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The Relationship Between Sluggish Cognitive Tempo and Impairment in Children With and Without ADHD

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Abstract This study examined impairment in multiple domains of functioning in children with and without ADHD who present with high or low levels of sluggish cognitive tempo (SCT) while taking into account the total symptom ratings of ADHD. Participants were 584 children in kindergarten through eighth grade (55.7 % male, 91.7 % Caucasian), drawn from five archival datasets. Two, 2 (SCT groups: high and low) x 3 (ADHD Status: ADHD-I, ADHD-C, and non-ADHD) MANCOVAs were conducted with the total ADHD symptom ratings and child age as covariates. One MANCOVA was conducted on scores on the teacher Impairment Rating Scale (IRS; Fabiano et al. Journal of Clinical Child and Adolescent Psychology 35:369–385, 2006) and the other on the 6 scores on the parent IRS. The results indicated that the presence of SCT symptoms was associated with greater functional impairment at home according to parent report while it was associated with less functional impairment at school according to teacher report. Thus, the relationship between SCT symptoms and impairment differs depending on the informant and the context in which impairment is evaluated.

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Attention deficit/hyperactivity disorder (ADHD) is a chronic and impairing condition that affects 3-7 % of children and adolescents (American Psychiatric Association [APA] 2000). In the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV; APA 2000), the diagnoses associated with ADHD are currently classified into one of three subtypes: ADHD-Inattentive Type (ADHD-I), ADHD-Hyperactive/Impulsive Type (ADHD-H), and ADHD-Combined Type (ADHD-C). However, in the history of DSM revisions, other symptom clusters have been considered for inclusion in diagnostic formulations.

One cluster that has received considerable attention and controversy is Sluggish Cognitive Tempo (SCT). SCT has been defined as inconsistent alertness and orientation such as sluggishness, daydreaming, drowsiness, lethargy, and hypoactivity (Carlson and Mann 2002; McBurnett et al. 2001). Some have argued that the ADHD-I with low levels or no symptoms of hyperactivity/impulsivity, which may represent SCT, is so unique that it should be considered its own separate disorder (Barkley 2001, 2011a; Hinshaw 2001). However, before adopting such a proposal, additional data are needed to determine the diagnostic utility of SCT within or beyond the symptoms of ADHD. If SCT is a unique disorder, one would expect children who present with this symptom cluster to demonstrate a unique pattern or a different level of impairment than children without this symptom cluster. The purpose of this study was to examine impairment profiles in children with high and low levels of SCT in the context of varying levels of ADHD symptomatology.

Origins of the SCT Controversy

The preliminary diagnostic utility of SCT symptoms was tested in the field trials conducted to establish the diagnostic

categories for the disruptive behavior disorders in the DSM-IV (Frick et al. 1994). The researchers examined the diagnostic utility of 11 inattentive symptoms including two SCT items (i.e., daydreams; sluggish/drowsy), and nine hyperactive/impulsive symptoms, in predicting a diagnostic threshold for each dimension of ADHD (i.e., inattention and hyperactivity/impulsivity). The results showed that the two symptoms of SCT had strong positive predictive power, but poor negative predictive power for the diagnostic threshold of inattention. Consequently, these SCT symptoms were not included in the DSM-IV criteria for ADHD. Currently, SCT is included under ADHD Not Otherwise Specified category in the DSM-IV. Since the Frick et al. study, the diagnostic utility of SCT symptoms has been investigated by other researchers (e.g., McBurnett et al. 2001).

Symptoms Associated with SCT

SCT symptoms are highly related to inattention, yet minimally related to hyperactivity/impulsivity. For example, some studies reveal that children with ADHD-I exhibit higher levels of SCT than children with other ADHD subtypes (Bauermeister et al. 2005; Hartman et al. 2004; McBurnett et al. 2001). Further, some researchers argue that ADHD-I is a heterogeneous group that may include those who exhibit high, but still sub-threshold, levels of hyperactivity/impulsivity, as well as those who exhibit no symptoms of hyperactivity/impulsivity. Barkley (2001) and Hinshaw (2001) proposed that an SCT subgroup may best characterize the latter subgroup of children with ADHD-I (i.e., those with a high level of inattention symptoms and a low level of or no hyperactive/impulsive symptoms).

Studies utilizing factor analyses indicate that SCT is a separate construct from inattention. McBurnett et al. (2001) found evidence for a two-factor model within the inattentive dimension that included seven of the DSM-IV inattention symptoms on one factor and three SCT items (*sluggish*, *daydreams*, *forgetful*) on a separate factor. Symptom utility statistics for the SCT items were particularly strong in the prediction of ADHD-I, as compared to ADHD-C, and were stronger than that found in the original DSM-IV field trials (Frick et al. 1994). Subsequent studies have corroborated this factor structure with a variety of informants and samples (Barkley 2011a; Bauermeister et al. 2011; Garner et al. 2010; Hartman et al. 2004).

Functional Impairment Associated with SCT

Assessing impairment in functioning is particularly important given that functional impairments are often the primary problems identified by parents and teachers (Pelham 2001). In addition, functional behaviors better inform intervention planning than do symptom presentation or the presence of comorbid disorders (Pelham et al. 2005). Barkley (2001) also emphasized that high levels of symptoms are not sufficient to substantiate the validity of SCT as a distinct disorder. There must be some evidence of harm to the individuals, manifested by significant impairment in major life activities, and unique to the presence of SCT. For these reasons, we argue that differentiation between children with high and low SCT symptoms on functional impairments is critically important to determining the utility of SCT within or beyond the symptoms of ADHD.

To date, five studies offer insights into the association between SCT symptoms and functional impairment. Carlson and Mann (2002) compared the social functioning of children with ADHD-I/High SCT (n=34) to that of children with ADHD-I/Low SCT (n=89). In this study, SCT was defined as *daydreaming and slow moving*. The results revealed no significant differences between the two groups in teacher's estimates of the proportion of peers who like/accept the child, dislike/reject the child, or ignore the child. Mikami et al. (2007) investigated the patterns of social skills in children with ADHD during a computer-based chat room experience. Regression analyses indicated that SCT symptoms (*daydreams*, *sluggish*, *apathetic*) were predictive of fewer social statements made, less detection of subtle social cues, worse memory for details about the interaction, and fewer hostile statements in the total sample [which included children with ADHD-I (n=45), ADHD-C (n=33), and comparison children (n=38)]. Although the regression analyses included subtype (coded as ADHD-I or ADHD-C) as a covariate, the analyses did not take into account ADHD symptom severity. Thus, it remains unclear if the effects of SCT were a function of the presence of more severe symptoms or an effect that is unique to the manifestation of SCT symptoms. Furthermore, these studies investigated functional impairment in the social domain only.

There are two studies that investigated how SCT was related to both social and academic functioning (Bauermeister et al. 2011; Becker and Langberg 2012) in children with or screened for ADHD. The results from Bauermeister and colleague's study (n=140; 55.7 % males) indicated that SCT (defined as four symptoms: *confused or seems to be in a fog, daydreams or gets lost in his/her thoughts, stares blankly, and underactive, slow moving or lacks energy*) explained a significant amount of variance in academic achievement and social skills according to teacher's ratings, but not mother's ratings. Similarly, the analyses in Becker and Langberg's study (n=57; 77.2 % male) indicated that SCT (defined as the same four symptoms) was associated with parent-rated social problems, but not parent-rated homework problems above and beyond ADHD severity. Although this study controlled for ADHD severity, there were limitations to the assessment of impairment (i.e., parent ratings only; social functioning with peers only but not with parents or teachers).

Barkley's (2011b) study is the only one in which the incremental effect of SCT on multiple areas of functioning (e.g., social functioning, educational activities, marital relationships, child rearing, organizational skills) with an adult sample was assessed. In this study, functioning was examined among four groups: Control, SCT only (defined by 9 symptoms), ADHD only, and SCT+ADHD. A threshold of four or more symptoms (from either the inattention or hyperactive/impulsive dimension) was used as a criterion for ADHD. The results indicated that SCT+ADHD group exhibited significantly more impairment than other groups. Furthermore, both inattention and SCT symptoms significantly predicted the severity of impairment in many domains of functioning. However, this study did not control for symptoms severity, they used a liberal diagnostic threshold for ADHD status, and only adults were included. Given the vast inconsistency across studies and limitations of those studies, additional research that examines the effect of SCT on impairment across multiple domains of functioning with children with ADHD, while controlling for total symptom severity, is warranted.

Limitations of SCT Studies

There are several limitations within this body of work that may contribute to the controversy over the utility of SCT symptoms. First, in some studies (e.g., Carlson and Mann 2002) researchers failed to obtain symptom ratings from both parents and teachers when creating diagnostic groups, as is recommended in evidence-based assessment guidelines for the assessment of ADHD (Pelham et al. 2005). Second, in many studies (e.g., Hartman et al. 2004), the DSM-IV criterion of impairment in two settings was not applied when establishing ADHD diagnosis. Thus, collectively, studies with these limitations fail to include indices of both symptoms and impairment across settings to create their diagnostic groups. Third, there are inconsistent definitions of SCT used across studies. Fourth, although some studies have examined impairment in some aspects of social and academic functioning in children or impairment across multiple domains of functioning in adults, no study has comprehensively examined the relationship between SCT and multiple domains of functioning in children with and without ADHD. Lastly, most studies have not taken into account the indicator of total ADHD symptomatology as a covariate in the analyses. If SCT is a unique disorder, children with ADHD who present with this symptom cluster must show a unique pattern or a different level of impairment than children with ADHD but without this symptom cluster.

Current Study

The goal of this study was to address these limitations by examining multiple domains of functioning (i.e., academic performance, family functioning, classroom functioning, self-esteem, and relationships with peers, teachers, and parents, and overall functioning) in children with and without ADHD who present with high or low levels of SCT symptoms. In accordance with evidence-based assessment practices and DSM-IV criteria, both parent and teacher ratings of symptoms and impairment were used to determine classification in the ADHD group. SCT was defined by three items (*sluggish*, *daydreams*, *forgetful*; McBurnett et al. 2001). Lastly, there is a significant correlation between ADHD symptoms and impairment in functioning (e.g., Fabiano et al. 2006). Thus, it is important to control for overall severity of symptoms in order to determine if SCT is merely a quantitative addition to ADHD or a qualitatively distinct category or disorder. Thus, the total symptom ratings were entered as a covariate.

Method

Participants

Participants were 584 children in kindergarten through eighth grade (56.7 % male) drawn from five archival datasets (recruitment procedures for each study are described below). The majority of participants are Caucasian (91.7 %); some are African American (2.9 %), Native American (1.2 %), Asian (0.7 %), Hispanic (0.9 %), and biracial/other (2.6 %). Table 1 provides demographic information for the participants from each study.

In accordance with evidence-based assessment guidelines for ADHD (Pelham et al. 2005) parent and teacher ratings of symptoms (i.e., Disruptive Behavior Disorder [DBD] Rating Scale; Pelham et al. 1992) and impairment (Impairment Rating Scale [IRS]; Fabiano et al. 2006) were used to determine ADHD status and subtype. Although we did not utilize a comprehensive evaluation process to diagnose children with ADHD, using rating scales to measure both parent and teacher ratings of ADHD symptoms and impairment to create the ADHD diagnostic groups was an improvement upon the previous SCT studies, which utilized ratings from only one informant (e.g., Carlson and Mann 2002), or did not require impairment in multiple settings (e.g., McBurnett et al. 2001). Nonetheless, because our classification of participants according to DSM-IV criteria for ADHD was solely reliant on parent and teacher ratings of symptoms and impairment, we recognize that our methods may not accurately represent actual clinical diagnoses. To meet criteria for our group labeled ADHD, six or more symptoms of hyperactivity/impulsivity

Table 1 Demographic characteristics of participants

Characteristic	Total *N*=584	Dataset 1 *N*=52	Dataset 2 *N*=70	Dataset 3 *N*=91	Dataset 4 *N*=151	Dataset 5 *N*=220
Gender (% Male)	56.7 %	76.9 %	50.0 %	52.7 %	67.6 %	48.4 %
Race (% White)	91.7 %	88.5 %	97.1 %	94.5 %	82.4 %	95.9 %
Met criteria for ADHD (%)	32.9 %	73.1 %	50.0 %	29.7 %	55.0 %	4.1 %
Met criteria for SCT (%)	28.8 %	36.5 %	42.9 %	38.5 %	43.0 %	8.6 %
Age (*M*, *SD*)	8.89 (2.98)	8.35 (2.07)	9.53 (1.25)	9.96 (1.10)	12.76 (0.87)	5.73 (0.37)
Parent DBD (*M*, *SD*)						
Inattention	1.08 (0.91)	1.50 (0.86)	1.19 (0.90)	1.06 (0.91)	1.82 (0.77)	0.50 (0.46)
Hyp/Imp	0.94 (0.73)	1.49 (0.79)	0.90 (0.72)	0.96 (0.76)	1.20 (0.76)	0.65 (0.52)
SCT	0.73 (0.77)	0.79 (0.70)	0.82 (0.76)	0.76 (0.72)	1.38 (0.74)	0.24 (0.39)
Teacher DBD (*M*, *SD*)						
Inattention	0.98 (0.95)	1.79 (0.85)	1.10 (1.01)	0.91 (0.92)	1.42 (0.88)	0.50 (0.71)
Hyp/Imp	0.70 (0.80)	1.62 (0.84)	0.69 (0.84)	0.66 (0.78)	0.74 (0.76)	0.48 (0.67)
SCT	0.60 (0.78)	1.06 (0.76)	0.94 (1.03)	0.76 (0.80)	– (–)	0.32 (0.56)

DBD disruptive behavior disorder rating scale; *Hyp*/*Imp* hyperactivity/impulsivity; *SCT* sluggish cognitive tempo. DBD items represent the average score on a 4-point scale ranging from 0 (*not at all present*) to 3 (*very much present*)

and/or six or more symptoms of inattention had to be endorsed (as "pretty much" present or "very much" present) on the DBD Rating Scales. The symptoms may have been endorsed by the teacher, the parent, or both. The same symptom was not counted twice if endorsed by both raters. In addition, both the parent and the teacher had to endorse impairment in at least one domain of functioning (impairment in similar domains or different domains across raters was acceptable for meeting the DSM-IV criterion of impairment in two settings). Impairment was defined as a score of three or higher on the IRS, as this threshold has predictive validity for distinguishing ADHD from non-ADHD samples (Fabiano et al. 2006). In order to meet the criteria for ADHD-I, six or more symptoms of inattention but less than six symptoms of hyperactivity/impulsivity had to be endorsed[1]. For ADHD-C, six or more symptoms of inattention and six or more symptoms of hyperactivity/impulsivity had to be endorsed. Children in the non-ADHD group are those who failed to meet the above rating scale criteria for any of the ADHD groups. Group assignment resulted in 192 (32.9 %) children classified as ADHD and 392 children without ADHD. Of those who met criteria for ADHD, 77 (40.1 %) children met criteria for ADHD-I and 115 (59.9 %) children met criteria for ADHD-C.

[1] Because McBurnet et al. (2001) used the ADHD symptom of forgetful to determine SCT status, they excluded this symptom when determining classification of ADHD, allowing participants to meet the threshold for ADHD-I with only 5 of 8 symptoms or for ADHD-C with only 11 of 17 symptoms. Thus, in addition to the grouping described here and the analyses below, we also categorized participants with the forgetful item excluded and re-conducted all analyses. The percentage of children classified with ADHD across the two methods only differed by about 1 %. Furthermore, MANCOVA results yielded the same patterns as described below.

Procedures

Study 1 Participants were children in Kindergarten through 6th grade who were consecutively referred to a school mental health program for youth with disruptive behavior problems (Owens et al. 2008). Recruitment occurred over a four-year period. Because the study examined treatment outcome with typically-referred cases, strict inclusion and exclusion criteria were not imposed.

Study 2 Participants were children with and without ADHD, in 3rd through 5th grade, who were enrolled in a study investigating perceptions of self and other's competence in children with ADHD (Evangelista et al. 2008). Participants were recruited through elementary schools, community fairs, local newspapers and university listservs, and a summer treatment program for children with ADHD. Inclusion criteria for the ADHD group were consistent with those described above for the current study. To be classified into the control group, children had to demonstrate three or fewer symptoms of hyperactivity/impulsivity and inattention (i.e., indicating no impairment and no need for services). No other exclusion criteria were applied. All data in the current study were drawn from the rating scales completed by informants at intake.

Study 3 Participants were children with and without ADHD in 3rd through 6th grade who were enrolled in a study examining the self-protective hypothesis of positive bias in children with ADHD (Evangelista 2009). Participants were recruited through a community mental health center, a university psychology clinic, elementary schools, and a

university listserv. Inclusion criteria for the ADHD group were consistent with those described above for the current study. In order to be classified into the control group, children had to demonstrate three or fewer symptoms of hyperactivity/impulsivity and inattention. Exclusion criteria included a previous diagnosis Pervasive Developmental Disorder, Mental Retardation, Adjustment Disorder, or significant language deficits, as well as a full scale IQ score estimate that fell below 70.

Study 4 Participants were middle school-age adolescents who were enrolled in a study examining the efficacy of a school-based treatment program for ADHD (Evans & Langberg; R01 MH082864 NIMH). In order to be eligible for the study, adolescents needed to meet criteria for one of the subtypes of ADHD based on comprehensive evaluation for ADHD using evidence-based procedures (e.g., a semi-structured interview, rating scales for ADHD symptoms and impairment, and examination of school records). Exclusion criteria included a full scale IQ score estimate that fell below 80, pervasive developmental disorder, psychosis, substance dependence or obsessive compulsive disorder. Although inattention and hyperactivity/impulsivity items on the DBD were completed by both teachers and parents, only parents completed SCT items. Thus, teacher ratings of two SCT symptoms were not available for this sample.

Study 5 Participants represent a Kindergarten cohort (94 % consent rate) for one school district in Southeastern Ohio (Storer et al. 2012). There were no exclusion criteria. Caregivers consented to a screening study when they registered their child for Kindergarten. Teachers completed the DBD and IRS rating scales on all consented children approximately 8 weeks after the start of the school year.

Measures

Disruptive Behavior Disorder (DBD) Rating Scale Parents and teachers completed the DBD Rating (Pelham et al. 1992), which contains 45 items that assess the DSM-IV symptoms of inattention (9 items), hyperactivity/impulsivity (9 items), oppositional defiant disorder (ODD: 8 items) and conduct disorder (CD; 16 items). Each symptom is rated on a 4-point scale ranging from 0 (*not at all present*) to 3 (*very much present*). The parent and teacher versions, both of which have robust psychometric properties have been widely used in treatment outcome studies (e.g., Fabiano et al. 2007; Fabiano et al. 2010; Owens et al. 2008). Consistent with McBurnett et al. (2001), SCT was defined by two additional SCT items that were added to the DBD (*daydreams* and *sluggish*/*drowsy*), and 1 of the 9 DSM-IV inattention items (*forgetful*).

Impairment Rating Scale (IRS) The IRS (Fabiano et al. 2006) contains six items assessing teachers' and parents' perceptions of child impairment in multiple domains: academic performance, family functioning, classroom functioning, self-esteem, relationships with peers, and parents, and overall functioning. Informants place an "X" on a 7-point visual analogue scale to signify their perceptions of child functioning along a continuum of impairment ranging from 0 (*not a problem at all*/*definitely does not need treatment or special services*) to 6 (*extreme problem*/*definitely needs treatment and special service*s). The measure has respectable test-retest reliabilities, cross-informant reliability convergent validity with other impairment scales and predictive validity in identifying children with ADHD diagnoses (Fabiano et al. 2006).

Data Preparation and Analytic Plan

Consistent with McBurnett et al. (2001) and other studies supporting a similar factor structure, (e.g., Hartman et al. 2004) SCT symptoms were assessed using the three SCT items: *daydreams*, *sluggish*/*drowsy*, and *forgetful*. Items rated as a 2 (*pretty much*) or 3 (*very much*) were considered endorsed. High SCT was defined as having 2 or 3 SCT symptoms endorsed; low SCT was defined as having 0 or 1 SCT symptom endorsed. The symptoms may have been endorsed by the teacher, parent, or a combination (except in Study 4 where teacher ratings of SCT items were not available). The same symptom was not counted twice if endorsed by both raters. To be able to compare our results with the results of all previously reviewed studies, we examined impairment patterns of each combination of ADHD subtype and SCT status.

An independent samples *t*-test on child age, and chi-square analyses on child race indicated that high and low SCT groups differed with regard to child age. Namely, children in the low SCT groups were significantly younger than children in the high SCT groups. Thus, age was included in the primary analyses.

To examine the relationship between SCT and impairment in children with and without ADHD, while accounting for age and total symptom ratings, two 2 (SCT: High, Low) x 3 (ADHD Status: ADHD-I, ADHD-C, Non-ADHD) multivariate analyses of covariance (MANCOVA) tests were conducted. In the first MANCOVA, the dependent variables were the 6 scores for the teacher IRS. In the second MANCOVA, the dependent variables were the 6 scores on the parent IRS. In both models, age and total symptom ratings were entered as covariates. Total symptom ratings were calculated by summing parent and teacher ratings of the 18 symptoms of ADHD on the DBD.

We examined the two main effects and a 2 two-way interaction (ADHD x SCT). If multivariate effects were

significant, follow-up univariate effects were explored to determine which IRS domain/s were significant and accounting for the multivariate effect. Further, if higher-order interactions were significant they were interpreted using simple-effects tests or post-hoc tests before significant main effects were interpreted. Below we report the results of the MANCOVAs. Means and standard deviations associated with the MANCOVAs and effect sizes (ESs) are provided in Tables 2 and 3. Effect sizes are calculated using Cohen's d formula with the estimated marginal means that account for the covariates. Positive ES indicates greater impairment in the High SCT group than the Low SCT group.

Results

Teacher-Rated Impairment Profiles

The overall multivariate model for teacher ratings of impairment indicated a significant main effect for SCT group, F (6, 571)=6.21, $p<0.001$, and ADHD group, F (12, 1144)=21.57, $p<0.001$. The interaction between SCT and ADHD groups was not significant. The covariates, total symptom ratings, F (6, 571)=19.10, $p<0.001$, and child age F (6, 571)=2.58, $p<0.019$, were also significant. Namely, higher total symptoms ratings and older child age were both associated with higher rates of impairment in all IRS domains.

The follow-up paired comparisons for the SCT group main effect revealed that children with higher levels of SCT were rated as less impaired than children with lower levels of SCT in peer relationship, $p<0.026$, relationship with teachers, $p<0.001$, academic functioning, $p<0.005$, classroom functioning, $p<0.001$, and overall functioning, $p<0.008$ (see Table 2). The follow-up paired comparisons for the ADHD group main effect (see Table 3) revealed that children with ADHD-I and ADHD-C were both rated as more impaired than ch1ildren without ADHD in relationship with teachers, self-esteem, and overall functioning, ps<0.001. Furthermore, children with ADHD-C were rated as more impaired than children with ADHD-I and children without ADHD in peer relationship, $p<0.001$. Children with ADHD-I were rated as more impaired than children with ADHD-C, peers, $p<0.001$, who were rated more impaired than children without ADHD, $p<0.007$, in academic functioning. Finally, Children with ADHD-C were rated as more impaired than children with ADHD-I, $p<0.001$, who were rated as more impaired than children without ADHD, $p<0.001$, in classroom functioning.

Parent-Rated Impairment Profiles

The overall multivariate model for parent ratings of impairment indicated a significant main effect for SCT group, F (6, 571)=3.24, $p<0.005$, and ADHD group F (12, 1144)=9.17, $p<0.001$. The interaction between SCT and ADHD groups

Table 2 Teacher and parent impairment ratings by SCT group

	Raw means		Estimated marginal means		
	Low SCT n=416	High SCT n=168	Low SCT n=416	High SCT n=168	ES[b]
Teacher ratings					
Peer relations[a]	1.26 (1.76)	2.75 (2.11)	2.30 (1.41)	1.93 (1.41)	−0.26
Teacher-child relations[a]	1.19 (1.79)	2.48 (2.03)	2.34 (1.38)	1.61 (1.38)	−0.53
Academic performance[a]	1.62 (2.04)	3.74 (2.04)	3.28 (1.32)	2.83 (1.32)	−0.34
Classroom functioning[a]	1.30 (1.85)	2.77 (2.15)	2.49 (1.34)	1.88 (1.34)	−0.46
Self-esteem	1.33 (1.79)	3.17 (2.08)	2.39 (1.49)	2.44 (1.49)	0.03
Overall impairment[a]	1.55 (1.97)	3.52 (1.94)	2.98 (1.31)	2.57 (1.31)	−0.31
Parent ratings					
Peer relations	0.95 (1.59)	2.75 (2.13)	1.56 (1.43)	1.83 (1.43)	0.19
Teacher-child relations	1.14 (1.79)	3.05 (2.19)	1.94 (1.50)	1.96 (1.50)	0.01
Academic performance	1.29 (1.97)	3.86 (2.11)	2.60 (1.36)	2.78 (1.36)	0.13
Family functioning	1.11 (1.75)	3.21 (2.09)	1.96 (1.46)	2.27 (1.46)	0.21
Self-esteem[a]	1.12 (1.73)	3.55 (2.11)	2.10 (1.42)	2.74 (1.42)	0.45
Overall impairment	1.37 (1.92)	3.77 (1.94)	2.41 (1.35)	2.63 (1.35)	0.16

ES effect size

[a] significant SCT group main effect

[b] ES are based on the estimated marginal means that account for age and ADHD symptoms severity. Impairment ratings range from 0 to 6. Positive effect sizes represent greater impairment in the High SCT group

Table 3 Teacher and Parent Impairment Ratings by ADHD Group

	Raw means			Estimated marginal means			ES[d]		
	Non-ADHD *n*=392	ADHD-I *n*=77	ADHD-C *n*=115	Non-ADHD *n*=392	ADHD-I *n*=77	ADHD-C *n*=115	Non-I	Non-C	I-C
Teacher ratings									
Peer relations	0.81 (1.29)	2.58 (1.82)	4.10 (1.76)	1.07 (1.41)[a]	2.16 (1.41)[b]	3.12 (1.41)[c]	0.77	1.45	0.68
Parent–child relations	0.71 (1.23)	2.58 (1.97)	3.78 (1.85)	0.99 (1.38) [a]	2.26 (1.38)[b]	2.67 (1.38)[b]	0.92	1.22	0.30
Academic performance	1.02 (1.46)	4.68 (1.46)	4.72 (1.39)	1.48 (1.32)[a]	4.19 (1.32)[b]	3.48 (1.32)[c]	2.05	1.52	−0.54
Classroom functioning	0.77 (1.24)	2.57 (2.02)	4.40 (1.63)	1.03 (1.34)[a]	2.25 (1.34)[b]	3.20 (1.34)[c]	0.91	1.62	0.71
Self-esteem	0.91 (1.39)	3.66 (1.65)	3.87 (1.92)	1.19 (1.49)[a]	3.21 (1.49)[b]	2.84 (1.49)[b]	1.36	1.11	−0.25
Overall impairment	0.99 (1.45)	4.08 (1.39)	4.63 (1.34)	1.36 (1.31)[a]	3.63 (1.31)[b]	3.33 (1.31)[b]	1.73	1.50	−0.23
Parent ratings									
Peer relations	0.76 (1.46)	2.05 (1.75)	3.50 (1.95)	1.43 (1.43)[a]	1.22 (1.43)[a]	2.45 (1.43)[b]	−0.15	0.71	0.86
Parent–child relations	0.87 (1.55)	2.70 (1.91)	3.80 (2.09)	1.61 (1.50)[a]	1.77 (1.50)[a]	2.47 (1.50)[b]	0.11	0.57	0.47
Academic performance	0.90 (1.69)	4.43 (1.42)	4.25 (1.79)	1.79 (1.36)[a]	3.34 (1.36)[b]	2.94 (1.36)[b]	1.14	0.85	−0.29
Family functioning	0.85 (1.55)	3.01 (1.80)	3.80 (1.93)	1.56 (1.46)[a]	2.09 (1.46)[a]	2.70 (1.46)[b]	0.36	0.78	0.42
Self-esteem	0.87 (1.53)	3.68 (1.78)	3.84 (1.96)	1.62 (1.42)[a]	2.70 (1.42)[b]	2.94 (1.42)[b]	0.76	0.93	0.17
Overall impairment	1.05 (1.73)	3.73 (1.44)	4.37 (1.55)	1.93 (1.35)[a]	2.63 (1.35)[b]	3.01 (1.35)[b]	0.52	0.80	0.28

ES effect size

[abc] significant ADHD group main effect (ADHD groups in a given row that have different superscripts are significantly different from each other)

[d] ES are based on the estimated marginal means that account for age and ADHD symptoms severity. Impairment ratings range from 0 to 6. Positive effect sizes represent greater impairment in the second group in the comparison (e.g., a positive ES for Non-ADHD-I indicates higher impairment in the I group)

was not significant. The covariates, child age, F (6, 571)=26.00, $p<0.001$, and symptom score total, F (6, 571)=14.76, $p<0.001$, were also significant. Consistent with teacher ratings, having higher total symptoms ratings and older child age were associated with higher rates of impairment in all domains.

The follow-up paired comparisons for the SCT group main effect revealed that children with higher SCT were rated as more impaired than children with lower SCT in self-esteem, $p<0.001$ (see Table 2). The follow-up paired comparisons for the ADHD group (see Table 3) main effect revealed that children with ADHD-C were rated as more impaired than children with ADHD-I and children without ADHD in peer relationship, relationship with parents, and family functioning (ps ranged from < 0.001 to 0.045). Moreover, children with ADHD-C and ADHD-I were rated as more impaired than children without ADHD in academic functioning, self-esteem, and overall functioning (ps ranged from < 0.001 to 0.004)

Discussion

Using a large sample that includes a similar proportion of boys and girls across a wide age range, we investigated the relationship between SCT symptoms and multiple domains of functional impairment in youth with and without ADHD. Given the controversy in the literature over the role of SCT and the argument that SCT represents a unique disorder, we sought to investigate whether children who present with this symptom cluster demonstrate a consistent and unique pattern or a different level of impairment than children without this symptom cluster. Because more symptomatology of any kind could be associated with greater impairment than less symptomatology, it was important to examine if the relationship between SCT and impairment was merely a quantitative addition to the impairment typically seen in children with ADHD or a qualitatively distinct category or disorder. Thus, we examined the relationship after accounting for total ADHD symptom ratings. Further, because SCT was associated with age, age was accounted for in the models.

The results revealed that the relationship between SCT and impairments was viewed differently by parents and teachers. The effect sizes demonstrate that for most domains, higher SCT was associated with more severe impairment in the home setting, whereas higher SCT was associated with less severe impairment in a school setting (see Table 2). On the surface, this inconsistency makes it difficult to draw a firm conclusion about whether SCT is a qualitatively distinct phenomenon; however, when this pattern of results is considered in context of the covariates examined, and in the context of past studies and environmental factors associated with the home and school settings, we argue that the results lead to the following conclusion. Namely, our findings

suggest that the presence of SCT symptomatology, while it may influence how parents and teachers view the child's functioning, is not associated with a consistent and sufficiently unique profile of adult-perceived impairment to warrant its own unique diagnostic status. Although our findings warrant replication with other indicators of impairment, below we discuss the findings in context of past studies, as well as in the context of environmental factors to make the case for this conclusion. We also discuss implications for future research and clinical practice.

Impairment Profile in a School Setting

The significant results of the MANCOVA for teacher ratings, as well as the pattern of effect sizes, indicate that when age and total ADHD symptoms are considered, higher levels of SCT were associated with lower levels of impairment (see Table 2). This finding may seem unexpected given that some previous studies have found SCT symptoms to be predictive of teacher-rated social and academic impairment (e.g., Bauermeister et al. 2011). However, our results may be explained by contextual factors, as well as by the fact that we accounted for teacher-perceived ratings of ADHD symptoms. For example, in a typical classroom setting teachers work with a large number of students (e.g., 20 to 30 students). The behaviors that are often noticed by teachers as contributing to impairment are those that interfere with teacher and student goals (i.e., following rules and completing academic work). Thus, relative to disruptive behaviors associated with ADHD (e.g., overactivity, impulsivity, noncompliance) that are easily noticed within a group of 20–30 students, SCT symptoms (e.g., daydreaming, sluggish) may not standout and or be as noticeable to teachers. The nature of SCT may also be less noticeable relative to other ADHD symptoms of inattention (e.g., easily distracted, avoids tasks, makes careless mistakes, and loses things). Namely, it is possible that that SCT represents a more *passive* type of inattention rather than a more *active* type of inattention. Thus, passive inattentiveness may not be as noticed by teachers, particularly in the context of other ADHD symptoms or may not be interpreted as impairing to child functioning because it does not interfere with the teacher's goals of teaching and classroom management as much as other ADHD symptoms. Indeed, in the context of other ADHD symptoms, teachers may perceive the child with ADHD and higher SCT symptoms as more obedient and quiet, and less disruptive (and our results suggest less impaired).

We believe that our findings and interpretations are consistent with past literature. Carlson and Mann (2002) failed to find significant differences between ADHD-I/high SCT and ADHD-I/low SCT groups in teacher-rated peer relations. In this study, we also failed to find that the ADHD-I/high SCT group was more impaired than the ADHD-I/low SCT group. Further, Mikami et al. (2007) found that SCT was significantly associated with fewer overall statements and fewer hostile statements for children with ADHD-I and ADHD-C. This is consistent with the protective role described above. It is possible that fewer hostile responses associated with SCT may make children with ADHD *appear* to have less social impairment with peers because they demonstrate less of the noticeably disruptive behaviors that actively interfere with social success. If they are making fewer statements overall, relative to those with ADHD and lower SCT symptoms, there may be less data (or at least less negative data) for teachers to consider in their judgments of impairment.

Bauermeister and colleagues (2011) found that SCT was negatively associated with math achievement. In contrast, we found that children with higher SCT were rated by teachers as significantly less impaired than those with lower SCT in academic impairment. These discrepant findings may be due to different ways of measuring academic achievement. Bauermeister et al. used an objective measure of academic achievement (i.e., Woodcock Johnson Psychoeducational Battery-Spanish), whereas we used a subjective measure (i.e., teacher ratings of academic impairment). Consistent with our interpretation above, the passive inattentiveness associated with SCT may not be as noticed by teachers, particularly in the context of other ADHD symptoms, and/or may not be interpreted as impairing to children's functioning because it does not interfere with the teacher's goals as do other ADHD symptoms. The pattern observed in the non-ADHD group further supports this possibility. Namely, the raw means in Table 2 suggest that higher SCT is associated with more severe impairment in children without ADHD; yet, once ADHD symptoms are considered (see ESs based on estimated marginal means), higher SCT is associated with less impairment, perhaps because the variation in impairment noticed by teachers (albeit within normal limits) is associated with hyperactivity/impulsivity and the more active forms of inattention, not the less noticeable SCT symptoms.

Lastly, the only domain in which the ESs for the relationship between SCT and impairment were in the positive direction after the covariates had been accounted for was teacher-rated self-esteem (see Table 2). Given the previous findings (Carlson and Mann 2002; Hartman et al. 2004) that show that children with SCT tend to be viewed as demonstrating more withdrawn and internalizing behaviors, this pattern is not surprising.

Impairment Profile at Home

The significant results of the MANCOVA for parent ratings and the effect sizes indicate that once age and total ADHD symptoms were considered, higher levels of SCT were associated with more severe parent-rated impairment in self-

esteem. As described above, this positive relationship between SCT and self-esteem is not surprising given the strong association that has previously been found between internalizing symptoms and SCT (Carlson and Mann 2002; Hartman et al. 2004). Further, the SCT main effect for family functioning was marginally significant ($p=0.078$) and produced small to moderate effect size, which indicated that higher SCT (regardless of the sex or ADHD status of the child) could be associated with more severe impairment in family functioning. It is important to emphasize the disturbance to family functioning as parent–child relations can affect behavioral development (Eyberg et al. 2001), as well as child engagement in education and academic achievement (Lopez Turley et al. 2010; Mullis et al. 2003). In the home settings, activities typically occur in the context of one-on-one or in small group interactions as opposed to the large groups in a school setting. In this context, "passive" inattention would be noticeable and likely frustrating for parents. Daydreaming and sluggishness during interpersonal interactions, homework time or completion of chores likely contributes to parent perceptions of impairment in child functioning.

The differences in findings for parent and teacher ratings are not terribly surprising given the literature (e.g., Achenbach et al. 1987; Gomez 2007) that documents small correlations between informants in different settings. Nonetheless, the quality of the difference is striking; namely, for most domains, higher SCT was associated with more severe impairment in the home setting, whereas higher SCT was associated with less severe impairment in a school setting (see Table 2). We argue that when this pattern of results is considered in context of age and ADHD symptoms, and in the context of environmental factors (i.e., the number of children present, the goals of the adults in the setting, and the relative impact of SCT symptoms on those goals), the pattern is understandable and consistent with previous studies. Thus, although SCT symptomatology may influence how parents and teachers view the child's functioning, these data suggest that it is not associated with a consistent and sufficiently unique profile of adult-perceived impairment to warrant its own unique diagnostic status.

Limitations

First, this study determined ADHD groups solely using parent and teacher ratings of ADHD symptoms and impairment and the sample was relatively homogeneous with regard to race and ethnicity. Both of these factors limit the generalizability of the results. Second, although this study used methods for measuring SCT that were similar to those used in previous studies, a more comprehensive SCT measure has been developed (Penny et al. 2009). Thus, replication of our findings with such a measure is important. Third, the datasets used in this study did not include a measure of internalizing problems such as anxiety and depression prohibiting our ability to examine the extent to which internalizing symptoms may explain the relationship between SCT symptoms and impairment in self-esteem. Similarly, we could not control for IQ in our analyses. Fourth, this study utilized five archival datasets, which were not equivalent for the child's age, proportion of children with and without ADHD, or study methodologies. In both analyses, age was a significant covariate. It is possible that this effect is related the nature of our aggregated sample. Namely, Study 6 had the largest proportion of young students (all Kindergarteners) and the smallest proportion of typical (non-diagnosed) children. Thus, further investigation of age in regards to the effect of SCT on impairment is warranted. Lastly, this study utilized only parent and teacher ratings of impairment, which measured their perceptions of the child impairment. Replication with objective measurement of impairment in multiple domains is important.

Summary and Clinical Implications

Children who are diagnosed with ADHD often experience impairment in many domains of their lives and these challenges continue across multiple developmental stages (Barkley 1998; Barkley et al. 2008). These impairments place children with the disorder at increased risk for grade retention, suspension, expulsion, school dropout, elevated levels of substance use in adolescence, and other mental health problems in adulthood (Biederman et al. 2006; Molina and Pelham 2003). Our current conceptualization suggests that children with different subtypes of ADHD have different profiles of impairment that are distinct and meaningful. Some argue that the SCT symptom cluster is sufficiently unique to be considered its own separate disorder (e.g., Hinshaw 2001). We and others (Barkley 2001) argue that high levels of symptoms are insufficient to substantiate the validity of SCT as a distinct disorder. Rather, there must be a pattern of impairment that is unique to the presence of SCT and qualitatively distinct from that observed in children with ADHD-I or ADHD-C.

The current findings suggest that in order to understand the profile of parent- and teacher-perceived impairment associated with SCT, the potential impact of age, ADHD status, total ADHD symptomatology and the context must be considered. Namely, although SCT symptoms may be present, the presence of these symptoms may only influence impairment to the extent that they are noticed above and beyond other disruptive behaviors, to the extent that they interfere with the goals of the setting, and to the extent that the child's behavior deviates from gender-normative behaviors. Our current findings suggest, that in the context of other ADHD-behaviors, higher SCT symptoms are associated with

lower teacher-rated impairment, particularly in classroom functioning and academic performance. Although this finding may seem somewhat counterintuitive, the pattern can be explained when we consider the number of children in the setting, the goals of the setting and the relative impact of SCT on those goals. This finding warrants caution in assuming that SCT leads to greater teacher-perceived impairment. It also highlights the importance or obtaining more objective indicators of academic impairment to determine the distinct role of SCT beyond that of ADHD. According to both parent and teacher ratings, higher SCT symptoms were associated with more severe impairment in child self-esteem. Studies investigating discriminant validity between SCT and internalizing symptoms is warranted. Further, according to parents, higher SCT is associated with more severe impairment in family functioning. Given the role of family functioning in contributing to future impairments as well as the role of families in evidence-based treatments for ADHD, this finding highlights the importance of understanding parents' perceptions of factors that contribute to parenting stress, and child and family functioning. Lastly, the context-specific and informant-specific patterns that emerged underscore the importance of following evidence-based guidelines for the assessment of ADHD, to include both parent and teacher ratings of ADHD symptoms and associated impairment, and extend this recommendation to include symptoms associated with SCT. This study contributes to the literature by highlighting the factors that are important to consider when attempting to understand the relationship between SCT and impairment, and recommending caution in considering SCT as its own separate disorder. Further research is needed, as these data do not definitively support the recommendation that SCT is a separate disorder.

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