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"For Some Reason I Find it Hard to Work Quickly": Introduction to the Special Issue on Sluggish Cognitive Tempo

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Abstract

The body of research investigating the sluggish cognitive tempo (SCT) construct continues to accumulate at a rapid pace. This article provides an introduction to the Special Issue on SCT, which includes ten empirical studies that collectively make a major contribution to the SCT knowledge base. Notably, the studies in this Special Issue include participants spanning in age from 4 to 64 years and from four continents, helping to move the field toward a life span, transcultural understanding of SCT. Together, these studies demonstrate that SCT symptoms can be distinguished from attention-deficit/hyperactivity disorder (ADHD) symptoms as early as preschool and that SCT does not fall under the overarching umbrella of ADHD. These studies also show SCT to be associated with a range of external correlates including internalizing symptoms, learning difficulties, functional impairment, and daily life executive functioning (but not performance-based measures of executive functions). Preliminary findings of SCT in relation to thyroid functioning and tobacco exposure are reported. In addition to providing a summary of the key themes across studies included in the Special Issue, this article highlights key ways in which future research can build from these studies. There is a particular need for research utilizing longitudinal, multi-method, and multi-informant designs that can shed light on the etiologies and developmental psychopathology of SCT across the life span.

Keywords

ADHD; attention deficit disorder; attention problems; sluggish cognitive tempo; validity

> "I'm a sluggish character; I'm a bit slow. For some reason I find it hard to work quickly."
>
> – Jarvis Cocker, musician

In an interview with *Pitchfork* music magazine, singer-songwriter Jarvis Cocker goes on to say that his difficulty in working quickly is "the one major regret that I've got, that for a band [*Pulp*] that's existed for so long, and for someone who's been involved with it for so long, our actual record output is pretty dire really, as in, there's not that much of it"

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(Plagenhoef, 2007). Though surely unintentional, Cocker's description of himself as sluggish and slow bears striking similarity to some characteristic symptoms of sluggish cognitive tempo (SCT), and his acknowledged regret pointedly speaks to the potential negative impact of SCT on functioning. Although it would be remiss to use a single interview quote to draw conclusions about an individual, Cocker's self-descriptions nevertheless point to the need for the continued study of SCT symptoms and their influence on people's lives. This *Journal of Attention Disorders* Special Issue on SCT plays a role in addressing this need.

This Special Issue includes 10 empirical studies that collectively make a major contribution to the SCT knowledge base. Table 1 provides an overview of the study characteristics and key findings. In this introductory article, four overarching themes stemming from these studies are considered: from statistical separation to clinical correlates, SCT across the life span, SCT across cultures, and novel preliminary findings.

From Statistical Separation to Clinical Correlates

A key focus on SCT research to date has been whether or not SCT symptoms are actually distinct from ADHD symptoms and, more recently, whether SCT is distinct from depression, anxiety, and daytime sleepiness. My colleagues and I recently conducted a meta-analysis to examine this very question and found strong support for 13 SCT items that were consistently distinct from ADHD inattentive symptoms (Becker et al., 2016). Other studies have also shown SCT to be distinct from internalizing symptoms and daytime sleepiness (Becker et al., 2014; Langberg et al., 2014; Lee et al., 2014; Willcutt et al., 2014). Still, additional studies are needed to advance what is known about the distinction between SCT and ADHD as well as other psychopathology symptoms. Four studies in this Special Issue (Belmar et al., 2017; Fenollar Cortés et al., 2017; Garner et al., 2017; Lee et al., 2017) examine this issue in novel and important ways.

First, Lee et al. (2017, this issue) tested whether SCT can be distinguished from ADHD inattentive symptoms in very young children (ages 4–6 years). The findings from this study join the singular other study (Leopold et al., 2016) in demonstrating SCT symptoms to be distinct from ADHD inattention in preschool-aged children. Second, Belmar et al. (2017, this issue) demonstrate for the first time the separability of SCT from ADHD inattention in a South American sample. Using both mothers' and teachers' ratings, SCT was once again found to be distinct from ADHD inattention. The third study examining the distinction between SCT and ADHD inattention used a sample of Spanish children diagnosed with ADHD (Fenollar Cortés et al., 2017, this issue). What is unique about this study is the conceptualization of SCT as a multidimensional construct, with separate *inconsistent alertness* and *slowness* factors similar to the daydreaming and sluggish factors found in Barkley's (2013) nationally representative sample of United States children. Whether or not SCT is best conceptualized as a unidimensional or multidimensional construct remains uncertain (Becker et al., 2016), and the study by Fenollar Cortés and colleagues is a welcome addition to an incredibly small literature examining SCT dimensions as having potentially different external correlates. Additional studies are needed that not only evaluate the factor structure of SCT itself but also examine whether there are dimension-specific

external correlates; one important caveat to keep in mind is that low initiative/effort items sometimes used to create an SCT dimension have not demonstrated discriminant validity from ADHD inattention in several multidimensional studies (Jacobson et al., 2012; McBurnett et al., 2014; Penny et al., 2009) or in the recent SCT meta-analysis (Becker et al., 2016). Finally, in a sample of ADHD-referred children, Garner et al. (2017, this issue) evaluated SCT in the context of a bifactor model of ADHD for the first time. This study demonstrated that SCT is not only distinct from ADHD symptom dimensions but also best conceptualized as outside the overarching ADHD umbrella entirely. Of note, since Garner et al.'s study was published online, their findings have already been replicated in a community-based sample of children (Lee, Burns, Beauchaine, & Becker, 2016).

The studies in this Special Issue point to novel ways to further examine the distinction of SCT from ADHD and other psychopathologies, with more studies needed that evaluate the structure of SCT across development, the structure of SCT itself, and the distinction of SCT from internalizing and sleep symptoms. For example, while two studies have now found that SCT falls *outside* the umbrella of ADHD and externalizing psychopathology, no study has yet evaluated whether SCT falls *under* the umbrella of internalizing psychopathology. Although it appears clear that SCT is not the same as ADHD, there is still much work to be done to determine exactly what SCT is.

In addition to evaluating the structure of SCT and its relation to other psychopathologies, a primary way to advance our understanding of the nature, course, and clinical relevance of SCT is to examine external correlates. Although many studies preceding this Special Issue examined external correlates of SCT (Becker & Barkley, in press; Becker et al., 2016), for many of those studies it was seemingly a prerequisite to *first* demonstrate statistical separation before *secondarily* examining clinical correlates. Likely because of the convincing data demonstrating SCT as distinct from ADHD across sample types, participant ages, and SCT measures (Becker et al., 2016), the tide seems to be appropriately shifting whereby the examination of clinical correlates of SCT is a primary objective in its own right. The external validity findings of the studies in this Special Issue are summarized in Table 1. These studies largely replicate and extend previous study findings in demonstrating SCT to be related to internalizing symptoms, learning difficulties, functional impairment, and socioeconomic adversity (see Table 1).

Studies in this Special Issue also demonstrate SCT to be related to greater daily life executive functioning (EF) deficits but not performance-based EF deficits (Jarrett et al., 2017; Wood, Lewandowski et al., 2017; Wood, Potts et al., 2017). Consistent with these findings, and in line with the quote that serves as the title for this article, Wood, Potts, and colleagues (2017, this issue) found a statistically significant association between SCT and self-reported difficulty on timed tests but concluded that SCT was unassociated with actual speed on cognitive and academic tasks. However, one aspect of this conclusion warrants further mention: the moderate effect size for reading fluency performance may be clinically meaningful and should therefore not be so quickly dismissed simply because it did not reach a threshold of statistical significance after a Bonferroni correction was applied (particularly since statistical corrections come with their own issues and controversies; Nakagawa, 2004; Perneger, 1998). It is also important to note that the studies in this Special Issue that did not

find a relation between SCT and performance-based EF functioning consisted of college student participants, who as a group are likely less neuropsychologically impaired than the general population. Nevertheless, with a few notable exceptions (Tamm et al., 2016; Wåhlstedt & Bohlin, 2010; Willcutt et al., 2014), the extant literature examining SCT in relation to performance-based EF tests in non-college samples is generally mixed and uncompelling (Becker et al., 2016). More studies are needed that evaluate SCT in relation to executive functioning (particularly in non-ADHD-defined samples), as well as other domains that have thus far received scant, if any, attention (e.g., substance use, temperament/personality). Toward this end, as recently noted by Barkley (2016), it remains important to identify domains of functioning that are both related and unrelated to SCT.

SCT across the Life Span

The studies in this Special Issue include participants spanning in age from 4 years (Lee et al., 2017, this issue) to 64 years (Leikauf & Solanto, 2017, this issue). Considered alongside Barkley's nationally representative studies of children and adults which spanned in age from 6 to 96 years (Barkley, 2012, 2013), there is now evidence that SCT is separable from ADHD across the vast majority of the human life span. Still, most studies examining the structure and external correlates of SCT have focused on school-aged children, with studies examining SCT in preschool-aged children and adolescents particularly lacking. Thankfully, there has been some recent progress in examining the structure and correlates of SCT in preschoolers (Lee et al., 2017, this issue; Tamm et al., 2016) and adolescents (Smith et al., 2016), though these studies merely scratch of the surface in terms of areas to be investigated. In addition, there is a growing body of research examining SCT in college students, including three studies in this Special Issue (Jarrett et al., 2017; Wood, Lewandowski et al., 2017; Wood, Potts et al., 2017). While it remains important to understand SCT in college students, particularly since college students may have higher rates of SCT than the overall adult population (Flannery et al., 2016; Jarrett et al., 2017, this issue; Wood, Potts et al., 2017, this issue), there is a clear need for studies that examine SCT in adult samples not wholly comprised of college students. Toward that goal, the study by Leikauf and Solanto (2017) in this Special Issue is a welcome addition to the literature on SCT in adults. Hopefully additional studies will soon follow, including studies which draw from both clinical and nonclinical samples.

Although the existing SCT studies have included participants across the life span, most studies, including all studies in this Special Issue, have utilized a cross-sectional design. There is a glaring need for longitudinal research that can inform a *developmental* perspective of SCT. For instance, Leopold et al. (2016) recently found that SCT is quite stable over a ten-year period from preschool through ninth grade, though SCT increased slightly over time. This is an important finding and raises the possibility that SCT may parallel an increase in depressive symptoms across the transition from childhood to adolescence. Likewise, the maximum span in the extant studies examining the longitudinal correlates of SCT is two years (Bernad et al., 2016), and it is important to evaluate SCT over longer periods in order to evaluate SCT in the context of developmental trajectories, risk and protective factors that moderate and mediate associations, as well as likely bidirectional linkages.

SCT across Cultures

Over the last few years, a number of studies have been published examining the validity of SCT in various countries, with studies in this Special Issue examining SCT among individuals in Chile, South Korea, Spain, and the United States. This is an important first step in moving towards a transcultural understanding of SCT given cultural differences in how symptoms are (or are not) perceived as well as whether symptoms are (or are not) associated with maladjustment. For example, as noted by Lee, Burns, and Becker (2016) in a separate study of school-aged children in South Korea, SCT symptoms may not be perceived as problematic in the Korean culture since the symptoms are not disruptive in nature. Furthermore, SCT seems to be consistently linked to withdrawal, but withdrawal itself may not be viewed as problematic or associated with more general peer difficulties in the Korean culture (Lee, Burns, & Becker, 2016). In addition, the presentation and perception of psychopathology can vary in nuanced ways within distinct cultural contests, and it is thus important to examine the structure, prevalence, and correlates of SCT both across and within cultures. To go one step further, it would be useful to better understand the phenomenology and invariance of SCT in differing cultural contexts, as well as the possibility that cultural context moderates the association between SCT and adjustment.

Novel Preliminary Findings

Three novel findings from studies in this Special Issue warrant brief mention in hopes that they will spur more research. First, Becker et al. (2017, this issue) found SCT symptoms, but not ADHD symptoms, to be related to thyroid functioning (as measured with thyroid stimulating hormone [TSH]). This association was found in a sample of children who had normative levels of TSH (though the sample was comprised of psychiatrically hospitalized children). As the authors note, the effect size between TSH and SCT was small and the study design cannot speak to causality. Second, Camprodon-Rosanas and colleagues (2017, this issue) found SCT to be related to second-hand smoke exposure at home and, to a somewhat lesser degree, prenatal tobacco exposure. This too was a cross-sectional study and used parent-report of prenatal and current smoke exposure. Together, the preliminary findings from these studies point to the need for more studies that examine SCT in relation to both environmental and biological correlates that can shed light on the etiology – or, more likely, etiologies – of SCT (Becker, 2013; Becker et al., 2016).

Finally, Leikauf and Solanto (2017, this issue) found that the association between SCT and self-organization EF deficits was limited to participants who were taking psychostimulant medication for ADHD. Once again, this was a cross-sectional, observational study, so explanations for this finding are necessarily speculative. The authors speculate that psychostimulant medication use might “unmask” specific EF deficits by reducing core ADHD inattentive symptoms that in turn allows the patient to have increased awareness into their difficulties (Leikauf & Solanto, 2017, this issue). More studies are needed to examine SCT in the context of psychotropic, as well as behavioral, interventions. For instance, very few studies have examined whether SCT predicts/moderates treatment response (in individuals treated for ADHD or other clinical conditions) or whether currently-existing

interventions are effective for reducing SCT symptoms (Becker & Barkley, in press; Becker et al., 2016).

Conclusion

As seen in the ten empirical articles in this *Journal of Attention Disorders* Special Issue on SCT, steady progress continues to be made toward advancing our understanding of SCT though the reality is we still know little regarding the causes, correlates, consequences, and clinical implications of SCT. It is hoped that this Special Issue will inspire others to consider existing datasets that might be leveraged for answering questions related to SCT, to add an SCT measure as part of a broader research study or clinical assessment battery, or to launch new studies focused entirely on SCT. Through all of these efforts, we can move forward in understanding – and helping – those individuals who appear sluggish, slow, or "for some reason find it hard to work quickly".

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Table 1

Overview of Study Characteristics and Key Findings of Special Issue Articles, Ordered by Participant Mean Age

Study	Age Range (M±SD)	N	% Male	Sample Type	Country	SCT Measure	Key Findings
Lee et al., 2017	4–6 (5.13±0.79)	172	48%	Community	South Korea	CADBI	• 8 of 10 SCT symptoms demonstrated convergent and discriminant validity with ADHD-IN. • SCT remained associated with greater emotional reactivity, anxiety/depression, and withdrawal when controlling for ADHD-IN. • SCT no longer associated with externalizing behaviors (i.e., ADHD-HI, ODD, aggression) or sleep problems when controlling for ADHD-IN.
Camprodon-Rosanas et al., 2017	7–10 (8.40±0.81)	183	47%	Community	Spain	CBCL	• SCT symptoms higher in boys than girls and correlated with paternal unemployment, lower maternal education, greater socioeconomic adversity, maternal smoking during pregnancy, and current second-hand smoke exposure at home. • Children with elevated SCT (11%) had higher ADHD symptoms and more peer, emotional, and academic problems than children without elevated SCT. • When controlling for demographics and other symptoms, SCT remained associated with socioeconomic vulnerability, current second-hand smoke exposure, ADHD symptoms, peer problems, and

Study	Age Range (M±SD)	N	% Male	Sample Type	Country	SCT Measure	Key Findings
							dyslexia symptoms.
Garner et al., 2017	6–12 (8.43±1.86)	168	65%	Clinical (92% diagnosed with ADHD)	United States	CBCL/TRF	• SCT symptoms did not fit within a bifactor model of ADHD but instead loaded on a factor independent of ADHD '*g*', with findings consistent across parent and teacher ratings. • The SCT factor was strongly positively associated with the ADHD-IN factor but negatively associated with the ADHD-HI factor.
Becker et al., 2017	6–12 (9.16±1.93)	570	73%	Clinical (psychiatrically hospitalized)	United States	CBCL	• Thyroid stimulating hormone (TSH) concentration was significantly correlated with SCT but not ADHD symptoms. • In regression analysis controlling for demographics, ADHD symptoms, and broadband internalizing and externalizing symptoms, TSH remained significantly associated with SCT.
Fenollar Cortés et al., 2017	6–16 (9.59±2.38)	131	72%	Clinical (100% diagnosed with ADHD)	Spain	CADBI	• Two-factor model of SCT: inconsistent alertness (e.g., daydreams) and slowness (e.g., thinking is slow) factors. • Controlling for ADHD-IN and SCT slowness, SCT inconsistent alertness was significantly associated with greater ADHD-HI symptoms and peer problems. • Controlling for ADHD-IN and SCT inconsistent alertness, SCT slowness was significantly

Study	Age Range (M±SD)	N	% Male	Sample Type	Country	SCT Measure	Key Findings
							associated with lower ADHD-HI symptoms and lower conduct problem symptoms, as well as greater depression and learning problems. • In regression analysis, ADHD-IN, but neither of the SCT factors, remained significantly associated with greater conduct problems, defiance/ aggression, and anxiety.
Belmar et al., 2017	6–14 (9.64±1.77)	652	55%	Community	Chile	CADBI	• For both mother and teacher ratings, SCT had convergent and discriminant validity from ADHD-IN symptoms. • SCT had a uniquely stronger association than ADHD-IN with anxiety and depression, whereas ADHD-IN had a uniquely stronger association than SCT with ADHD-HI and ODD. • SCT was unassociated with academic and social impairment when controlling for ADHD-IN.
Jarrett et al., 2017	17–25 (18.82±1.08)	298	28%	College students	United States	BAARS	• Controlling for demographics, depression, sleep disturbances, and ADHD symptoms, SCT was significantly associated with poorer daily life EF. • In regression analyses, none of the sleep or psychopathology symptoms (i.e., SCT, ADHD, depression) variables were significantly associated with

Study	Age Range (M±SD)	N	% Male	Sample Type	Country	SCT Measure	Key Findings
							neuropsychological task performance. • 14.4% had elevated SCT (based on full screening sample of *N*=499).
Wood, Potts et al., 2017	17–46 (19.03±2.4)	253	49%	College students	United States	BAARS	• SCT significantly associated with self-reported difficulty on timed reading tasks but not speed on cognitive and academic tasks (after a Bonferroni correction was applied). • Between-group analyses indicated that students with elevated SCT (11%) had significantly more self-perceived problems on timed reading tasks than comparison students, with no group differences in actual performance speed (after applying a correction). Effect sizes showed a large group difference for self-perceived timed performance (d = 0.89), moderate group difference for reading fluency (d = 0.46), and small group difference for reading comprehension completion time (d = 0.28) and processing speed (d = 0.26).
Wood, Lewandowski et al., 2017	18–24 (19.91±1.59)	458	35%	College students	United States	BAARS	• Students with elevated SCT (13%), with or without elevated ADHD, had greater anxiety, depression, and overall functional impairment than controls or students with ADHD who did not have elevated SCT. • Controlling for depression, anxiety, and ADHD

Study	Age Range (M±SD)	N	% Male	Sample Type	Country	SCT Measure	Key Findings
							dimensions, SCT remained significantly associated with greater functional impairment, total daily life EF, and all five daily life EF subscales.
Leikauf & Solanto, 2017	18–64 (37.8±11.6)	102 (N=86 for EF regression analyses)	57%	Clinical (100% diagnosed with ADHD)	United States	BAARS	• SCT was associated with ADHD-IN and internalizing symptoms. • Adults with high SCT (53%) did not differ from other adults with ADHD in ADHD subtype, comorbid internalizing disorder diagnoses, sex, race/ethnicity, or marital status, though those with high SCT were younger and had fewer advanced educational degrees than other adults with ADHD. • Controlling for age, ADHD dimensions, and internalizing dimensions, SCT remained significantly associated with greater self-organization/ problem-solving EF deficits and total EF deficits. • Supplemental analyses indicated that SCT was significantly associated with self-organization EF deficits only for adults with ADHD who were taking stimulant medication.

Note. ADHD = attention-deficit/hyperactivity disorder. ADHD-HI = ADHD hyperactive/impulsive symptoms. ADHD-IN = ADHD inattentive symptoms. BAARS = Barkley Adult ADHD Rating Scale. CADBI = Child and Adolescent Disruptive Behavior Inventory. CBCL = Child Behavior Checklist. EF = executive functioning. ODD = oppositional defiant disorder. SCT = sluggish cognitive tempo. TRF = Teacher's Report Form.