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ORIGINAL CONTRIBUTION

Empathy and prosocial behavior in response to sadness and distress in 6- to 7-year olds diagnosed with disruptive behavior disorder and attention-deficit hyperactivity disorder

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Abstract Empathy has been associated with decreased antisocial and increased prosocial behavior. This study examined empathy and prosocial behavior in response to sadness and distress in disruptive behavior disorder (DBD) and attention-deficit hyperactivity disorder (ADHD). Six- and 7-year-old children with DBD (with and without ADHD) ($n = 67$) and with ADHD only ($n = 27$) were compared to typically developing children (TD) ($n = 37$). Parents and teachers rated affective empathy in response to sadness and distress on the Griffith Empathy Measure. Children reported affective empathic ability in response to sad story vignettes. Empathy-induced prosocial behavior in response to sadness and distress was assessed with a computer task, the Interpersonal Response Task (IRT). Compared to TD, children with DBD (with and without ADHD) and those with ADHD only were rated as less empathic by their teachers, but not by their parents. No differences between groups were observed in children who reported affect correspondence. Children with DBD (with and without ADHD) showed less prosocial behavior in response to sadness and distress compared to TD. Children with ADHD only did not differ from TD. An additional analysis comparing all children with a diagnosis to the TD group revealed that the difference in prosocial behavior remained after controlling for ADHD symptoms, but not after controlling for DBD symptoms. These findings of impaired empathy-induced prosocial behavior in response to sadness and distress in young children with DBD suggest that interventions to ameliorate peer relationships may benefit from targeting on increasing prosocial behavior in these children.

Keywords Children · Empathy · Disruptive behavior disorder · Attention-deficit hyperactivity disorder · Prosocial behavior

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Introduction

Empathy is the ability to understand and share emotions of other people with whom we interact [1, 2]. Empathy is assumed to be initiated by the observation of another's emotional state [3] and consists of an emotional (i.e., experiencing another's emotional state) and a cognitive component (i.e., understanding another's emotional state) [4, 5]. In addition, a distinction has been proposed between dispositional (i.e., trait) and situational (i.e., state) empathy. Accordingly, to study empathic traits in children self- and other-report questionnaires on feelings, thoughts, and behavior have been developed [6]. Likewise, experimental paradigms have been designed to evaluate the understanding of another's emotional state (cognitive empathy, CE), to elicit emotional experience (affective empathy, AE), and to elicit empathy-induced behavior [7, 8].

Empathy-related responding tends to be positively associated with prosocial behavior such as helping, sharing, and comforting another individual (see for reviews [7, 9]). Empathy is also thought to contribute to the inhibition of

antisocial and aggressive behavior [10]. Researchers trying to explain the mechanisms involved have focused on the central role of the display of sadness and distress in the inhibition of aggressive behavior [11, 12]. For example, children inflicting harm upon another person and witnessing the sadness or distress in this person have been proposed to become distressed themselves and stop harming the other to reduce their own personal distress [13]. Similarly, witnessing distress in mammals evokes sharing, helping and comforting behaviors [5], analogous to the positive association between empathy and prosocial behaviors in humans [9]. An important point to consider is that it is especially prosocial behavior that does have no direct material benefits for the actor that seems to be related to empathy for the pain and distress of others [14].

Whereas in developmental and ethological studies attention has been paid to empathy and prosocial as well as aggressive behavior, in clinical studies the focus has been mainly on the association between empathy and aggression. In children and adolescents, deficits in empathy have been reported in disruptive behavior disorders (DBD), a disorder characterized by oppositional, defiant and antisocial behavior. Indeed, in school-aged children and adolescents with DBD lower scores were obtained on self-report questionnaires of empathic traits [1, 15, 16]. Similarly, most studies assessing empathy in DBD in experimental paradigms have agreed on a central role for affective empathy deficits in DBD patients [1, 15–18]. Cognitive empathy, however, in these experimental studies, was generally found to be intact in patients with DBD [17, 19], although one study suggested otherwise [1]. In sum, it seems that reduced sharing of feelings of sadness and distress in others is linked to disruptive and aggressive behavior in children and adolescents.

However, several important issues concerning affective empathy deficits and prosocial behavior in children with DBD need further clarification. First, a useful approach would be to examine affective empathic response patterns specifically in response to signals of sadness and distress of others [20]. In experimental studies, the study of affective empathy in response to vignettes of sadness and distress has shown impairments in children with DBD compared to TD [15, 16, 18], whereas results of reduced responses to happiness and anger have been more mixed [15, 18]. With regard to report of empathic traits, studies thus far have not distinguished between empathy in response to feelings of sadness/distress, happiness or anger [1, 15, 16].

Second, with regard to prosocial behavior, two studies using community samples have shown an association between conduct problems and reduced prosocial behavior reported as exemplified in how helpful, nice and cooperative children were in classroom situations as rated by teachers [21, 22]. Conduct problems were negatively correlated with teacher and peer-reported prosocial behavior [21], and physical aggression was negatively correlated with peer-reported prosocial behavior [22]. However, to date no studies have investigated prosocial behavior in clinical samples of children diagnosed with DBD, although experimental methods such as a computer game to elicit prosocial behavioral responses have been developed [4].

Third, despite high comorbidity of attention-deficit/hyperactivity disorder (ADHD) and DBD [23], and high co-occurrence of ADHD symptoms in children with DBD and DBD symptoms in children with ADHD [24], little attention has been paid to the influence of ADHD on emotion perception and processing in children with DBD. Several studies in children with ADHD have shown that affective empathy might also be impaired, to some extent, in boys with ADHD compared to TD children, either assessed as a trait using parent reports [25], or as a state assessing affective responses to vignettes [26]. With regard to prosocial behavior in ADHD, two studies indicate that in community samples, ADHD symptoms are negatively correlated with prosocial behavior [21, 22]. Interestingly, it has been argued that deficits in responding to emotions of others in children with ADHD are at least partially accounted for by the coexistence of DBD [25]. Likewise, in boys with DBD, deficits might at least partially be related to ADHD.

Finally, it remains unclear whether empathy deficits in school-aged children and adolescents with DBD are already present at a younger age. Studies suggest that, compared to their typically developing peers, aggressive school-aged children and adolescents [9, 10], but not preschoolers [27, 28], show less signs of affective empathy in response to stories [29] or to a distressed adult in a laboratory setting [28]. No systematic studies assessing empathy in clinical populations with ADHD and DBD in early school-aged children have yet been performed, while at this age, social demands in peer interactions rapidly increase.

The present study aimed to address these issues by (1) comparing parent and teacher reports of affective empathy in response to sadness and distress of others; (2) measuring affective empathy in response to sad vignettes; (3) assessing empathy-induced prosocial behavior with a computer task, in a sample of 6- to 7-year-old children with DBD or ADHD and a typically developing control (TD) group. Two lines of approach were followed. First, in a categorical approach, three groups were compared, i.e., children with DBD, children with ADHD, and typically developing children. Second, we assessed the influence of dimensions of DBD and ADHD within the spectrum of DBD and ADHD psychopathology. While comparing the clinical group (i.e., all children with a

diagnosis) to the typically developing group, first the effect of DBD on empathy and prosocial behavior was examined with ADHD symptoms as a covariate, and second the effect of ADHD was examined with DBD symptoms as a covariate.

In keeping with the previous studies in school-aged children and adolescents, we hypothesized that 6- to 7-year-old children with a diagnosis of DBD or ADHD would show less parent- and teacher-reported affective empathic traits, less affective empathy in response to vignettes, and less empathy-induced prosocial behavioral responses as compared to TD children. Furthermore, we hypothesized that children in the clinical group would show less empathy and prosocial behavior and that this difference would remain after controlling for ADHD symptoms, but not after controlling for DBD symptoms.

Methods

Participants

A sample of 103 children aged 6 and 7 years old with a previous clinical diagnosis of DBD and/or ADHD was recruited at the Outpatient Clinic of the Department of Child and Adolescent Psychiatry, University Medical Center Utrecht as part of a project on empathy in children with psychiatric disorders. Children were excluded from analysis in case a clinical diagnosis of ADHD or DBD could not be confirmed ($n = 3$) in the parent version of the Diagnostic Interview Schedule for Children (DISC, module E) [30] or when they had an estimated IQ below 70 based on the vocabulary and block design subsets of the Wechsler Intelligence Scale for Children III-Dutch version ($n = 7$) [31, 32]. The sample of 93 children included 18 children who had taken methylphenidate on the day of testing, despite instructions to cease medication the day prior to assessment.

The TD group consisted of 37 children from regular elementary schools in the vicinity of Utrecht who did not meet criteria for a clinical diagnosis of ADHD or DBD on the DISC and had an estimated IQ within the normal range. The Medical Ethics Committee of the University Medical Centre Utrecht approved the study protocol and parents gave written informed consent prior to participation.

Procedure

The parent version of the DISC interview (module E) was administered during a home visit by a trained interviewer. Parents also completed the Child Behavior Checklist 6–18 (CBCL) [33] and the Griffith Empathy Measure (GEM). Teachers completed the Teacher Report Form (TRF) and the GEM. The CBCL and TRF were used to quantify attention problems and rule-breaking/aggressive behavior.

All child data were collected in a quiet room at the children's own school. To assure participants were at ease, they first had a small talk with the experimenter and completed the two WISC-III subtests. Next, subjects were presented a facial mimicry paradigm [34], the Interpersonal Response Task, and the Story Task. Between each task, a short break was allowed and children received a sticker as a reward upon completing each task as well as a small gift upon completing all tasks.

Measures

Disc

The parent version of the DISC (module E) [30] was used to distinguish patient groups. The patient group of 93 children consisted of children with ADHD without comorbid DBD ($n = 27$), of children with DBD without a comorbid ADHD diagnosis ($n = 6$) and of children with ADHD and DBD ($n = 60$). In line with the previous reports, comorbidity of ADHD and DBD in the clinical sample was high while the DBD-only group was small [35, 36]. Because of the small sample size of the DBD-only group ($n = 6$) in this study, we pooled children with DBD with ADHD ($n = 60$) and children with DBD without comorbid ADHD ($n = 6$) in one DBD group.

Griffith Empathy Measure

Empathy was measured using the Griffith Empathy Measure (GEM) [4] which is a 23-item parent questionnaire adapted from Bryant's index of Empathy for children and adolescents. The GEM assesses both aspects of cognitive empathy (e.g., "My child doesn't understand why other people cry out of happiness") and affective empathy (e.g., "My child becomes sad when other children are sad", "My child gets upset when he/she sees an animal being hurt") using a 9-point Likert scale (-4 = strongly disagree; $+4$ = strongly agree). A higher total score represents a higher level of empathy. For the current study, we made a selection of questions relating to affective empathy in response to sadness and distress of others, and removed questions tapping cognitive empathy and empathy in response to other emotions. The GEM affective sadness scores consisted of six items; the Cronbach alpha for this scale for parents in our total study sample was 0.76. For teachers the Cronbach alpha for this scale was 0.82.

No GEM teacher data were collected for eight children (4 TD, 2 ADHD, 2 DBD), because teachers did not return the forms.

Story Task

The story narratives used were based on the classic Feshbach Affective Situation Test for Empathy [27]. The task has been adapted to assess aspects of emotion recognition as well as affective empathy (affect match between the participant and protagonist in the stories) [37]. It consists of eight short stories in which the protagonist is involved in an event arousing angry, happy, sad, or fearful emotion. Each emotion is represented by two stories. The version presented to boys involves scenarios with a boy protagonist; the version for girls involves a girl.

In the present study, two sad stories were used. After each vignette, children were interviewed to assess whether they had been able to recognize and share the emotions depicted in the stories. Participants were asked how the protagonist felt (angry, happy, fearful, sad or neutral) and to what extent (a little, average, very much). They reported and indicated their responses on a card showing the emotional categories and intensity. Next the child was asked how he or she felt after listening to the story. Again, the child could choose between the five different emotions and the three intensity levels.

Levels of affect correspondence were evaluated on a four-point scale (0 = the child did not report an affect match; 1 = the child's emotion was similar to his or her report of the character's emotion; 2 = the child's emotion was the same as the character's emotion but different in intensity; 3 = both the child's emotion and the intensity were the same as the character's). This resulted in a continuous score for affect match in response to sadness computed by adding the scores on the two sad stories per emotion, ranging between 0 and 6 points.

Interpersonal Response Task

The Interpersonal Response Task [38] is a computer-based task that assesses a prosocial behavioral response of subjects to emotional stimuli in a social context. Subjects play a ball-throwing computer game against two computer-controlled players. Subjects are assigned to choose toward which of two computer players they will play the ball. They are told that they will receive 'money' (score) for throwing the ball to a particular player, and that each player will show them their feelings through facial expression (photos). The game consists of three rounds. In the first round (10 trials), both computer players keep a happy facial expression, regardless of whether the ball is passed to them or not. When subjects play the ball toward any of both players, they are displayed a coin rolling toward them on the computer screen with simultaneous sound of coins rolling. In the second round (10 trials), one of the players has run out of money and does not give money (no rolling coins or sound). This player continues to show a happy face even when the ball is not thrown to him. In the third round (20 trials), each time the ball is not passed to the player that has ran out of money, the player displays a progressively sad and distressed facial expression. In the current study, we used an adapted version of the IRT; the task could be performed twice, once with a girl and once with a boy showing distressed facial expressions.

The number of times the participant throws the ball to the 'sad' player in the third round was the dependent variable in this game. This variable reflects empathy-induced prosocial behavior in response to the increasing sadness and distress of the computer player that does not provide the child with a monetary reward. The variable yields a continuous score in which a higher score represents a higher sensitivity to sadness and distress and associated empathy-induced prosocial behavior.

Data analysis

First, in a categorical perspective, three groups were compared: children with DBD ± ADHD ($n = 66$), children with ADHD ($n = 27$), and TD children. Second, we compared the clinical group ($n = 93$) (i.e., all children with a diagnosis) to the typically developing group, first the effect of DBD was examined controlling for ADHD symptoms, and second the effect of ADHD was examined controlling for DBD symptoms.

Statistical analyses were performed using PASW Statistics 18.0 (IBM Company, Chicago, IL, USA). For the distribution of demographic variables between groups multiple one-way ANOVA's (i.e., age, IQ and SES) or Chi square tests (sex) were performed. First, to examine differences in parent and teacher-rated empathy, analyses of variance (ANOVA) were conducted. Dependent variables were the GEM affective sad scores from parent and teacher reports. GROUP was entered as between-subjects variable with three levels (DBD with or without ADHD, ADHD, and healthy controls). Statistical significant group differences were followed by simple contrasts, comparing healthy developing children to children with DBD and ADHD. Next, ANCOVA's were conducted to compare the GEM affective empathy scores in the overall patient group with the typically developing children (GROUP) with the parent- and teacher-reported attention and aggression symptom scores entered as covariates.

Second, to examine differences between groups in affect match in response to sadness in the Story Task, a non-parametric test was used as distributions of mean raw scores across subjects that violated the assumptions of normality. To test for group effects, we performed Kruskal–Wallis tests.

Table 1 Descriptives

Characteristics	TD ($n = 37$) M (SD)	ADHD ($n = 27$) M (SD)	DBD ± ADHD ($n = 66$) M (SD)	F	Post hoc tests
Age	7.1 (0.5)	7.1 (0.7)	6.8 (0.6)	5.93*	(TD, ADHD) > DBD
Sex[a]	18/19	17/10	55/11	14.02*	
Estimated IQ	110 (20)	103 (18)	102 (20)	2.10	
SES	7.0 (2.3)	5.4 (2.1)	5.6 (1.6)	7.14*	TD > (ADHD, DBD)
CBCL T score					
Attention	52.6 (3.8)	66.4 (8.9)	67.2 (7.3)	58.02*	TD < (ADHD, DBD)
Rule-breaking	52.9 (4.2)	56.4 (6.3)	62.1 (7.1)	27.97*	(TD, ADHD) < DBD
Aggression	53.5 (5.5)	61.0 (8.5)	71.6 (8.6)	67.05*	TD < ADHD < DBD
TRF T score					
Attention	51.9 (3.0)	59.1 (8.6)	60.8 (7.1)	21.90*	TD < (ADHD, DBD)
Rule-breaking	51.0 (2.6)	54.5 (5.1)	58.6 (7.4)	19.60*	(TD, ADHD) < DBD
Aggression	52.4 (3.9)	59.6 (5.6)	64.7(10.4)	26.15*	TD < ADHD < DBD

TD typically developing children, *ADHD* ADHD without comorbid DBD, *DBD* DBD ± ADHD

* $p < 0.05$

[a] Male/female

Third, to examine differences in empathy-induced prosocial behavior, ANOVA was performed with PROSOCIAL RESPONSE as dependent variable and GROUP as a between-subject factor. Statistical significant group differences were followed by simple contrasts, comparing TD children to children with DBD and ADHD. Next, ANCOVA's were conducted to compare the PROSOCIAL RESPONSE scores in the overall patient group with the typically developing children (GROUP) with the parent- and teacher-reported attention and aggression symptom scores entered as covariates.

In all tests, the alpha level of significance was set at <0.05 (two tailed) throughout.

Results

Descriptives

Table 1 shows the characteristics of the samples used for data analyses, separately for the DBD ± ADHD group, the ADHD group and the TD group. Analyses presented in Table 1 demonstrate that children in the DBD ± ADHD and ADHD groups contained fewer girls and had lower socio-economic status (SES) than children in the control group. As expected, the three groups differed significantly on attention problems and rule-breaking/aggressive behavior.

Since groups differed in SEX and SES, we first examined whether these variables were related to our outcome variable. The only significant association we retained was between the GEM parent report of affective empathy and SES. Thus, SES was included as a covariate in further analysis for the GEM parent sadness scores.

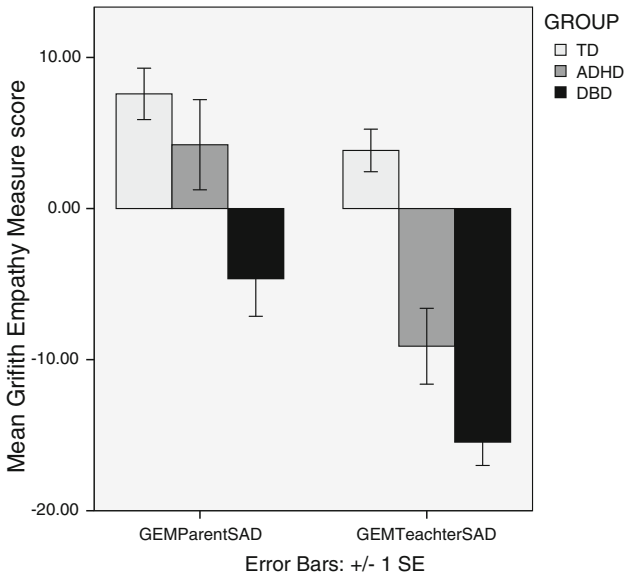

Fig. 1 Parent- and teacher-reported empathy in response to sadness/distress. *Note*: a significant difference was found between the DBD ± ADHD and the TD group and between the ADHD and TD group for the GEM (Griffith Empathy Measure) Sadness teacher scores; *brackets* indicate significant differences between groups at the $p < 0.05$ level

Griffith Empathy Measure

Results regarding the GEM SAD parent and GEM SAD teacher are demonstrated in Fig. 1.

For the GEM affective empathy in response to sadness reported by parents, the ANCOVA revealed a significant effect of SES ($p < 0.005$). Results showed no significant between-group differences [$F(2,130) = 0.98$, $p = 0.38$].

For teachers, results showed significant between-group differences [$F(2,122) = 19.23$, $p < 0.001$]. Follow-up analysis using simple contrasts showed that children with DBD ± ADHD were rated as less empathic to sadness by their teachers compared to TD children ($p < 0.001$). Likewise, children with ADHD were rated as less empathic to sadness by their teachers compared to TD children ($p < 0.005$).

Next, analyses were conducted to examine the effect of GROUP (all patients versus typically developing children) on reported sadness by parents and teachers controlling for attention and aggression symptom scores, respectively, reported by either parents (CBCL attention and CBCL aggression T scores) or teachers (TRF attention and TRF aggression T scores). For parents, no significant effect of GROUP was found in any of the ANCOVA's with the CBCL factors entered as covariate (all $p > 0.10$). For teachers, a significant effect of GROUP was found in an ANCOVA controlling for TRF attention ($p < 0.001$) as well as in an ANCOVA controlling for TRF aggression symptoms ($p = 0.001$). Furthermore, a negative correlation was found between TRF aggression scores and teacher-rated affective empathy ($p < 0.005$).

Story Task

The Kruskal–Wallis test performed for affect match in response to sadness in the Story Task to examine whether TD children (Mean 2.54, SD 2.4) differed from children with ADHD (Mean 2.33, SD 2.7) and children with DBD ± ADHD (Mean 2.38, SD 2.3) showed no significant group effect ($p = 0.92$). An additional analysis in a subsample that excluded the children who did accidentally take methylphenidate medication on the day of the assessment showed similar results ($p = 0.74$). Similarly, no differences were found comparing the overall patient group to the typically developing children ($p = 0.75$).

Interpersonal Response Task

First, we entered sex of the computerized player as a within-subject factor (PLAYER GENDER), to explore differences between the tasks in which a boy or girl computer player showed sadness and distress. The ANOVA for PROSOCIAL RESPONSE did not reveal a significant effect of PLAYER GENDER ($p = 0.86$). Thus, for our main analyses, the results from the boy and girl task were pooled.

Results of the IRT are shown in Fig. 2. The ANOVA revealed a significant effect of GROUP [$F(2,126) = 4.21$, $p < 0.05$] on empathy-induced prosocial behavior, indicating differences in scores between the three groups.

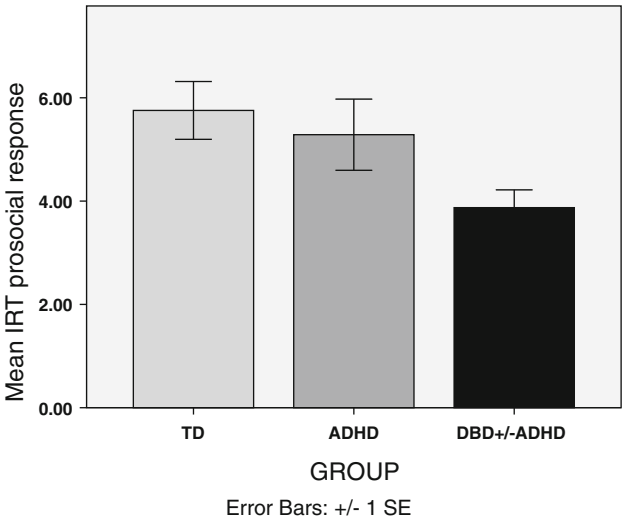

Fig. 2 Mean prosocial response on the IRT task. *Note*: a significant difference was found between the DBD ± ADHD and the TD group but not between the ADHD and TD group on the IRT (Interpersonal Response Task); *brackets* indicate significant differences between groups at the $p < 0.05$ level

Further analysis using simple contrasts showed that children with DBD ± ADHD scored significantly lower than TD children ($p = 0.01$). Children with ADHD only did not show significant differences in empathy-induced prosocial behavior when compared to TD children ($p = 0.78$). An additional ANOVA in a subsample that excluded the children who took methylphenidate medication on the day of the assessment showed similar results (effect of GROUP $p < 0.05$, contrast ADHD versus TD $p = 0.95$, contrast DBD ± ADHD versus TD $p < 0.05$).

Next, two analyses were conducted to examine the effect of GROUP (all patients versus typically developing children) on prosocial response controlling for attention and aggression symptom scores, respectively, reported by either parents (CBCL attention and CBCL aggression T scores) or teachers (TRF attention and TRF aggression T scores). The ANCOVA controlling for CBCL Attention scores ($p < 0.05$) as well as the ANCOVA controlling for TRF Attention scores ($p = 0.05$) revealed a significant effect of GROUP, whereas the ANCOVA controlling for CBCL Aggression scores as well as the ANCOVA controlling for TRF Aggression scores did not show a significant GROUP effect (both $p > 0.05$).

Discussion

The present study of empathy differs from other studies in that empathy was examined in relation to sadness and

distress, while empathy-induced prosocial behavior in response to sadness and distress was assessed as well. Teachers reported impairments in affective empathy in response to sadness and distress in 6- to 7-year-old children with DBD with and without ADHD as well as in children with ADHD without a comorbid DBD diagnosis. Furthermore, children with DBD with and without ADHD were impaired in observed empathy-induced prosocial behavior in response to sadness and distress. Children with ADHD only, however, did not differ from TD children in prosocial behavior. An additional analysis comparing the clinical group (i.e., all children with a diagnosis) with the TD group revealed that the difference in prosocial behavior remained when controlling for ADHD symptoms but not when controlling for DBD symptoms.

Most studies on empathy in children with aggressive behavior thus far have focused on a theory that underlines the role of sharing of sadness and distress in the inhibition of aggressive behavior [11, 12]. The present study showed that children with disruptive and aggressive behavior indeed have problems in sharing sadness and distress at school. Findings of the present study, however, suggest that we not only should consider the putative role of empathy in inhibiting aggression, but that we also should pay attention to the role of empathy in the induction of prosocial behavior [9, 14]. Notably, the latter notion seems to be a neglected target of interventions in children with DBD [9]. Interventions to ameliorate peer relationships in children with disruptive behavior may consider targeting not only on decreasing aggressive behavior, but also on increasing empathy-induced prosocial behavior.

Furthermore, the present study aimed to examine whether previously reported empathy deficits in older school-aged children and adolescents with DBD would already be present at a younger age. First, with regard to empathic traits assessed with questionnaires, we found impaired teacher-rated empathy. It should be noted that all previous studies in school-aged children and adolescents with DBD have used self-report questionnaires of empathic traits [1, 15, 16]. Since the ability of young children to reliably report on their empathic traits using questionnaires has been questioned [4], in the present study in young children parent as well as teacher reports were obtained, which complicates comparison with the previous reports. Second, we found intact affective empathy in response to vignettes whereas impairment was found in studies in older school-aged children [15–17] and adolescents [1, 18] with DBD. The finding of the present study regarding reported affective empathy in children with DBD seems to be in line with the observation that the association of empathy and antisocial behavior in children is most consistent when empathy is measured using questionnaires (i.e., dispositional empathy), but not using experimental paradigms (i.e., measures of situational empathy) [8, 9]. In addition, the inverse relations between empathy and aggression have been proposed to become stronger with age [8, 9]. Finally, since throughout development into late childhood and adolescence, symptoms of DBD are known to persist in certain, and decline in other children [39, 40], our sample might have included children with less severe psychopathology. Attention and aggression assessed with CBCL and TRF symptom checklists in the present study indeed were lower as compared to those in some previous studies [15].

The difference between parent and teacher-reported empathy in response to sadness and distress in DBD is not easy to interpret. In the study of child and adolescent psychopathology and related constructs, discrepancies often arise among multiple informants' reports and yield important information regarding where children express behaviors [41]. Teachers typically supervise a large group of children simultaneously, whereas parents will have much more one-on-one interaction with their children. Possibly, school settings are socially more demanding and therefore putative impairments in empathy become more manifest in the school environment. Finally, it should be noted that a negative correlation was found between socio-economic status and parent reported empathy; parents with a higher educational level reported higher empathic ability in their children than parents with a lower educational level. Notably, in the present study SES of the clinical groups was lower compared to the typically developing group. However, as no differences between groups were found on parent-rated empathy, it is unlikely that SES influenced the main findings of the study.

Children with ADHD without comorbid DBD showed impaired empathy in response to sadness and distress according to their teachers but not according to their parents. The absence of parent reported deficits in empathy in ADHD is consistent with a study in older children that showed that children with ADHD were rated to be less empathic than controls by their parents, but differences between children with ADHD and controls in that study were exclusively explained by comorbid conduct problems [25]. In the present study, however, teacher-rated affective empathy deficits were present in the ADHD group without a comorbid DBD diagnosis and persisted after controlling for conduct problems. This seems to suggest that in young ADHD children, empathic responding to sadness and distress of peers is impaired regardless of conduct problems, but only in a socially highly demanding school setting. This converges with our finding that ADHD, in contrast to DBD, was not associated with reduced empathic responding to sadness and distress and subsequent prosocial behavior in a setting where the interaction with only one peer in a quiet environment was simulated. Mainly in a socially demanding school setting, the core pattern of

inattention and/or hyperactivity–impulsivity seems to influence social functioning and rejection by peers that have been associated with ADHD [42, 43].

Finally, several limitations should be noted. First, most of DBD children were comorbid with DBD, and we did not succeed in including a large enough group of DBD-only children to reliably distinguish DBD with comorbid ADHD from DBD-only children. Therefore, an additional analysis was conducted comparing the clinical group (i.e., all children with a diagnosis) and the TD group taking the impact of both symptom clusters into account. Second, the affective empathy dimension of the Story Task showed low affect correspondence in all groups. The lack of a group difference on this measure may have been driven by the fact that the task did not sufficiently lead to an affective empathic response in this age group. It has been proposed that the hypothetical character of most experimental paradigms such as the Story Task as well as the rapid changes in affective content, together with the probability of social desirable answers, limits the validity to detect affective empathy deficits using these paradigms [10]. Third, the IRT we applied to assess empathy-induced prosocial behavior is a complex measure, the outcome most likely to be related not only to empathy, but also to several other relevant processes including the specific context (e.g., monetary versus social reward). For example, evidence has been provided showing that empathic healthy children tended to benefit more from social reward than monetary reward on an outcome measure of response inhibition [44]. Further study is needed to examine whether decreased prosocial responses in DBD children are accounted for by an increased dependency on monetary reward.

In conclusion, findings of impaired empathy-induced prosocial behavior in response to sadness and distress in young children with DBD were found. As interventions have shown that empathy can be used to foster prosocial behavior in healthy developing children [9], this may serve as a guidance to adjust present treatment approaches in children with DBD as they could benefit from targeting on increasing empathy-induced prosocial behavior.

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Conflict of interest None

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