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Research / Araştırma

The Interaction Between Attention Deficit Hyperactivity Disorder and Anxiety Symptoms

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ABSTRACT

The interaction between attention deficit hyperactivity disorder and anxiety symptoms

Objective: Attention deficit hyperactivity disorder (ADHD) and anxiety disorders are commonly seen in the field of child psychiatry. Childhood ADHD and anxiety disorders are comorbid with an estimated rate of 13% to 50%. In this study, it was aimed to research anxiety symptoms and its relation with ADHD symptoms in children with ADHD.

Method: Fifty children with ADHD and 49 healthy controls (aged 8-15 years) who do not have any psychiatric diagnosis were included in study. We used socio-demographic information form, Conners' Teacher Rating Scale (CTRS), Child Behavior Checklist for 4-18 years (CBCL), The Screen for Child Anxiety Related Emotional Disorders (SCARED) both parent and child report for assessing these children. The diagnosis were made with Kiddie Schedule for Affective Disorders and Schizophrenia Present and Lifetime Version (K-SADS-PL).

Results: The anxiety disorders comorbidity rate was 24% in ADHD group. The total scores of SCARED parent and children reports were higher in ADHD group. SCARED children report scores were higher than SCARED parent report scores in both groups.

Discussion: Our results agree with the previously reported common anxiety comorbidity with ADHD and the association between attention deficit symptoms and anxiety symptoms. In our study, parents reported fewer anxiety symptoms in their children than children's self reports. Clinicians should evaluate anxiety symptoms carefully in children with ADHD that could be unnoticed by their parents. The treatment should be determined according to the comorbidities.

Key words: ADHD, anxiety, attention, children, comorbidity

ÖZET

Dikkat eksikliği hiperaktivite bozukluğu ile kaygı belirtileri ilişkisi

Amaç: Dikkat eksikliği hiperaktivite bozukluğu (DEHB) ve kaygı bozuklukları çocuk psikiyatrisi alanında sıklıkla görülen bozukluklardır. Çocukluk çağında DEHB'ye kaygı bozukluklarının eşlik etme oranı %13-50 arasında değişmektedir. Bu çalışmada DEHB tanısı alan çocuklarda kaygı belirtilerinin araştırılması, bu belirtilerin DEHB belirtileri ile ilişkisinin değerlendirilmesi ve sağlıklı kontrollerle karşılaştırılması amaçlandı.

Yöntem: Çalışmaya DEHB tanısı almış 8-16 yaş arası 50 çocuk ve herhangi bir ruhsal bozukluk tanısı almayan 48 sağlıklı kontrol dahil edildi. Katılımcıların değerlendirilmesinde sosyodemografik bilgi formu, Conners' Öğretmen Derecelendirme Ölçeği (CÖDÖ), Çocukluk Çağı Anksiyete Tarama Ölçeği (ÇATÖ) (Ebeveyn ve Çocuk Formu) ve 4-18 Yaş Çocuk ve Gençlerde Davranış Değerlendirme Ölçeği (ÇDDÖ) kullanıldı. Tanılar Okul Çağı Çocukları için Duygulanım Bozuklukları ve Şizofreni Görüşme Çizelgesi- Şimdi ve Yaşam Boyu Şekli (ÇDŞG-ŞY) ile konuldu.

Bulgular: DEHB grubunun %24'ünde kaygı bozukluğu eş tanısı saptandı. DEHB grubunda, ÇATÖ ebeveyn ve ÇATÖ çocuk formu toplam puan ortalamalarının kontrol grubundan daha yüksek olduğu belirlendi. Her iki grupta, ÇATÖ çocuk formu puanları ÇATÖ ebeveyn formu puanlarına göre daha yüksek bulundu.

Tartışma: Bu çalışmanın sonuçları kaygı belirtilerinin DEHB'ye sıklıkla eşlik ettiğini ve kaygı belirtilerinin dikkat eksikliği belirtileri ile ilişkili olduğunu doğrulamaktadır. Çalışmamızda, ebeveynler çocukların öz bildirimine kıyasla çocuklarında daha az kaygı belirtisi bildirmişlerdir. DEHB'li çocuk ve ergenlerde ebeveynleri tarafından atlanabilen kaygı belirtileri klinisyenler tarafından sorgulanmalı ve eş tanı varlığı tespit edilip tedavi yaklaşımları buna göre belirlenmelidir.

Anahtar kelimeler: DEHB, kaygı, dikkat, çocuklar, eş tanı

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INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is one of the most prevalent and studied disorder of child and adolescent psychiatry. It is reported that the prevalence of ADHD is 2-20% among school-age children and comorbidity with ADHD is relatively high (1-2). Following oppositional defiant disorder, the most frequently seen comorbidity with ADHD is anxiety disorder (3). Despite its highly prevalent comorbidity with ADHD, factors associated with anxiety disorder are less studied. It is suggested in reference to the results of clinical and epidemiological studies that, there is a consistent and bi-directional relationship between ADHD and anxiety disorders, these conditions mutually increase the prevalence of the other when compared to the prevalence in general population and display an independent transition (4-7). Moreover, introvert manifestations concomitant to anxiety symptoms is leading to less referral of those children to the clinic, when compared with other mental illnesses (8). It is assumed that the anxiety symptoms comorbid with ADHD might alter the prevalence of application to clinics. As the comorbidity of – anxiety disorder with ADHD affects the severity, long term progression, mode of treatment and treatment response of the disorder, understanding the interaction between two disorders is important (9). In our study, we aimed to investigate the anxiety symptoms reported by the child with ADHD diagnosis or their parents; and the interaction of the anxiety symptoms with ADHD.

METHOD

The study was carried out in Child and Adolescent Psychiatry Department outpatient clinics in Marmara University Hospital, one of the primary child mental health centers on the Anatolian side of Istanbul. The study was approved by the ethical committee of Marmara University (09.2010.0039). Access information of 236 children who received the diagnosis of ADHD in reference to DSM-IV between January-March 2010 was acquired in order to establish the study sample. Of those 236 children, we failed to contact 64 cases presumably because of incorrect phone number or lack of response to our call. One hundred and seventy two parents were contacted and 56 of them participated in the study. Data of six children was excluded from the statistical analysis due to low quality of rating information. ADHD group was established by including 50 eligible child and adolescent who accepted to participate. Children with mental retardation, autism spectrum disorder, psychotic disorder or a chronic medical illness were excluded.

Control group was established with the age and sex matched offsprings (child and adolescent) of the staff working in the hospital, who accepted to participate in the study. Children and adolescents with mental retardation, a chronic medical illness or mental disorder diagnosed by a semi-structured interview, were excluded.

Measures

Sociodemographic Information Form: Sociodemographic data of the participating children were collected by using the Sociodemographic Information Form filled by an investigator. Age, educational level and marital status of the parents were included in the Sociodemographic Information Form.

Conners' Teacher Rating Scale-Revised (CTRS): CTRS was developed by Conners for teachers to rate the in-class behaviors of the students (10). The first version of the scale is consisting of 39 items; later on a 28-item short version was developed (11). Efforts to prepare Turkish short version are dated to 1995, 1997 and 2007. Turkish short version is suggested to screen ADHD and disruptive behavior disorders (12-14). Short version of CTRS was used to rate the severity of ADHD symptoms in our study.

Screen for Child Anxiety Related Disorders (SCARED - parents and child form): Parents and child form is existing for Screen for Child Anxiety Related Disorders (SCARED), which was developed by Birmaher et al. (15,16) and validated for Turkish by Cakmakci (17). Scores of 25 and above are considered

as warning level for this 41-item anxiety disorder rating scale. There are also somatic/panic, generalized anxiety, separation anxiety, social anxiety and school fear subscales inside SCARED. Parents and child form of this rating scale was used to assess the anxiety levels of participating children.

The Child Behavior Checklist (ages 4-18) (CBC): Achenbach and Edenbrock (18) developed The Child Behavior Checklist (ages 4-18) (CBC) to assess the fields of skills and problematic behaviors of the children and adolescents between ages of 4-18 years, in reference to the information collected from parents. Erol and Kilic (19) translated the form 1991 of CBC and the Turkish translations were reviewed to ensure the continuity of use of form 1985 in our country. Test/Retest confidence of the rating scale was calculated as 0.70 and 0.84, respectively. Internal consistency values were found as 0.39 and 0.86, respectively (21). In our study, total problem scale score, attention-hyperactivity sub-scale score and anxiety sub-scale score were used to assess the severity of emotional and behavioral problems of the children.

Schedule for Affective Disorders and Schizophrenia for School-age Children-present and Lifetime version (K-SADS-PL): Kauffman et al. (22) developed Schedule for Affective Disorders and Schizophrenia for School-age Children-present and Lifetime version (K-SADS-PL), a semi-structured interview procedure, and the validation of the Turkish version of K-SADS-PL was studied by Gokler et al. (23). K-SADS-PL is a semi-structured interview form implemented in conformance to DSM-IV, which is used to detect both the present and the lifetime psychopathologies of children and adolescents between the ages of 6-18 years. K-SADS-PL is able to rate mood disorders, anxiety disorders, externalizing disorders, disruptive behavior disorders, substance misuse, eating disorders and tick disorders. The least possible number of parents to provide information about the child participated in the study. This rating scale was used to detect the past and present mental disorders of the participating children.

Statistical Analysis

The statistical analyses of the collected data was carried out by using Statistical Program for Social Sciences-SPSS for Windows version 17.0, a software designed to make statistics in social sciences. Assessment of counting data was made with Chi-square test. In comparative analysis of continuous data, independent t test was used in case the parametric test hypotheses are met or Mann-Whitney U test was use if parametric test hypotheses are not met. The Wilcoxon Matched-Pairs Signed-Ranks Test was utilized to compare the rating scores inside the group, if normal distribution is lacking. Pearson correlation test was used to find the power and direction of interrelation between data. Results were evaluated within the confidence limits of 95% and at a significance level of $p<0.05$.

RESULTS

Ninety-eight children (50 ADHD and 48 healthy controls) participated in our study. ADHD and control groups were age matched (11.04±2.19 and 10.27±2.04, respectively with t=1.947, p=0.054). Male ratio in ADHD and control groups were 68% and 58%, respectively (χ^2=0.985, p=0.321).

ADHD and control groups were also matched in terms of mean age of parents and distribution of marital status. The educational level of both mothers and fathers in ADHD group was statistically significantly lower than that of those in the control group (p=0.020, p<0.001) (Table 1).

Distribution of ADHD sub-types was as follows: 76% mixed, 20% primarily attention deficit and 2% primarily hyperactivity/impulsivity. In 34% of ADHD group (n=17), there was at least one comorbidity. Distribution of the comorbidities in ADHD group was as follows: 24% with oppositional defiant disorder, 18% with enuresis, 4% with conduct disorder, 8% with generalized anxiety disorder, 8% with tic disorder, 4% with encopresis, 4% with specific phobias, 2% with dysthymic disorder, 2% with obsessive-compulsive disorder and 2% with social phobia. Psychiatric assessment revealed that 8% of ADHD cases were

Table 1: Demographic characteristics of parents

	ADHD (n=50) Mean±SD		Control (n=48) Mean±SD		t	p
Age of mother (years)	37.04±5.76		38.29±5.41		-1.10	0.27
Age of father (years)	41.84±5.84		43.08±5.08		-1.12	0.26
	n	**%**	**n**	**%**	χ^2	**p**
Education of mother						
Primary school	30	60.0	14	29.2	9.41	0.02
High school or more	20	40.0	34	70.8		
Education of father						
Primary school	25	50.0	8	16.7	12.18	<0.001
High school or more	25	50.0	40	83.3		
Unity of parents						
Live together	47	94.0	48	100.0	2.97	0.24
Separate/Divorced	3	6.0	0	0.0		

ADHD: Attention Deficit Hyperactivity Disorder, χ^2: Chi square test

Table 2: Comparison of CTRS, The Child Behavior Checklist (ages 4-18) (CBC) and Screen for Child Anxiety Related Disorders (SCARED) scores between groups

	ADHD group Median (min-max)	Control Group Median (min-max)	z	p
Conners' Teacher Rating Scale-Revised (CTRS)				
Attention deficit	11 (1-23)	2.5 (0-18)	-6.82	<0.001
Hyperactivity/Impulsivity	10 (0-18)	3.5 (0-11)	-5.50	<0.001
Total	33 (6-60)	7.5 (0-35)	-7.16	<0.001
SCARED Parents	15.50 (1-59)	7.50 (0-31)	-4.58	<0.001
SCARED Children	23.05 (4-70)	15.00 (0-40)	-3.68	<0.001
CBC	**Mean±SD**	**Mean±SD**	**t**	**p**
Introversion	62.26±9.84	47.70±8.59	7.74	<0.001
Extroversion	63.04±11.25	42.35±8.48	10.20	<0.001
Anxiety symptoms	63.22±8.98	53.04±5.16	6.88	<0.001
Attention problems	71.65±10.06	51.83±3.76	12.14	<0.001
Total	66.51±9.40	43.89±8.61	12.33	<0.001

CBC: The Child Behavior Checklist (ages 4-18), SCARED - parents and child form: Screen for Child Anxiety Related Disorders, ADHD: Attention Deficit Hyperactivity Disorder

suffering from specific learning disability.

The distribution of past diagnoses of both the ADHD and control groups was as follows: 14% enuresis, 10% depressive disorder, 6% separation anxiety disorder, 6% tic disorder, 4% encopresis and 2% post-traumatic stress disorder in ADHD group; 8.3% enuresis, 4.2% tic disorder, and 2.1% separation anxiety disorder in control group.

In ADHD group, consolidated (past and present) ratio of anxiety disorders was 24% (present 16%).

CTRS total and sub-scale scores in ADHD were all statistically significantly higher than those of the control group (Table 2). SCARED for parents and child total score for child in ADHD group, which was statistically significantly higher than the score of the control group, revealed the high level of anxiety symptoms (Table 2).

Mean scores of SCARED for both the parents and the child were moderately directly proportional and correlated in ADHD group (p=0.023, r=0.322). Mean score of SCARED for child was statistically significantly higher in ADHD group than in the control group (z=-2.936, p=0.003, z=-3.587, p<0.001 in ADHD and control groups, respectively).

The scores of Child Behavior Checklist (ages 4-18) (CBC), which is used to assess the behavioral problems, for introversion, extroversion, attention and anxiety

Table 3: Distribution of Conners' Teacher Rating Scale-Revised (CTRS), The Child Behavior Checklist (ages 4-18) (CBC) and Screen for Child Anxiety Related Disorders (SCARED) scores and The Child Behavior Checklist (ages 4-18) (CBC) scores of ADHD group between sexes

	Female Median (min-max)	Male Median (min-max)	z	p
CTRS				
Attention deficit	11 (5-15)	13 (1-23)	-0.60	0.54
Hyperactivity/Impulsivity	9 (0-18)	11 (3-18)	-0.89	0.37
Total	29 (10-48)	37 (6-60)	-1.29	0.19
SCARED parents	18.00 (1-59)	15.00 (3-45)	-0.16	0.86
SCARED children	24.00 (4-70)	23.00 (4-52)	-0.66	0.50
CBC	**Mean±SD**	**Mean±SD**	**t**	**p**
Introversion	62.12±9.52	62.33±10.14	-0.69	0.94
Extroversion	57.37±9.05	65.78±11.29	-2.59	0.01
Anxiety symptoms	61.43±7.92	64.09±9.45	-0.96	0.33
Attention problems	66.68±8.17	72.57±10.44	0.26	0.05
Total	63.56±7.24	67.93±10.08	-1.54	0.12

CBC: The Child Behavior Checklist (ages 4-18), SCARED - parents and child form: Screen for Child Anxiety Related Disorders, ADHD: Attention Deficit Hyperactivity Disorder

Table 4: Correlation between anxiety symptoms and attention deficit and hyperactivity disorder symptoms in ADHD group

	CTRS total	CTRS attention deficit	CTRS hyperactivity	CBC total	CBC introversion	CBC extroversion	CBC attention problems
SCARED children	0.349***	0.209***	0.151*	0.349***	0.166*	0.097*	0.150*
SCARED parent	0.310**	0.401****	0.042*	0.322**[a]	0.440****	0.046*[a]	0.308**
CBC anxiety symptoms	0.312**	0.322**	0.081*	0.808*****	0.895*****[a]	0.714*****[a]	0.703*****

*p>0.05, **p<0.05, ***p=0.01, ****p<0.01, *****p<0.001. CTRS: Conners' Teacher Rating Scale-Revised, CBC: The Child Behavior Checklist (ages 4-18), SCARED – parents and child form: Screen for Child Anxiety Related Disorders, ADHD: Attention Deficit Hyperactivity Disorder, p[a]: pearson correlation coefficient (r), others are spearman correlation coefficient

level sub-scales were statistically significantly higher than those of the control group (p<0.001) (Table 2). CBC scores for extroversion were higher in males in both groups (Table 3).

In ADHD group, attention deficit subscale mean scores of CTRS were directly proportional and correlated with SCARED mean score for parents (p<0.05, r=0.401) and mean score of CBC anxiety symptoms subscale (p<0.05, r=0.322) moderately. The mean score of CBC anxiety symptoms subscale and the mean score of CBC attention problems subscale were highy in direct proportion and correlation (p<0.001, r=0.703) (Table 4).

DISCUSSION

ADHD is known to co-exist usually with more than one psychiatric disorders and the comorbid mental illness increases the severity of the clinical manifestation of ADHD and the prevalence of applications to healthcare settings as well as the number of initiated treatments (5,24-27). Despite the high prevalence of ADHD comorbidity with anxiety disorders, the number of studies in this field is surprisingly few (3,5,7). It has been demonstrated that the comorbidity of ADHD with anxiety disorders reduced the treatment response; adverse effects of the medications used to treat every other disorder might worsen the manifestations of the co-existing disorder and impair the functionality (9,28-30). Consequently, rating of anxiety symptoms in our sample with ADHD diagnosis was made based on the reporting of parents and self-reporting of the children. In our study, we recorded that anxiety symptoms were seen more common in children with ADHD diagnosis with no significant difference between genders and attention deficit were associated with anxiety symptoms.

While there exist differences between general population samples and clinical samples, comorbidity ratio of anxiety disorders with ADHD varies between 13-50% (31,32). In our sample, comorbidity ratio of ADHD with anxiety disorders was 16% with respect to present diagnosis while it was 24%, when past diagnosis is added on. Variance between results of different studies could be due to the utilization of different rating scales and rating different age groups. Additionally, studies carried out in this field have been mentioning about some differences in the methodologies used to define ADHD and anxiety disorders (33). Existence of dimensional approaches along with the clinical approach grounded on DSM-IV and evaluation of anxiety disorders as constellations might lead to some differences (34).

Many of anxiety disorders are known to be more prevalent among female children (35). However, there are different opinions about the sex-effect on the comorbidity of anxiety disorders with ADHD. In a meta-analysis, Gaub and Carlson (36), determines that hyperactivity and externalizing behaviors have rarely been seen whereas mood and anxiety disorders have been more prevalent in the female children with ADHD diagnosis, sampled from general population. In a recent study, no difference was found in the prevalence of comorbid psychiatric disorders between male and female children with ADHD diagnosis (37). Similarly, Faraone et al. (38) suggested that gender plays a role in the psychiatric disorders co-existing with ADHD as well as their parental transition. In our study, where we detected no difference between genders in terms of anxiety symptoms, lesser prevalence of extroversion traits was observed in female children. Although our data sources and the research methods were different than previously conducted studies, our results are supporting the lack of gender-effect on the anxiety disorders accompanying ADHD.

Parents of the children in the ADHD group described their kids as more anxious, less attentive, more hyperactive and behaviorally more problematic, when compared with the control group. Children in the ADHD group described themselves as more anxious than those in the control group. Teachers of our sample on the other hand, reported that attention deficit as well as the hyperactivity/impulsivity symptoms was relatively more prevalent in the ADHD group. The higher frequency of comorbidity in ADHD and demonstration of problematic behaviors in more than one environment such as home, school and social vicinity are able to explain the relatively higher scores of ADHD group in the reports of parents, children and teachers (35). However, the interrelation of the psychiatric symptoms comorbid with ADHD has scarcely been studied. In previous studies comparing Screen for Child Anxiety Related Disorders (SCARED) scores of the children and the parents, a moderately directly proportional relationship was displayed between the reports of the parents and their children, consistent with our findings. As coherent to the previously published studies, children in both groups self-rated themselves more anxious than they were rated by their parents (31,39,40). Although anxiety complaints create a subjective coercion in children, they are less likely to display a manifesting behavior that is remarkable and describable by the parents; thus, anxiety disorders in children might be under-diagnosed (8).

There are studies demonstrating differences between ADHD sub-types as a matter of clinical features and comorbidity rates (41-43). It is suggested that the mixed sub-type (hyperactivity/impulsivity co-existing with attention deficit) is more prevalent in male children, oppositional defiant disorder and hyperactivity disorder have higher prevalence of comorbidity with this sub-type and even so, learning disorders have been een more in attention deficit sub-type (41,44). Studies with a clinical sample were demonstrating a higher frequency of comorbidity of anxiety disorder and depression with attention deficit sub-type while studies with a general population sample were detecting a more prevalent comorbidity of anxiety and depression in mixed sub-type (43). Studies carried out in clinical samples in Turkey show a higher comorbidity of somatic/panic and generalized anxiety symptoms with the mixed sub-type (45). The use of clinical interviews in some studies and self-rating scales in some others may explain the discrepancy of results. In our study, we failed to compare the ADHD sub-types in terms of anxiety

symptoms due to low sample size but we detected the association of anxiety symptoms and attention deficit, in agreement with the literature (46). However, none of the rating scales used showed an association between hyperactivity/impulsivity and anxiety symptoms. It is indicated that anxiety and attention deficit are the symptoms that are often overlooked by the parents and the threshold of symptom severity to seek for medical help is relatively high (8,47). Attention deficit and anxiety symptoms were concluded to be germane in our sample as the anxiety symptoms appear to be intense among the attention deficit sub-types, who apply to our clinics. In the course of study design in this field, recruitment of a larger sample and examination of general population samples would be helpful for a better assessment of the comorbidity rates between ADHD sub-types.

The results of our study should be evaluated within the frame of the strengths and limitations of the study. The leading constraint of our study is the low sample size, which led to inability to evaluate the comorbidity between ADHD sub-types. Another limitation of our study is the lack of examination of some demographic parameters such as income and habitat. In some publications, income level of ADHD cases is stated to be lower than that of the control group (3). Because we recruited our control subjects from the parents, who work as a healthcare provider, there was an inherent difference in the socioeconomic levels between two groups; this discrepancy depleted the power of our study. Differentiation of demographic characteristics between groups was evaluated in some studies about ADHD sub-types (44). The relevance between the educational and socioeconomic levels of parents makes the relatively low parental educational level of ADHD groups consistent with the literature (3). Moreover, the relatively low educational level of the parents of ADHD cases is a confusing factor for understanding and answering the items of rating scales as well as for establishing a causal connection, due to the socioeconomic difference. Studies demonstrating an inversely proportional relationship between the economical power and depression and anxiety in children and adolescents, led us consider that the relatively high level of anxiety in our ADHD group could be associated with an ADHD–related factor regardless of the socioeconomic difference (48). Equalizing the socioeconomic levels of groups in new ADHD studies may help understand the causality relationship between socioeconomic level and anxiety symptoms. According to DSM-IV, diagnosis of psychiatric symptoms requires an impairment of functionality in more than one environment (35). Therefore, joint use of child, parents and teacher forms in the assessment of ADHD and anxiety symptoms makes our findings more reliable.

In conclusion, the anxiety symptoms of the children and adolescents with ADHD diagnosis that could be overlooked by the parents should be evaluated and treatment should be designed in consideration of comorbidity, by the clinicians. Considering the cross-sectional design, there is no causality analysis of data in our study. Taking into account the adverse effects of the comorbidity of these two disorders on the clinical practice, selection of a treatment option, progression of the illness and remission, it becomes apparent that we need more structured and long-term studies in this field.

REFERENCES

1. Faraone S, Sergeant J, Gillberg C, Biederman J. The worldwide prevalence of ADHD: is it an American condition? World Psychiatry 2003; 2:104-113.

2. Polanczyk G, De Lima MS, Horta BL, Biederman J, Rohde LA. The worldwide prevalence of ADHD: A systematic review and metaregression analysis. Am J Psychiatry 2007; 164:942-948. **[CrossRef]**

3. Biederman J. Attention-deficit/hyperactivity disorder: a selective overview. Biol Psychiatry 2005; 57:1215-1220. **[CrossRef]**

4. August GJ, Realmuto GM, MacDonald AW 3rd, Nugent SM, Crosby R. Prevalence of ADHD and comorbid disorders among elementary school children screened for disruptive behavior. J Abnorm Child Psychol 1996; 24:571-595. **[CrossRef]**

5. Biederman J, Milberger S, Faraone SV, Kiely K, Guite J, Mick E, Ablon SJ, Warburton R, Reed E, Davis SG. Impact of adversity on functioning and comorbidity in children with attention-deficit hyperactivity disorder. J Am Acad Child Adolesc Psychiatry 1995; 34:1495-1503. **[CrossRef]**

6. Biederman J, Faraone SV, Keenan K, Steingard R, Tsuang MT. Familial association between attention deficit disorder and anxiety disorders. Am J Psychiatry 1991; 148:251-256.

7. Braaten EB, Biederman J, Monuteaux MC, Mick E, Calhoun E, Cattan G, Faraone SV. Revisiting the association between attention-deficit/hyperactivity disorder and anxiety disorders: a familial risk analysis. Biol Psychiatry 2003; 53:93-99. **[CrossRef]**

8. Monga S, Birmaher B, Chiappetta L, Brent D, Kaufman J, Bridge J, Cully M. Screen for Child Anxiety-Related Emotional Disorders (SCARED): convergent and divergent validity. Depress Anxiety 2000; 12:85-91. **[CrossRef]**

9. Hammerness P, Geller D, Petty C, Lamb A, Bristol E, Biederman J. Does ADHD moderate the manifestation of anxiety disorders in children? Eur Child Adolesc Psychiatry 2010; 19:107-112. **[CrossRef]**

10. Conners CK. A teacher rating scale for use in drug studies with children. Am J Psychiatry 1969; 126:884-888. **[CrossRef]**

11. Conners CK. Rating scales for use in drug studies with children. Psychopharmacol Bull 1973; 9(Special Issue):24-84.

12. Sener S, Dereboy C, Dereboy IF, Sertcan Y. Conners' Teacher Rating Scale Turkish Version-1. Turkish Journal of Child and Adolescent Mental Health 1995; 2:131-141. (Turkish)

13. Dereboy C, Sener S, Dereboy IF, Sertcan Y. Conner's Teacher Rating Scale Turkish Version-II. Turkish Journal of Child and Adolescent Mental Health 1997; 4:10-18. (Turkish)

14. Dereboy C, Senol S, Sener S, Dereboy F. Validation of the Turkish versions of the short-form Conners' teacher and parent rating scales. Turk Psikiyatri Derg 2007; 18:48-58. (Turkish)

15. Birmaher B, Khetarpal S, Brent D, Cully M, Balach L, Kaufman J, Neer SM. The Screen for Child Anxiety Related Emotional Disorders (SCARED): scale construction and psychometric characteristics. J Am Acad Child Adolesc Psychiatry 1997; 36:545-553. **[CrossRef]**

16. Birmaher B, Brent DA, Chiappetta L, Bridge J, Monga S, Baugher M. Psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED): a replication study. J Am Acad Child Adolesc Psychiatry 1999; 38:1230-1236. **[CrossRef]**

17. Cakmakci FK. Validation of the Anxiety Disorders Screening Scale for Children. Unpublished Master's Thesis, Kocaeli University, Faculty of Medicine, Department of Child Psychiatry, Kocaeli, 2004. (Turkish)

18. Achenbach TM, Edelbrock C. Manual for the Child Behavior Checklist/4-18 and Revised Child Behavior Profile. Burlington: University of Vermont, Department of Psychiatry, 1983.

19. Erol N, Simsek Z. Mental health among children and adolescents: distribution of problems associated with fields of skills, behaviors and emotions. In: Erol N, Kilic C, Ulusoy M, Kececi M, Simsek Z (editors). Mental Health Profile Report of Turkey. First Ed., Ankara: Eksek Tanitim Ltd. Sti., 1998, 25-75. (Turkish)

20. Akcakin M. Introduction and validity of behavioral assessment scale for children. Turk Psikoloji Dergisi 1985; 5:3-6. (Turkish)

21. Erol N, Arslan BL, Akcakin M. The adaptation and standardization of the Child Behavior Checklist among 6-18 year old Turkish children. In: Sergeant J (editor). Eunethdis: European Approaches to Hyperkinetic Disorder. Zürih: Fotoratar, 1995, 97-113.

22. Kaufman J, Birmaher B, Brent D, Rao U, Flynn C, Moreci P, Williamson D, Ryan N. Externalizing initial reliability and validity data. J Am Acad Child Adolesc Psychiatry 1997; 36:980-988. **[CrossRef]**

23. Gokler B, Unal F, Pehlivanturk B, Kultur EC, Akdemir D, Taner Y. Reliability and Validity of Schedule for Affective Disorders and Schizophrenia for School Age Children-Present and Lifetime Version-Turkish Version (K-SADS-PL-T). Turk J Child Adolesc Ment Health 2004; 11:109-116. (Turkish)

24. Pliszka, SR, Carlson CL, Swanson JM. ADHD With Comorbid Disorders: Clinical Assessment And Management. New York: The Guilford Press, 1999, 150-162.

25. Greene RW, Biederman J, Faraone SV, Monuteaux MC, Mick E, DuPre EP, Fine CS, Goring JC. Social impairment in girls with ADHD: patterns, gender comparisons, and correlates. J Am Acad Child Adolesc Psychiatry 2001; 40:704-710. **[CrossRef]**

26. Volk HE, Neuman RJ, Todd RD. A systematic evaluation of ADHD and comorbid psychopathology in a population-based twin sample. J Am Acad Child Adolesc Psychiatry 2005; 44:768-775. **[CrossRef]**

27. Connor DF, Steeber J, McBurnett K. A review of attention-deficit/hyperactivity disorder complicated by symptoms of oppositional defiant disorder or conduct disorder. J Dev Behav Pediatr 2010; 31:427-440. **[CrossRef]**

28. MTA Cooperative Group. Moderators and mediators of treatment response for children with ADHD. Arch Gen Psychiatry 1999; 56:1088-1096.

29. Diamond IR, Tannock R, Schachar RJ. Response to methylphenidate in children with ADHD and comorbid anxiety. J Am Acad Child Adolesc Psychiatry 1999; 38:402-409. **[CrossRef]**

30. Tannock R, Ickowicz A, Schachar R. Differential effects of methylphenidate on working memory in ADHD children with and without comorbid anxiety. J Am Acad Child Adolesc Psychiatry 1995; 34:886-896. **[CrossRef]**

31. Cosi S, Canals J, Hernández-Martinez C, Vigil-Colet A. Parent–child agreement in SCARED and its relationship to anxiety symptoms. J Anxiety Disord 2010; 24:129-133. **[CrossRef]**

32. Bowen R, Chavira DA, Bailey K, Stein MT, Stein MB. Nature of anxiety comorbid with attention deficit hyperactivity disorder in children from a pediatric primary care setting. Psychiatry Res 2008; 157:201-209. **[CrossRef]**

33. Mennin D, Biederman J, Mick E, Faraone SV. Towards defining a meaningful anxiety phenotype for research in ADHD children. J Atten Disord 2000; 3:192-199. **[CrossRef]**

34. Jarret MA, Ollendick TH. A conceptual review of the comorbidity of attention-deficit/hyperactivity disorder and anxiety: Implications for future research and practice. Clin Psychol Rev 2008; 28:1266-1280. **[CrossRef]**

35. Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV). Washington DC: American Psychiatric Association, 1994.

36. Gaub M, Carlson CL. Gender differences in ADHD: a meta-analysis and critical review. J Am Acad Child Adolesc Psychiatry 1997; 36:1036-1045. **[CrossRef]**

37. Biederman J, Faraone SV, Keenan K, Benjamin J, Krifcher B, Moore C, Sprich-Buckminster S, Ugaglia K, Jellinek MS, Steingard R, Spencer T, Norman D, Kolodny R, Kraus I, Perrin J, Keller MB, Tsuang MT. Further evidence for family-genetic risk factors in attention deficit hyperactivity disorder: Patterns of comorbidity in probands and relatives in psychiatrically and pediatrically referred samples. Arch Gen Psychiatry 1992; 49:728-738. **[CrossRef]**

38. Faraone SV, Biederman J, Mick E, Doyle AE, Wilens T, Spencer T, Frazier E, Mullen K. A family study of psychiatric comorbidity in girls and boys with attention-deficit/hyperactivity disorder. Biol Psychiatry 2001; 50:586-592. **[CrossRef]**

39. Muris P, Merckelbach H, Van Brakel A, Mayer AB. The revised version of the screen for child anxiety related emotional disorders (SCARED-R): further evidence for its reliability and validity. Anxiety Stress Coping 1999; 12:411-425. **[CrossRef]**

40. Nauta MH, Scholing A, Rapee RM, Abbott M, Spence SH, Waters A. A parent-report measure of children's anxiety: psychometric properties and comparison with child-report in a clinic and normal sample. Behav Res Ther 2004; 42: 813-839. **[CrossRef]**

41. Weiss M, Worling D, Wasdell M. A chart review study of the inattentive and combined types of ADHD. J Atten Disord 2003; 7:1-9. **[CrossRef]**

42. Maedgen JW, Carlson CL. Social functioning and emotional regulation in the attention deficit hyperactivity disorder subtypes. J Clin Child Psychol 2000; 29:30-42. **[CrossRef]**

43. Carlson CL, Mann M. Attention-deficit/hyperactivity disorder, predominantly inattentive subtype. Child Adolesc Psychiatr Clin N Am 2000; 9:499-510.

44. Grizenko N, Paci M, Joober R. Is the inattentive subtype of ADHD different from the combined/hyperactive subtype? J Atten Disord 2010; 13:649-657. **[CrossRef]**

45. Fis N, Kayan E, Murat D. Poyraz OT, Irmak MY, Buyukdeniz A, Arman A. Distribution of anxiety symptoms among the subtypes of Attention Deficit Hyperactivity Disorder. 22th National Child and Adolescent Mental Health Congress (24-27th of April, 2012). Book of Abstracts. Bolu: 2012, 84-85. (Turkish)

46. Baldwin JS, Dadds MR. Examining alternative explanations of the covariation of ADHD and anxiety symptoms in children: a community study. J Abnorm Child Psychol 2008; 36:67-79. **[CrossRef]**

47. Martin A, Volkmar FR. Lewis's Child and Adolescent Psychiatry: A Comprehensive Textbook. Fourth Ed. Philadelphia: Lippincott Williams & Wilkins, 2007, 439.

48. Lemstra M, Neudorf C, D'Arcy C, Kunst A, Warren LM, Bennett NR. A systematic review of depressed mood and anxiety by SES in youth aged 10-15 years. Can J Public Health 2008; 99:125-129.