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# The Effects of ODD Comorbidity on Internalizing and Externalizing Symptoms in Children and Adolescents with ADHD

## DEHB Olan Çocuk ve Ergenlerde KOKGB Komorbiditesinin İçselleştirme ve Dışsallaştırma Semptomları Üzerindeki Etkileri

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**ABSTRACT**

**Aim:** Oppositional defiant disorder (ODD) is the most common psychiatric disorder comorbid with attention deficit hyperactivity disorder (ADHD). This study aims to identify the areas of difficulty and to evaluate the internalizing and externalizing symptoms of children and adolescents diagnosed with ADHD with and without ODD comorbidity.

**Materials and Methods:** The study was conducted with 51 children and adolescents with ADHD and 51 children and adolescents with ADHD+ODD. The Strengths and Difficulties Questionnaire (SDQ) was used to determine the areas of difficulty experienced by the children, and the Revised Child Anxiety and Depression scale was used to assess depression and anxiety levels, rated separately by the children and their parents.

**Results:** In children's statements, emotional problems, peer problems, internalization, total difficulty, and de-pression scores were significantly higher in the ADHD+ODD group compared to the ADHD group ($p<0.05$). In the ADHD+ODD group, behavioral problems, attention-deficit/hyperactivity, externalization, total difficulties, anxiety, and depression scores were found to be higher on the parental scales compared to the ADHD group. In the binary logistic regression analysis examining the predictive factors related to the presence of ODD comor-bidity, it was found that externalizing symptoms such as conduct problems and attention-deficit/hyperactivity obtained from the parent-rated SDQ sub-scales predicted ODD.

**Conclusion:** Our findings suggest that the presence of ODD comorbidity leads to an increase in internalizing and externalizing symptoms in children with ADHD and that children's and parents' reports of subjective expe-riences may differ from each other.

**Keywords:** Attention deficit hyperactivity disorder, oppositional defiant disorder, internalizing, externalizing, symptoms

**ÖZ**

**Amaç:** Bu çalışmada, karşıt olma karşı gelme bozukluğu (KOKGB) komorbiditesi olan ve olmayan dikkat eksikliği hiperaktivite bozukluğuna (DEHB) tanılı çocuk ve ergenlerin güçlük yaşadıkları alanların tespit edilmesi, içselleştirme ve dışsallaştırma semptomlarının değerlendirilmesi amaçlanmıştır.

**Gereç ve Yöntem:** Çalışmaya DEHB olan 51 çocuk ve ergen ve DEHB+KOKGB olan 51 çocuk ve ergen dahil edildi. Katılımcılar okul çağı çocukları için duygulanım bozuklukları ve şizofreni çizelgesi, şimdi ve yaşam boyu versiyonu kullanılarak değerlendirildi. Çocukların yaşadıkları zorluk alanlarını belirlemek için Güçler ve Güçlükler Anketi (GGA), depresyon ve anksiyete düzeylerini değerlendirmek çocuklar için kaygı ve depresyon ölçeği-yenilenmiş kullanıldı.

**Bulgular:** Çocuk bildirimlerinde DEHB+KOKGB grubunda duygusal sorunlar, akran sorunları, internalizasy-on, toplam güçlük ve depresyon puanlarının DEHB grubuna göre anlamlı derecede yüksek olduğu saptanmıştır. DEHB+KOKGB grubunda DEHB grubuna kıyasla ebeveyn ölçeklerinde davranış sorunları, dikkat eksikliği/aşırı hareketlilik, eksternalizasyon, toplam güçlük, anksiyete ve depresyon puanlarının daha yüksek olduğu bulunmuştur. KOKGB komorbiditesi varlığı ile ilgili yordayıcı faktörlerin incelendiği binary lojistik regresyon analizinde, ebeveyn tarafından derecelendirilen GGA

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alt ölçeklerinden elde edilen davranış sorunları ve dikkat eksikliği/aşırı hareketlilik gibi dışsallaştırma semptomlarının KOKGB'nu öngördüğü tespit edilmiştir.

**Sonuç:** Bulgularımız, KOKGB komorbiditesi varlığının DEHB'li çocuklarda içselleştirme ve dışsallaştırma semptomlarında artışa neden olduğunu ve çocukların ve ebeveynlerin öznel deneyimler yoluyla verdikleri rapor-ların birbirlerinden farklılık gösterebileceğini düşündürmektedir.

**Anahtar Kelimeler:** Dikkat eksikliği hiperaktivite bozukluğu, karşıt olma-karşı gelme bozukluğu, içselleştirme, dışsallaştırma, belirtiler

## INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder that is characterized by developmentally inappropriate levels of inattention, hyperactivity and impulsivity[1]. Although the age of onset is in childhood, persistence in adolescence and adulthood is common. ADHD is more common in males, and both externalizing and internalizing disorders are quite prevalent[2]. Oppositional defiant disorder (ODD) is the most common comorbid disorder among children with ADHD[3]. The high comorbidity of ADHD and ODD is evident even in the early years of life[4]. ADHD and ODD alone can cause significant impairments in family, school, and social functioning. Additionally, functional impairments worsen when these disorders co-occur[5]. It has been reported that when ADHD and ODD symptoms are observed together, they result in different and more negative clinical manifestations than the effects of ADHD symptoms alone[6]. In addition, it has been shown that the association of ADHD and ODD leads to higher behavioral and emotional difficulties[7]. Symptoms of oppositional defiant behavior, inattention, and hyperactivity are more severe when ADHD and ODD co-occur[8]. Another study showed that the ADHD+ODD group exhibited higher anxiety/depression scores, more problems in peer relationships, and lower academic achievement than the ADHD group[9].

The existing literature reports that the relationship between ADHD and ODD is associated with academic performance, depressive symptoms, peer rejection, and peer bullying in childhood and that this association may lead to more negative outcomes at later ages[10]. Most of these studies were based on symptoms reported by parents. Studies focusing on symptom assessment indicate that reports given by children and parents through subjective and objective experiences differ from each other[11]. It is known that parent-reported measures can report more accurately about a child's objective experiences, whereas child self-report measures provide important information about subjective experiences that cannot be obtained from other sources such as parents. Considering all these, it seems to be a more accurate approach to make use of both parent- and child-reported measures in symptom assessment.

This study aimed to identify areas of difficulty and assess depression and anxiety levels in children and adolescents with ADHD with and without ODD. Our aim was not only to focus on externalizing and internalizing symptoms but also to assess how children and parents perceive symptoms using both self-report and parent-reported measures. We hypothesized that parents are a better source of information than children for externalizing symptoms due to their more observable nature and that children are a better source of information for internalizing symptoms because they experience less observable emotional difficulties.

## MATERIALS AND METHODS

### Participants

The study sample consisted of children and adolescents aged 8-17 years with ADHD with and without comorbidity of ODD who were admitted to the Child and Adolescent Psychiatry Outpatient Clinic between June 2022 and October 2022. The study groups were divided into ADHD without comorbidity and ADHD with ODD. Participants with psychiatric disorders other than ADHD and ODD (specific learning disorder, intellectual disability, other neurodevelopmental disorders including autism spectrum disorder, conduct disorder, major depression, anxiety disorders) were excluded. Participants with a history of used psychiatric medications in the last 6 months were also excluded from thestudy.

All study procedures were planned according to the Declaration of Helsinki, and the local laws and regulations. The research was carried out by taking the necessary permissions from the Ethics Committee of the Clinical Research, Atatürk University Faculty of Medicine (decision no: B.30.2.0.01.00/475, date: 02.06.2022).

The study procedure was explained to the participants and their parents, and written informed consent was obtained from parents who agreed to participate in the study. In addition, the children and their parents verbally agreed to participate in the study.

### Procedure

Sociodemographic and clinical data were obtained using a questionnaire prepared by the researchers. All children and adolescents in the study group were evaluated by a certified child and adolescent psychiatrist using the Schedule for Affective Disorders and Schizophrenia for School-Age Children-

Present and Lifetime Version (K-SADS-PL)[12], and ADHD and ADHD+ODD were diagnosed according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition criteria[1]. The K-SADS-PL has been used to support ADHD and ODD diagnoses according to the DSM-5 criteria, as well as to identify possible psychiatric comorbidities, through clinical interviews. The Strengths and Difficulties Questionnaire (SDQ)[13] was used to determine the areas of difficulty experienced by the subjects, and the Revised Child Anxiety and Depression scale (RCADS)[14] was completed by the subjects themselves and their parents to assess depression and anxiety levels. Psychiatric diagnoses were made by child and adolescent psychiatrists through clinical interviews, while internalizing and externalizing symptoms were assessed using scales.

## Materials

**Sociodemographic Data Form:** The questionnaire prepared within the scope of the study was used to collect information about the demographic data (age, gender, grade, duration of maternal and paternal education, income status, etc.) of the children and their parents.

**Schedule for Affective Disorders and Schizophrenia for School- Age Children-Present and Lifetime version DSM-5 November 2016 - Turkish Adaptation:** This schedule was developed by Kaufman et al.[12]. The same interview chart was renewed to comply with the DSM-5 diagnostic criteria. In the first part of the interview schedule, basic information about the sociodemographic characteristics, complaints, developmental history, and general functionality of the child and his/her family was questioned in an unstructured interview. The second part included screening questions that assessed more than 200 specific symptoms, both past and present (in the last two months). The third part consisted of assessment and observation results to confirm the DSM-5 diagnoses. At the end of the interview, the clinician's observations and information received were evaluated and scored together. Its Turkish validity and reliability study was conducted by Ünal et al.[15].

**Strengths and Difficulties Questionnaire:** The SDQ was developed by Goodman[13] for use in screening mental health problems in children and adolescents. The subscales of the scale consist of attention deficit/hyperactivity, behavioral problems, emotional problems, peer problems, and social behaviors. Each subscale can be evaluated separately, and a score can be obtained for each scale. Alternatively, a total difficulty score can be calculated with the sum of the first four subscales. The Turkish version of the scale adapted to Turkish by Güvenir et al.[16] was found to be valid and reliable.

**Revised Child Anxiety and Depression Scale:** It was developed by Chorpita et al.[14]. The 47-item scale comprises six subtests: separation anxiety disorder, generalized anxiety disorder, panic disorder, social phobia, obsessive-compulsive disorder, and major depressive disorder. Total anxiety and total internalization scores were obtained by combining subscale scores. Both the child and parent versions were adapted into Turkish by Gormez et al.[17,18].

## Statistical Analysis

The data obtained in this study were evaluated using the SPSS 24.0 statistics software package (SPSS Inc., Chicago, IL, USA). All variables were evaluated using the Shapiro-Wilk test to determine whether the distribution was normal. Student's t or Mann-Whitney U tests were used to compare the differences between the two groups according to their distribution. Pearson's chi-square and Fisher's exact tests were used to evaluate the distribution of categorical variables. Binary logistic regression analysis was used to examine the variables that predicted the presence of ODD comorbidity. Statistical significance was set at $p<0.05$.

# RESULTS

The study was conducted with 51 children and adolescents (36 boys and 15 girls) with ADHD and 51 children and adolescents (45 boys and 6 girls) with ADHD+ODD. There was a statistically significant difference between the groups in terms of sex ($p=0.022$). The mean age was 13.34±2.77 in the ADHD group, and 11.62±2.31 in the ADHD+ODD group, and a significant difference was found between these values ($p=0.028$). There was no statistically significant difference between the two groups in terms of age, educational level, and family income of the parents ($p>0.05$). Demographic characteristics of the participants are presented in Table 1.

A comparison of the SDQ and RCADS children's scores in the study groups is shown in Table 2. The total difficulty and internalization scores were significantly higher in the ADHD+ODD group than in the ADHD group ($p=0.003$, $p=0.001$ respectively). The SDQ subscale analysis revealed that emotional problems and peer problems scores were significantly higher in the ADHD+ODD group ($p=0.017$, $p=0.028$ respectively). In terms of the RCADS children's scores, only the RCADS depression score was found to be significantly higher in the ADHD+ODD group than in the ADHD group ($p=0.005$).

A comparison of the SDQ and RCADS parental scores of the study groups is shown in Table 3. The total difficulty and externalization scores were significantly higher in the ADHD+ODD group than in the ADHD group ($p=0.006$, $p=0.001$ respectively). In the SDQ subscale analysis, conduct problems and attention-deficit/hyperactivity scores were significantly higher in the ADHD+ODD group ($p=0.001$, $p=0.005$, respectively). In terms of the RCADS parental scores, the total RCADS internalization score was significantly higher in the

**Table 1. Sociodemographic characteristics of the participants**

| | ADHD (n=51) | ADHD+ODD (n=51) | p |
|---|---|---|---|
| Age (years) | | | |
| Mean ± SD | 13.34±2.77 | 11.62±2.31 | **0.028**[a] |
| Gender, n (%) | | | |
| Male | 36 (70.6) | 45 (88.2) | **0.022**[c] |
| Female | 15 (29.4) | 6 (11.8) | |
| Mothers' age (years) | | | |
| Mean ± SD | 39.09±6.52 | 38.96±6.30 | 0.945[a] |
| Mothers' schooling (years) | | | |
| Mean ± SD | 8.39±4.42 | 6.26±3.65 | 0.082[b] |
| Mother's psychiatric disorder, n (%) | 12 (23.5) | 49 (17.6) | 0.463[c] |
| Fathers' age (years) | | | |
| Mean ± SD | 44.51±6.83 | 44.14±7.22 | 0.869[a] |
| Fathers' schooling (years) | | | |
| Mean ± SD | 9.64±4.18 | 8.55±3.62 | 0.360[b] |
| Father's psychiatric disorder, n (%) | 11 (21.6) | 14 (27.5) | 0.489[c] |
| Family income, n (%) | | | |
| Low | 24 (47.1) | 31 (60.8) | |
| Middle | 19 (37.3) | 14 (27.5) | 0.380[c] |
| High | 8 (15.7) | 6 (11.8) | |

p<0.05 statistically significant; bold p-values highlight where the comparisons between

[a]: Student's t-test, [b]: Mann-Whitney U test, [c]: Chi-square test, ADHD and ADHD+ODD groups are statistically significant

ADHD: Attention deficit hyperactivity disorder, ODD: Oppositional defiant disorder, SD: Standard deviation

**Table 2. Comparison of the study groups' SDQ and RCADS child scores**

| | ADHD (n=51) | ADHD+ODD (n=51) | p |
|---|---|---|---|
| SDQ Emotional symptoms | 2.96±2.07 | 4.43±1.95 | **0.017**[a] |
| SDQ conduct problems | 3.01±1.53 | 3.96±2.03 | 0.079[b] |
| SDQ hyperactivity-inattention | 5.22±1.38 | 5.17±1.96 | 0.931[a] |
| SDQ peer problems | 3.96±1.63 | 5.03±1.47 | **0.028**[a] |
| SDQ prosocial | 7.17±2.08 | 6.65±2.41 | 0.436[b] |
| SDQ internalizing difficulties | 6.91±2.48 | 9.52±2.60 | **0.001**[a] |
| SDQ externalizing difficulties | 8.22±1.99 | 9.13±2.68 | 0.198[a] |
| SDQ total difficulties | 15.13±3.61 | 18.65±3.88 | **0.003**[a] |
| RCADS SoP | 10.17±5.31 | 9.43±5.57 | 0.647[b] |
| RCADS PD | 4.01±3.46 | 5.91±5.03 | 0.141[b] |
| RCADS SAD | 3.57±3.01 | 4.83±3.79 | 0.219[b] |
| RCADS GAD | 5.87±3.07 | 6.09±3.61 | 0.827[a] |
| RCADS OCD | 4.87±2.61 | 5.35±3.41 | 0.596[a] |
| RCADS MDD | 6.96±4.95 | 11.09±4.40 | **0.005**[a] |
| RCADS anxiety total score | 28.48±12.71 | 31.61±16.57 | 0.476[a] |
| RCADS total (internalizing) score | 35.43±16.31 | 42.70±18.43 | 0.164[a] |

p<0.05 statistically significant; bold p-values highlight where the comparisons between

[a]: Student's t-test, [b]: Mann-Whitney U test

ADHD and ADHD+ODD groups are statistically significant

ADHD: Attention deficit hyperactivity disorder, ODD: Oppositional defiant disorder, SDQ: Strengths and Difficulties Questionnaire, RCADS: Revised Child Anxiety and Depression scales, SoP: Social phobia, PD: Panic disorder, SAD: Separation anxiety disorder, GAD: Generalized anxiety disorder, OCD: Obsessive-compulsive disorder, MDD: Major depressive disorder

ADHD+ODD group compared to the ADHD group (p=0.041). The subscale analysis of the RCADS revealed that separation anxiety disorder, generalized anxiety disorder, and depression scores were significantly higher in the ADHD+ODD group (p<0.05).

A regression model was created to independently determine the predictors of ODD. The relationship between the subscale scores that were found to be statistically significant as a result of pairwise comparisons and the presence of ODD comorbidity was estimated using binary logistic regression analysis. The conduct problems sub-scale [odds ratio (OR)=3.353, p=0.020] and the attention-deficit/hyperactivity sub-scale (OR=2.765, p=0.021) of the SDQ parent form were found to be significantly correlated with the presence of ODD comorbidity. The binary logistic regression analysis of the predictors of ODD presence is presented in Table 4.

**Table 3. Comparison of the study groups' SDQ and RCADS parent scores**

| | ADHD (n=51) | ADHD+ODD (n=51) | p |
|---|---|---|---|
| SDQ emotional symptoms | 3.26±1.86 | 4.00±2.69 | 0.285[b] |
| SDQ conduct problems | 2.70±1.39 | 4.35±1.72 | **0.001**[a] |
| SDQ hyperactivity-inattention | 4.83±1.11 | 6.04±1.63 | **0.005**[a] |
| SDQ peer problems | 5.43±1.72 | 5.04± 2.21 | 0.506[b] |
| SDQ prosocial | 7.52±2.06 | 6.30±2.40 | 0.072[b] |
| SDQ internalizing difficulties | 8.70±2.58 | 9.04±4.11 | 0.733[b] |
| SDQ externalizing difficulties | 7.52±1.81 | 10.39±2.29 | **<0.001**[a] |
| SDQ total difficulties | 16.22±3.24 | 19.43±4.25 | **0.006**[a] |
| RCADS SoP | 9.35±5.17 | 8.61±4.79 | 0.618[a] |
| RCADS PD | 2.52±2.39 | 3.96±3.51 | 0.112[b] |
| RCADS SAD | 3.65±2.97 | 6.26±4.27 | **0.021**[a] |
| RCADS GAD | 3.61±1.99 | 5.39±3.11 | **0.026**[a] |
| RCADS OCD | 2.74±3.12 | 4.26±3.16 | 0.108[b] |
| RCADS MDD | 7.74±3.92 | 11.04±5.07 | **0.017**[a] |
| RCADS anxiety total score | 21.87±11.56 | 28.48±14.01 | 0.088[b] |
| RCADS total (internalizing) score | 29.61±14.50 | 39.52±17.27 | **0.041**[a] |

p<0.05 statistically significant; bold p-values highlight where the comparisons between

[a]: Student's t-test; [b]: Mann-Whitney U test

ADHD and ADHD+ODD groups are statistically significant

ADHD: Attention deficit hyperactivity disorder, ODD: Oppositional defiant disorder, SDQ: Strengths and Difficulties Questionnaire, RCADS: Revised Child Anxiety and Depression scales, SoP: Social phobia, PD: Panic disorder, SAD: Separation anxiety disorder, GAD: Generalized anxiety disorder, OCD: Obsessive-compulsive disorder, MDD: Major depressive disorder

**Table 4. Binary logistic regression predictors of the presence of ODD comorbidity**

| | B | SE | Wald | OR | 95% CI-OR | p |
|---|---|---|---|---|---|---|
| SDQ emotional symptoms-child | 0.434 | 0.343 | 1.601 | 1.543 | 0.788-3.020 | 0.206 |
| SDQ peer problems-child | 0.314 | 0.312 | 1.017 | 1.369 | 0.743-2.522 | 0.313 |
| RCADS MDD-child | -0.070 | 0.139 | 0.252 | 0.933 | 0.710-1.225 | 0.616 |
| SDQ conduct problems-parent | 1.210 | 0.519 | 5.434 | 3.353 | 1.212-9.274 | **0.020** |
| SDQ hyperactivity-inattention-parent | 1.017 | 0.441 | 5.326 | 2.765 | 1.166-6.560 | **0.021** |
| RCADS MDD-parent | 0.283 | 0.170 | 2.758 | 1.327 | 0.950-1.853 | 0.097 |
| RCADS SAD-parent | 0.435 | 0.258 | 2.853 | 1.546 | 0.933-2.562 | 0.091 |
| RCADS GAD-parent | -0.405 | 0.311 | 1.694 | 0.667 | 0.363-1.227 | 0.193 |

p<0.05 statistically significant; bold p-values highlight where it is statistically significant

SE: Standard error, OR: Odds ratio, CI: Confidence interval (lower limit-upper limit)

ODD: Oppositional defiant disorder, SDQ: Strengths and Difficulties Questionnaire, RCADS: Revised Child Anxiety and Depression scales, MDD: Major depressive disorder, SAD: Separation anxiety disorder, GAD: Generalized anxiety disorder

## DISCUSSION

This study assessed the areas of difficulty, internalizing, and externalizing symptoms in children and adolescents with ADHD with and without ODD comorbidity. To the best of our knowledge, this is the first study to assess the internalizing and externalizing symptoms of children and adolescents with ADHD with and without ODD comorbidity in detail using both self-reported and parent-reported measures. Our findings suggest that the presence of ODD comorbidity leads to an increase in internalizing and externalizing symptoms in children with ADHD and that children's and parents' reports of subjective experiences differ from each other. Additionally, our findings also indicate that externalizing symptoms, such as conduct problems and attention-deficit/hyperactivity obtained from the parent-rated SDQ sub-scales predicted ODD.

In the present study, a significant difference was found between the two groups in terms of age and gender of the children. Similarly, in many studies, it has been observed that the vast majority of children with both ADHD and ODD are male, and the age of children with ODD comorbidity tends to be younger[7,19]. In this respect, the results of our study are in line with the literature.

In the present study, when children's SDQ scores were examined, it was observed that emotional problems, peer problems, internalization, and total difficulty scores were significantly higher in the ADHD+ODD group than in the ADHD group. Sobanski et al.[20] found that emotional problems were more closely related to ODD comorbidity than to core symptoms of ADHD. Likewise, Biederman et al.[21] showed that worsening anxiety/depressive, attention, and aggression subscales of the child behavior checklist (CBCL) were strongly associated with higher rates of ODD. Moreover, in a study comparing the executive functions of children with ADHD and children with ADHD with comorbidity of ODD, more severe deficits in emotional control were found in children with ADHD and ODD[22]. In addition, ODD symptoms in middle childhood and adolescence are associated with peer problems such as peer rejection and peer bullying[23]. It has been reported that children with ODD assessed with the SDQ have a higher risk of emotional symptoms and peer problems[24]. In line with the literature, it was found that children in the ADHD+ODD group experienced more emotional problems and peer problems. On the other hand, the RCADS depression sub-scale scores of the children were significantly higher in the group with ODD. Consistent with this result, it has been shown that ODD symptoms in adolescence are directly related to depressive symptoms assessed through self-reported scales[25]. Indeed, these findings show that the comorbidity of ODD, which is defined as an externalizing disorder, in children and adolescents with ADHD poses a high risk of internalizing symptoms.

Another main finding of the study was that the ADHD+ODD group had higher scores for conduct problems, attention deficit/hyperactivity, anxiety, and depression on the SDQ and RCADS parent subscales compared to the ADHD group. The differences in these parental sub-scales suggest that ADHD cases with ODD tend to suffer from both internalizing and externalizing symptoms more than those without ODD. The association between ODD and ADHD is consistent with the findings of previous studies indicating that they experience more severe emotional and behavioral difficulties[6,26]. In a study, it was shown that comorbidity of ADHD and ODD was associated with higher scores in both attention deficit and hyperactivity/impulsivity scores compared to the group with ADHD alone, according to parental reports[8]. In another study, similar to our study, anxiety/depression, attention problems, behavioral problems, and externalizing scores of the CBCL scale rated by the parents were found to be higher in the ADHD+ODD group compared to the ADHD-only group[9]. In addition, it has been reported that ODD in adolescents is associated with internalizing symptoms such as anxiety and depression as well as externalizing symptoms such as behavior problems[27]. These results provide evidence that ODD comorbidity harms the clinical symptoms of children with ADHD. In addition, it is believed that the recognition of ODD among children and adolescents with ADHD and the addition of appropriate intervention methods will reduce the negative effects that may occur in the future.

As experiencing and observing symptoms are separate situations, differences may be observed in children's and parents' reports. Since children's self-report measures provide important information about their less observable subjective experiences, parental reports may lead to inaccurate estimates, especially for assessing internalizing symptoms[14]. In contrast, parents have been shown to report more accurate reports about observable, objective experiences, and parental reports have been shown to provide a more precise estimate, especially in assessing externalizing symptoms[14,28]. In addition, it has been reported that parents are the best source of information for externalizing disorders, whereas children and adolescents are the best sources of information for internalizing disorders[29]. In the present study, the finding of a significant difference between the two groups in internalizing scores on the SDQ child form and, conversely, the finding of higher externalizing scores in the SDQ parental form in the ADHD+ODD group supports the finding that child and parent reports may differ from each other. Even if children's and parents' reports differ from each other, it is a fact that ODD leads to an increase in internalizing and externalizing symptoms of children with ADHD. Indeed, the results of our study are consistent with those of studies in which the ADHD+ODD group showed significantly more internalizing and externalizing problems compared to pure ADHD[19].

The results of the binary logistic regression analysis examining the predictive factors for the presence of ODD comorbidity showed that externalizing symptoms, such as conduct problems and attention-deficit/hyperactivity obtained from the parent-rated SDQ sub-scales predicted ODD. In a related study, it was reported that the SDQ parental form could be used as an appropriate screening tool to identify the comorbidity of ODD in an ADHD sample and that the SDQ had sufficient accuracy in predicting the comorbidity of ODD[19]. It has been reported that comorbid ODD increases the severity of symptoms of inattention and hyperactivity/impulsivity in children and adolescents diagnosed with ADHD[30]. According to reports from parents, children with both ADHD and ODD have been found to have higher scores for both inattention and hyperactivity/impulsivity than those with ADHD alone[8]. The same study also found that parental reports could help clinicians to identify suspected ODD in children and adolescents with ADHD. Having difficulty with parent-rated behavioral control in the presence of comorbid ODD in young people with ADHD was found to be an important predictor of social functioning[31]. Additionally, compared to the ADHD-only group, the ADHD+ODD group exhibited greater anxiety and depression, more aggressive behavior, and poorer emotional control in daily life[32]. When all of these results are considered together, the results of the present study are in line with the literature.

### Study Limitations

Our results should be evaluated considering the various limitations. First, there was no healthy control group in this study. However, our main aim was to evaluate the effect of ODD comorbidity on internalizing and externalizing symptoms in children with ADHD compared to children with pure ADHD. Therefore, it is clear that having a healthy control group in the study would not have contributed to our results. Therefore, the absence of a control group was considered reasonable. Second, another limitation is the wide age range of the children included in the study. This affects the generalizability of the results of the present study to children and adolescents. Third, this study was limited by the lack of ADHD-specific measures. Consequently, it was not possible to assess the severity of ADHD and ODD symptoms. Many studies have shown that children with a co-diagnosis of ADHD and ODD have more severe inattention, hyperactivity/impulsivity, and oppositional symptoms than children with ADHD alone. Therefore, when designing the research, the areas in which the children had difficulties and other conditions that may accompany these symptoms, especially anxiety and depression were considered rather than core symptoms. Taking into account all these together, it should be considered a more accurate approach to not use ADHD-specific measurements in the study in line with our aim.

## CONCLUSION

Our study showed that the presence of ODD comorbidity leads to an increase in internalizing and externalizing symptoms in children with ADHD. Moreover, children's and parents' reports of subjective experiences may differ. Evidence has shown that the comorbidity of ODD has a negative effect on the clinical symptoms of children with ADHD. In addition, early diagnosis of ODD comorbidity in children and adolescents with ADHD is critical as it causes worsening of internalizing and externalizing symptoms. Planning future studies with larger sample sizes and evaluating children and adolescents separately will make a significant contribution to the literature.

### Ethics

**Ethics Committee Approval:** The research was carried out by taking the necessary permissions from the Ethics Committee of the Clinical Research, Atatürk University Faculty of Medicine, (decision no: B.30.2.0.01.00/475, date: 02.06.2022).

**Informed Consent:** Written informed consent was obtained from all participants.

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### Footnotes

### Authorship Contributions

Concept: M.A.A., E.Y.D., Design: M.A.A., B.T., Data Collection or Processing: M.A.A., E.Y.D., Analysis or Interpretation: M.A.A., B.T., Literature Search: M.A.A., B.T., Writing: M.A.A.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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