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Original Research

A Comparison of Cognitive Disengagement Syndrome in Children with Major Depression Versus Attention Deficit and Hyperactivity Disorder

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ABSTRACT

Objective: There is growing evidence that Cognitive Disengagement Syndrome (CDS) is a distinct construct, supported by both empirical research and clinical differentiation. CDS demonstrates a stronger association with the inattentive type of Attention Deficit Hyperactivity Disorder (ADHD-IA), compared to its correlation with hyperactivity/impulsivity symptoms. Several studies have identified a significant positive relationship between CDS and internalizing symptoms such as anxiety and depression. To our knowledge, no study has explored CDS in children with major depression (MD). In the present study, we compared children with MD but without ADHD to children with ADHD but without depression in terms of CDS. We examined whether children with MD would have greater CDS when compared to children with ADHD.

Methods: Thirty-six adolescents with ADHD, and twenty-five adolescents with MD, aged 12 to 18 years old, were administered the Barkley Child Attention Scale (BCAS), Turgay's DSM-IV Based ADHD and Disruptive Behavior Disorders Screening Scale, and the Children's Depression Rating Scale-Revised (CDRS-R).

Results: The majority of the ADHD and MD groups were boys. The MD group had significantly higher BCAS scores than the ADHD group (U=287.0, p=0.016). In the ADHD group, the severity of BCAS scores was inversely correlated with ADHD-Hyperactivity/impulsivity scores (r=-0.681, p<0.001). In the MD group, there was a significant positive relationship between BCAS and CDRS scores (r= 0.493, p=0.012).

Conclusions: The findings of this study highlight the transdiagnostic relevance of CDS by demonstrating its association with depression, independent of ADHD. This underscores the importance of considering CDS in the assessment and treatment of depression across various clinical contexts.

Keywords: Cognitive Disengagement Syndrome; Attention Deficit and Hyperactivity Disorder; Major Depression; Children.

INTRODUCTION

The symptoms of Cognitive Disengagement Syndrome (CDS) (previously called Sluggish Cognitive Tempo, SCT) appear to be a trait that emerges early in childhood [1]. Several studies have defined the cognitive and behavioral dimensions of CDS [2, 3]. CDS is characterized by excessive daydreaming, confusion, drowsiness, absent-mindedness, being lost in one's own thoughts, and a noticeable slowing in behavior and cognitive processes [2]. Until recently, CDS has been studied primarily in the context of Attention Deficit Hyperactivity Disorder (ADHD), specifically as a symptom of the ADHD-inattentive (ADHD-IA) subtype [2, 4]. However, ample evidence suggests that CDS is a distinct entity with both empirical and clinical differentiation [5]. CDS demonstrates a stronger association with ADHD-IA compared to its correlation with hyperactivity/impulsivity symptoms [6]. Some studies specifically suggest that CDS represents a distinct entity with a unique clinical profile, separate from ADHD, implying that the relationship between CDS and ADHD involves the comorbidity of two distinct disorders [4-8]. Studies have identified a significant positive relationship between CDS and internalizing symptoms such as anxiety and depression, as well as social and academic impairment, low self-esteem, and sleep problems, even when controlling for ADHD-IA [3, 6, 9-12]. Bernad et al. [13] conducted a comprehensive 2-year longitudinal study involving a large cohort of school-aged children. The primary objective was to explore the unique predictive value of CDS in relation to various academic and emotional outcomes. The study found that higher CDS were significantly associated with increased levels of teacher-reported depression and academic impairment, independent of ADHD-IA. A recent study found that baseline CDS symptoms predicted future depression and teacher-rated anxiety [2]. Similarly, a 7-year longitudinal study showed that CDS predicted anxious/depressive behaviors, even after controlling for the effects of ADHD [14]. Moreover, a recent study revealed the predictive relationship of CDS with depressive symptoms [15]. Research has also shown that children with severe CDS tend to exhibit increased symptoms of generalized anxiety, social phobia, and obsessions than children with lower levels of CDS [16]. Children with CDS often exhibit significant challenges in various aspects of their daily lives, including social interactions and cognitive functions. Social isolation and loneliness are common among these children due to their tendency to withdraw from social situations. Additionally, they may struggle with reduced efficiency in processing information and face difficulties in managing cognitive tasks and regulating their emotions effectively [8, 17-19]. The emergence of CDS symptoms has been associated with increased activation of the behavioral inhibition system [20, 21], and conflicted shyness [8, 20, 21]. Additionally, some findings suggest that CDS is associated with poor learning strategies, an increased risk of suicide, self-reported rumination and mind wandering (MW), even after controlling for co-occurring conditions such as ADHD, anxiety, and depression [6, 17, 19, 22, 23]. It should be noted that CDS is distinct from both anxiety and depression [8]. A recent study of undergraduate students reported that having more than one other psychiatric disorder was associated with higher levels of CDS symptoms [24].

Main Points

- In this study, we aimed to investigate the associations of CDS with ADHD and depressive symptoms in order to understand unique associations with each disorder.
- In the group of ADHD patients, the severity of CDS scores was inversely correlated with ADHD-Hyperactivity/Impulsivity. In the patients with MD, CDS scores were positively correlated with depression severity.
- The findings of this study highlight the transdiagnostic relevance of CDS by demonstrating its association with depression, independent of ADHD.
- It is important to consider CDS in the assessment and treatment of depression across various clinical contexts.

Adolescents with ADHD are at significant risk of developing depression and related problems compared to their typically developing peers [25]. It was reported that 14% of children and adolescents with ADHD and 1% of youth without ADHD were diagnosed with depression [26]. A longitudinal study showed that children with ADHD exhibited higher depressive symptoms through age 18 compared to children without ADHD, and youth with a history of continued to experience higher depressive symptoms than their age-matched peers from ages 18 to 25 [25]. CDS may contribute to the link between ADHD and depression. It appears to explain much of the covariance between ADHD and depressive symptoms, independently of IA symptoms and externalizing psychopathology [10]. Many studies indicate that the relationship between IA symptoms and depression is no longer significant when CDS is taken into account, but that CDS remains associated with depression when IA is controlled [4, 12,

27]. Therefore, CDS appears to be an important risk factor that should be integrated into research on depression risk in youth with ADHD.

Although a positive relationship between CDS and internalizing symptoms such as anxiety and depression has been recognized, the characteristics of CDS in children with major depression (MD) have not been extensively studied. In this study, we compared children with MD but without ADHD to children with ADHD but without depression in terms of CDS. We examined whether children with MD would have higher CDS compared to children with ADHD. We hypothesized that CDS, as a distinct clinical entity, would exhibit a stronger correlation with depression in children with MD compared to its association with ADHD symptoms in children with ADHD. This is based on the expectation that the emotional characteristics of depression align more closely with CDS symptomatology, whereas the behavioral aspects of ADHD may have a less direct connection. Understanding these differences may lead to more tailored approaches to the diagnosis and treatment of CDS in different clinical conditions.

MATERIALS AND METHODS

Subjects and assessment

Participants consisted of 36 adolescents with ADHD and 25 adolescents with MD, aged 12–18, who applied to the outpatient clinics of Kars Harakani State Hospital between July and November 2023. Data were collected from parents, adolescents, and teachers. All procedures were approved by the institutional review board of Kafkas University (approval date: 04.07.2023, approval number: 274). Parental informed consent and adolescent assent were obtained. Diagnostic assessments for both groups were based on the Diagnostic and Statistical Manual of Mental Disorders, 5th edition [28]. Exclusion criteria for both groups were as follows:

1) Previous diagnoses of neurological disorder, intellectual disability, autism, schizophrenia, bipolar disorder, and substance use disorder;
2) There was no current MD diagnosis in the ADHD group.
3) Participants with MD had no lifetime or current diagnosis of ADHD.

Data Collection Tools

Sociodemographic questionnaire: Sociodemographic characteristics of the sample were obtained through a form prepared by the authors.

Barkley Child Attention Scale [4]: To assess the severity of childhood CDS, all parents completed the Turkish version [29] of the Barkley Child Attention Scale (BCAS) [4]. This scale has been widely used in previous studies involving children and adolescents in Türkiye [30, 31]. The BCAS, for children aged 6 to 12 consists of 12 items divided into two subcategories: sluggishness and daydreaming. The sluggishness dimension includes seven symptoms, such as decreased activity, lethargy, and slowness of behaviors. The daydreaming dimension covers five symptoms, including daydreaming, absentmindedness, and mental confusion. The Cronbach's alpha coefficient was found to be 0.86 in the Turkish reliability study of BCAS

Turgay's DSM-IV Based ADHD and Disruptive Behavior Disorders Screening Scale [32]: This parent-reported scale serves as a screening tool for disruptive behavior disorders based on DSM-IV diagnostic criteria. It has been validated for use in Türkiye by Ercan et al., [33]. The scale consists of a total of 41 items: 9 questions regarding attention deficit, 6 questions regarding hyperactivity, 3 questions regarding impulsivity, 8 questions regarding oppositional defiant disorder and 15 questions regarding conduct disorder. Response options range from zero to three; 0 and 1 indicate normal situations and behaviors, while options 2 and 3 indicate clinically important conditions. A total score of 'six' out of 'nine' criteria rated as 2 or 3 indicates the presence of a serious problem, lasting 'at least six months,' suggestive of ADHD. The Cronbach's alpha coefficients for the sample of the current study was as follows: 0.89 for Inattention, and 0.81 for Hyperactivity.

Children's Depression Rating Scale-Revised: Severity of depression was measured with the clinician-rated Children's Depression Rating Scale-Revised (CDRS-R) [34]. The 16 items on CDRS are measured on 3-, 4-, 5-, and 6-point scales. The CDRS is derived from the Hamilton Rating Scale for Depression (HAM-D); A score of 15 on the CDRS is equivalent to a score of 0 on the HAM-D [35]. Based on family reports and clinical interviews, children demonstrated normal ranges of intelligence, as assessed through adaptive functioning in domains such as communication, self-care, social skills, self-direction, academic skills, work, leisure, health, and/or safety.

Statistical Analysis

Data were analyzed using SPSS 21.0 (IBM Corp., Armonk, NY, USA). Normality assumptions were evaluated through Skewness and Kurtosis values. Descriptive statistics for continuous

variables are presented as mean (M), standard deviation (SD), and standard error (SE). In addition, the number (n) and percentage (%) values of categorical variables were determined for each study group. Sociodemographic and clinical variables were compared between groups using Student's t Test or Mann-Whitney-U Test. Categorical variables were compared between groups using the Chi-Square Test. The relationship between clinical variables in both groups was evaluated by Pearson's or Spearman's correlation analysis.

RESULTS

Comparison of both groups in terms of some sociodemographic and clinical variables is presented in Table 1. The majority of ADHD and MD groups consisted of boys (72.2%, 64.0 %, respectively). There were no significant differences between ADHD (median: 14 (11-17)) and MD (median: 15 (12-18)) groups in terms of age (U=336.5, p=0.092). As expected, Inattention (17.33±3.48 for ADHD; 13.96±1.59 for MD) and Hyperactivity (14.22±7.46 for ADHD; 5.16±1.34 for MD) scores were significantly higher in ADHD group (T=5.096, p<0.001; T=7.123, p<0.001; respectively). Additionally, CDRS scores (median: 27 (18-49) for ADHD; 69 (53-82) for MD) were higher in the MD group (U=0.0, p<0.001). BCAS scores of the MD group (median: 24 (22-29)) were significantly higher than those of the ADHD group (median: 21 (12-31)) (U=287.0, p=0.016).

As seen in Table 2, the severity of BCAS scores in the ADHD group was inversely correlated with ADHD-HI/impulsivity scores (r=-0.681, p<0.001). There is a significant positive relationship between the BCAS and CDRS scores in the MD group, (r= 0.493, p=0.012) (Table 3).

Table 1. Comparison of Sociodemographic and Clinical Characteristics Between ADHD and Depression in Adolescents

	ADHD n=36	**Depression n=25**	**Statistical Analysis**	
	N (%)	**N (%)**	**X^{2*}**	**p**
Gender			0.465*	0.495
Boy	26 (72.2)	16 (64.0)		
Girl	10(28.8)	9(36.0)		
Parents' Marital Status			2.847*	0.092
Married	32 (88.9)	18 (72.0)		
Divorced/separated	4(11.1)	7(28.0)		
Type of Delivery			0.014*	0.905
Normal	25 (69.4)	17 (68.0)		
Caesarean	11(31.6)	8 (32.0)		
Any obstetric complication (yes)	2 (5.6)	0.0 (0.0)	-	0.508
	M±SD Median (min-max)	**M±SD Median (min-max)**	**T**/U*** **	**P**
Age	14.16±1.79 14 (12-18)	15.00±1.82 15 (12-18)	336.5***	0.092
Mothers' Age at Birth	23.55±4.65 24 (16-32)	25.88±5.21 26 (16-33)	-1.825**	0.073
Fathers' Age at Birth	26.55±5.07 27 (18-36)	32.00±5.28 32 (20-42)	-4.053**	**<0.001**
Birth Weight (kg)	3.22±0.63 3.25 (2.00-4.50)	3.32±0.46 3.25 (2.60-4.50)	-0.706**	0.483
Walking onset (month)	13.27±2.36 13 (10-19)	13.20±2.50 13 (10-19)	430.5***	0.766
Speech onset (month)	13.91±2.66 13 (10-24)	13.04±2.22 13 (10-18)	368.0***	0.223

Duration of Breastfeeding (month)	16.69±8.15 13.50 (0-36)	18.40±8.54 19 (0-36)	-0.788**	0.434
BCAS	20.58±5.76 21 (12-31)	24.24±1.78 24 (22-29)	287.0***	**0.016**
Turgay-Inattention	17.33±3.48 17.50 (7-23)	13.96±1.59 14 (11-17)	5.096**	**<0.001**
Turgay-Hyperactivity	14.22±7.46 15 (2-27)	5.16±1.34 5 (3-7)	7.123**	**<0.001**
CDRS	30.00±9.65 27 (18-49)	67.00±8.28 69 (53-82)	0.0***	**<0.001**

**Chi-Square Test **Student's T Test ***Mann-Whitney-U Test*

ADHD: Attention Deficit Hyperactivity Disorder BCAS: Barkley Child Attention Scale

CDRS: Children's Depression Rating Scale

Table 2. Correlation Analysis Between Clinical Variables in the Group of Adolescents Diagnosed with ADHD (n=36)

(R,p)	1	2	3	4	5	6
1. Age	-					
2. Mothers' Age at Birth	.114, .509	-				
3. Father's Age at Birth	.274, .106	**.783, <.001**	-			
4. BCAS	.145, .398	.110, .523	.088, .610	-		
5. Turgay-IN	-.125, .466	-.162, .345	-.236, .166	.097, .574	-	
6. Turgay-HI/I	-.147, .392	-.253, .137	-.282, .095	**-.681, <.001**	.321, .056	-

**Spearman's Correlation Coefficient*

ADHD: Attention Deficit Hyperactivity Disorder BCAS: Barkley Child Attention Scale

Turhay-IN: Inattention Turgay-HI/I: Hyperactivity/Impulsivity

Table 3. Correlation Analysis Between Clinical Variables in the Group of Adolescents Diagnosed with Depression (n=25)

(R,p)	1	2	3	4	5
1. Age	-				
2. Mothers' age at birth	.299, .147	-			
3. Fathers' age at birth	-.184, .380	**.590, .002**	-		
4. BCAS	.052, .807	.069, .743	.153, .466	-	
5. CDRS	.010, .963	.042, .841	.054, .799	**.493, .012**	**-**

**Spearman's Correlation Coefficient*

BCAS: Barkley Child Attention Scale

CDRS: Children's Depression Rating Scale

DISCUSSION

To our knowledge, there are very few studies investigating CDS in children with MD. In this study, it was investigated whether there was a difference in terms of CDS between children with ADHD and children with MD. By excluding cases of clinical depression in the ADHD group, we hypothesized that CDS, as a separate clinical entity would be higher in children with MD than in children with ADHD. Our results demonstrated that there was no significant relationship between CDS and ADHD-IA scores in the ADHD group without depression. In contrast, the severity of CDS was inversely related to ADHD-HA/I scores. Consistently, some previous studies have shown that that CDS is not associated with, or is negatively associated with externalizing behaviours, when controlling for ADHD inattention [8, 12, 36-39]. One reason for the non-significant relationship between CDS and ADHD-IA may be the exclusion of clinical depression in the ADHD group. CDS may contribute to the development of depression in children with ADHD. As previously reported, there is a significant positive association between CDS and internalizing symptoms such as anxiety and depression, even when controlling for ADHD-IA [3, 6, 9-12, 36, 40, 41]. Therefore, the absence of depression in the ADHD group in our study may have prevented the emergence of a relationship between CDS and ADHD-IA.

Another important finding of this study is that depression severity was strongly associated with CDS in the MD group, excluding individuals with ADHD. Although there is an established relationship between CDS and depression, studies have not examined the possible mechanisms of this association. Theoretical models of depression propose domains of competency, self-perceptions, and information processing as key features in the development and maintenance of symptomatology [42]. For example, it is theorized that negative life events and ongoing negative feedback will lead to negative self-perceptions, which in turn will increase negative affect, cognitive biases, and social withdrawal [42, 43]. Depression in adolescents may occur due to high levels of impairment and resulting stress and demoralization secondary to CDS. Among the various clinical features of CDS, social problems occupy an important place. In typically developing children, higher rates of CDS symptoms have been associated with academic problems, emotional and peer relationship problems [44], and more anxiety/depression, emotional reactivity, withdrawal, and somatic complaints [45]. Individuals with CDS exhibit internalizing behaviors such as social withdrawal [8, 18, 46], lower self-esteem, lower teacher-reported social skills [9, 38], sleep problems, being less interactive, and conflicted shyness [47] in school-aged and adolescent samples. Impaired social and academic functioning in individuals with high CDS is associated with increased levels of peer-rejection [8, 40, 41]. Adolescents with elevated CDS may experience more peer bullying and, accordingly, increased depressive symptoms for a variety of reasons. Difficulties in emotional regulation may explain the association between CDS and avoidance of social situations [8]. When specific internalizing comorbidites are considered, CDS appears to be more strongly associated with depression than anxiety [4, 36, 48, 49]. Therefore, we suggest that CDS and depression symptoms exhibit a differential association, indicating distinct interactions or correlation patterns between these two constructs.

Previous studies have investigated CDS in children and adolescents with autism spectrum disorder [50-52], trauma [53], and sleep disorders [6]. These studies indicates that CDS may be a construct of transdiagnostic significance. The association between CDS and depression, independent of ADHD, in our study may underscore the transdiagnostic relevance of CDS, and highlight its potential significance in multiple mental health conditions.

The current study has several limitations. First, our sample size was relatively small, limiting the generalizability of our findings to a broader population. Secondly, the use of a cross-sectional design in this study prevents the establishment of a causal relationship between the variables investigated. Third, CDS in children was assessed using a scale based on parent report. It is noteworthy that children and adolescents tend to report internalizing disorders more accurately than parents [54]. Therefore, relying solely on parental reports to evaluate CDS in this study represents a significant methodological limitation. Using the self-report CDS scale [55] would provide a more appropriate approach.

CONCLUSIONS

In this study, we have found that CDS scores were inversely correlated with hyperactivity/impulsivity, as expected. However, there were no significant relationships between CDS and inattention. Instead, CDS was positively related to depressive symptoms. The strong correlation observed between depression severity and CDS in the MD group highlights the need to assess and address cognitive daydreaming symptoms in patients

with MD. This relationship may provide insight into cognitive patterns associated with depressive disorders. The findings of this study highlight the transdiagnostic relevance of CDS by demonstrating its association with depression independent of ADHD. This underscores the importance of considering CDS in the assessment and treatment of depression in a variety of clinical contexts. It has been known that CDS symptoms have been associated with several academic and social problems which may lead to anxiety or depression. Understanding the differential relationship between CDS and depression symptoms may help clinicians develop more specific interventions. It may suggest that treatment strategies should address these symptoms differently depending on the specific profile of the individual. Further research may explore the underlying mechanisms that contribute to the differential association between CDS and depression symptoms. Studies should investigate whether specific cognitive or emotional factors mediate this relationship. Comparative studies should examine whether similar correlations exist in different populations or across other mental health disorders.

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Informed Consent: An informed consent form was filled out by all participants and their parents participating in the study.

Conflict of interest: There is no conflict of interest in our study.

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Ethical Approval: Ethics committee approval was received from Kars Kafas University ethics committee (Approval date: 04.07.2023, Approval number: 274).

Author Contributions: Conception: D, S; MM, Ö - Design: T,CÖ - Supervision: D,S - Fundings:MM,Ö -Materials: MM,Ö ; T;CÖ- Data Collection and/or Processing: T,CÖ- Analysis and/or Interpretation: D,S - Literature: D,S; MM,Ö - Writing: D,S; MM,Ö - Critical Review: T,CÖ.

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