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The Prevalence, Sociodemographic, and Comorbidity Characteristics of Turkish Children with Cognitive Disengagement Syndrome

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ABSTRACT

Objective: Cognitive disengagement syndrome, formerly known as sluggish cognitive tempo, is defined as mental fogginess, daydreaming, and sluggishness. This study aimed to determine the prevalence and sociodemographic characteristics of children with cognitive disengagement syndrome and to examine the relationship between cognitive disengagement syndrome and psychiatric disorders.

Methods: About 268 randomly chosen Turkish primary school children aged 7-11 years from 4 different cities were included in this study. Both teachers and parents completed the cognitive disengagement syndrome scanning scale of the Child Behavior Checklist and the Barkley Child Attention Survey. Psychiatric diagnoses in children were assessed using a semi-structured clinical interview. Four separate cognitive disengagement syndrome measurements were performed, matching informants with scales.

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Results: The prevalence of cognitive disengagement syndrome was estimated with a range of 4.9%-10.9%, depending on the way of measurement. Logistic regression analyses revealed that paternal psychopathology (odds ratio = 6.7) and low maternal education (odds ratio = 3.1) increased while advanced maternal age (odds ratio = 0.7) decreased the risk of cognitive disengagement syndrome. Although cognitive disengagement syndrome was found to be more prevalent in children with chronic diseases, this association no longer remained in the full logistic regression model. Attention-deficit/hyperactivity disorder was the most observed disorder and accompanied 42.9%-75% of the cases with higher cognitive disengagement syndrome. However, there was no strong support in favor of associations between cognitive disengagement syndrome and depression and anxiety as a whole.

Conclusion: This study provides the first estimates regarding the prevalence and the sociodemographic characteristics of Turkish children with cognitive disengagement syndrome. Cognitive disengagement syndrome seems to be relatively more prevalent in Turkey than in Western cultures. Children whose fathers had a psychiatric disorder, whose mothers had low education, and who were at younger ages should be scrutinized for cognitive disengagement syndrome.

Keywords: Sluggish cognitive tempo, cognitive disengagement syndrome, prevalence, sociodemographic factors, epidemiology

INTRODUCTION

Cognitive disengagement syndrome (CDS), formerly known as sluggish cognitive tempo (SCT), is a cognitive and behavioral symptom cluster that includes clinical symptoms such as daydreaming, having a hard time staying awake, decreased energy, living in one's world, and seeming to be in a confused state.[1] A recent approach by an international work group on SCT suggests the term "cognitive disengagement syndrome" to replace "SCT" as the name for this construct.[2] Previously, CDS was thought to be a subtype of attention-deficit/hyperactivity disorder (ADHD). However, recent evidence suggests that although CDS is frequently seen together with ADHD, it may be a completely distinct disorder.[3,4] Different from this perspective, some authors claim that CDS should be handled as a transdiagnostic construct, which means a clinical entity presented across diverse psychiatric diagnoses.[5] The subject of how CDS may be a transdiagnostic construct or a disorder is still an ongoing debate.[6]

Even though CDS has been identified since the 1980s, a limited amount of research is available related to the epidemiological characteristics of CDS. Although several studies suggest no evidence of any significant difference in age and sex,[3,7-10] Becker's meta-analysis indicates female dominance in sex.[6] In addition, it was reported that individuals with CDS come from families with lower socioeconomic income.[11] A recent study indicated that CDS might be associated with younger maternal age.[12]

To date, there has been a limited number of studies on the prevalence of CDS in childhood. Barkley studied the executive functioning, sociodemographic features, and comorbidity of CDS and ADHD and found that 102 of 1800 participants (5.6%) had higher CDS symptoms by using the Barkley Child Attention Survey (the BCAS).[11] A study conducted with 183 children suggested the rate of the children with significant CDS symptoms to be 11% by measuring CDS with a 4-item scale in the Child Behavior Checklist (the CDS-CBCL).[13] Servera et al studied a large population sample, and 5.7% of the sample met the symptom count criteria for CDS by measuring it with the Child and Adolescent Behavior Inventory.[14] To replicate this study, Burns and Becker[15] indicated that 4.96% of a large community sample in the United States met their criteria for CDS using the same scale as Servera et al did.[14] When we scrutinized all these studies, we explored 2 common points: They assessed the presence of CDS with only 1 scale. Moreover, none included a diagnostic and structured interview to clarify the comorbid diagnoses. Using more than one CDS measuring scale and obtaining information from multiple informants would provide a broader perspective for clinicians regarding the prevalence of CDS, sociodemographic factors, and predictors for CDS. Besides, determining the comorbidities that accompany CDS with a structured clinical interview would ensure more accurate and reliable information. Apart from that, all the existing studies concerning the prevalence of CDS belong to Western cultures. Thus, the lack of data from non-Western cultures related to the demographics of children with CDS is prominently noticeable.

To fulfill the gaps mentioned above, we aimed (i) to ascertain the prevalence and the sociodemographic characteristics of children with CDS by using 2 CDS-measuring tools obtained from 2 informants in a non-Western childhood population and (ii) to examine the relationships between CDS and other psychiatric disorders by performing a diagnostic interviews in a non-Western childhood population. We do not have any preliminary data regarding the prevalence of CDS and its sociodemographic features in non-Western countries. Hence, it is not easy to predict the prevalence of CDS in Turkish children. However, based on the previous studies, it can be estimated that the prevalence of CDS would fall within the range of 5%-11%. We also hypothesized that some maternal and paternal demographic features, such as maternal age and parental psychopathology, would be associated with CDS.

MATERIAL AND METHODS

Study Design

The present study was a multi-centered, and cross-sectional study conducted with second-, third-, and fourth-grade students residing in 4 Turkish metropolitan cities (İzmir, Bursa, Kocaeli, and Kayseri). After Medical Research Ethics Committee of Ege University approved the study (Approval No: 15-11/3, Date: September 24, 2015), schools and classrooms were selected with a randomized stratification method regarding low/middle/high socioeconomic status classified by the Provincial Directorate of National Education of each city (11 schools and 42 classrooms). Then, the students whose orders were 4 and multiples of 4 in the lists of the beginning periods in the second, third, and fourth grades were selected. Participants who qualified for the study criteria were included after written informed consents were obtained from themselves and their parents.

Participants

According to the power analysis for the study, the minimum sample size was calculated to be 265 children, with a 4.5% frequency of CDS,

a 4% variance level, and a 95% confidence level. Initially, there were 270 registered participants, but 2 were excluded from the sample as they did not complete the study. Therefore, the study was conducted with 268 children. The children whose ages were between 7 and 11 and attended the second, third, and fourth grades of elementary school were included in the study. We did not have any exclusion criteria regarding psychiatric diagnoses. Of the cases, 144 (53.7%) were boys, and 124 (46.3%) were girls. The mean age and standard deviation of the participants were 8.75 ± 0.95 years. The mean ages of the girls and the boys were 8.74 ± 0.94 and 8.76 ± 0.96, respectively.

Instruments

The sociodemographic data form: This form was created by the current study's authors to collect sociodemographic information and the health history of the parents and participants. In this form, information regarding participant age, gender, mother's/father's age, family structure status, maternal/paternal education level, child's chronic/physical disease, and mother's/father's psychiatric disorders were investigated across the participants. Regarding family structure, "elementary family" defines the type of family in which mother, father, and children live together, "extended family" defines the type of family that includes family members such as grandparents or other relatives in addition to elementary family members, and "divorced family" defines the type of family, where the parents are formally divorced.

CDS scanning scale of Child Behavior Checklist (the CDS-CBCL): The CBCL is a behavioral assessment scale developed by Achenbach and Edelbroh for children and adolescents between 4 and 18 years old.[16] Having adapted to Turkish, Erol et al performed a validity and reliability study of the 1991 version of the scale.[17] Four items included in the CBCL are part of the CDS-CBCL and have been utilized in previous studies to assess CDS.[13,18-20] The numbers of these items are, respectively, 13 (looks wooly-minded and confused), 17 (daydreams and forgets himself/herself), 80 (stares for a long time with blank eyes), and 102 (he/she is immobile, slow, and not energetic). The construct validity for these items involved in the CDS-CBCL has been performed in some studies.[21] We performed receiver operating characteristic (ROC) curve analyses via a web-based application, "easyROC: a web-tool for ROC curve analysis (ver. 1.3.1)"[22] to evaluate the discriminant validity of both parent- and teacher-reported CDS-CBCL scores between the cases with higher and lower CDS taking the BCAS measurement as a gold standard. To determine optimal cut-off points for both parent- and teacher-reported CDS-CBCL scores, we used the "OptimalCutpoints" package.[23] The area under the curve (AUC) values were equal to 0.85 (95% CI = 0.76-0.94) in terms of parent-rated CDS-CBCL, and 0.89 (95% CI = 0.79-0.99) in terms of teacher-rated CDS-CBCL. Both AUC values indicated excellent discriminant validity. We selected the "MaxKappa" method, which maximizes the kappa index[24] to detect optimal cut-off points. A score of 4 was detected as an optimal cutoff for the CDS-CBCL when rated by both parents and teachers (specificity for parent rating = 97%; sensitivity for parent rating = 41%; specificity for teacher rating = 92%; and sensitivity for teacher rating = 81%). In other words, a child with 4 or more points from the CDS-CBCL was considered to have higher CDS. The same cut-off value has been used in a previous study.[20] In addition, the Cronbach's α value was measured as 0.713 for the parent-rated CDS-CBCL and 0.743 for teacher-rated CDS-CBCL items in the current study.

Barkley Child Attention Survey (the BCAS): The BCAS comprised 12 CDS-scanning items and was developed by Barkley.[11] Internal consistency (Cronbach's α) was 0.934, and test–retest reliability was $r = 0.84$ in the original form. The validity and reliability study in Turkey was performed by Fırat et al.[25] According to the confirmatory factor analysis of the Turkish version, CDS items consisted of 2 factors (sluggishness and daydreaming). In this study, Cronbach α values were detected as 0.86 for the total, 0.83 for the daydreaming factor, and 0.80 for the sluggishness factor. The internal and external validity of the scale was evaluated, and it was stated that CDS's construct validity was relative to the inattentive presentation of ADHD by parental and teacher ratings in Turkey.[26] In order to determine the cases with higher CDS while using the BCAS, we preferred Barkley's symptom count procedure.[11] According to this procedure, children rated as occurring "often" or "very often" on at least 3 CDS symptom items were accepted as they were over the threshold of 3 or more symptoms, which was chosen as the cut point.[11] A similar approach has been performed in a previous study.[27] The Cronbach's α value was measured as 0.877 for parent-rated BCAS items and 0.930 for teacher-rated BCAS items in the present study.

Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present and Lifetime Version (the K-SADS-PL): This diagnostic tool is a semi-structured interview form used to detect present and past psychopathologies in children and adolescents. The diagnostic criteria were based on the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders. The form comprises 3 sections: unstructured initial interview, screening interview for diagnosing, and general evaluation scale for children. It was developed by Kaufman et al,[28] and the validity and reliability evaluation of the Turkish version was performed by Gökler et al.[29]

Procedures

First, participants' teachers were requested to complete the CDS scanning items of the CDS-CBCL and the BCAS for each student. Subsequently, the parents of the students included in the study were contacted and invited to participate in a clinical interview with their children. The CDS-CBCL and the BCAS were filled out by the parents (preferably the mother). In the following stage, children and parents participated in a semi-structured diagnostic interview; the K-SADS-PL, and the psychiatric diagnosis status were defined for each participant.

Determination of the Children with Higher CDS

The children with higher CDS were determined according to the BCAS and the CDS-CBCL scales filled in by parents and teachers. As a result, considering each scale's cut-off point, 4 separate CDS case groups and 4 CDS prevalence values emerged. The schematic diagram of the study procedure and the way of determination of the children with CDS are demonstrated in Figure 1.

Statistical Analysis

The resulting data were transferred to The Statistical Package for Social Sciences version 22.0 software (IBM Corp.; Armonk, NY, USA). A comparison of categorical variables was performed via Pearson chi-square analysis. Descriptive statistics of qualitative variables were expressed as a number and a frequency (%). The risk values were expressed with odds ratio (OR) and 95% CI. Two continuous variables were compared with 2 independent sample *t*-tests. Descriptive statistics for quantitative variables were reported as mean ± standard deviation. A *P*-value of less than .05 was considered statistically significant. Possible demographic variables were entered into multiple logistic regression models to examine the relationship between sociodemographic factors and CDS. Four separate multiple logistic

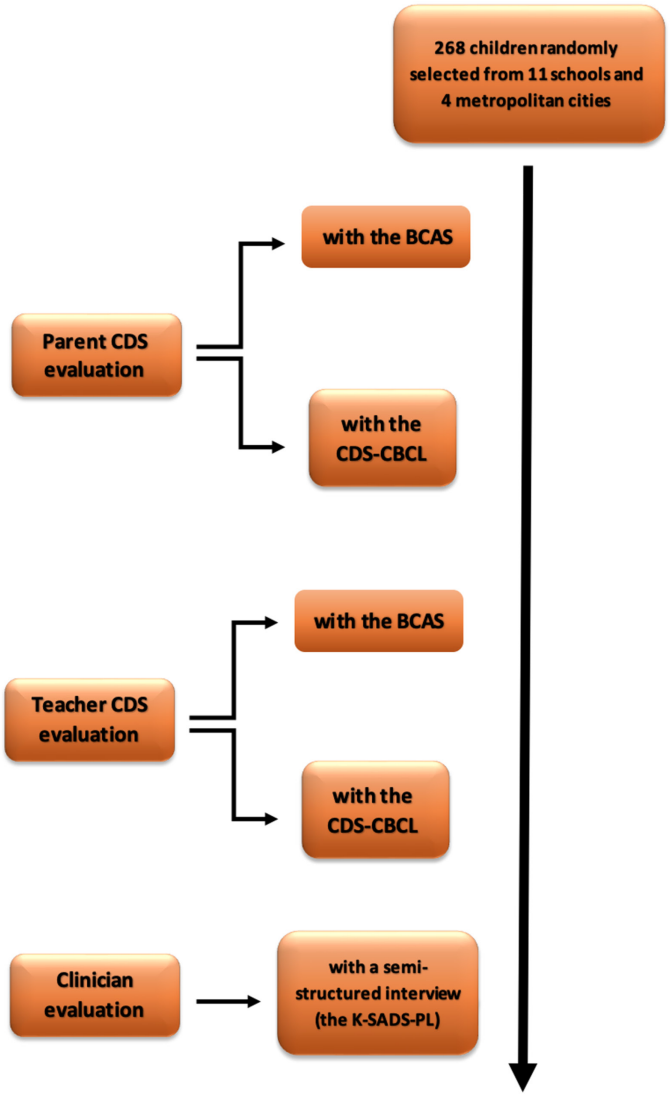

Figure 1. Schematic diagram of the study procedure. BCAS, Barkley Child Attention Survey; CDS-CBCL, CDS scanning scale of Child Behavior Check List; CDS, cognitive disengagement syndrome.

regression results were established since the cases with higher and lower CDS were determined from 4 separate measurements based on parent- and teacher-reported BCAS and the CDS-CBCL. Hosmer–Lemeshow tests indicated that all models were appropriate for the data presented for multiple logistic regression analyses ($P > .05$).

RESULTS

The Prevalence of CDS

About 7.1% of the participants (n = 19) scored above the clinical cut-off on the BCAS when rated by parents. The percentage of cases with higher CDS was 7.5% (n = 20) when teachers rated the BCAS. According to the CDS-CBCL measurement performed by parents, 4.9% (n = 13) of the cases scored above the clinical cutoff. When teachers filled out the CDS-CBCL, the prevalence of CDS was 10.9% (n = 29).

Sociodemographic and Health History Features

The sociodemographic data and health history of the sample are presented in Tables 1 and 2. According to the measurements made by each of the informants on each scale, several significant differences were detected. The mean age of the mothers whose children had higher CDS was significantly lower than that of those whose children did not have higher CDS, according to parental evaluation in the CDS-CBCL (t (14.28) = 2.50, P = .025). The rates of having a chronic physical disease were significantly higher in cases with higher CDS than in those with lower CDS, according to teacher-reported BCAS (χ^2 (1) = 5.22, P = .022, OR = 3.033, 95% CI = 1.125-8.177). Teacher's evaluations in the BCAS also revealed that fathers of cases with higher CDS were found to have significantly higher rates of psychopathology when compared to the fathers of the cases with lower CDS (χ^2 (1) = 9.26, P = .002, OR = 7.367, 95% CI = 1.675-32.403). Regarding age, gender, maternal education level, paternal education level, family structure, and maternal psychopathology, no significant differences were detected among cases with higher and lower CDS according to the measurements made by both informants on both scales (all $P > .05$).

Logistic Regression Analyses for Sociodemographic Features

To investigate possible associations between demographic factors and CDS, multiple logistic regression analyses were performed between the cases with higher and lower CDS (Table 2). The dependent or outcome variable was the status of having higher CDS. All sociodemographic factors (gender, age, mother's age, father's age, having a chronic disease, family structure status, maternal education status, psychopathology status in mother, paternal education status, and psychopathology status in father), whether related to CDS or not according to chi-square analyses, were included in the final model as independent variables. To simplify the interpretations, the "family structure" status was recoded into 2 categories: elementary family/extended family and divorced family. "Maternal and paternal education levels" were also recoded into 2 categories: no education/primary school/secondary school as low education and high school/university as high education. Thus, the final multiple logistic regression full models had accuracy rates ranging from 89.1% to 95%.

When teacher-reported BCAS was used to determine CDS, the presence of psychopathology in fathers was detected as a predictor of having higher CDS (P = .03, OR = 6.780, 95% CI = 1.205-38.160; see Table 3). When teacher-reported CDS-CBCL was taken as the measure for CDS, low maternal education increased the likelihood of higher CDS (P = .021, OR = 3.180, 95% CI = 1.163-8.694). It was also pointed out that the increase in the mother's age decreased the probability of having higher CDS (P = .012, OR = 0.740, 95% CI = 0.585-0.936) when parent-reported CDS-CBCL was used to determine CDS. No matter which scale and which informant was used to determine CDS, age, gender, father's age, having a chronic disease, family structure status, psychopathology status in the mother, and paternal education status were not statistically significant in the full model (all $P > .05$; see Table 3).

The Associations Between CDS and Psychiatric Disorders

When CDS was determined according to parent- and teacher-reported BCAS and the CDS-CBCL, the rates of those having at least 1 psychiatric diagnosis among the cases with higher CDS were found to be 78.9% (n = 15), 68.4% (n = 13), 83.3% (n = 10), and 64.3% (n = 18), respectively. These rates were significantly higher than the rates of those having at least 1 psychiatric diagnosis among the cases with lower CDS when parents assessed CDS via both the BCAS and the CDS-CBCL (χ^2 (1) = 7.90, P = .005; χ^2 (1) = 6.39, P = .011; respectively).

Table 1. Sociodemographic Information and Health History of the Parents and the Participants (When CDS Was Evaluated by Parents and Teachers Using the BCAS)

	Parent-Rated BCAS						Teacher-Rated BCAS					
	CDS– (n = 249)		CDS+ (n = 19)				CDS– (n = 248)		CDS+ (n = 20)			
	M	SD	*M*	SD	*P**	*t*	*M*	SD	*M*	SD	*P**	*t*
Age	8.73	0.95	9.00	0.81	ns	-1.36	8.75	0.95	8.75	0.78	ns	0.00
Age of mother	35.2	5.26	34.68	6.41	ns	0.40	35.16	5.28	36.35	6.05	ns	–1.26
Age of father	39.3	6.25	38.63	6.57	ns	0.43	39.10	6.14	41.30	7.56	ns	–0.85
	n	%	n	%	*P***	χ^2	n	%	n	%	*P***	χ^2
Gender (boy)	134	53.8	10	52.6	ns	0.01	134	54	10	50	ns	0.12
Presence of chronic disease	44	17.7	3	15.8	ns	0.04	40	16.1	7	36.8	**.022**	5.22
Maternal education status												
No education	4	1.6	1	5.3	ns	2.96	4	1.6	1	5	ns	2.26
Primary school	93	37.5	9	47.4			93	37.7	9	45		
Secondary school	45	18.1	4	21.1			45	18.2	4	20		
High school	80	32.3	4	21.1			79	32	5	25		
University	26	10.5	1	5.3			26	10.5	1	5		
Paternal education status												
No education	2	0.8	0	0	ns	2.68	2	0.8	0	0	ns	1.50
Primary school	54	22	6	31.6			54	22	6	30		
Secondary school	51	20.7	3	15.8			51	20.8	3	15		
High school	99	40.2	9	47.4			99	40.4	9	45		
University	40	16.3	1	5.3			39	15.9	2	10		
Family structure												
Elementary family	192	78.4	14	73.7	ns	0.43	192	78.4	14	73.7	ns	0.43
Extended family	46	18.8	4	21.1			46	18.8	4	21.1		
Divorced family	7	2.9	1	5.3			7	2.9	1	5.3		
Psychopathology in mothers												
No psychopathology	212	91	15	83.3	ns	1.13	211	90.6	16	88.9	ns	0.05
Have psychopathology	21	9	3	16.7			22	9.4	2	11.1		
Psychopathology in fathers												
No psychopathology	219	96.5	17	94.4	ns	0.19	221	97.4	15	83.3	**.002**	9.26
Have psychopathology	8	3.5	1	5.6			6	2.6	3	16.7		

Bold values mark statistically significant differences. "CDS–" refers to the cases with lower CDS. "CDS+" refers to the cases with higher CDS.
BCAS, Barkley Child Attention Scale; CDS, cognitive disengagement syndrome; ns, not significant.
*Independent samples *t*-test was performed.
**Pearson chi-square test was performed.

As expected, the most common psychiatric disorder among the cases with CDS was ADHD, with rates of 47.4% (n = 9), 52.6% (n = 10), 75% (n = 9), and 42.9% (n = 12). The second most observed psychiatric disorder among the cases with higher CDS was anxiety disorders, with rates of 31.6% (n = 6), 36.8% (n = 7), 33.3% (n = 4), and 25% (n = 7), when CDS was determined according to parent- and teacher-reported BCAS, and parent- and teacher-reported CDS-CBCL, respectively. Attention-Deficit/Hyperactivity Disorder was found to be significantly higher in cases with higher CDS than in those with lower CDS in all informant and scale-matched CDS evaluations (for parent-reported BCAS: χ^2 (1) = 4.94, *P* = .026, OR = 2.822, 95% CI = 1.095-7.275; for teacher-reported BCAS: χ^2 (1) = 7.65, *P* = .006, OR = 3.563, 95% CI = 1.381-9.191; for parent-reported CDS-CBCL: χ^2 (1) = 16.14, *P* < .001, OR = 9.931, 95% CI = 2.602-37.898; for teacher-reported CDS-CBCL: χ^2 (1) = 4.72, *P* = .023, OR = 2.397, 95% CI = 1.070-5.370; see Table 4).

The category "anxiety disorders" was constituted involving the cases in which any of the anxiety subgroups (separation anxiety disorder (SAD), generalized anxiety disorder (GAD), specific phobia (SpP), and social phobia (SP)) existed. Although anxiety disorders were detected to be higher in cases with higher CDS compared to those with lower CDS, no significant differences between the 2 groups were detected when CDS was evaluated by any of the informants and any of the scales. Social phobia was the most commonly observed anxiety subgroup and was significantly higher in cases with higher CDS according to the BCAS evaluation rated by parents (χ^2 (1) = 16.66, *P* < .001, OR = 10.578, 95% CI = 2.692-41.566), while GAD was the most observed anxiety subgroup and was significantly higher in cases with higher CDS according to the BCAS evaluation rated by teachers (χ^2 (1) = 4.88, *P* = .027, OR = 5.624, 95% CI = 1.015-31.156).

Table 2. Sociodemographic Information and Health History of the Parents and the Participants (When CDS was Evaluated by Parents and Teachers Using the CDS-CBCL)

	Parent-Rated CDS-CBCL						Teacher-Rated CDS-CBCL					
	CDS– (n = 254)		CDS+ (n = 13)				CDS– (n = 238)		CDS+ (n = 29)			
	M	SD	*M*	SD	*P**	*t*	*M*	SD	*M*	SD	*P**	*t*
Age	8.74	0.94	8.92	0.95	ns	-0.67	8.77	0.96	8.59	0.73	ns	1.24
Age of mother	35.39	5.38	32.46	4.03	**.025**	2.50	35.25	5.30	35.34	5.83	ns	–0.44
Age of father	39.32	6.36	37.75	4.04	ns	1.27	39.20	6.08	39.86	7.82	ns	-0.08
	n	%	n	%	*P***	χ^2	n	%	n	%	*P***	χ^2
Gender (boy)	136	53.5	7	53.8	ns	0.00	129	54.2	15	51.7	ns	0.06
Presence of chronic disease	46	18.2	0	0	ns	2.85	42	17.6	5	17.9	ns	0.00
Maternal education status												
No education	4	1.6	1	7.7	ns	4.44	4	1.7	1	3.4	ns	5.68
Primary school	98	38.7	4	30.8			90	38	12	41.4		
Secondary school	46	18.2	3	23.1			40	16.9	9	31		
High school	78	30.8	5	38.5			78	32.9	5	17.2		
University	27	10.7	0	0			25	10.59	2	6.9		
Paternal education status												
No education	2	0.8	0	0	ns	3.63	2	0.9	0	0	ns	3.98
Primary school	57	22.6	2	16.7			51	21.7	9	31		
Secondary school	53	21	1	8.3			50	21.3	4	13.8		
High school	100	39.7	8	66.7			93	39.6	14	48.3		
University	40	15.9	1	8.3			39	16.6	2	6.9		
Family structure												
Elementary family	195	78	10	76.9	ns	0.53	185	78.7	20	71.4	ns	0.79
Extended family	47	18.8	3	23.1			43	18.3	7	25		
Divorced family	8	3.2	0	0			7	3	1	3.6		
Psychopathology in mothers												
No psychopathology	214	90.3	12	92.3	ns	0.05	203	91	24	88.9	ns	0.13
Have psychopathology	23	9.7	1	7.7			20	9	3	11.1		
Psychopathology in fathers												
No psychopathology	222	96.1	13	100	ns	0.52	211	96.8	24	92.3	ns	1.31
Have psychopathology	9	3.9	0	0			7	3.2	2–	7.7		

Bold values mark statistically significant differences. "CDS–" refers to the cases with lower CDS. "CDS+" refers to the cases with higher CDS.
CDS-CBCL, CDS scanning scale of Child Behavior Check List; CDS, cognitive disengagement syndrome; ns, not significant.
*Independent samples *t*-test was performed.
**Pearson chi-square test was performed.

No matter which scale and which informant was used to determine CDS, major depression, SAD, SpP, obsessive–compulsive disorder, oppositional defiant disorder, tic disorder, communication disorder, enuresis, encopresis, and post-traumatic stress disorder were not observed to be significantly different between the cases with higher and lower CDS (all $P > .05$). The relationship between CDS and psychiatric disorders, as well as the frequencies of psychiatric disorders across the cases with higher and lower CDS, can be found in Table 4.

DISCUSSION

The current study found the prevalence of CDS in a range of 4.9%-10.9%. Apart from that, paternal psychopathology, low maternal education, and low maternal age were detected as CDS-related risk factors. As expected, ADHD was the most commonly observed disorder and accompanied 42.9%-75% of the cases with higher CDS. However, the study did not indicate strong support in favor of associations between depression/anxiety and CDS.

Depending on the measurement material and informant, we estimated that the prevalence of CDS ranges from 4.9% to 10.9% in Turkish school-age children, supporting our abovementioned prediction. Our result is consistent with the precursor studies. For instance, Barkley's study reported that 102 (5.6%) of 1800 children aged 6-17 were reported to have higher CDS.[11] Camprodon-Rosanas et al found that 11% of the sample had higher CDS in their study, including 183 participants aged 7-10.[13] Servera et al performed a study with a sample of 2142 Spanish children aged 8-13 years and found that 5.7% of the sample had higher CDS, whereas 2.3%-2.8% had only higher CDS without ADHD.[14] Burns and Becker[15] replicated this study in an American sample (n = 2056) aged 4-13 and detected that 4.96% of the sample had CDS; 2.58% had only higher CDS

Table 3. Logistic Regression Full Model Examining the Relationship Between Demographic and Health-Related Factors and Likelihood of CDST

Demographic predictors	Parent-Rated BCAS				Teacher-Rated BCAS				Parent-Rated CDS-CBCL				Teacher-Rated CDS-CBCL			
	β	OR	95% CI	*P*	*β*	OR	95% CI	*P*	*β*	OR	95% CI	*P*	*β*	OR	95% CI	*P*
Gender (girl)	0.165	1.179	0.438-3.178	ns	−0.031	0.969	0.349-2.688	ns	0.046	1.047	0.311-3.526	ns	0.021	1.021	0.440-2.367	ns
Chronic disease	−0.107	0.898	0.238-3.397	ns	0.717	2.049	0.669-6.274	ns	−1.131	0.323	0.031-3.410	ns	−0.096	0.909	0.306-2.700	ns
Family structure (divorced family)	0.669	1.952	0.110-34.590	ns	0.274	1.315	0.078-22.281	ns	−0.846	0.429	0.048-3.853	ns	0.562	1.753	0.133-23.077	ns
Age	0.321	1.379	0.798-2.382	ns	−0.074	0.929	0.538-1.605	ns	0.351	1.420	0.727-2.774	ns	−0.222	0.801	0.511-1.254	ns
Mother's age	−0.043	0.958	0.794-1.155	ns	−0.086	0.917	0.761-1.107	ns	**−0.301**	**0.740**	**0.585-0.936**	**0.012**	−0.040	0.961	0.824-1.120	ns
Low maternal education	0.868	2.382	0.759-7.480	ns	1.016	2.762	0.823-9.273	ns	0.411	1.508	0.389-5.849	ns	**1.157**	**3.180**	**1.163-8.694**	**0.021**
Psychopathology in mothers	0.937	2.553	0.581-11.226	ns	0.062	1.064	0.170-6.667	ns	0.655	1.926	0.196-18.878	ns	−0.033	0.967	0.184-5.081	ns
Father's age	0.018	1.018	0.863-1.200	ns	0.111	1.117	0.948-1.316	ns	0.164	1.178	0.968-1.434	ns	0.055	1.057	0.922-1.212	ns
Low paternal education	−0.337	0.714	0.242-2.105	ns	−0.332	0.718	0.238-2.166	ns	−1.137	0.321	0.071-1.445	ns	−0.384	0.681	0.276-1.680	ns
Psychopathology in fathers	0.025	1.025	0.066-15.937	ns	**1.914**	**6.780**	**1.205-38.160**	**0.030**	2.092	8.099	0.059-47.594	ns	0.735	2.086	0.333-13.084	ns
Nagelkerke R^2		0.059				0.117				0.162				0.067		

Bold values mark statistically significant differences.
BCAS, Barkley Child Attention Survey; CDS, cognitive disengagement syndrome; CDS-CBCL, CDS scanning scale of Child Behavior Check List; ns, not significant.

without ADHD, consistent with Servera's study. Most of these studies, excluding the study by Camprodon-Rosanas et al,[13] report the prevalence of CDS in the range of 4.9%-5.7%, all originating from Western countries. However, with a rate range of 4.9%-10.9%, the prevalence rate of CDS was found to be slightly higher in Turkey, a non-Western country geographically located at the intersection of Europe, Asia, and the Middle East. This condition might be interpreted as communities living in different geographies may have different frequency levels for CDS. The prevalence of CDS in the childhood population may be higher in Eurasian countries such as Turkey than in Western countries. It should be noted that the prevalence of ADHD is also higher in Turkey than in Western countries.[30,31] Given the highly overlapping relationship between CDS and ADHD, it is not surprising that CDS, like ADHD, is more prevalent in Turkey compared to Western countries.

Understanding and determining the sociodemographic factors related to CDS will enable the identification of different perspectives on the etiology of CDS. A previous study suggested that the children living in areas with a high socioeconomic vulnerability index, whose fathers are unemployed, whose maternal education level is lower, with a history of maternal smoking during pregnancy, and who are exposed to second-hand smoking at home are at a higher risk of having more CDS symptoms.[13] Some of our findings became consistent with this study regarding maternal education level. Despite the lack of associations when CDS was assessed by the BCAS and parent-rated CDS-CBCL, logistic regression analysis showed that low maternal education was associated with a 3.1-fold increased risk for elevated CDS when teachers measured CDS via the CDS-CBCL. Supportively, Becker et al indicated that the mothers of cases with CDS are more likely to have lower education levels.[5] Besides, lower parental education, annual household income, and higher parental unemployment were reported to be associated with high levels of CDS.[11] On the other hand, there are also studies indicating that there is no relationship between CDS and maternal education level.[15] In our study, such a relationship was not observed with other CDS measurements except the CDS-CBCL assessment of teachers.

When teachers evaluated CDS with the BCAS, the logistic regression analysis in the current study pointed out that the presence of a psychiatric disorder in the father predicted that CDS symptomatology would be present with a 6.7-fold increased risk in a child. When we scrutinized the literature, we did not find any data assessing the relationship between paternal psychopathology and CDS. Genetic transmission of psychopathologies from the family (especially from the father) might play a role in the formation of such a link. However, this hypothesis needs to be confirmed in different and larger samples with CDS.

When parent-rated CDS-CBCL was used to determine CDS, it was concluded that advanced maternal age had a decreasing effect on the likelihood of higher CDS in a child by 0.7. Supporting this, a recent study reported an association between younger maternal age and CDS.[12] Conversely, the mother's age has been suggested as not different among the groups with higher and lower CDS in a study.[15] However, several studies reported an association between younger maternal age and higher vulnerability to ADHD in offspring (32-34). Moreover, these studies suggested a negative correlation between maternal age and ADHD symptom intensity. Given that CDS and ADHD are intertwined developmental and psychiatric structures, it can be concluded that the effect of maternal age on psychopathology intensity in CDS may be a similar way to that in ADHD. However,

Table 4. Presence of Psychiatric Disorders in CDS According to the Measures of Parent- and Teacher-Rated BCAS and the CDS-CBCL

Psychiatric Disorders	Parent-Rated BCAS						Teacher-Rated BCAS						Parent-Rated CDS-CBCL						Teacher-Rated CDS-CBCL					
	CDS–		CDS+				CDS–		CDS+				CDS–		CDS+				CDS–		CDS+			
	n	%	n	%	*P**	χ^2	n	%	n	%	*P**	χ^2	n	%	n	%	*P**	χ^2	n	%	n	%	*P**	χ^2
ADHD	59	24.2	9	47.4	**.026**	4.94	58	23.8	10	52.6	**.006**	7.65	58	23.2	9	75	**<.001**	16.14	56	23.8	12	42.9	**.03**	4.72
MDD	5	2	1	5.3	ns	0.81	5	2	1	5.3	ns	0.81	5	2	1	8.3	ns	2.05	6	2.6	0	0	ns	0.73
SAD	18	7.4	3	15.8	ns	1.69	18	7.4	3	15.8	ns	1.69	20	8	1	8.3	ns	0.00	17	7.2	4	14.3	ns	1.69
GAD	6	2.5	1	5.3	ns	0.53	5	2	2	10.5	**.027**	4.88	7	2.8	0	0	ns	0.34	5	2.1	2	7.1	ns	2.42
SpP	28	11.5	2	10.5	ns	0.01	28	11.5	2	10.5	ns	0.01	28	11.2	2	16.7	ns	0.33	28	11.9	2	7.1	ns	0.56
SP	6	2.5	4	21.1	**<.001**	16.66	10	4.1	0	0	ns	16.66	9	3.6	1	8.3	ns	0.69	8	3.4	2	7.1	ns	0.95
Anxiety disorders ‡	49	20.1	6	31.6	ns	1.40	48	19.7	7	36.8	ns	3.14	51	20.4	4	33.3	ns	1.15	48	20.4	7	25	ns	0.31
OCD	2	0.8	0	0	ns	0.15	1	0.4	1	5.3	ns	2.67	2	0.8	0	0	ns	0.09	2	0.9	0	0	ns	0.24
ODD	9	3.7	1	5.3	ns	0.11	9	3.7	1	5.3	ns	0.11	9	3.6	1	8.3	ns	0.69	10	4.3	0	0	ns	1.23
TD	6	2.5	0	0	ns	0.47	6	2.5	0	0	ns	0.47	5	2	1	8.3	ns	2.05	6	2.6	0	0	ns	0.73
Communication Disorder	2	0.8	0	0	ns	0.15	2	0.8	0	0	ns	0.15	2	0.8	0	0	ns	0.09	1	0.4	1	3.6	ns	3.28
Enuresis	17	7	2	10.5	ns	0.33	19	7.8	0	0	ns	1.59	18	7.2	0	0	ns	0.33	16	6.8	3	10.7	ns	0.56
Encopresis	4	1.6	1	5.3	ns	1.24	5	2	0	0	ns	0.39	4	1.6	0	0	ns	0.19	4	1.7	1	3.6	ns	0.46
PTSD	3	1.2	0	0	ns	0.23	3	1.2	0	0	ns	0.23	3	1.2	0	0	ns	0.14	3	1.3	0	0	ns	0.36
Having 1 or more psychiatric disorder	111	45.5	15	78.9	**.005**	7.90	113	46.3	13	68.4	ns	3.45	115	46	10	83.3	**.011**	6.39	108	46	18	64.3	ns	3.36

Bold values mark statistically significant differences. "CDS–" refers to the cases with lower CDS. "CDS+" refers to the cases with higher CDS.
ADHD, attention-deficit/hyperactivity Disorder; BCAS, Barkley Child Attention Survey; CDS, cognitive disengagement syndrome; CDS-CBCL, CDS scanning scale of Child Behavior Check List; GAD, generalized anxiety disorder; MDD, major depressive disorder; ns, not significant; OCD, obsessive–compulsive disorder; ODD, oppositional defiant disorder; PTSD, post-traumatic stress disorder; SAD, separation anxiety disorder; SP, social phobia; SpP, specific phobia; TD, tic disorder.
*Chi-square test was performed.
‡Anxiety disorders were considered to be the totality of anxiety subgroups such as SAD, GAD, SpP, and SP.

as mentioned regarding paternal psychopathology, this association should be supported by consistent results from future studies.

The other demographic factors, such as age, gender, father's age, paternal education status, and family structure, and maternal psychopathology status, were not estimated as significant predictors of CDS. Consistently, many previous studies also indicated no male or female dominance in CDS.[3,7-10,14,15] Conversely, ADHD is seen more commonly in boys than in girls. The difference between CDS and ADHD in terms of gender distribution may be due to the close relationship between CDS with internalizing characteristics, which are more associated with girls, and ADHD with externalizing characteristics, which are more associated with boys. Regarding family structure, Burns and Becker stated that it does not significantly differ among the groups with and without CDS.[15] Consistent with this, our analyses did not show such an association. Due to the lack of knowledge in the literature, our study is the first study reporting paternal education status, maternal psychopathology status, and father's age to be the demographic variables not associated with CDS.

The present study also investigated how CDS accompanies participants' psychiatric diagnoses. According to each informant and scale-matched CDS measurement, ADHD was found to be the most prevalent disorder among the cases with higher CDS (OR = 2.3-9.9). This outcome is not surprising but consistent with previous literature. It has commonly been reported that CDS and ADHD are commonly present together.[5,7,11,19,35] Although anxiety disorders were also observed higher in cases with higher CDS compared to those with lower CDS, no bivariate analyses confirmed that anxiety disorders (as a whole) are significantly more common in CDS. As well as anxiety, the results did not provide any support for the relationship between CDS and depression. It is a commonly shared aspect that CDS symptoms mostly accompany internalizing disorders such as anxiety and depression, as well as ADHD. Despite a substantial number of evidence regarding the link between CDS and internalizing symptoms, some studies emphasize that CDS is associated with but distinct from internalizing symptoms (36-38). It is also worth mentioning that this condition in the present study might depend on the sample characteristics or CDS measurement ways. Consistent with our result, studies by Servera et al[14] and Burns and Becker[15] reported that conflicted shyness as one of the signs of social anxiety was more prominent in the CDS-only group than the ADHD-only group. In the context of the mentioned evidence, it can be assumed that the internalizing symptoms associated with CDS are more likely to be social withdrawal, social anxiety, and shyness rather than depression. To our knowledge, this is the first study that explores the relationship between CDS and GAD as a descriptive diagnosis.

The present study has some strengths. Perhaps the most significant strength is that the study covers and presents data on the prevalence and the demographic features of CDS in an epidemiological sample with all the emerging variations both by obtaining information from different informants (parents and teachers) and by using 2 different scales (the BCAS and the CDS-CBCL) related to CDS. Therefore, our study did not contain limited data from a single source or a single measurement material. Second, this study confirmed the psychiatric diagnoses of the children with a semi-structured face-to-face clinical interview in which both the parents and the children participated. Some existing studies[11,15] were performed, having the parents and teachers access internet websites and being asked to complete the online questionnaires.

The current study should be interpreted in the context of some limitations. First, the sample size was low. Since the sample was small, we could not divide the sample into "CDS-only," "CDS+ADHD," "ADHD-only," and comparison groups, and perform further comparisons among these groups. Second, since the sample group in our study represented only elementary school students between the ages of 7 and 11 years, generalizing these results to children and adolescents from other age groups would not be appropriate. Third, although the CDS-CBCL is commonly preferred scale in the studies of CDS, as a composite, it may not be an adequate symptom item for CDS. Despite this interpretation, we performed a discriminant validity analysis of the CDS-CBCL for the current study.

This study provides the first estimates regarding the prevalence, sociodemographic, and comorbidity characteristics of CDS in Turkey, a non-Western country, in a well-determined, non-referred community sample of children. The study also presents some familial and individual health-related predictors for CDS. The prevalence of CDS ranged from 4.9% to 10.9%, depending on the informant and the measurement tool. The presence of psychopathology in fathers and low maternal education were found to be predictors increasing the likelihood of CDS. In contrast, advanced maternal age was estimated to be a factor in decreasing CDS symptoms. Hence, it is essential to investigate CDS in children with such features. However, these factors were found to be significant only when CDS was measured by one of four measurement ways included in the study and should be confirmed as predictors for CDS in future studies. Age, gender, father's age, paternal education level, family structure, and psychopathology in mothers were not associated with CDS in all informant and scale-matched measurements of CDS according to both bivariate and multiple logistic regression analyses. Among the sample, ADHD was accurately the only disorder that accompanies CDS. However, anxiety disorders as a whole and depression provided no support for an association with CDS. Future studies should enlighten the unclarities regarding the status of CDS in the psychopathology field. Future studies on the epidemiology of CDS should also include studies involving structured psychiatric interviews in larger samples and confirm our results in other non-Western cultures.

Ethics Committee Approval: Ethics committee approval was received for this study from Medical Research Ethics Committee of Ege University (Approval No: 15-11/3, Date: September 24, 2015).

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