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Theory of mind failure and emotion dysregulation as contributors to peer bullying among adolescents with attention-deficit/hyperactivity disorder

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ABSTRACT

This study investigated whether poor performance in the Reading the Mind in the Eyes Test (RMET) and emotion dysregulation (ED) contributes to involvement in bullying among adolescents with attention-deficit/hyperactivity disorder (ADHD). Altogether, 105 adolescents with ADHD aged 10–18 years (mean: 13.9±1.8 years, 77% boys) were recruited. RMET was applied to evaluate the ToM abilities. Participants completed the Difficulties in Emotion Regulation Scale (DERS) and the Olweus Bully/Victim Questionnaire to measure ED and evaluate involvement in bullying, respectively. Among the subjects, 24.8% were victims, 23.8% were perpetrators. The perpetrators and victims exhibited significantly lower RMET scores and higher DERS awareness scores than non-victims/non-perpetrators. The perpetrators also exhibited significantly higher DERS impulse scores and DERS total scores than non-victims/non-perpetrators. Binary logistic regression analysis revealed that a 1-point decrease in the RMET score increased the odds of bullying victimization by 53% and bullying perpetration by 21.6%, while a 1-point increase in DERS impulse scores increased the risk of bullying perpetration by 14.9%. This study is the first to show an association between poor ToM ability and involvement in bullying as victims/perpetrators among children with ADHD. Both victims and perpetrators had problems with emotional awareness, while only perpetrators had difficulties controlling their impulses.

KEYWORDS

Attention-deficit /hyperactivity disorder; peer bullying; theory of mind; emotion dysregulation; adolescents

Introduction

Bullying is defined as repeated negative actions with the intention of hurting another person, characterized by an imbalance of power within the interaction (Olweus, 1994). Bullying occurs at workplaces, homes (e.g., between siblings),

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prisons, nursing rooms, and most frequently, at schools (Phye & Sanders, 2004). Rivers and Smith (1994) identified three types of aggression involved in bullying: direct physical, direct verbal, and indirect. Observable aggressive behaviors, such as hitting, pushing, and kicking, constitute direct physical aggression. Direct verbal aggression consists of name-calling and threats. Indirect aggression, the most difficult form to detect, involves behaviors such as lying and spreading rumors about a victim.

In recent years, numerous studies have demonstrated that children with attention-deficit/hyperactivity disorder (ADHD) are at an increased risk of bullying at school as both victims and perpetrators when compared with typically developed children (Holmberg & Hjern, 2008; Taylor, Saylor, Twyman, & Macias, 2010; Timmermanis & Wiener, 2011; Unnever & Cornell, 2003; Verlinden et al., 2015). Among children with ADHD, bullying is associated with depressive symptoms (Roy, Hartman, Veenstra, & Oldehinkel, 2015), psychotic-like experiences (Hennig, Jaya, & Lincoln, 2016), suicidality (Chou, Liu, Hu, & Yen, 2016), eating disorders (Levin & Rawana, 2016), pain experience and pain-induced functional impairment (Yeh, Huang, Wu, Hu, & Yen, 2019), and exacerbation of ADHD symptoms (Stenseng, Belsky, Skalicka, & Wichstrøm, 2016). Thus, timely intervention and prevention of bullying victimization (BV) or bullying perpetration (BP) in these children can hinder further functional deterioration.

Theory of mind (ToM), a foundational social cognition skill, is described as an individual's ability to conceptualize other people's mental states (i.e., their beliefs and intentions) (Bora & Pantelis, 2016). ToM failures in childhood lead to reactive aggression, friendlessness, involvement in bullying, and social incompetence (Fink, Begeer, Peterson, Slaughter, & de Rosnay, 2015; Langdon, 2003; Renouf et al., 2010; Shakoor et al., 2012). Shakoor et al. (2012) reported that poor ToM abilities at 5 years of age predicted bullying involvement as a victim and as a victim-perpetrator at 12 years of age. ToM ability is compromised in a range of psychiatric disorders, including autism spectrum disorder, schizophrenia, bipolar disorder, specific learning disorder (SLD), communication disorders, and ADHD (Miller, 2012; Özbaran, Kalyoncu, & Köse, 2018). A recent meta-analysis conducted by Bora and Pantelis (2016) showed that ToM ability was significantly impaired in children with ADHD, and this association had a medium effect size. Although some studies have shown that social skill impairment in ADHD is associated with bullying involvement as a victim (Cook, Williams, Guerra, Kim, & Sadek, 2010; Murray-Close et al., 2010; Taylor et al., 2010) and as a victim perpetrator (Cook et al., 2010), these studies evaluated childrens' social skills using reports by parents and teachers. To the best of our knowledge, no study has investigated whether ToM ability affects the involvement in bullying among children with ADHD.

Gratz and Roemer (2004) conceptualized emotion regulation as correctly understanding and being aware of emotions, adjusting emotional arousal, and accomplishing goal-directed behaviors regardless of the emotional state. Emotion dysregulation (ED) is defined as difficulties in recognizing, monitoring, appraising, or adjusting emotional reactions (Gratz & Roemer, 2004). Similar to ToM failures, ED in children leads to low social competence, involvement in bullying as victims and as perpetrators, peer rejection, and low social functioning (Gross, 2008; Kim & Cicchetti, 2009; Shields & Cicchetti, 2001). The estimated prevalence of ED is 25%–45% in children with ADHD. Thus, it is a major contributor to impairment in these children (Shaw, Stringaris, Nigg, & Leibenluft, 2016). In their meta-analysis, Graziano and Garcia (2016) reported that children with ADHD exhibited a considerable impairment in emotion recognition, emotional reactivity, emotion regulation, and empathy. Fogleman, Slaughter, Rosen, Leaberry, and Walerius (2019) found that ED mediates the association between ADHD and BV. However, data regarding impairment in specific aspects of ED among children with ADHD who are victims or perpetrators of bullying are lacking.

Determining the risk factors for BV or BP in children with ADHD could help improve the prevention and intervention strategies. Since the child version of the Reading the Mind in the Eyes test (cRMET) is an advanced measure of ToM, we initially aimed to investigate whether poor performance in the cRMET was associated with involvement in bullying among adolescents with ADHD. We also aimed to explore which aspects of ED were impaired in adolescents with ADHD who were victims or perpetrators of bullying. Finally, we aimed to examine which variables (ADHD characteristics, cRMET performance, and ED) significantly affected the presence of BV or BP in these adolescents. We considered the following hypotheses: (1) Adolescents with ADHD who are victims or perpetrators of peer bullying exhibit a significantly higher incidence of problems regarding emotional awareness, acceptance, controlling impulses, and finding effective emotion regulation strategies than those who are not the victims or perpetrators. (2) These adolescents perform poorly in the cRMET. (3) Poor performance in the cRMET and as well as ED contribute to BV or BP in these adolescents.

Methods

Sample characteristics and assessment

Altogether, 105 adolescents with ADHD were recruited from the Department of Child and Adolescent Psychiatry at the Ministry of Health Ankara City Hospital, Van Training and Research Hospital, and Kanuni Sultan Süleyman Training and Research Hospital. The inclusion criteria were as follows: (1) children aged 10–18 years and (2) children and parents who were willing and

able to provide informed consent. Children with concomitant autism spectrum disorder, intellectual disability, bipolar disorder, substance use disorder, schizophrenia spectrum disorder, and chronic or neurological diseases were excluded. Since there is no structured rehabilitation program in Turkey for children involved in bullying at schools, none of the participants had participated in a rehabilitation program.

Initially, the Schedule for Affective Disorders and Schizophrenia for School-Aged Children, Present and Lifetime Version (K-SADS-PL) was used to confirm the diagnosis of ADHD and to assess concomitant psychiatric diagnoses. We also verified the diagnosis based on the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5). School bullying was evaluated using the Olweus Bully/Victim Questionnaire (OBVQ). For this evaluation, clinicians helped adolescents understand the concept of bullying. The cRMET was applied to each adolescent to evaluate the ToM abilities. Problems in emotion regulation were assessed using the Difficulties in Emotion Regulation Scale (DERS), which is a self-report questionnaire. Parents completed the Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale (T-DSM-IV-S) to assess the severity of ADHD in participants.

Ethical approval for this study was obtained from the Ethics Committee of the Ministry of Health, Ankara City Hospital. Patients and parents were verbally informed about the design of the study, and written informed consent was obtained from both in accordance with the Declaration of Helsinki. The study procedures adhered with the principles of the Declaration of Helsinki.

Materials

Socio-demographic data form

Characteristics of children (date of birth, sex, school type [private/state], special education status, age at ADHD diagnosis, psychostimulant treatment status, and duration of psychostimulant treatment) and family (education level of parents, total income per year, and the number of individuals in the family) were acquired using a sociodemographic data form designed by the authors. Despite the lack of rehabilitation programs for bullying in Turkey, students are usually taught the definition of bullying by their guidance counselors to raise awareness. In the socio-demographic data form, we asked whether the participants had ever received a lecture about the description of bullying at school.

Application of the K-SADS-PL

K-SADS-PL, which is a semi-structured interview, was used to assess and diagnose major psychiatric disorders in children and adolescents based on the DSM-IV text revision criteria. The reliability and validity of the Turkish

K-SADS-PL were examined by Gökler, Ünal, Pehlivantürk, Kültür, and Akdemir (2004).

Revised OBVQ

This 38-item questionnaire was developed by Olweus (1996) to measure bullying involvement, attitudes toward bullying, and school climate. It contains a detailed description of bullying, followed by questions concerning eight different types of bullying: verbal, physical harm, threats, forcible loss of belongings (theft), spreading rumors, racial, sexual, and social exclusion. As suggested by Solberg and Olweus (2003), we utilized "2 or 3 times a month" as the cutoff value. Thus, children who were bullied two or three times a month or more frequently were categorized into the BV group, children who bullied their peers two or three times a month or more frequently were categorized into the BP group, and those who did not meet these criteria were categorized into the non-bully/non-victim (N-BV) group.

Application of the cRMET

The Reading the Mind in the Eyes test (RMET) was developed by Baron-Cohen, Wheelwright, Spong, Scahill, and Lawson (2001) to assess the theory of mind components of social cognition. During the test, individuals were asked to interpret the mental state of the 28 photographs containing only the eyes. Yildirim et al. (2011) reported that the Turkish version of the RMET has good reliability. We utilized the cRMET (Girli, 2014).

Application of the DERS

Gratz and Roemer (2004) developed the DERS to assess the ability of individuals to regulate negative emotional states. This 36-item questionnaire contains six subscales: (a) lack of awareness of emotional responses (awareness), (b) lack of clarity of emotional responses (clarity), (c) non-acceptance of emotional responses (non-acceptance), (d) limited access to effective strategies (strategies), (e) difficulties in controlling impulsive behavior when experiencing negative affect (impulse), and (f) difficulties in engaging in goal-directed behavior when experiencing negative affect (goals) (Gratz & Roemer, 2004). The Validation and reliability of the DERS in the Turkish population were investigated by Sarıtaş-Atalar, Gençöz, and Özen (2015). A higher DERS score indicates more severe difficulties in emotion regulation.

Application of the T-DSM-IV-S

The T-DSM-IV-S was developed by Turgay (1994), and its reliability was validated by Ercan, Amado, Somer, and Çıkoğlu (2001). This 4-point Likert-type scale was developed according to the DSM-IV diagnostic criteria. It appraises hyperactivity-impulsivity (nine items), inattention (nine items), opposition-defiance (eight items), and conduct disorder (15 items).

Statistics

Descriptive statistics (mean, standard deviation, median, interquartile range, and frequencies) and group statistics were calculated. The normality of quantitative variables was assessed via histogram, skewness, kurtosis, normality plots, and the Kolmogorov–Smirnov test. Between-group comparisons of categorical variables were performed using the $\chi 2$ test or Fisher's exact test. The Kruskal–Wallis test was used for non-normally distributed quantitative data for comparisons between the N-VP, BP, and BV groups. The Bonferroni-adjusted alpha level ($p = .0166$) was used in the Kruskal–Wallis post-hoc pairwise comparison. One-way analysis of variance with Tukey's post-hoc test was used to analyze the differences in the DERS total scores between the three groups. A multivariate binary logistic regression analysis was conducted to detect the variables that could predict BV or BP in children with ADHD. The 95% confidence interval was calculated. The results were adjusted for sex and age.

Results

The mean age was 13.9±1.8 years (range: 10–18 years) and 73.3% (n = 77) of the patients were male. The most frequent subtype of ADHD was combined (57.1%, n = 60), followed by the attention-deficit-predominant subtype (38.1%, n = 40), and the hyperactivity-predominant subtype (4.8%, n = 5). Among the included patients, 81% (n = 85) were under the psychostimulant treatment regimen. At least one comorbidity was detected in 59.1% (n = 63) of the patients. Comorbidities included oppositional defiant disorder (ODD) (23.8%, n = 25), anxiety disorders (19%, n = 20), SLD (19%, n = 20), major depressive disorder (11.4%, n = 12), conduct disorder (CD) (6.7%, n = 7), tic disorder (6.7%, n = 7), elimination disorder (4.8%, n = 5), and obsessive compulsive disorder (3.8%, n = 4).

Among the adolescents with ADHD, 24.8% (n = 26) were pure victims, 6.7% (n = 7) were pure perpetrators, and 17.1% (n = 18) were victim-perpetrators. The most common types of BV and BP were verbal bullying, followed by social exclusion in the BV category and physical bullying in the BP category (Figure 1). When compared with adolescents with attention-deficit-predominant subtype, adolescents the combined/hyperactivity-predominant subtype were more frequently subjected to bullying ($\chi 2[1] = 3.988$, $p = .04$) and perpetrated bullying more frequently ($\chi 2[1] = 6.695$, $p = .01$). Adolescents with combined/hyperactivity-predominant subtype exhibited a higher rate of physical bullying others ($\chi 2[1] = 4.512$, $p = .03$) and a higher rate of being ostracized ($p = .006$) by their peers than those with attention-deficit-predominant subtype (Figure 1).

Considering the small number of pure perpetrators, we combined pure perpetrators and victim-perpetrators into a single group and compared the

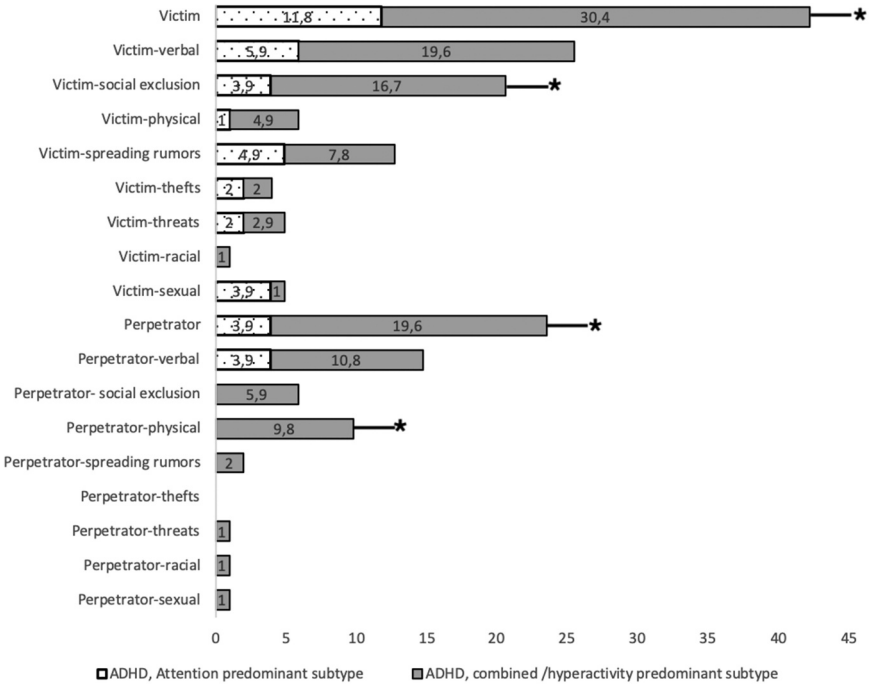

Figure 1. Distribution of the Types of BP or BV Among ADHD Sub-types (%) Chi-square test; N-VP = Non-victim or perpetrator; BV = Bullying-victimization; BP = Bullying perpetration; ADHD = Attention deficit and hyperactivity disorder; *p < .05.

three groups (N-VP, BV, and BP) during further analysis. The groups exhibited no significant differences in age, gender, per capita income of the family, age at ADHD diagnosis, duration of psychostimulant treatment, and paternal education level (Table 1). The school types and special education status of the participants and the rate of explanation of the description of bullying at school did not differ significantly among the groups (Table 1). Maternal education level was significantly lower in the BP group than in the N-VP group (Table 1). The BP group exhibited a significantly higher frequency of ODD than the N-VP group (p = .004) and a higher frequency of CD than the BV group (p = .04). Moreover, the incidence of tic disorders was significantly higher in the BV group than in the N-VP group (p = .03). The BP group exhibited significantly higher T-DSM-IV-S-Hyperactivity, T-DSM-IV-S-ODD, and T-DSM-IV-S-CD scores than the BV and N-VP groups (Table 1). The BP and BV groups exhibited significantly poorer performance in the cRMET than the N-VP group (H[2] = 30.536, p < .001; BP vs. N-VP: p < .001; BV vs. N-VP: p < .001; BV vs. BP: p = 1.00) (Figure 2). Furthermore, the BP and BV groups exhibited significantly higher DERS awareness scores than the N-VP group (H [2] = 7.090, p = .02; BP vs. N-VP: p = .01; BV vs. N-VP: p = .05; BV vs. BP: p = .80) (Figure 2). When compared to the N-VP group, the BP group

Table 1. Comparison of groups (N-VP, BP, and BV) in terms of demographics, scales, and the features of bullying.

	N-VP	BP	BV	Statistics		Post-hocs		
	(n = 54)	(n = 25)	(n = 26)	*H*, χ^2, *F*	*p* value	BP vs. N-VP	BV vs. N-VP	BP vs. BV
Age (Median (IQR))	14.1 (2.9)	13.4 (1.1)	13.1 (3.1)	4.396	0.11 [a]	n.a.	n.a.	n.a.
Gender (Girls (n (%))	13 (24.1)	5 (20)	10 (38.5)	2.507	0.28 [b]	n.a.	n.a.	n.a.
Participants' school type	46 (85.2)	23 (92)	23 (88.5)	0.64 5	0.80 [b]	n.a.	n.a.	n.a.
State school (n (%))	8 (14.8)	2 (9)	3 (11.5)					
Private school (n (%)								
Special education (n (%))	7 (13)	6 (24.3)	5 (19.2)	1.734	0.45	n.a.	n.a.	n.a.
Been taught about the description of peer bullying at school (n (%))	16 (30.8)	5 (20)	6 (25)	1.225	0.54 [b]	n.a.	n.a.	n.a.
Missing value (n)	2	0	2					
Education level of parents (years)	11 (9)	5 (6)	8.5 (7)	10.887	0.004 [a,*]	0.003*	0.74	0.18
Mother (Median (IQR))	12 (6)	9 (6)	12 (5.7)	5.843	0.05 [a]	n.a.	n.a.	n.a.
Father (Median (IQR))								
Income per capita ( ) (Median (IQR))	12.000 (10.500)	9.600 (8.000)	10.500 (12.800)	1.230	0.54 [a]	n.a.	n.a.	n.a.
Duration of psychostimulant treatment (months) (Median (IQR))	4 (33)	4 (15)	12 (44)	2.700	0.25 [a]	n.a.	n.a.	n.a.
Age at ADHD diagnosis (Median (IQR))	12 (4.5)	11 (5)	10 (6)	4.229	0.12 [a]	n.a.	n.a.	n.a.
Comorbidity (% (n))	47.2 (25)	73.9 (17)	65.4 (17)	5.634	0.06 [b]	n.a.	n.a.	n.a.
Major Depressive Disorder	7.5 (4)	17.4 (4)	15.4 (4)	2.218	0.36 [b]	n.a.	n.a.	n.a.
Anxiety Disorder	13.2 (7)	21.7 (5)	30.8 (8)	3.542	0.16 [b]	n.a.	n.a.	n.a.
ODD	15.1 (8)	47.8 (11)	23.1 (6)	8.692	0.01 [b]	0.004*	0.53	0.13
CD	5.7 (3)	17.4 (4)	0 (0)	6.024	0.04 [b]	0.21	0.18	0.04*
OCD	3.8 (2)	0 (0)	7.7 (2)	1.643	0.53 [b]	n.a.	n.a.	n.a.
SLD	13.2 (7)	30.4 (7)	23.1 (6)	3.400	0.17 [b]	n.a.	n.a.	n.a.
Tic Disorder	1.9 (1)	8.7 (2)	15.4 (4)	5.132	0.04 [b]	0.21	0.03*	0.67
Elimination Disorder	1.0 (1)	0 (0)	1.9 (1)	1.126	1.000 [b]	n.a.	n.a.	n.a.
T-DSM-IV-S-Attention (Median (IQR))	15 (9)	15 (9)	15 (6.5)	0.852	0.65 [a]	n.a.	n.a.	n.a.
T-DSM-IV-S-Hyperactivity (Median (IQR))	7 (12)	17 (9)	9.5 (12)	12.890	0.002 [a]	0.001*	1.000	0.03*
T-DSM-IV-S-ODD (Median (IQR))	7 (8.5)	14 (11)	9 (7.2)	11.729	0.003 [a]	0.003*	1.000	0.02*
T-DSM-IV-S-CD (Median (IQR))	0 (3)	3 (9)	1 (3.5)	9.833	0.007 [a]	0.008*	1.000	0.03*
Total score of DERS (Mean (SD))	83.9 (18.3)	100.3 (24)	94.3 (27.5)	4.178	0.01 [c]	0.02*	0.22	0.56

[a]Kruskal Wallis Test; [b] Chi Square test; [c] One-way Anova test; N-VP = Non-victim or perpetrator; BV = Bullying-victimization; BP = Bullying perpetration; ADHD = Attention deficit and hyperactivity disorder; ODD = Oppositional defiant disorder; CD = Conduct disorder; OCD = Obsessive compulsive disorder; SLD = Specific learning disorder; T-DSM-IV-S = Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale; cRMET = Child reading the mind in the eyes test; DERS = Difficulties in emotion regulation scale, *p < 0.05

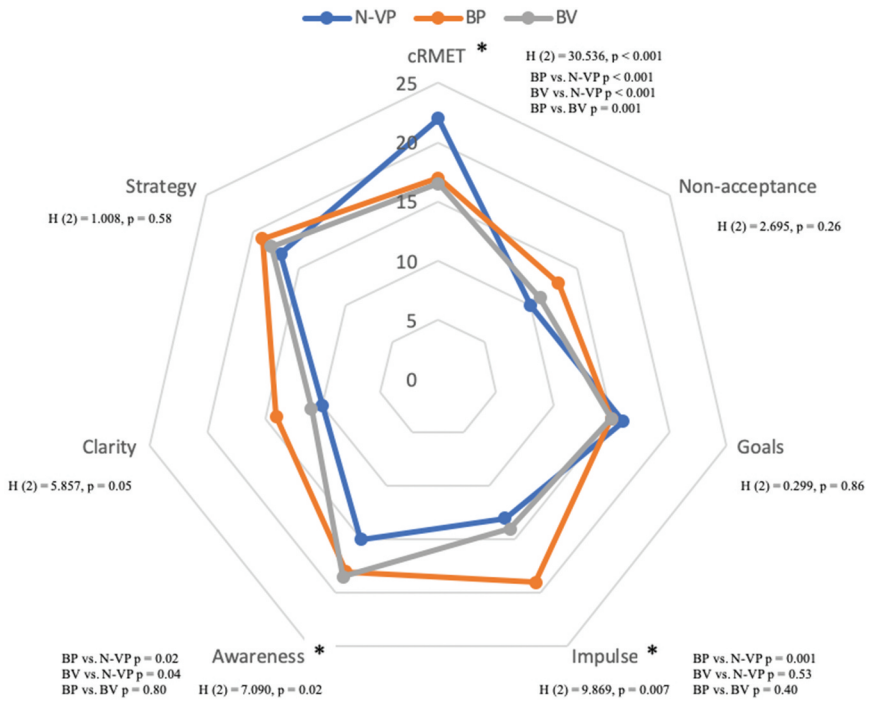

Figure 2. Comparison of cRMET performances and DERS-subscales scores between the three groups (BV, BP, and N-VP) Kruskal-Wallis test; N-VP = Non-victim or perpetrator; BV = Bullying-victimization; BP = Bullying perpetration; ADHD = Attention deficit and hyperactivity disoder; cRMET = Child reading the mind in the eyes test; DERS = Difficulties in emotion regulation scale; *p < .05.

exhibited a significantly higher DERS total score (F[2] = 4.178, p = .01) and DERS impulse score (H[2] = 9.869, p = .007; BP vs. N-VP, p = .01; BV vs. N-VP, p = .05; BV vs. BP, p = .40) (Figure 2).

Participants were also divided into two groups according to their grades: middle-school students (n = 83) and high-school students (n = 22). The frequency of bullying involvement tended to be higher among middle-school students (N-BV: n = 38, 45.8%; BV: n = 22, 26.5%; BP: n = 23, 27.7%) than in high-school students (N-BV: n = 16, 72.7%; BV: n = 4, 18.2%; BP: n = 2, 9.1%) (χ2[2] = 5.904, p = .05). The most common form of bullying among middle-school students was name-calling (n = 26, 31.3%), followed by exclusion (n = 20, 24.1%). The most common form of bullying among high-school students was telling lies (n = 3, 13.6%), and ostracism (n = 2, 9.1%) was the second most common form of BV. Name-calling (n = 14, 16.9%) and physical bullying (n = 11, 13.3%) were the most frequent types of BP among middle-school students. On the other hand, only two high-school students reported that they perpetrated bullying by calling and ostracizing. None of the high-school students reported that they had been exposed to or perpetrated physical bullying. Comparison of BV and BP behaviors between

Table 2. Multivariate binary logistic regression analysis to estimate which variables significantly affect the presence of BV or BP in adolescents with ADHD.

	Unstandardized Coefficients				95% *CI* for Exp (*B*)	
Model	*B*	*SE*	*p* value	Exp (*B*)	Lower	Upper
cRMET total score	−0.429	0.128	0.001*	0.651	0.506	0.838
DERS-Awareness	0.036	0.068	0.59	1.037	0.907	1.186
Tic disorder comorbidity	1.959	1.413	0.49	2.609	0.163	41.646
Maternal education	0.016	0.085	0.85	1.016	0.860	1.200
Age	−0.033	0.184	0.85	0.870	0.675	1.387
Gender	0.626	0.735	0.39	1.674	0.443	7.896
Model	Unstandardized Coefficients		*p* value	Exp (*B*)	95% *CI* for Exp (*B*)	
	B	*SE*			Lower	Upper
cRMET total score	−0.235	0.108	0.02*	0.790	0.640	0.976
DERS-Awareness	−0.006	0.084	0.94	0.994	0.843	1.173
DERS-impulse	0.139	0.067	0.03*	1.149	1.008	1.310
T-DSM-IV-S-Hyperactivity	0.075	0.061	0.21	1.078	0.957	1.214
T-DSM-IV-S-ODD	−0.099	0.096	0.29	0.906	0.751	1.092
T-DSM-IV-S-CD	0.204	0.144	0.15	1.227	0.925	1.627
Maternal education (year)	−0.196	0.100	0.049*	0.822	0.676	0.999
Age	−0.009	0.222	0.96	0.991	0.641	1.533
Gender	0.056	0.768	0.94	1.057	0.235	4.758

Dependent variable = Bullying-perpetration; Binary logistic regression model; cRMET = Child reading the mind in the eyes test; DERS = Difficulties in emotion regulation scale; T-DSM-IV-S = Turgay DSM-IV-Based Child and Adolescent Behavior Disorders Screening and Rating Scale; ODD = Oppositional defiant disorder; CD = conduct disorder; *p < 0.05

middle-school and high-school students revealed that being bullied by name-calling was significantly higher in middle-school students ($\chi 2[1] = 8.375$, $p = .004$). Other forms of BV or BP did not differ significantly between the groups.

To test Hypothesis 2, a binary logistic regression analysis was performed with significant variables. The independent variables included in the model to predict BV were cRMET total score, DERS awareness score, tic disorder, maternal education level, gender, and age. According to this model, cRMET was the only significant variable that affected the presence of BV. Our model for BV explained 43% of the variance and correctly classified 84.3% of the cases, with a sensitivity of 93.9% and a specificity of 61.9%. A 1-point decrease in the cRMET total score increased the risk of BV by 53% in adolescents with ADHD (Table 2). On the other hand, the following variables were included in the model to predict BP: cRMET total score, DERS impulse score, DERS awareness score, T-DSM-IV-S-Hyperactivity, T-DSM-IV-S-ODD, T-DSM-IV-S-CD, maternal education level, gender, and age. Our model for BP explained 46.1% of the variance and correctly classified 84.1% of the cases, with a sensitivity and specificity of 92.8% and 52.6%, respectively. We found that a 1-year decrease in the education level of mothers and a 1-point decrease in the children's cRMET total score increased the risk of BP by 26.5% and 21.6%, respectively. Moreover, a 1-point increase in the "impulse" subscale of the DERS was associated with a 14.9% increase in the risk of BP in adolescents with ADHD (Table 2).

Discussion

Elucidating the underlying risk factors among children with ADHD that lead to involvement in bullying as victims or as perpetrators might be beneficial for improving prevention and intervention programs. Hence, we aimed to examine whether poor ToM ability contributed to BV or BP in adolescents with ADHD. Moreover, we aimed to investigate which aspects of ED were associated with BV or BP in these adolescents.

To the best of our knowledge, this study is the first to show that adolescents with ADHD who were victims or perpetrators of bullying had poorer ToM ability than those who were not involved in bullying. A 1-point decrease in the cRMET total score increased the risk of BV by 53% and the risk of BP by 21.6% in these adolescents. Consistent with our findings, Unnever and Cornell (2003) and Shea and Wiener (2003) suggested that the inability to read social cues, poor social skills, or inappropriate behaviors result in children with ADHD being perceived as different, thus eliciting aggressive behaviors in their peers and making them vulnerable to BV. Binary logistic regression analysis showed that the odds of BV were higher than the odds of BP with a 1-point decrease in the cRMET score in adolescents with ADHD. This might be explained by the findings reported by Sutton, Smith, and Swettenham (2001), who claim that some of the bullies have good ToM skills to manipulate others, whereas others fail to process other people's intentions accurately and only see events from their perspectives. Therefore, future studies involving a latent class analysis for the identification of social cognition subtypes of children with ADHD who are victims or perpetrators of bullying would be beneficial.

The present study showed that the BV group exhibited a significantly higher incidence of emotional awareness problems than those who were not involved in bullying. Consistent with this finding, a lower level of understanding emotions has been found in bullying victims with high-functioning autism spectrum disorder (Liu, Wang, Yang, Shyi, & Yen, 2019) and developmental language disorder (Van Den Bedem, Dockrell, Van Alphen, Kalicharan, & Rieffe, 2018) when compared with non-victims. The diminished ability to understand others' emotions might result in children with ADHD being less sensitive to others' emotions. Thus, they might be perceived as impolite, increasing their odds of being bullied (Liu et al., 2019). Moreover, we found that the BP group exhibited problems in emotional awareness as well as impulse control and emotion regulation when compared with the N-VP group. A 1-point increase in the "impulse" subscale of the DERS was associated with a 14.9% increase in the risk of BP in adolescents with ADHD. The finding of impaired emotional awareness in the BP group is consistent with that reported by van den Bedem et al. (2018). However, Pozzoli, Gini, and Altoè (2017) and Liu et al. (2019) reported better emotion recognition ability

in perpetrators than in non-perpetrators. It should be noted that in our sample, most perpetrators were also victims. In addition, the combined presentation was the predominant ADHD subtype among the perpetrators. Poor impulse control in children with combined presentation leads them to experience negative emotions more intensely (Fogleman, 2019). Their emotional excessiveness and emotional lability might lead them to be targeted by bullies (Fogleman, 2019). Thus, it might be assumed that when children with combined presentation are victimized due to their poor ToM abilities, emotional unawareness, excessive emotions, and emotional lability, they act impulsively and exert reactive aggression toward their peers. Consistent with this observation, Renouf et al. (2010) showed that the inverse relationship between ToM skills and reactive aggression was evident only in children who were frequently victimized by their peers. They suggested that since these children lack the skills to understand others' intentions and emotions, they evaluate events from their perspectives, which are based on their previous experiences (Renouf et al., 2010). Therefore, once they are victimized, they interpret such situations as threatening and react aggressively (Renouf et al., 2010). Their aggressive behaviors could also lead them to be bullied, resulting in the development of a bully-victim pattern. Thus, the more they perpetuate bullying, the more they are victimized, and the more they are victimized, the more they perpetuate bullying (Žic Ralić, Cvitković, & Sekušak-Galešev, 2018).

Consistent with previous literature, we observed that adolescents with ADHD who also had tic disorder exhibited a significantly higher risk of being bullied, and those with concomitant ODD or CD exhibited a higher risk of BP (Fite, Evans, Cooley, & Rubens, 2014; Zinner, Conelea, Glew, Woods, & Budman, 2012). Furthermore, although family income was not associated with bullying involvement, a 1-year decrease in maternal education level increased the risk of BP by 26.5%. Consistent with our results, Flouri and Buchanan (2003) and Holt, Kaufman Kantor, and Finkelhor (2008) did not find a link between income and bullying. On the other hand, Christie-Mizell (2004) reported a curvilinear relationship between bullying and income. The authors reported that children from low-income and high-income families exhibited higher odds of bullying involvement compared to those from middle-income families. A meta-analysis by Tippett and Wolke (2014) showed a significant but weak association between SES and bullying roles. Inconsistent findings regarding the association between income and bullying might be explained by different study designs, age ranges, and types of measures utilized by studies. Consistent with our findings, Alikasifoglu, Erginoz, Ercan, Uysal, and Albayrak-Kaymak (2007) found that a low maternal education level was associated with a bully victim status. Since highly educated parents are better models, provide better supervision, and help their children acquire social and emotion regulation skills, lower maternal education levels might put children with ADHD at a risk of

BP (Pears & Moses, 2003; Tattum & Herbert, 1997). Thus, it would be beneficial for clinicians to consider comorbidities and parental education levels while evaluating the risk of involvement in bullying among adolescents with ADHD.

In the present study, only 26.7% of the participants reported that they were taught the definition of bullying at school. Being taught, the description of bullying was not associated with lower involvement in bullying among children with ADHD. Thus, merely raising awareness regarding the description of bullying might not be sufficient to prevent bullying. Although some studies have shown the effectiveness of bullying prevention programs (i.e., Vienna Social Competence Training and Bullying Prevention Program at Schools) in Turkey (Albayrak, 2012; Doğan et al., 2017), no structured peer bullying prevention and rehabilitation programs are routinely administered. There is an urgent need to validate the effectiveness of bullying prevention and rehabilitation programs and to disseminate them in Turkey. We found that high-school adolescents with ADHD tended to be less involved in bullying than those in middle school. Moreover, bullying behaviors differed between middle-and high-school students. Consistent with our findings, Napoletano, Elgar, Saul, Dirks, and Craig (2016) and Wang, Iannotti, and Nansel (2009) reported that the risk of being victimized decreased for all bullying types with increasing school grades. Hence, it seems that effective anti-bullying intervention strategies should be developed by considering school grades (Salmon, Turner, Taillieu, Fortier, & Afifi, 2018).

Several limitations need to be considered. The cross-sectional design prevented us from determining the causal links between the variables. We used only the cRMET as an advanced ToM test. Thus, our findings need to be confirmed using other ToM tasks. Another limitation of our study was the use of a self-report questionnaire to assess ED. Moreover, since only 6 out of the 22 high-school adolescents with ADHD were involved in bullying, we could not examine the association between bullying involvement and ED or ToM ability by age group. Future studies should explore this relationship specifically in high school adolescents with ADHD. Altogether, 81% of the patients from our sample were under psychostimulant treatment, and 59% had a comorbidity. Since both comorbidities and psychostimulants can affect emotion regulation and ToM ability during adolescence (Bora & Berk, 2016; Gamli & Tahiroglu, 2018; Maoz et al., 2014; Sharp, 2008; Sheppes, Suri, & Gross, 2015), it would be beneficial to explore the relationship between bullying involvement and ToM or ED in drug-naïve children and in children with pure ADHD. The strengths of the present study include an explanation of the bullying concept to adolescents by clinicians and utilizing a semi-structured interview (K-SADS-PL) to confirm the diagnosis of ADHD and to detect comorbidities.

Implications for clinical practice

Several clinical implications can be proposed based on our findings. Due to the cross-sectional design of our study, we could not determine whether poor ToM ability or ED predicted bullying involvement in children with ADHD. If future longitudinal studies elucidate this pathway, improving the ability of preschool children with ADHD to read the "language of the eyes" and the ability to regulate emotions might help prevent bullying among these children. Verlinden et al. (2015) reported that behavioral problems associated with ADHD and ODD at 3 years of age predicted bullying involvement in primary school. Thus, they proposed that improving children's social and problem-solving skills and behavioral control during preschool years could prevent them from being involved in bullying. The Incredible Years Dinosaur Social Skills and Problem Solving Curriculum, which helps preschool children to decrease their aggressive and externalizing problems and in improving their pro-social behaviors, might be an option to prevent bullying involvement during school years (Webster-Stratton, Reid, & Hammond, 2001). Liu et al. (2018) showed that ToM performance training and social skill training are effective for self-reported bullying victimization in children with high-functioning autism spectrum disorder. Similarly, social skill training, including emotion recognition and ToM practices, might contribute to bullying intervention programs for children with ADHD. Moreover, both stimulant treatment and behavioral contingency management can improve children's social competence by decreasing their aggressive, intrusive, and disruptive behaviors (Mikami, 2010). Thus, it would be fruitful to investigate whether stimulant treatment is effective for children with ADHD in preventing their future involvement in bullying by improving their emotion regulation and ToM abilities.

Author Contributions

Helin Yilmaz Kafali: Data collection, statistical analysis, drafting article; **Binay Kayan Ocakoğlu**: data collection, data interpretation; **Adem Işık**: data collection, critical revision of article; **Ümran Gül Ayvalık Bodur**: data collection, critical revision of article; **Gizem Müjdecioğlu Demir**: data collection, critical revision of article; **Müge Şahin Erener**: data collection, critical revision of article; **Özden Şükran Üneri**: supervision, concept/design, critical revision of article.

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No potential conflict of interest was reported by the author(s).

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