience peer neglect as opposed to active peer dislike/rejection.

Evidence is more mixed in terms of whether or not SCT is associated with academic functioning. Several studies have not found the hypothesized association between SCT and academic functioning (Bauermeister, Barkley, Bauermeister, Martínez, & McBurnett, 2012; Becker & Langberg, 2012; Carlson & Mann, 2002), perhaps owing to reliance on brief measures of SCT with unclear psychometric properties. Three recent studies using well-validated measures of SCT have found a significant association between SCT and academic impairment, even after controlling for ADHD symptoms (Jacobson et al., 2012; Langberg, Becker, & Dvorsky, 2013; Lee, Burns, Snell, & McBurnett, 2013). However, it is important to note that ADHD inattention remained the strongest predictor of parent- and teacher-rated academic competence in the study by Lee, Burns, Snell, & McBurnett (2013), and the SCT factor most strongly associated with academic functioning in the articles by Langberg, Becker, & Dvorsky (2013) and Jacobson et al. (2012) was the low initiation/persistence subscale, which, as noted above, may be more closely tied to ADHD inattention than to a distinct SCT construct.

**Relevance of SCT for Pediatric Psychology**

The research reviewed above suggests that SCT is an important construct for pediatric psychologists to be aware of and may also be directly useful for their research and practice. Although the available evidence is limited in size and scope, findings to date clearly support further research with clinical and nonclinical samples. In particular, examining SCT in the context of pediatric psychology may broaden our understanding of SCT as a construct, uncover associations with psychosocial functioning related to injury or illness, and shed light on predictors or moderators of treatment effectiveness.

Perhaps most clearly, SCT should be evaluated as a possible consequence of early environmental risk, pediatric medical conditions, or injury (e.g., traumatic brain injury [TBI]). For example, it is possible that SCT mediates the relation between medical illness and subsequent internalizing problems/social withdrawal. Only a handful of studies have examined SCT in samples that are directly relevant to pediatric psychology, and these studies are summarized in Table II. Three of the four studies summarized examined SCT in tandem with ADHD. Also, three of the studies used the Child Behavior Checklist (CBCL) measure of SCT, which is limited in its scope, and while the fourth study (Graham et al., 2013) used a longer measure of SCT, its validity has not been well-established and some of the items overlap with DSM-IV inattention (e.g., forgetful). Nonetheless, these studies suggest that SCT may be elevated in pediatric samples and relevant to children with prenatal alcohol exposure (Graham et al., 2013), epilepsy (Loutfi, Carvalho, Lamounier, & Nascimento, 2011), and acute lymphoblastic leukemia (Reeves et al., 2007). Likewise, although they did not directly examine SCT, Bonner, Hardy, Willard, & Gururangan (2009) suggested that SCT may be an important construct for understanding the cognitive and behavioral deficits of childhood cancer survivors. Preliminary evidence also suggests that thyroid functioning is related to SCT but not to ADHD symptoms...
### Table II. Summary of Studies Examining SCT With Relevance to Pediatric Psychology

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample type</th>
<th>N</th>
<th>Percent male</th>
<th>Ages</th>
<th>Measure of SCT</th>
<th>Summary of findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Becker et al. (2012)</td>
<td>Psychiatrically hospitalized children.</td>
<td>570</td>
<td>73%</td>
<td>6-12 (M = 9.16, SD = 1.93)</td>
<td>Three parent-reported items from the CBCL (confused or seems to be in a fog; daydreams or gets lost in his or her thoughts; stares blankly).</td>
<td>Thyroid stimulating hormone (TSH) was significantly associated with SCT symptoms after controlling for child demographics, broadband externalizing/internalizing symptoms, and ADHD symptoms. In contrast, TSH was not associated with ADHD symptoms.</td>
</tr>
<tr>
<td>Graham et al. (2013)</td>
<td>Youth with or without histories of heavy prenatal alcohol exposure and/or ADHD.</td>
<td>272</td>
<td>60%</td>
<td>8-16 (M = 12.18, SD = 2.55)</td>
<td>Fifteen parent-reported items.</td>
<td>Youth with prenatal alcohol exposure and ADHD had higher SCT scores than youth with alcohol exposure but without ADHD; youth with alcohol exposure but without ADHD and youth with ADHD but without alcohol exposure had higher SCT scores than typically developing youth (with neither alcohol exposure nor ADHD). The significant Alcohol Exposure × ADHD interaction demonstrated that prenatal alcohol exposure (even in the absence of ADHD) was associated with elevated rates of SCT in comparison with typically developing youth. For all groups, SCT was significantly, positively associated with inattention and broadband internalizing and externalizing behaviors.</td>
</tr>
<tr>
<td>Loutfi, Carvalho, Lamounier, &amp; Nascimento (2011)</td>
<td>Children with idiopathic epilepsy.</td>
<td>30</td>
<td></td>
<td>6-13 (M = 9)</td>
<td>Brazilian version of the CBCL (T-scores were used).</td>
<td>This study focused on epilepsy and ADHD (and ADHD comorbidity). Of the patients diagnosed with ADHD (n = 16), 11 (68.7%) had clinical or borderline SCT scores. Most of the ADHD group also had elevations on other psychopathology domains (e.g., affective problems, conduct problems, posttraumatic stress problems, anxiety problems). Of the patients without ADHD (n = 14), 2 (14.2%) had clinical or borderline SCT scores.</td>
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<tr>
<td>Reeves et al. (2007)</td>
<td>ALL survivors and a sibling control group.</td>
<td>80</td>
<td>54% of ALL group; 33% of sibling group.</td>
<td>6-18 for ALL group (M = 12.4, SD = 3.3); 6-19 for sibling group (M = 12.6, SD = 3.6).</td>
<td>Five parent-reported items from the CBCL (confused or seems to be in a fog; daydreams or gets lost in his or her thoughts; stares blankly; underactive slow moving or lacks energy; overtired).</td>
<td>ALL survivors had significantly higher SCT scores than sibling controls. Associations between SCT and intelligence/academic achievement were examined in the ALL survivor group only: SCT was associated with lower IQ and academic achievement (across basic reading, reading comprehension, numerical operations, and math reasoning scales; SCT was not associated with spelling achievement). The association between group status and basic reading was mediated by SCT symptoms.</td>
</tr>
</tbody>
</table>

Note: ADHD = attention-deficit/hyperactivity disorder; ALL = acute lymphoblastic leukemia; CBCL = Child Behavior Checklist; SCT = sluggish cognitive tempo.

*aThis scale (McBurnett & Pfiffner, 2005) is available from L. Pfiffner at lindap@lppi.ucsf.edu.
Possible links between SCT and daytime sleepiness have also been noted (Cortese, Faraone, Konofal, & Lecendreux, 2009), but studies have yet to directly examine SCT in relation to pediatric sleep functioning.

In addition, while SCT is associated with slowed and sluggish behaviors, studies have not found the hypothesized links between SCT and processing speed or reaction time on neuropsychological tests (Bauermeister, Barkley, Bauermeister, Martínez, & McBurnett, 2012; Skirbekk, Hansen, Oerbeck, & Kristensen, 2011; Wahlstedt & Bohlin, 2010). It is unclear whether these null findings represent a consistent characteristic of SCT or are attributable to methodological/environmental factors (e.g., studies using measures of SCT with limited psychometric evidence). Pediatric psychologists are well-positioned to further examine and clarify this issue. For instance, Eme (2012) cogently noted a similarity between SCT and slow information processing as a sequela of TBI. However, this link has yet to receive empirical attention, and studies documenting SCT to be phenomenologically different from (or similar to) the slow processing speed evidenced by many youth with medical conditions would be highly informative.

Finally, time management, slow processing, and poor self-organization have been implicated in reduced treatment adherence (e.g., Modi & Quittner, 2006). Because SCT may be associated with self-organization/problem-solving impairments (Barkley, 2013; Becker & Langberg, 2013), determining whether SCT symptoms predict or moderate treatment adherence or response (for ADHD as well as other conditions) is another worthwhile line of inquiry.

**Measurement of SCT**

For the pediatric psychologist interested in incorporating SCT in their work, several measurement options are available, which vary in their degree of comprehensiveness and time involvement. The parent-report CBCL and its teacher-report counterpart (the Teacher Report Form) are frequently used and include an SCT scale. Although this scale is brief, it does correlate with longer measures of SCT (Skirbekk, Hansen, Oerbeck, & Kristensen, 2011) and is statistically distinct from the CBCL DSM-IV-based ADHD, oppositional defiant disorder, anxiety, and depression scales (Becker, Luebbe, Fite, Stoppelbein, & Greening, 2013). Still, although many researchers likely have already-existing datasets with the CBCL/TRF that could be used to answer preliminary questions about the role of SCT in pediatric psychology samples, this scale does not adequately capture the multidimensional nature of SCT, and caution is warranted given the limited psychometric evidence available. Likewise, an empirically based classroom observation measure of SCT has been developed (Volpe, McConaughy, & Hintze, 2009), but this measure includes items that overlap with inattention/internalizing and demonstrates low internal consistency. The recent development of SCT-specific rating scales offers a much-needed improvement over previously available measures, and these scales remain brief, demonstrate acceptable reliability and validity, and are multidimensional (Barkley, 2013; Penny, Waschbusch, Klein, Corkum, & Eskes, 2009). Finally, an SCT diagnostic interview has been developed that includes behavioral descriptors of each SCT symptom (McBurnett, 2010), and although the interview awaits validation, a parent- and teacher-report scale version of the interview has promising psychometric properties (Lee, Burns, Snell, & McBurnett, 2013).
the sluggish cognitive tempo, inattention, and hyperactivity symptom dimensions: Neuropsychological and psychosocial correlates. *Journal of Abnormal Child Psychology*, 40, 683–697.


