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# Sluggish cognitive tempo and peer functioning in school-aged children: A six-month longitudinal study

Stephen P. Becker <sup>a,b,\*</sup><sup>a</sup> Department of Psychology, Miami University, 90 North Patterson Avenue, Oxford, OH 45056, USA<sup>b</sup> Division of Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

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## ABSTRACT

Although research demonstrates sluggish cognitive tempo (SCT) symptoms to be statistically distinct from other child psychopathologies (including attention-deficit/hyperactivity disorder [ADHD], anxiety, depression, and oppositionality) and associated with social impairment, all studies conducted to date have been cross-sectional. Thus, while extant research demonstrates an *association* between SCT and social functioning, it is entirely unknown whether or not SCT longitudinally *predicts* increases in social impairment. This study provides an initial examination of the prospective association between SCT symptoms and children's peer functioning. Teachers of 176 children in 1st–6th grades (ages 6–13; 47% boys) provided ratings of children's psychopathology (i.e., SCT, ADHD, anxious/depressive, and oppositional/conduct problems) and peer functioning (i.e., popularity, negative social preference, peer impairment), and peer functioning was assessed again 6 months later. Multilevel modeling analyses indicated that, above and beyond child demographics, other psychopathologies, and baseline peer functioning, SCT symptoms were significantly associated with poorer peer functioning at the 6-month follow-up. In addition, 75% of children with high levels of SCT were rated as functionally impaired in the peer domain, in contrast to only 8% of children with low SCT. Further research is needed with larger samples to examine SCT over a longer developmental period and with other domains of adjustment.

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## 1. Introduction

Sluggish Cognitive Tempo (SCT) is defined by daydreaming, drowsiness, lethargy, mental confusion, and seeming to be in a world of one's own. Although initially identified as a set of symptoms hypothesized to be useful for identifying a distinct set of children with Attention-Deficit/Hyperactivity Disorder (ADHD) Predominately Inattentive Type (ADHD-I) (McBurnett et al., 2001; Carlson and Mann, 2002), recent studies do not convincingly support the hypothesis that the presence of elevated SCT is useful for identifying a subset of children diagnosed with ADHD-I (Marshall et al., 2014; Willcutt et al., 2014). Still, SCT has recently gained attention for its broader relevance for child adjustment (Becker, 2013; Barkley, 2014; Becker et al., 2014b). In support of the increased attention devoted to the SCT construct, multiple studies using a variety of sample types and age ranges have demonstrated SCT to be statistically distinct from *DSM-IV* ADHD (Willcutt et al., 2012; Barkley, 2013) as well as symptoms of

anxiety and depression (Burns et al., 2013; Becker et al., 2014a; Lee et al., 2014; Willcutt et al., 2014). Further, a growing body of research demonstrates that SCT is not only separable from ADHD and other psychopathologies but also related to a range of psychosocial impairments (see Barkley, 2014; Becker, 2013, for reviews). Given these findings, it has been suggested that SCT may be itself a distinct psychiatric disorder (Concentration Deficit Disorder; Barkley, 2014), although much more research is needed before determining precisely what role SCT should ultimately have in psychiatry, psychology, and developmental psychopathology.

One of the most consistent findings to date is that of an association between SCT and social impairment. Multiple studies have documented a significant relation between SCT symptoms and general social problems (Bauermeister et al., 2012; Becker and Langberg, 2013; Burns et al., 2013; Becker et al., 2014a; Lee et al., 2014; McBurnett et al., 2014; Willcutt et al., 2014). SCT symptoms have also been shown to be significantly associated with sensitivity to punishment broadly and shyness/fear specifically (Becker et al., 2013a). Other studies have shown that among youth with ADHD-I, those with high levels of SCT are more socially withdrawn (and less aggressive) than those without high SCT (Carlson and Mann, 2002; Marshall et al., 2014). In line with these findings, Willcutt and colleagues (2014) found SCT symptoms to be

\* Correspondence address: Department of Psychology, Miami University, 90 North Patterson Avenue, Oxford, OH 45056, USA. Tel.: +1 513 803 2066; fax: +1 513 803 0084.

E-mail address: [beckersp@miamioh.edu](mailto:beckersp@miamioh.edu)

uniquely associated with social isolation after controlling for inattentive and hyperactive-impulsive symptoms. Finally, SCT symptoms were associated with a poorer perception of subtle social cues and less memory for a laboratory-based chat room conversation (Mikami et al., 2007).

Although these studies suggest that SCT is an important construct for understanding youth's social adjustment, a significant limitation of SCT-related research conducted to date is that all studies have used a cross-sectional design. Thus, while extant research demonstrates an *association* between SCT and social functioning, it is entirely unknown whether or not SCT longitudinally *predicts* increases in social impairment. Therefore, the purpose of the present study was to provide an initial examination of the longitudinal association between SCT symptoms and children's peer functioning. Since the use of clinic-based samples of children diagnosed with ADHD make it "difficult to identify distinctive features that may be associated with SCT" (Barkley, 2013, p. 162), a non-referred school-based sample of children was used in the present study. Specifically, the teachers of children in first through sixth grades participated in a 6-month longitudinal study examining SCT in relation to subsequent peer functioning. In addition to being the first study to examine SCT as a longitudinal predictor of children's adjustment, multiple domains of peer functioning were examined (i.e., popularity, negative social preference, impairment in the peer domain). Since SCT is linked to social withdrawal, mental confusion, and slow processing, it was hypothesized that SCT symptoms would predict poorer peer functioning over a 6-month period, even after controlling for baseline peer functioning and other psychopathologies (i.e., ADHD inattentive, ADHD hyperactive-impulsive, anxious/depressive, and conduct/oppositional symptoms). Additional analyses were conducted that compared children with high levels of SCT to children with low levels of SCT, with the expectation that children with elevated SCT would have higher levels of other psychopathology symptoms and functional impairment in the peer domain than children without elevated SCT.

## 2. Methods

### 2.1. Participants

The current study included teacher ratings of 176 students attending an elementary school in the Midwestern United States. Students included in this study were in first through sixth grades (ages 6–13 at the fall time point,  $M=9.17$ ,  $S.D.=1.82$ ). The sample was approximately equally split between boys ( $n=82$ ; 47%) and girls ( $n=94$ ; 53%). According to official school records, and consistent with demographics of the surrounding community (95% White in the 2010 United States Census), the majority of participants in this study were White ( $n=164$ ; 93%) with remaining participants African American ( $n=9$ ; 5%) or Asian ( $n=3$ ; 2%). According to the 2010 Census, 28.4% of the city population was below the federal poverty level (median household income=\$30,299). Fifty-two percent ( $n=92$ ) of the students included in this study received free or reduced lunch, which was used in the present study as a marker of socioeconomic status. To further describe the sample, the county in which the school resides is classified by the 2013 Rural-Urban Continuum Codes as nonmetropolitan (specifically, Code 6: Urban population of 2500 to 19,999, adjacent to a metro area).

### 2.2. Procedures

All study procedures were approved by the university Institutional Review Board (IRB). Approximately one month into the school year, the principal investigator described the study to teachers of grades one through six. Teachers were told that participation in the study included completing measures for participating students at both the fall and spring time points (i.e., T1 and T2) but that they could withdraw their consent at any time during the duration of the study. All eligible teachers (i.e., mainstream classroom teachers of students in grades one through six) provided signed informed consent to participate in the study at both time points ( $N=12$ ; i.e., two teachers for each of the first through sixth grades).

After the teachers provided informed consent, the study was described by research staff to the students in each teacher's classroom. Students were explicitly

told that whether or not they participated in the study would have no effect on their grades or overall school functioning. After answering any student questions, students were given informed consent forms for them to take home to their parents. Students were told that teachers would reward students for returning the informed consent forms by giving them a "blue ticket" (a reward system implemented across all grades at the school), but that these tickets were given simply for bringing the form back regardless of whether the form was signed giving permission or declining permission for the student to participate in the study. The parent consent form informed parents that student participation in the study was fully optional, that providing consent was allowing for the student's teacher to complete forms regarding their child at the fall and spring time-points (i.e., T1 and T2), and that parents could revoke consent for participation in the study at any time. Parents were also given the e-mail address and phone number of the research team in the event that they had any questions or concerns. Students had 2 weeks to return the consent forms to the school. After 1 week, teachers were prompted by research staff to give students who had not yet turned in the parent informed consent form a new copy to take home. Of the 280 total students in grades one through six at T1, 218 (78%) returned their consent forms. Of those, 189 (87% of those who returned their consent forms) provided consent for their child to participate in the study, and 176 (93% of the T1 sample) were still attending the school at T2 and were included in the current study analyses. Teachers were given a packet with the study measures to complete in reference to each participating student in October (T1) and 6 months later in April (T2). Teachers were asked to complete the packets within 2 weeks and were compensated \$5 and \$7 for each packet they completed at the baseline and 6-month follow-up time points, respectively.

### 2.3. Measures

#### 2.3.1. Child demographic variables

Official school records were used to gather demographic information for each participating student. Specifically, age, sex, race, and free or reduced lunch status data were collected. Age, sex, and free or reduced lunch status variables were used as covariates in the study analyses. Given the very few non-White students in the school, student race information was collected to describe the sample but was not used as a covariate.

#### 2.3.2. Child psychopathology

At T1, teachers completed the 35-item *Vanderbilt ADHD Diagnostic Teacher Rating Scale* (VADTRS; Wolraich et al., 1998, 2013), which is a well-validated teacher-report measure of child psychopathology. The VADTRS includes 18 items that correspond to the *DSM-IV* symptoms of ADHD (nine items assessing inattention and nine items assessing hyperactivity-impulsivity) in addition to 10 items assessing conduct/oppositional problems and seven items assessing anxiety/depression problems. Each item is rated on a four-point scale (0=*never*, 1=*occasionally*, 2=*often*, 3=*very often*). Construct and convergent validity of the VADTRS have been established and the VADTRS subscales demonstrate acceptable internal consistency and test-retest reliability (Wolraich et al., 1998, 2013). In the present study, internal consistencies of the mean scale scores were adequate: ADHD Inattention  $\alpha=0.95$ , ADHD Hyperactivity-Impulsivity  $\alpha=0.89$ , Conduct/ Oppositional  $\alpha=0.89$ , Anxiety/Depression  $\alpha=0.87$ .

At T1, teachers also completed the SCT Scale developed by Penny et al. (2009). Previous studies of SCT had primarily relied on brief measures of SCT that lacked psychometric validation. In response to the need for an empirically supported measure of SCT in children, Penny et al. (2009) first conducted a review of the literature in order to identify an initial pool of SCT items and then used a group of experts in the field of SCT to evaluate the content validity of these items. Results from this process led to the identification of a 14-item SCT scale which was then validated in a sample of 335 elementary school-aged children. Similar to the VADTRS, each item on the SCT scale is rated on a four-point scale (0=*not at all*, 1=*just a little*, 2=*pretty much*, 3=*very much*). Penny et al. (2009) provided initial support for the reliability (i.e., internal consistency, interrater reliability, and test-retest reliability) and external validity (i.e., convergent and discriminant validity) of the 14-item SCT scale. For example, although Penny et al. (2009) were unable to examine the test-retest reliability for the teacher-report version of their measure, they reported the test-retest reliability for the 14-item parent-report version to be 0.87 over a period of approximately 12 weeks (Penny et al., 2009). In their study, Penny et al. (2009) also conducted two sets of principal components analysis (PCA) in order to examine the 14 SCT items in isolation as well as to examine the SCT items in tandem with *DSM-IV* ADHD items. The authors conducted separate analyses for parent and teacher ratings, but since only teacher ratings of SCT were collected in the present study, the Penny et al. (2009) results specific to the teacher-report measure are described here. Specifically, Penny et al. (2009) identified a two-factor structure of SCT (i.e., Sleepy/Daydreamy and Slow factors) when examining the teacher-reported SCT items in a PCA, with three of the items cross-loading on both SCT factors. However, a subsequent PCA that included the 14 SCT items in addition to the 18 *DSM-IV* ADHD items found that the SCT Slow items loaded with the ADHD Inattention items. The eight remaining SCT items comprised a factor that was distinct from ADHD Inattention/SCT Slow and ADHD Hyperactivity-Impulsivity.

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