



Distinguishing SCT Symptoms from ADHD in Children: Internal and External Validity in Turkish Culture

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Published online: 15 July 2019
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Abstract

In this study, our aim was to evaluate the internal and external validity of Sluggish Cognitive Tempo (SCT) and to determine if it is an independent factor from Attention Deficit Hyperactivity Disorder (ADHD) in Turkish children, like in other cultures. Two hundred sixty-one children (6–12 years of age) who applied to Ankara University Child and Adolescent Psychiatry outpatient clinics and diagnosed with ADHD recruited the study. All children were evaluated with the Schedule for Affective Disorders and Schizophrenia for School-Age Children Present and Lifetime Version which is a semi-structured diagnostic interview (K-SADS-PL) for ADHD diagnosis. Child Behavior Checklist for ages 6–18, The Barkley's Child SCT Ratings Scale, SNAP-IV Parent and Teacher Scale, and Sociodemographic Information Form were enrolled by the parents and teachers of the children. Our results demonstrated that SCT symptoms formed two distinct but interrelated factors (Sluggish and Daydreaming) separate from those for ADHD. Due to regression analyses, higher levels of SCT predicted higher levels of ADHD-IN (Inattentive) and internalizing symptoms including anxiety-depression, social problems, and social withdrawal. These findings distinguished SCT cases from ADHD-IN in Turkish children. Results also indicated that ADHD-IN symptoms are risk factors for lower academic achievement while SCT symptoms haven't such an effect. Our study is the first which demonstrates SCT's construct validity relative to ADHD-IN by parental and teacher ratings in Turkey. Similar findings with Turkish children to the findings with children from other cultures would increase our confidence in the transcultural generalizability of SCT's internal-external validity.

Keywords ADHD · Sluggish cognitive tempo · Internal validity · External validity · Multicultural considerations

Introduction

Sluggish cognitive tempo (SCT) is characterized by inconsistent alertness, drowsiness, slow thinking/slow behavior, and lack of energy (Russell A Barkley 2015). For a long time, SCT was thought to be associated with Attention-deficit hyperactivity disorder (ADHD)'s inattention symptoms. As known, ADHD is a prevalent neurodevelopmental disorder in children

and adolescents worldwide (Polanczyk et al. 2007) and is organized into three presentations: Predominantly Inattentive (ADHD-I), Predominantly Hyperactive-Impulsive (ADHD-HI), and Combined (ADHD-C) (DSM-5®, American Psychiatric Association 2013). Literature reviews and meta-analysis completed evaluating the validity of ADHD (Erik G Willcutt et al. 2012). Also, factor analyses supported the internal and external validity of the inattention and hyperactivity-impulsivity symptom dimensions but did not support the distinction between ADHD-C and ADHD-IN instead of the academic and cognitive functioning, longitudinal stability, etiological influences, and treatment response (E. G. Willcutt et al. 2014). In addition, several other studies have reevaluated the potential utility of SCT symptoms for discriminating it from the subtypes of ADHD (C. L. Carlson and Mann 2002; Hartman et al. 2004; Todd et al. 2004) and results increasingly support SCT's internal and external validity (Barkley 2013a, b; Belmar et al. 2015; Lee et al. 2016; S. Lee et al. 2014a, b; Penny et al. 2009a, b; Willcutt et al. 2014). However, two important points should be kept in mind

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while addressing the validity. Firstly, SCT's external validity is not as clear as internal validity. Studies generally demonstrated that SCT is a multidimensional problem (R. A. Barkley 2013a, b; Fenollar Cortes et al. 2014; Jacobson et al. 2012a, b; Lee et al. 2014a, b; Penny et al. 2009a, b) and had a positive relationship with anxiety, depression, or general internalizing problems and had a non-significant or inverse association with general externalizing problems (Barkley 2013a, b; Bauermeister et al. 2012a, b; S. P. Becker and Langberg 2013; C. L. Carlson and Mann 2002; Garner et al. 2010a, b; Garner et al. 2013; Lee et al. 2016; S. Lee et al. 2014a, b; Penny et al. 2009a, b). On the other hand findings of these studies were not replicated in Harrington and Waldman's study (Harrington and Waldman 2010) and some other potential validators, such as social skills and academic functioning, found to be associated with SCT in recent studies (S. P. Becker and Langberg 2013; Langberg et al. 2014; Lee et al. 2014a, b). And secondly, results strongly support that SCT is distinct from ADHD-IN type but this information is generally based on the studies from Western Europe and North America with the exception of two studies from Asia and Chile (Belmar et al. 2015; Lee et al. 2016). Due to the culture's influences on children's mental health (T. M. Achenbach and Rescorla 2007), it is unknown if SCT will show the same pattern of internal and external validity for Turkish children. In Turkish culture, in contrast with the North America and Europe, independence and individualism are not prioritized, instead of these, filial piety, and balancing competition with group conformity are supported as in other Asian cultures (Lee et al. 2016). Due to these differences, SCT symptoms may not be viewed as problematic in Turkey because they are not disruptive and have no conflict with cultural norms and expectations. In this view, SCT may not have the same relationship with other problems and social impairment in Turkish children which was found in American and European samples. But on the other hand, the relationship between SCT and social impairment is hypothesized to be caused by shyness and social withdrawal in recent studies (S. P. Becker 2014; Stephen P Becker et al. 2013; E. G. Willcutt et al. 2014). Similar results had been found in Turkish children too. In a study which examined the underlying processes and conditions that contribute to the school adjustment of shy children in Turkey, results revealed that when children displayed shy behaviors, they reported more depressive symptoms that were, in turn, associated with poorer academic performance, less school liking, and higher school avoidance. Also, authors found that shyness negatively predicted school liking at low levels of peer acceptance and this result suggested that difficulties in peer relationships increased shy children's risk of school dissatisfaction (Bayram Özdemir et al. 2017).

In sum, it is important to determine SCT's validity and relationships between SCT and other impairments in Turkish culture. Although these issues were well

established among Turkish children with ADHD (Ercan et al. 2001; Kaner et al. 2011) no study has examined SCT's internal and external validity.

In this study, our aims and hypotheses were as follows:

- First aim: to evaluate if SCT is an independent factor from ADHD by using exploratory factor analysis in a 6–12 years old Turkish ADHD sample, by maternal, paternal and teacher scores. Our hypotheses was: SCT is an independent factor from ADHD in our sample.
- Second aim: to determine the relationships between SCT, ADHD-IN, ADHD-HI and internalizing-externalizing problems. Our hypotheses were: The correlations between SCT and ADHD-IN, internalizing symptoms are stronger than the correlations between SCT and ADHD-HI, externalizing problems.
- Third aim: to determine the unique correlations of SCT and ADHD-IN. Our hypotheses were: Although both SCT and ADHD-IN have significant unique relationships with anxiety, depression, academic competence, and social problems, ADHD-IN has significantly stronger unique relationships than SCT with ADHD-HI and ODD.

Methods

Participants and Settings

The study protocol was approved by the institutional review boards of Ankara University School of Medicine. The children (6–12 years of age) and their parents who applied to Ankara University Child and Adolescent Psychiatry outpatient clinics for several psychiatric/psychological problems between June 2016 and January 2017 invited to the study. All children and their parents who agreed to participate in the study were evaluated with the Schedule for Affective Disorders and Schizophrenia for School-Age Children Present and Lifetime Version which is a semi-structured diagnostic interview (K-SADS-PL) by the child and adolescent psychiatrists. Two hundred sixty-one children who were diagnosed with ADHD and had no comorbid psychiatric/medical problems including mental retardation, specific learning disability, autism spectrum disorders, psychosis, bipolar disorder and persistent medical condition including epilepsy, asthma or physical disability, etc. included the study. Informed consent was obtained from these children and their parents. Then, The Child Behavior Checklist for ages 6–18, The Barkley's Child SCT Ratings Scale, SNAP-IV Parent and Teacher Scale, and Sociodemographic Information Form were enrolled by the parents and teachers of the children.

249 maternal, 208 paternal and 212 teacher outcomes were evaluated. The average age of the 261 students were

9.37 ± 1.73 years). There were 211 boys (80.8%) and 50 girls in the sample. 49 of the ADHD children (18.8%) were inattentive type, 4 (1.5%) were hyperactive-impulsive, and 207 (79.6) were combine type. The mean age of mothers was (35.6 ± 5.5 years), the mean age of the fathers was (39.9 ± 5.5 years), the mean completed maternal education level was (9.7 ± 3.5 years), the mean completed paternal education level was (10.5 ± 3.3 years) and monthly income of the families were (3000 ± 1650 Turkish Liras).

Anxiety disorder was the most common comorbid psychiatric disorder with the range of 24.1% (separation anxiety: 5.8%, social phobia: 7.7%, specific phobia: 5.8%, OCD: 2.3%, and generalized anxiety disorder: 7.3%). The other psychiatric disorders are as follows: oppositional defiant disorder was 16.3%; Major depression was 2.7%, Conduct disorder was 2.7%, the chronic motor tick was 0.8% and other externalizing disorders was 2.3%.

Instruments

Demographic Information Form This form consisted of questions that were prepared by the authors to obtain information about demographic characteristics (age, school, parental age and education, monthly household income, marital status of parents).

The Schedule for Affective Disorders and Schizophrenia for School-Age Children Present and Lifetime Version It is a semi-structured diagnostic interview which was designed to determine current and past episodes of psychopathology in children and adolescents, according to DSM-III-R and DSM-IV criteria. The standardization for Turkish children was conducted by Gokler (Gökler et al. 2004). The Turkish version of the K-SADS-PL was reported to have good test–retest and interrater reliability. Adolescents and parents were interviewed using K-SADS-PL.

Child Behavior Checklist for Ages 6–18 (CBCL 6–18) Child Behavior Checklist for Ages 6–18 is a tool to assess behavioral issues in children ages 6 through 18. A wide range of domains is assessed including school, social, activities, depression, anxiety, somatic complaints, ADHD, defiance, and conduct problems. Parents rate how true each item is now, or was within the past 6 months, using the same 3-point Likert scale as (0 = not true; 1 = somewhat/sometimes true; 2 = very true/often). The inventory is composed of 138 questions, 20 of which refer to a competence scale score and 118 address behavioral problems. Measurement structure of the Turkish version of the CBCL-6-18 has been reported by Dümenci et al. (Dumenci et al. 2004).

Teacher Report Form (TRF/6–18) The Achenbach Teacher Rating Form (Achenbach and Edelbrock 1991) includes 118 items describing common behaviors in children (e.g., Impulsive or acts without thinking). Teachers are instructed to respond to each item based on whether or not the description is a true reflection of the child's behavior, using a scale of 0 = Not True, 1 = Somewhat or Sometimes True, or 2 = Very True or Often True. Scores from the TRF were used only if the teacher had known offspring for a minimum of three months (T. Achenbach & Rescorla 2001; T. M. Achenbach and Edelbrock 1991). The Turkish version of the scale was found to be appropriate for the factor structure RMSEA = .07; Test-retest reliability of the scale = 0.88 and internal consistency = 0.87 (Erol and Şimşek 2000).

SNAP-IV (Swanson, Nolan, and Pelham Questionnaire) It is an 18-item checklist designed to screen for attention-deficit-hyperactivity disorder (ADHD) traits. Each of the items was rated on a 4-point Likert scale from 0 (not at all) to 3 (very much). There are nine items for inattention and nine items for hyperactivity/impulsivity. The high total scores on the subscales indicated severe ADHD symptoms. It has been used in clinical trials (Jensen 1999), and in community surveys to identify children with probable ADHD (Bussing et al. 2008).

It has solid psychometric properties with coefficient alpha values on parent ratings of 0.94 for the total score, 0.90 and 0.79 for inattention and hyperactivity scores, respectively; the alpha coefficients for teacher ratings are 0.97, 0.96, and 0.92 for total, inattention and hyperactivity scales, respectively (Bussing et al. 2008). A Turkish validation study has not yet been published; however, the scale has been used in a recently published large community survey from Turkey (Güler et al. 2014) in which per item mean thresholds for 1.5 SD were similar to those obtained in the US survey (Bussing et al. 2008). In the current study, the SNAP was completed by mothers, fathers, and teachers. The Cronbach α values of the SNAP-IV in the present study were 0.88, 0.90 and 0.92, respectively.

The Barkley's Child SCT Ratings Scale This rating scale was created by Barkley in 2013 (Barkley 2013a, 2013b). The scale consisted of 12 items. (You can see the items in Table 1) Internal consistency (Cronbach's alpha) of the 12 items was .934. Test–retest reliability for the same 86 parents noted above was $r = .84$, with no significant changes over this period, $t(85) = 0.06$. Recently the validity and reliability study has been completed (Firat et al. 2018). In our country, the exploratory factor analysis revealed that SCT items were separated into two factors (Daydreaming and Sluggishness). Confirmatory factor analysis was found to be a good fit. ($\chi^2 = 2.82$, RMSEA = 0.079, GFI = 0.926, NFI = 0.893,

Table 1 Standardized ADHD symptoms and factor loadings of maternal, paternal and teacher scorings

ADHD-IN Symptoms						
	Maternal ADHD-IN Factor		Paternal ADHD-IN Factor		Teacher ADHD-IN Factor	
	IN Factor-1	IN Factor-2	IN Factor-1	IN Factor-2		
1)making careless mistakes	.677			.623		.766
2)Sustaining attention	.706			.703		.645
3)Listen	.523		.396	.319		.519
4)Follow through	.677		.783			.820
5)Organizational skills	.738		.756			.784
6)Concentration	.658		.736			.770
7) Loses things		.796	.681			.688
8) Easily distracted	.511		.566	.496		.618
9)Forgetful		.743	.618			.728
ADHD-HI Symptoms						
	Maternal ADHD/ HI Factor		Paternal ADHD/ HI Factor		Teacher ADHD/ H-I Factor	
	H Factor	I Factor	H Factor	I Factor	H Factor	I Factor
10)Fidgets/squirms	.776		.796		.793	
11) Restless when seated	.810		.836		.846	
12) Moves excessively	.788		.785		.862	
13) Too noisy	.604		.673		.722	
14) Driven by motor/on the go	.816		.814		.889	
15) Talks too much		.735		.717	.758	
16) Blurts out answers		.782		.791	.653	
17) Does not wait turn		.726		.738	.704	.611
18)Interrupts/intrudes on others		.806		.814		.815

ADHD-IN:Attention Deficit Hyperactivity Disorder-Inattention, ADHD-H:Attention Deficit Hyperactive Disorder –Hyperactivity, ADHD-I:Attention Deficit Hyperactivity Disorder-Impulsivity, ADHD-HI:Attention Deficit Hyperactive Disorder –Hyperactivity and Impulsivity

RFI = 0.859, CFI = 0.927 ve IFI = 0.928) Cronbach alpha was 0.86 for total, 0.83 for daydreaming factor and 0.80 for the sluggish factor.

Statistical Analysis

Statistical analyses were performed with IBM SPSS Statistics for Windows 22.0 software and AMOS 24.

Firstly, to determine whether the component structure of the SCT measure within a clinically referred population was consistent with that reported in the original community-based sample, exploratory factor analyses was conducted on the 12 SCT and 18 ADHD items completed by teachers and parents. The Kaiser Meyer Olkin (KMO) coefficient and Barlett Sphericity test were used to test the appropriateness of the sample for factor analyses. (KMO coefficients were for mothers: 0.86; for fathers: 0.86; and for teachers: 0.90; *p* value of Barlett Spehericity test for all scorings were < 0.001. Results demonstrated that the data is suitable for factor analysis). The maximum likelihood method and Kaiser

normalization with varimax rotation were used to determine the factors. The Scree graph method was used to determine the number of factors. Factors which had eigenvalues above 1.0. were considered as significant.

Secondly, to examine the associations among total ADHD symptomatology, SCT total and CBCL subscales, Spearman/ Pearson correlation tests, where appropriate, were used (in the correlation analyses, the association between the SCT, ADHD-IN, ADHD-HD scores and anxiety/depression, social withdrawal, opposite defiant disorder symptoms, conduct problems, academic competence, and social problems were addressed). Then regression analyses were used to determine if SCT has unique relationships with anxiety/depression, social withdrawal, ODD, conduct problems, academic competence and social problems after controlling for ADHD-IN and ADHD-HI or not. SCT, ADHD-IN, and ADHD-HD were also evaluated by the linear regression analysis to determine the relationship between them.

For all analyses, the results were considered to be statistically significant if *p* < 0.05.

Results

Results of Explanatory Factor Analysis

Maternal Results

Maternal scores of 30 items were loaded on 6 factors and these factors explained 61.04% of the variance.

- The first factor was titled as ADHD-inattentiveness factor-1 (ADHD-IN) and was composed of the SNAP / IV items 1, 2,3,4,5,6,8. This factor explained 8.46% of the total variance.
- The second factor was titled as ADHD-inattentiveness factor-2. The second factor was composed of the SNAP / IV' items 7 and 9. This factor explained 3.59% of the variance.
- The third factor was titled as ADHD/Hyperactivity factor (ADHD-H) and was composed of the SNAP / IV items 10,11,12,13,14. This factor explained 21.36% of the variance.
- The fourth factor was titled as ADHD/ impulsivity (ADHD-I) factor and composed of the SNAP / IV items 15,16,17,18. This factor explained 5.28% of the variance.
- The fifth factor was titled as SCT/daydreaming factor and was composed of the SCT Scale items 1,2,3,4,5,9,12. This factor explained 17.95% of the variance.
- And finally, the sixth factor was titled as SCT/sluggish factor and was composed the SCT Scale items 6,7,8,10,11. This factor explained 4.37% of the variance.

Due to maternal scores, All SCT items were loaded within the SCT factors (The factor loadings range from 0.491 to 0.862) (Table 2) and all ADHD items were loaded within the ADHD factors (The factor loadings range from 0.511 to 0.816), as expected (Table 1 and Table 2). ADHD-inattentiveness factor-2 did not contain enough number of items so we compounded ADHD-inattentiveness factor-1 and 2 in to a single factor titled “ADHD-inattentiveness factor” (Table 1) in the light of previous studies (Jacobson et al. 2012a, b). Due to varimax rotation analyses, there were not any cross-loadings in maternal factor loadings.

Paternal Results

Paternal scores of 30 items were loaded on 6 factors (like the mothers) and these factors explained 64.99% of the variance

- The first factor was titled as ADHD-inattentiveness factor and was composed of the SNAP / IV items 3,4,5,6,7,8,9. This factor accounts for 25.16% of the variance.

- The second factor was titled as ADHD-inattentiveness factor-2. The second factor was composed of SNAP/IV items 1,2. This factor accounts for 4.3% of the variance.
- The third factor was titled as ADHD/H factor is composed of SNAP/IV items 10,11,12,13,14. This factor explained 16.19% of the variance.
- The fourth factor was titled as ADHD/ impulsivity (ADHD-I) factor and was composed of SNAP/IV items 15,16,17,18. This factor explained 7.01% of the variance.
- The fifth factor was titled as SCT/daydreaming factor and was composed of the SCT Scale items 1,2,3,4,5,9,10,12. This factor explained 7.96% of the variance.
- The sixth factor was titled as SCT/sluggish factor and was composed of the SCT Scale items 6,7,8,11. This factor explained 4.35% of the variance.

Due to paternal scores, all SCT items were loaded within the SCT factors (The factor loadings range from 0.487 to 0.869) (Table 2) and all ADHD items were loaded within the ADHD factors (The factor loadings range from 0.396 to 0.836), as expected and as similar in maternal scores (Table 1). The maternal-paternal factor loadings are generally similar except SNAP-IV items 1,2,7,9 and SCT Scale item 10. SNAP-IV items 1 and 2 were loaded in the second ADHD-IN factor in fathers while this factor was composed of the items 7 and 9 in mothers. SCT Scale item 10 was loaded in SCT-Sluggish factor in mothers, while it was loaded in SCT-Day Dreaming in fathers (Table 2) Due to varimax rotation analyses, there were two cross-loadings in SNAP (item 3 and 8 were both loaded on ADHD-inattentiveness factor 1 and 2) and two in SCT scale (item 10 was both loaded on SCT-Daydreaming and SCT-Sluggish factor while item 1 was both loaded on ADHD-inattentiveness factor-2 and SCT-Daydreaming Factor) for paternal scorings. You can see the details of factor loadings in Tables 1 and 2 (we used bold characters for cross-loadings). Due to clinical relevance, we included SCT item 1 in SCT-Daydreaming Factor (Loading values were: 0.511 for daydreaming Factor and 0.528 for Inattentiveness factor 2). For other cross-loadings, we used loading value for decision.

Finally, ADHD-inattentiveness factor-2 did not contain enough number of items so we compounded ADHD-inattentiveness factor-1 and 2 in to a single factor titled “ADHD-inattentiveness factor”, in the light of previous studies (Jacobson et al. 2012a, b).

Teachers Results

Teacher scores of 30 items were loaded on 5 factors (the second factor in maternal and paternal ratings was not an independent factor in teacher analysis) and these factors explained 69.78% of the variance.

Table 2 Standardized SCT symptoms and factor loadings of maternal, paternal and teacher scorings

SCT Symptoms	Maternal (<i>n</i> = 246)		Paternal (<i>n</i> = 209)		Teacher (<i>n</i> = 215)	
	Maternal daydream factor	Maternal sluggish factor	Paternal daydream factor	Paternal sluggish factor	Teacher daydream factor	Teacher Sluggish Factor
1) daydreams	.710		.511		.812	
2) trouble staying alert	.552		.696		.679	
3) easily confused	.711		.819		.902	
4) stares a lot	.727		.754		.819	
5) their mind seems to be elsewhere	.686		.713		.784	
6) lethargic		.708		.861		.818
7) underactive		.862		.866		.852
8) sluggish		.794		.869		.896
9) doesn't seem to understand as quickly	.536		.564		.674	
10) seems drowsy		.574	.487	.396	.600	
11) apathetic or withdrawn.		.491		.514	.428	
12) gets lost in his or her thoughts	.725		.626		.873	

- The first factor was titled as ADHD-inattentiveness (ADHD / IN) factor and was composed of the SNAP / IV items 1,2,3,4,5,6,7,8,9. This factor explained 6.96% of the variance.
- The second factor was titled as ADHD/Hyperactivity (ADHD/H) (This factor was the third factor in parental scores). It was composed of SNAP/IV items 10,11,12,13,14,15,16,17. This factor explained 32.42% of the variance.
- The third factor was titled as ADHD/Impulsivity(ADHD/I) factor (This factor was the fourth factor in parental scores) and was composed of SNAP/IV item 18. This factor explained 3.51% of the variance.
- The fourth factor was titled as SCT/Daydreaming and was composed of SCT Scale items 1,2,3,4,5,9,10,11,12. This factor explained 22.87% of the variance.
- The fifth factor was titled as SCT/Sluggish factor and was composed of SCT Scale items 6,7,8. This factor explained 4.3% of the variance.

Due to teacher scores, all SCT items were loaded within the SCT factors (The factor loadings range from 0.516 to 0.837)(Table 2) and all ADHD items were loaded within the ADHD factors (The factor loadings range from 0.519 to 0.889) (Table 1), as expected and as similar in parental scores. Due to varimax rotation analyses, there was one cross-loading in SNAP item 17 (it was both loaded on ADHD/Hyperactivity (Factor 2) and ADHD/Impulsivity Factor (Factor 3)). You can see the details of the factor loadings in Table 1. ADHD/Impulsivity(ADHD/I) factor did not contain enough number of items so we compounded ADHD/

Hyperactivity and ADHD/Impulsivity in to a single factor titled “ADHD- Hyperactivity / Impulsivity factor”.

Three major differences were determined between parental-teacher factor loadings. The first difference was in the second factor in parental scores. ADHD-IN symptom items were loaded in two different factors in maternal-paternal ratings while all items were loaded in one factor in teacher ratings. The second difference was in ADHD-Impulsivity symptom items. For parental ratings, SNAP-IV items 15,16,17,18 were loaded in ADHD/I factor while only 18th item loaded in this factor in teacher ratings. And the third difference was in 11th (apathetic or withdrawn) item of SCT Scale, this item was loaded in SCT-Sluggish factor in both parent ratings while it was loaded in SCT-DayDreaming Factor in teacher ratings (Table 1).

Finally, in the light of previous studies (Jacobson et al. 2012a, b), parental factors consisting of one or two factors were included in other clinically relevant factors (The two IN and two HI factors of parents were considered as a single IN and HI factors like in teacher scores).

Correlations among the SCT, ADHD-IN, ADHD-HI, Anxiety/Depression, Social Withdrawal, Oppositional Defiant Problems, Conduct Problems, Academic Competence, and Social Problems

The aim here is to determine whether SCT is relevant to other psychopathologies, whether it supports the usefulness of the distinction between SCT and ADHD. A correlation of 0.10 is considered as a minor effect, a correlation of 0.30 is considered as a moderate effect, and a correlation of 0.50 is

considered to be a large effect (Cohen et al. 2002). You can see the details in Table 3.

SCT with ADHD-IN and ADHD-HI

SCT has a significant positive relationship with ADHD/IN (for mothers: $r = 0,24$ $p < 0,001$; for fathers: $r = 0,36$ $p < 0,001$; for teachers: $r = 0,49$ $p < 0,001$) but has no significant relationship with ADHD/HI in all scores. On the other hand ADHD/IN has a significant positive relationship with ADHD/HI for mother, father and teacher scores ($r = 0,34$ $p < 0,001$; $r = 0,39$ $p < 0,001$; $r = 0,44$ $p < 0,001$, respectively).

SCT, ADHD-IN and ADHD-HI with Anxiety/Depression

SCT, ADHD/IN, ADHD/HI showed a significant positive correlation with anxiety / depression scores both in maternal and paternal scores (for maternal scores: $r = 0,29$ $p < 0,001$, $r = 0,14$ $p = 0,02$, $r = 0,23$ $p < 0,001$; for paternal scores: $r = 0,19$ $p = 0,006$, $r = 0,28$ $p < 0,001$, $r = 0,29$ $p < 0,001$, respectively). On the other hand for teacher scores, only SCT had a significant positive correlation with anxiety/depression ($r = 0,27$ $p < 0,001$).

SCT, ADHD-IN and ADHD-HI with Social Withdrawal

We found that SCT was significantly associated with social withdrawal in all scores (for maternal scores $r = 0,44$; for paternal scores $r = 0,44$ for teacher scores $r = 0,36$). On the other hand, ADHD/IN was associated with social withdrawal in only paternal scores ($r = 0,162$) and ADHD/HI had a

significant negative relationship with social withdrawal ($r = -0,22$) in only teacher scores.

SCT, ADHD-IN and ADHD-HI with ODD-CD

There was not a significant relationship between SCT and ODD-CD in all scores. But ADHD/IN and ADHD/HI has a significant positive relationship with both ODD-CD scores in maternal, paternal and teacher ratings (ADHD/IN and ODD/CD relationship: for maternal: $r = 0,15$, $r = 0,14$; for paternal: $r = 0,28$, $r = 0,25$ and for teacher: $r = 0,33$, $r = 0,30$, respectively. ADHD/HI and ODD/CD relationship: for maternal: $r = 0,41$, $r = 0,53$; for paternal: $r = 0,42$, $r = 0,53$ and for teacher: $r = 0,60$, $r = 0,68$, respectively.)

SCT, ADHD-IN and ADHD-HI with Academic Competence

There was significant negative relationship between ADHD/IN scores and academic achievement in all ratings (for maternal: $r = -0,16$ for paternal: $r = -0,18$ for teacher: $r = -0,33$) while there was a negative relationship between SCT and academic achievement in only maternal and teacher ratings (for maternal: $r = -0,16$; for teacher: $-0,29$). There was not a significant relationship between ADHD/HI scores and academic achievement.

SCT, ADHD-IN and ADHD-HI with Social Problems

SCT, ADHD/IN and ADHD/HI scores were positively associated with social problems in all ratings (for maternal: $r =$

Table 3 Correlations between sluggish cognitive tempo, adhd-in, adhd-hi, anxiety/depression, social withdrawal, oppositional defiant disorder symptoms, conduct problems, academic competence and social problems

	SCT	ADHD-IN	ADHD-HI	Anxiety/ Depression	Withdrawal	Oppositional defiant disorder	Conduct problems	Academic competence	Social problems
Maternal Ratings									
SCT		.240**		.299**	.449**			-.168**	.261**
ADHD-IN	.240**		.345**	.142*			.143*	-.163*	.300**
ADHD-HI		.345**		.236**		.450**	.471**		.362**
Paternal Ratings									
SCT		.361**		.192**	.334**				.176*
ADHD-IN	.361**		.395**	.280**	.162*	.192**	.259**	-.184*	.331**
ADHD-HI		.395**		.290**		.398**	.443**		.398**
Teacher's Ratings									
SCT		.492**		.275**	.360**			-.297**	.235**
ADHD-IN	.492**		.444**			.294**	.343**	-.332**	.412**
ADHD-HI		.444**			-.224**	.636**			.512**

** Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level. SCT Sluggish Cognitive Tempo; ADHD-IN attention deficit hyperactivity disorder-inattention; ADHD-HI attention deficit hyperactivity disorder-hyperactivity/impulsivity;

0,26 $r=0,30$ $r=0,36$; for paternal: $r=0,17$ $r=0,33$ $r=0,39$ and for teacher: $r=0,23$ $r=0,41$ $r=0,5$, respectively).

Unique Effects of SCT and ADHD-IN on Symptom and Impairment Dimensions

Unique Relationships of SCT and ADHD-IN with ADHD-HI

Higher levels of SCT predicted lower levels of ADHD-HI after controlling for ADHD-IN (mother: $\beta = -0.20$, $SE = 0.071$, $p = 0.001$, father: $\beta = -0.086$, $SE = 0.081$, $p = 0.212$, teachers: $\beta = -0.35$, $SE = 0.070$, $p = 0.000$;) while higher levels of SCT predicted higher levels of ADHD-IN after controlling for ADHD-HI (mother: $\beta = 0.27$, $SE = 0.047$, $p < .0001$, father: $\beta = 0.334$, $SE = 0.059$, $p < .0001$, teachers: $\beta = 0.517$, $SE = 0.041$, $p < 0.0001$).

On the other hand higher levels of ADHD-IN predicted higher levels of ADHD-HI after controlling for SCT (mother: $\beta = 0.397$, $SE = 0.087$, $p < 0.0001$, father: $\beta = 0.423$, $SE = 0.083$, $p < 0.0001$, teachers: $\beta = 0.618$, $SE = 0.086$, $p < 0.0001$) and higher levels of ADHD-HI predicted higher levels of ADHD-IN after controlling for SCT (mother: $\beta = 0.379$, $SE = 0.040$, $p < 0.0001$, father: $\beta = 0.370$, $SE = 0.050$, $p < 0.0001$, teachers: $\beta = 0.470$, $SE = 0.039$, $p < 0.0001$).

Thus, SCT and ADHD/IN showed opposite relationships with ADHD-HI after controlling for the other variable (Table 4).

Unique Relationships of SCT, ADHD-IN, and ADHD-HI with Other Problems

Due to regression analysis, higher levels of SCT predict higher levels of anxiety/depression, withdrawal and social problems in all ratings and higher levels of conduct problems in only mother ratings after controlling for ADHD-IN and ADHD-HI.

Higher levels of ADHD/IN predicting higher levels of academic impairment in all ratings while predicting anxiety/depression and social problems in only father ratings after controlling for SCT and ADHD/IN.

And finally, higher levels of ADHD/IN predicting higher levels of anxiety/depression, ODD, aggression and social problems in all ratings while predict lower withdrawal and academic impairment in only teacher ratings even after controlling for the SCT and ADHD/IN (See the details in Table 4).

Discussion

Although there is a growing body of work examining contributions of SCT to children and adolescents outcomes, few studies have examined the SCT within a clinical ADHD

sample via both parents and teacher ratings of children behavior. Also to date, an increasing number of studies support SCT's validity in North America- Western Europe and recently two studies in Chile and Korea (Belmar et al. 2015; Lee et al. 2016) but there is not enough evidence from other cultures. In this study, we examined the psychometric characteristics of Barkley's Children's SCT scale within a sample of children diagnosed with ADHD in Turkey. The SCT scale showed an excellent internal and external validity from ADHD-IN and ADHD-HI within this 6–12 years Turkish ADHD sample (using both parents and teacher ratings) and exploratory factor analysis suggested extraction of two factors which we have labeled *Daydreaming* and *Sluggish*.

Internal Validity and Factor Structure of the SCT

In our study all twelve SCT symptoms loaded on the SCT factor than the ADHD factors in mothers, fathers, and teachers ratings by exploratory and confirmatory factor analyses. Results demonstrated that SCT symptoms formed two distinct but interrelated factors (Sluggish and Daydreaming) separate from those for ADHD. These findings replicated earlier results of children and adults from the United States and children from Asia (R. A. Barkley 2012, Barkley 2013a, b; Belmar et al. 2015; A. A. Garner et al. 2010a, b; Hartman et al. 2004; Lee et al. 2016; Lee et al. 2014a, b; Penny et al. 2009a, b). In addition our results demonstrated that, SCT shared just 30–39% of the variation in its symptoms with those of ADHD in parental and teacher ratings, like the ADHD-IN than HI dimension as others have found before (Barkley 2013a, b; Garner et al. 2010a, b; Penny et al. 2009a, b). Similar findings were evident in a large U.S. sample of children and adults by Barkley (R. A. Barkley 2012, Barkley 2013a, b) and in earlier studies of children by Garner and Penny (Garner et al. 2010a, b; Penny et al. 2009a, b). Therefore SCT symptoms seem to comprise distinct symptom dimensions from those associated with ADHD as suggested originally by Carlson (1986) (Caryn L Carlson 1986) and our study makes a significant contribution in being the first study to support SCT's internal validity in Turkish children. SCT symptoms, however, are also partially coupled to ADHD symptoms and may coexist in %26 to %32.1 each case.

In our sample the items “1.Prone to daydreaming, 2.has trouble staying alert or awake, 3.mentally foggy or easily confused, 4.stares a lot, spacey, 5. their mind seems to be elsewhere and not paying attention to what is going on around them, 9.doesn't seem to understand or process questions or explanations as quickly or as accurately as others and 12. gets lost in his or her thoughts” were loaded to Daydreaming factor and the items “6. Lethargic, more tired than others or lacks energy, 7.underactive compared to other children, 8. slow moving or sluggish” were loaded to Sluggish factor in both

Table 4 Regression of ADHD-IN, ADHD-HI, anxiety/depression, withdrawal, oppositional defiant problems, conduct problems, academic competence and social problems on sluggish cognitive tempo, ADHD-IN and ADHD-HI

SCT	ADHD/IN		ADHD/HI		Anx/Depression		Withdrawal		Oppositional Defiant Disorder		Conduct Disorder		Academic competence		Social Problems	
	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
Mothers ¹	0.279**	0.047	-0.20**	0.071	0.376**	0.087	0.469**	0.086	0.071	0.085	0.145*	0.090	-0.077	0.073	0.269**	0.084
Fathers ²	0.334**	0.059	-0.086	0.081	0.170*	0.095	0.325**	0.105	-0.076	0.086	-0.098	0.091	0.011	0.081	0.135*	0.095
Teachers ³	0.517**	0.041	-0.35**	0.070	0.383**	0.091	0.398**	0.086	-0.11	0.059	-0.10	0.082	-0.04	0.069	0.182*	0.091
ADHD/IN	β	SE	ADHD/HI	β	SE	Anx/Depression	β	SE	Withdrawal	β	SE	Conduct Disorder	β	SE	Academic competence	Social Problems
ADHD/IN	β	SE	ADHD/HI	β	SE	Anx/Depression	β	SE	Withdrawal	Oppositional Defiant Disorder	β	SE	Conduct Disorder	β	SE	Social Problems
Mothers ⁴	0.397**	0.087	-0.71	0.115	0.113	-0.044	0.113	-0.103	0.112	0.118	0.096	0.103	-0.198*	0.096	0.086	0.111
Fathers ⁵	0.423**	0.083	0.166*	0.107	0.079	0.118	0.118	0.080	0.096	0.146	0.103	0.107	-0.47**	0.095	0.163*	0.107
Teachers ⁶	0.618**	0.086	-0.113	0.123	0.054	0.116	0.116	0.073	0.080	0.107	0.110	0.110	0.095	0.095	0.122	0.123
ADHD/HI	β	SE	ADHD/IN	β	SE	Anx/Depression	β	SE	Withdrawal	Oppositional Defiant Disorder	β	SE	Conduct Disorder	β	SE	Social Problems
Mothers ⁷	0.379**	0.040	0.324**	0.078	-0.041	0.077	0.473**	0.076	0.488**	0.080	0.051	0.066	0.364**	0.075	0.303**	0.083
Fathers ⁸	0.370**	0.050	0.218**	0.083	-0.037	0.091	0.336**	0.074	0.368**	0.079	0.008	0.071	0.303**	0.083	0.446**	0.083
Teachers ⁹	0.470**	0.003	0.237**	0.083	-0.165*	0.079	0.604**	0.054	0.585**	0.075	0.241**	0.064	0.446**	0.083		

** Regression is significant at the 0.01 level. *Regression is significant at the 0.05 level

β : Standardized regression coefficient; SE: Standard error; SCT: Sluggish Cognitive Tempo; ADHD-IN: attention deficit hyperactivity disorder-inattention; ADHD-HI: attention deficit hyperactivity disorder-hyperactivity/impulsivity; ODP: Oppositional defiant problems; CD: Conduct problems;

For all regression analyzes: Durbin Watson values were in the range of 1.0–2.0; VIF values were < 10.0; and Tolerance values were > 0.10

parents and teacher ratings. On the other hand, there were some differences in “10. seems drowsy” and “11. apathetic or withdrawn” factor loadings between mother- father and teacher ratings. The items “seems drowsy” loaded to Sluggish factor in mothers while it was loaded Daydreaming factor in father and teacher ratings. The item “apathetic or withdrawn” was loaded Sluggish factor in both parents while it was loaded to Daydreaming factor in teacher ratings. In school, the teacher’s expectation from the child is concentrating to the lessons. It is notable that the item “apathetic or withdrawn” which loaded as Daydreaming factor in teacher ratings was interpreted that children with ADHD are at higher risk of being perceived as putting forth less effort than their typically developing peers in school. On the other hand, parent’s expectations from the child is the fulfillment of his/her responsibilities on time, so being apathetic or withdrawn could be interpreted as Sluggish at home by parents. Similarly, the factor structure of SCT in population-based samples of children in the United States by Penny and Jacobson et al. differed between parents and teachers in different age groups (Jacobson et al. 2012a, b; Penny et al. 2009a, b). These results suggest that the difference in the way parents and teachers view SCT symptoms may also be universal.

In addition, the two SCT factors obtained from parent and teacher ratings in our ADHD sample differed slightly from the two factors extracted from parent ratings in the original community-based study of the Barkley’s SCT scale (Barkley 2013a, b). The items “2.Has trouble staying alert or awake” and “9. Doesn’t seem to understand or process questions or explanations as quickly or as accurately as others” were loaded to Sluggish factor in Barkley’s parent ratings while they were loaded in Daydreaming factor in our parents and teacher ratings. Studies demonstrated that SCT has two major domains: cognitive and motor slowness (Barkley 2013a, b; Lee et al. 2014a, b). Generally, sluggish factor express motor and daydreaming factor express cognitive impairments in Barkley’s and our sample. The difference between these two items could be a result of two factors: i. The age and the characteristics of the sample (narrow vs. broad age range; clinical sample vs. community-based sample); and ii. cultural effect on perception.

In the developmental hypothesis of SCT, it is stated that SCT symptoms increase with age. This hypothesis was supported by the study which examined ten-year longitudinal stability (from preschool to ninth grades) and inter-factor relationships of ADHD and SCT symptoms among a community sample. Results demonstrated that mean levels of hyperactivity-impulsivity decreased with time, inattentive ratings were generally stable, and SCT tended to increase slightly across development (Leopold et al. 2016a, b). When we consider this hypothesis, it appears that the age range of the selected sample is important. Barkley’s sample was a 6–17 years

old population-based sample while ours’ is a clinical sample with a range of 6–12 years. Although the age range of our sample is narrower, the SCT symptoms loaded on two distinct factors, similar to that of Barkley’s. However, in Barkley’s study, some of the items that were loaded with the Sluggish factor were loaded into the Daydreaming factor in our study. As known, the severity of hyperactivity- impulsivity symptoms decrease during adolescence (Leopold et al. 2016a, b). So, symptoms that express Sluggishness in adolescents could be more easily identifiable by parents and teachers. Unfortunately, our sample was included only the initial period of adolescence and is consisted of ADHD children so it could be possible that sluggish symptoms were not evaluated well. On the other hand, there are also studies suggesting that the symptoms associated with the factor of daydreaming may become more apparent as age increases. Burns et al. found that “daydreams,” “alertness fluctuates,” and “absentminded” SCT domains showed approximately equally low loadings on the SCT and ADHD-IN factors in the first-grade Spanish children, whereas these symptoms loaded on SCT-daydreaming factor among kindergarten through sixth-grade children (Belmar et al. 2015; Burns et al. 2013a, b). It was interpreted as these three domains may not show validity until children are older and face tasks that demand more focus like homework assignments. Similarly, del Mar Bernad et al. examined the SCT, ADHD-IN, ADHD-HI, ODD, and depression along with academic impairment in 758 Spanish children on three occasions (twice at the end of the first grade year and then again 12-months later at the end of the second grade year) and found that only three factors (seems drowsy, slow thinking, slow-moving) loaded on SCT. These results support the hypothesis that SCT factors (Sluggish and Daydreaming) show different patterns of development and might not develop until the children are older (del Mar Bernad et al. 2014).

Our results also demonstrated that SCT children were older than others but were not different due to gender, parental age, parental education and annual household income whereas, as would be expected from other research, boys had higher scores on the ADHD-IN measure than girls. These findings distinguished SCT cases from ADHD in Turkish children and were similar to those found in large samples of U.S. children and adults in recent studies (Barkley 2013a, b; Garner et al. 2010a, b). Also, our results were partially similar to the findings in Barkley’s 6–18 years old children-adolescents and adult samples (R. A. Barkley 2012, Barkley 2013a, b). In Barkley’s studies, SCT cases were older, were equally distributed across male and female participants, and had parents with less education and annual household income, whereas ADHD cases were younger, more likely to be male, and had parent education and income levels indistinguishable from the controls.

The other important point is the characteristics of the sample. A recent study with a clinical ADHD sample from the US

supports our results. In this study, 5 symptoms were loaded to Sluggish/Sleepy and 7 symptoms were loaded to Daydreaming factor like in our sample (Froehlich et al. 2018).

The other possible cause of the difference in factor loadings (Barkley's vs. ours) is the effect of culture. Slowness in Turkish society may not be regarded as a negative situation so the problematic behaviors may be loaded into the factor of daydreaming.

These findings emphasize the importance of assessing the psychometric validity of the SCT scale in a population-based, wider age range sample among Turkish children and adolescents.

Relationship between SCT, ADHD-IN, ADHD-HI and Other Psychiatric Problems

Approximately one third of the ADHD children also qualified as having SCT by their parents and teachers which is consistent with earlier studies exploring this overlap in children and adults (R. A. Barkley 2012; Barkley 2013a, b; Garner et al. 2010a, b; Hartman et al. 2004). When we address the relationships between SCT, IA and HA symptoms we found that SCT scores are weakly related to IA symptoms of ADHD in parental and moderately related in teacher scores, while there was not any relationship between SCT and HA symptoms in all scorings. On the other hand, there were moderate relations between IA and HA symptom of ADHD in both parental and teacher scores. Regression analyses demonstrated that higher levels of SCT predicted lower levels of ADHD-HI after controlling for ADHD-IN while higher levels of SCT predicted higher levels of ADHD-IN after controlling for ADHD-HI. Our results are in accordance with the recent studies which find that SCT symptoms demonstrate a far lower relationship to HI symptoms than they do to IN symptoms and the relationship between SCT and HI may become negative once the overlap of ADHD -IN with SCT is statistically removed (R. A. Barkley 2012; Burns et al. 2013a, b; Garner et al. 2010a, b; Hartman et al. 2004; Lee et al. 2014a, b; Lee et al. 2016; McBurnett et al. 2001a, b; Penny et al. 2009a, b). As previously mentioned by Barkley, correlation results also suggest that the relationship of SCT and ADHD-IN, ADHD-HA are comorbidities between two distinct but related psychopathologies like depression and anxiety (Barkley 2013a, b).

Regression analyses demonstrated that after controlling the effect of ADHD-IN and HI, SCT symptoms were linked to elevated ratings of internalizing symptoms including anxiety-depression, social problems, and social withdrawal, but when the inverse is done (SCT symptoms are statistically removed), the IN dimension of ADHD may be less or even unrelated to internalizing symptoms. While a few exceptions exist in the literature (G Leonard Burns et al. 2013a, b; Harrington and Waldman 2010; Wählstedt and Bohlin 2010) our results demonstrated that SCT and ADHD / IN differ in terms of

association with internalizing symptoms and are distinct conditions from each other, not subtypes of a common disorder. On the other hand, the correlation between SCT and Internalizing problems was moderate, not strong. It could be possible that they are related because some of the symptoms or associated features of the internalizing disorders include problems with attention and concentration. Also, some researchers suggested that internalizing disorders may be the cause of, rather than comorbid with, SCT and ADHD-IA (Lahey 2001).

We want to underline an important point about the relationship between IA, HI, SCT symptoms and social problems. We found that, due to regression analyzes, social problems are positively related with both SCT and HI but not IN. Also, SCT is positively and strongly related to social withdrawal while HA is strongly related with ODD and CD. Our results suggest that HA and SCT may have similar social problems, but the underlying mechanisms of the disorder are qualitatively different. We thought that aggression could be the major problem for adolescents with HA, while social withdrawal may be the primary concern for young people with SCT. Supporting this idea, Willcutt et al. found that only SCT was significantly associated with social isolation and weaknesses and only inattention and hyperactivity-impulsivity were independently associated with a greater likelihood of being disliked by peers (E. G. Willcutt et al. 2014).

Our results demonstrated that when ADHD / IN and ADHD / HI are controlled, SCT increases the risk of aggressive behavior in maternal scores while it does not affect the ODD and CD in paternal and teacher scores. On the other hand, contrary the recent studies (Belmar et al. 2015; del Mar Bernad et al. 2014; Burns et al. 2013a, b; Lee et al. 2014a, b), we did not find any relationship between ADHD-IN and externalizing problems in our sample.

When we address the recent results, we found that, the relationship between SCT and externalizing problems is more complex than with internalizing problems and the results are inconsistent between parental and teacher reports like ours in other studies (Some of the results suggest that SCT is unassociated (Burns et al. 2013a, b; Lee et al. 2014a, b), or negatively associated (del Mar Bernad et al. 2014; Garner et al. 2017; Jacobson et al. 2012a, b; Penny et al. 2009a, b; Wählstedt and Bohlin 2010) with externalizing problems while some others suggest a positive relationship (Bauermeister et al. 2012a, b). This different results may be outcomes of two important factors. Firstly, SCT could have a multidimensional nature, and not taking into account these dimensions, different associations with externalizing problems could not be demonstrated. Thus, a recent study examined the relationship of externalizing problems and two distinct dimensions of SCT (Inconsistent alertness and Slowness) separately. They found that whereas the SCT-inconsistent alertness factor was significantly bivariately correlated, the SCT-slowness factor was not

correlated with externalizing behaviors (Fenollar Cortes et al. 2014). And secondly, informants could have unique perspectives, due to differences in the demands of the school versus the home environment (Garner et al. 2010a, b; McBurnett et al. 2001a, b). In Turkish culture, mostly mothers have the responsibility of nurture so children with SCT are constantly being alerted and criticized by their mothers at home. This may lead to aggressive behaviors and resistance to mothers. It is possible that teacher reports to differentiating between SCT and inattentive symptoms are more accurate than parent reports for our culture, since these symptoms may be more apparent in structured settings such as the classrooms.

We showed that there are negative correlations between SCT, IN, and academic competence. But this relationship was supported for only IN by regression analyses. In other words, SCT was not a risk factor for academic competence in our sample. Some of the studies did not find an association between SCT-academic achievement after controlling for IQ and ADHD symptoms (Becker et al. 2014; Langberg et al. 2014; Watabe et al. 2014) while some others reported negative effect of SCT on academic achievement (Jacobson et al. 2012a, b; Lee et al. 2014a, b; McBurnett et al. 2014). This discrepancy could be related to the measures or dimensions of SCT. Thus Cortes et al. found that SCT-slowness factor was related to learning problems while inconsistent alertness factor was not (Fenollar Cortes et al. 2014).

Our results must be evaluated in light of limitations. First, due to a cross-sectional design, it is not possible to comment on causality. Second, we did not collect data from children and adolescent themselves, which could provide interesting findings. Third, it is recommended to apply EFA and CFA in different samples or split the sample in to two groups and apply tests in different parts of the sample, so we can only use EFA analyses in this paper, and we should underline the need for CFA analyses in another sample for better understanding. And finally, our sample is a clinical sample, a population-based sample could provide more information for Turkish children and adolescents.

Summary

Our study is the first which address SCT's construct validity relative to ADHD by parental and teacher ratings in Turkey. Our results demonstrated that SCT symptoms formed two distinct but interrelated factors (Sluggish and Daydreaming) separate from those for ADHD. Due to regression analyses, higher levels of SCT predicted higher levels of ADHD-IN (Inattentive), and internalizing symptoms including anxiety-depression, social problems and social withdrawal. These findings distinguished SCT cases from ADHD-IN in Turkish children. We also found that for academic achievement ADHD- IN is a risk factor while SCT is not.

Similar findings with Turkish children to the findings with children from the United States, Western Europe, Chile, and Korea would increase our confidence in the transcultural generalizability of SCT's internal and external validity. Also, we thought that our results will significantly contribute to the clinical practice of psychiatrists while evaluating and treating the comorbid problems of children with ADHD.

Funding We had received no financial support for the research, authorship, and/or publication of this article.

Compliance with Ethical Standards

Ethical Approval All procedures were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Experiment Participants Informed consent was obtained from all individual participants included in the study.

Conflict of Interest We, all authors have no conflicts of interest to declare.

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