

Relational aggression in adolescents with conduct disorder

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1 Relational aggression in youth with Conduct Disorder: Sex differences and associations with
2 callous-unemotional traits and empathy

3 ABSTRACT: As most research on conduct disorder (CD) has been conducted on male
4 participants, it has been suggested that female-specific symptoms may be underestimated
5 based on current DSM-5 criteria. In particular, relational aggression, i.e. the hurtful, often
6 indirect, manipulation of relationships with the intention of damaging the other's social
7 position, has been proposed as a characteristic of CD that is more common in females. In
8 addition, sex-specific studies on correlates of relational aggressive behavior are lacking.
9 Relational aggression may be strongly related to the correlates of proactive aggression,
10 namely low affective empathy, and high levels of callous-unemotional (CU) traits and
11 relational victimization. Thus, the present study investigated sex differences in relational
12 aggression, and associations between relational aggression and correlates of proactive
13 aggression in 662 adolescents with CD (403 females) and 849 typically-developing controls
14 (568 females) aged 9-18 years ($M = 14.74$, $SD = 2.34$) from the European multi-site
15 FemNAT-CD study. Females with CD showed significantly higher levels of relational
16 aggression compared to males with CD, whereas no sex differences were seen in controls.
17 Relational aggression was only partly related to correlates of proactive aggression in CD:
18 Independent of sex, CU traits showed a positive association with relational aggression. In
19 females only, cognitive, but not affective empathy, was negatively associated with relational
20 aggression. Relational victimization was more strongly associated with relational aggression
21 in males compared to females. Despite interesting sex specific correlates of relational
22 aggression, effects are small and the potential clinical implications should be investigated in
23 future studies.

24 KEYWORDS: relational aggression, conduct disorder, sex differences, empathy, callous-
25 unemotional traits, relational victimization

INTRODUCTION

Aggressive behavior is a multidimensional construct. It can be differentiated according to the form and function of aggressive behavior. *Form* of aggression refers to the method of aggressive behavior, such as physical versus relational aggression, whereas *function* refers to the motivation underlying aggressive behavior, such as reactive versus proactive aggression (e.g., Evans, Frazer, Blossom, & Fite, 2018). Relational aggression, in contrast to physical aggressive behavior (i.e. hitting, pushing, as well as verbal attacks), is defined as the hurtful manipulation of relationships and damaging of social position by spreading rumors, gossiping, or making indirect threats (Crick & Grotpeter, 1995). Despite being highly correlated with each other, studies on forms of aggression suggest that relational aggression shows independent and sex-specific psychological outcomes for the victim and perpetrator of the aggressive act (Burt, Donnellan, & Tackett, 2012; Card, Stucky, Sawalani, & Little, 2008; Perry & Ostrov, 2018; Preddy & Fite, 2012; Tackett, Daoud, De Bolle, & Burt, 2013). Prevalence of relational and physical aggression has been reported to differ between females and males. However, most studies on sex differences in aggression rely on community-based samples and only a few studies with clinical samples of youth with Conduct Disorder (CD) have included females with CD. This is particularly the case with respect to research on relational aggression in CD (Archer, 2004; Keenan, Coyne, & Lahey, 2008; Lansford et al., 2012; Loeber et al., 2009). Thus, the first aim of the present study is to compare levels of relational aggression in a large European sample of female and male children and adolescents with CD compared to typically-developing female and male controls. We hypothesized that females with CD would show higher levels of relational aggression than their male counterparts, as has been suggested by a recent study including a community, a residential and a detained sample (Marsee et al., 2014), but which did not include a sample of clinically-diagnosed adolescents with CD.

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To provide a model of relational aggression, it may be useful to build on existing knowledge on the functions of aggressive behavior (e.g., Evans et al., 2018). Regarding the functions of aggressive behavior, a theoretical model by Blair (2013) with assumed underlying neurobiological and cognitive substrates states that proactive aggressive (i.e. instrumental, goal-orientated and planned) behavior is characterized by reduced affective empathy (i.e. empathic concern; EC), high levels of callous-unemotional (CU) traits, and increased antisocial behavior. It also states that aggression may be driven by one's own experiences of aggressive victimization. However, proactive aggression does not necessarily lead to impaired psychosocial functioning (Card & Little, 2006; Fite, Craig, Colder, Lochman, & Wells, 2016). In contrast, the frustration- and threat-based reactive form of aggressive behavior is strongly linked to peer problems and subsequent functional impairment (Blair, 2013; Fite et al., 2016). Only a few studies have aimed to include different forms of aggression into this theoretical model of CD. In addition, no such studies have tested for sex differences in the correlates of relational aggressive behavior, in samples of clinically diagnosed youth with CD.

As relational aggression is a form of aggressive behavior, which involves manipulative and instrumental acts, it seems plausible that this form is related to the functional aspects and correlates of proactive aggression. That is, reduced affective empathy, high levels of CU traits, and direct experiences of relational aggression (relational victimization). Indeed, relational aggression was negatively correlated with affective empathy and CU traits in female undergraduate students (White, Gordon, & Guerra, 2015), and with affective empathy in female and male adolescents aged between 10 to 14 years (Batanova & Loukas, 2011). In addition, research in female and male school children (Kokkinos, Voulgaridou, & Markos, 2016), female college students (Centifanti, Fanti, Thomson, Demetriou, & Anastassiou-Hadjicharalambous, 2015), and in detained female adolescents (Marsee & Frick, 2007) has

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replicated the positive association of relational aggression with CU traits. Despite an overall lower level of CU traits in females (Essau, Sasagawa, & Frick, 2006), females with CD and high CU traits had higher levels of relational aggression than females with CD alone (Hipwell et al., 2007). In contrast to affective empathy, cognitive empathy (i.e., perspective-taking ability; PT) has not been proposed as a specific correlate of proactive aggression in Blair's neurocognitive model of CD. However, perspective-taking ability may be highly relevant to relational aggression: On the one hand, two studies with community-based samples have shown poorer perspective-taking skills in those who engage in relational aggression (Loudin, Loukas, & Robinson, 2003; White et al., 2015). On the other hand, it has been argued that perspective-taking skills may facilitate covert manipulation and harm, which may encompass relational aggressive acts (Batanova & Loukas, 2011; Caravita, Di Blasio, & Salmivalli, 2009; Sutton, Smith, & Swettenham, 1999).

In addition, Blair's (2013) neurocognitive model, as well as developmental models of proactive aggression propose that one's own experiences of aggressive behavior, such as being victimized by peers, are a risk factor for developing aggressive behavior. This is supported by studies on bullying behavior (deliberately harmful behavior toward a victim, often including, but not limited to, relational aggressive behavior) showing reciprocal relationships between being a victim and a perpetrator of bullying (Barker, Arseneault, Brendgen, Fontaine, & Maughan, 2008; Lam, Law, Chan, Zhang, & Wong, 2018). The association between victimization and aggression may especially account for relational aggressive behavior: Previous studies on bullying suggest that the motivation to bully partly relates to one's beliefs regarding the social effectiveness of aggression, and is therefore strongly related to proactive aggression (Camodeca & Goossens, 2005; Salmivalli & Nieminen, 2001). In line with this, a meta-analysis (Casper & Card, 2017) and a longitudinal study (Lam et al., 2018) found a moderate positive correlation between relational

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victimization (being the victim of relational aggression) and perpetration of relational aggressive behavior, which was equally strong for females and males. However, both studies were based on samples including typically developing children and adolescents only (e.g., incarcerated youth were excluded from the meta-analysis). No sample of children and adolescents with CD has been studied with regard to sex differences in correlates of relational aggression. Thus, applying Blair's neurocognitive model, the second aim of this study is to examine whether relational aggression is related to correlates of proactive aggression, namely affective and cognitive empathy, CU traits and relational victimization in a large sample of youth with CD.

To address these aims, we assessed relational aggression and its correlates in a large European wide sample of female and male youth with CD and typically developing youth. We first hypothesized that females with CD would show more relational aggression than males with CD, whereas this difference was not expected to be significant in typically-developing adolescents (Archer, 2004; Card et al., 2008; Marsee et al., 2014). Second, with regard to the idea that relational aggression may be related to correlates of proactive aggressive behavior, we hypothesized that CU traits would be positively associated with, whereas affective empathy would be negatively associated with, relational aggression. As findings on cognitive empathy are inconsistent, we also explored the association between cognitive empathy and relational aggression. Furthermore, we hypothesized that relational victimization would be positively associated with relational aggression. To avoid confounding the results on relational aggression with other forms of aggression, we controlled for physical aggression in all of our analyses (Smith, Rose, & Schwartz-Mette, 2009). In addition, it has been suggested that relational aggression requires more advanced verbal and cognitive skills (Bonica, Arnold, Fisher, Zeljo, & Yerushova, 2003), and is less stable over time than physical

aggression (Evans et al., 2018). Therefore, we included IQ and age as covariates in all statistical analyses.

METHODS

Participants and Recruitment

The present sample includes $n = 1511$ children and adolescents in total, all aged between 9 to 18 years old. The sample comprises a conduct disorder (CD) group with $n = 662$ (female $n = 403$) children and adolescents ($M_{age} = 14.95$; $SD = 2.18$) fulfilling a current diagnosis of CD according to DSM-5 criteria (American Psychiatric Association, 2013) and a control group (CG) containing $n = 849$ (female $n = 568$) children and adolescents ($M_{age} = 14.53$; $SD = 2.50$) without any current psychiatric diagnosis. The participants took part in the European study “Neurobiology and Treatment of Adolescent Female Conduct Disorder” (FemNAT-CD; Freitag et al., 2018). Participants were recruited in Aachen ($n = 294$), Amsterdam ($n = 181$), Athens ($n = 120$), Barcelona ($n = 39$), Basel ($n = 101$), Bilbao ($n = 106$), Birmingham ($n = 179$), Dublin ($n = 3$), Frankfurt ($n = 245$), Southampton ($n = 181$), and Szeged ($n = 62$). Participants were recruited via local schools, psychiatric clinics, youth welfare institutions, and adverts to the general public. Exclusion criteria for CD and CG were $IQ < 70$, neurological disorder, history of head trauma, a current or lifetime DSM-IV-TR diagnosis of autism spectrum disorder or schizophrenia, and bipolar disorder or mania. Additional exclusion criteria for the CG were current and lifetime diagnosis of CD, oppositional defiant disorder (ODD), and attention-deficit/hyperactivity disorder (ADHD) (based on DSM-IV-TR criteria). Further, participants were excluded when the following data were missing: total IQ score ($n = 2$), comorbidity data in controls ($n = 2$), and items on the perpetration subscale of the relational aggression questionnaire ($n = 6$). Complete data on sex, group, age, and site were available for all participants. All ethic committees in the respective countries approved the study prior to data collection (Electronic Supplemental Material

(ESM), Table 5). All participants and their legal guardian(s) signed informed consent forms before or on the date of assessment according to local ethical procedures. The data included in this study were collected between November 2013 and April 2017.

Measures

Psychopathology. The Schedule for Affective Disorders and Schizophrenia for School-aged Children - Present and Lifetime version (K-SADS-PL; Kaufman et al., 1997) was administered to all participants and their parents to assess current and lifetime diagnoses of CD and other psychiatric disorders. The K-SADS-PL is a semi-structured interview that is conducted with the participant and a parent. The K-SADS interviews were completed with both the child and their parent in 77.5% of the total sample. If parent(s) were not available for the interview, another adult who knew the child well was interviewed instead of the parent (e.g. another relative, youth welfare institution worker; this was the case for 11.6% of the total sample). In 10.9% of the total sample, no adult informant was available for the interview. The participant and the parent/carer were interviewed in separate rooms for confidentiality. Based on results of the interviews, clinician-rated DSM-5 diagnoses including severity ratings were obtained. For the current paper, the following psychiatric disorders (only current episode) were analyzed: ODD, CD, ADHD, Major Depression Disorder (MDD), Anxiety Disorders (AD, comprising Panic Disorder, Separation Anxiety Disorder, Avoidant Disorder of Childhood, Simple Phobia, Social Phobia, Agoraphobia, Overanxious Disorder, General Anxiety Disorder). Trained masters- and doctoral-level staff conducted the interviews. The inter-rater reliability of CD current episode was high (Cohen's kappa = .91, 95% agreement, $n = 75$). Similar values were obtained for ADHD, MDD, AD and ODD diagnoses (Cohen's kappas ranging from .84-.95, 92-95% agreement, $n = 75$).

IQ. To assess IQ, the vocabulary and matrix reasoning subtests of the Wechsler Scales for children (Wechsler, 2003) and adults (Wechsler, 1997), and the Wechsler Abbreviated

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Scale of Intelligence (Wechsler, 1999) were used at the non-UK and UK sites, respectively.

Medical history and parental education. The Medical History Questionnaire is a semi-structured parent interview focusing on current and past risk factors in the child's environment, educational status of the child and the parents, the medical history of the child, as well as family history of psychiatric disorders. Parental educational status was assessed with the ISCED-classifications (Organization for Economic Co-operation and Development, 1999). The total score on parental education status represents the mean of the biological father's and mother's ISCED score. If data for one biological parent was missing, the other biological parent's score was used. If information of both were unavailable, data were considered as missing. The ISCED score is based on the highest education achieved, and has been used in international studies (such as the educational PISA study; Kunter, Schümer, Artelt, Baumert, & Klieme, 2002): ISCED 0 = 0: pre-primary, ISCED 1 = 1: primary, ISCED 2A = 2: lower secondary, ISCED 3A, B, C = 3: upper secondary, ISCED 4A = 4: post secondary, ISCED 5 A, B = 5: lower tertiary, ISCED 6 = 6: higher tertiary education.

Relational aggression and relational victimization. The Relational Aggression Questionnaire (RAQ; Rusby, Crowley, Sprague, & Biglan, 2009) is a 11-item self-report questionnaire assessing two subscales: youth victimization (6 items; e.g. "How often did a student threaten to not do things with you or not be your friend?") and perpetration (5 items; e.g. "How often did you refuse to talk to another student?") of relational aggression. The questionnaire contains items related to school situations. Each item is answered on an 8-point Likert scale: 0 = "never in the past month", 1 = "1 – 2 times in the past month", 2 = "3 – 4 times in the past month", 3 = "2 – 4 times in the past week", 4 = "1 time per day", 5 = "2 – 5 times per day", 6 = "6 – 9 times per day", and 7 = "10 or more times per day" (total scores range from 0 - 77). The subscales scores are summary scores of the respective item answers. Internal consistency for the subscales relational aggression ($\alpha = .83$) and victimization ($\alpha =$

.87), and concurrent validity for the subscale relational victimization (depression: $r = .40$ females, $.29$ males; antisocial behavior: $r = .34$ females, $r = .21$ males) was assessed in 1,183 sixth and 1,649 seventh grade students (Rusby et al., 2009). In the present sample, the relational aggression perpetration subscale ($\alpha = .87$) and the victimization subscale score ($\alpha = .82$) showed good internal consistency. A Spearman correlation between the relational aggression subscale and the present measure of physical aggression ($r = .39$) indicated that these constructs are strongly related, yet somewhat distinct from each other.

The primary dependent variable in this study is the relational aggression perpetration subscale score of the RAQ. The discrete relational aggression perpetration subscale data showed a skewed distribution with 48% of the cases and 76% of the controls with a summary score below 2 (see ESM Table 4a and b). Therefore, all participants were assigned to 9 categories (0-8) according to their summary scores of the relational aggression perpetration subscale. The categories 0 to 7 reflect summary scores from 0 to 7 and those with a summary score > 7 were summarized as category 8. This was appropriate, because 99% of the control participants and 87% of the cases had relational aggression summary scores < 8 with median scores of two in CD cases and zero in controls.

Physical and overt verbal aggression. To assess physical and overt verbal aggression 12 out of the original 23 items of the Reactive Proactive aggression Questionnaire (RPQ; Raine et al., 2006) were used. The RPQ was designed to assess proactive and reactive aggression in children and adolescents – each item is answered on a 3-point Likert scale ranging from never (0) to often (2). For this study, only items assessing physical and overt aggressive behaviors towards others were selected (e.g. “Used physical force to get others to do what you want.”). Items describing attacks on property and non-physical forms of aggression were not considered, to ensure that only direct physical aggression was studied. A total sum score was calculated by adding the scores of each item. There was a correlation of r

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= .62, $p < .001$ ($N = 1466$) between the selected items of the RPQ summarized as a total score of physical aggression and the K-SADS CD item “initiates physical fights”, supporting the ability to use these RPQ items as a measure of physical aggression. Internal consistency was good ($\alpha = .88$).

CU traits. The Youth Psychopathic traits Inventory (YPI; Andershed, Stattin, Kerr, & Levander, 2002) is a 50-item self-report measure of psychopathic traits. Items are answered on a 4-point Likert scale ranging from “does not apply at all” (1) to “applies very well” (4). Higher scores indicate higher levels of psychopathy. In a sample of $n = 360$ (52% males) children aged 9-12 ($M = 10.9$; $SD = .90$) and adolescents (Andershed et al., 2002) the YPI dimensions showed overall good to excellent internal consistencies ($\alpha = .61$ to $\alpha = .80$), fit indices for factor structure and test-retest reliability ($r = .61$) (Baardewijk et al 2008). In addition, its convergent validity was supported in a sample aged between 12 and 20 years recruited from a clinic for youth with substance use disorders (Andershed, Hodgins, & Tengström, 2007). For this paper, the callous-unemotional dimension subscale (summary score of 15 items; e.g. “When other people have problems, it is often their own fault, therefore, one should not help them.”) was used to assess CU traits. The callous-unemotional dimension subscale showed an internal consistency of $\alpha = .81$ in the present sample.

Cognitive and affective empathy. The Interpersonal Reactivity Index (IRI) was administered to assess self-reported trait empathy, in contrast to state empathy (Davis, 1980). The 28 items are answered on a 5-point Likert-scale ranging from “does not describe me well” (1) to “describes me well” (5). For the current study, scores of two subscales, perspective taking (PT, $\alpha = .67$; e.g. “I try to look at everybody’s side of a disagreement before I make a decision.”) and empathic concern (EC, $\alpha = .70$; “I would describe myself as a pretty soft-hearted person”), were calculated to assess cognitive and affective empathy, respectively. In a validation study, the factor structure held equally well for university

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students ($n = 427$, females $n = 221$) and test-retest reliability for PT and EC was acceptable with alphas of .62 and .72, respectively (Davis, 1980).

Statistical Analyses.

To test for sex differences in relational aggression between males and females and to evaluate whether sex differences in relational aggression were specific to the CD group, a generalized linear mixed model [response distribution: multinomial (ordered), link function: cumulative logit] was applied with sex, group, group x sex interaction, IQ, age, and physical aggression as fixed effects, and site modeled as a random effect.

Imputation of missing items of the questionnaires (physical aggression, CU traits, cognitive empathy, affective empathy, and relational victimization) was conducted by the fully conditional specification approach using the logistic regression method including the items of the respective questionnaire, sex, group status (CD, CG), and site. The respective summary score was then calculated based on the imputed items (Eekhout et al., 2014).

To test for correlates of relational aggression within the CD sample, a second generalized linear mixed model was conducted with the independent predictors physical aggression, CU traits, cognitive empathy, affective empathy, relational victimization, and sex, controlling for possible confounding variables (IQ, age, and site as a random effect). In a first step, interaction effects of all single predictors with sex were included in the model. All nominally significant ($p < 0.05$) interaction effects were then included in the final model, which also included all main effects of predictors and covariates. Spearman correlations of the sum scores of relational aggression and all predictors were explored. Variance inflation was analyzed for collinear effects to justify the inclusion of all sum scores in the same model. Both models were applied to the imputed data set. Both models were additionally calculated separately for the subsample of children aged 12 or younger and adolescents aged 13-18 years, respectively, to further illustrate possible age effects.

Sensitivity analyses only including participants with complete data were conducted to examine the robustness of the results. All analyses were performed using SAS[®] Software Version 9.4 (SAS Inc., Cary/NC, USA).

RESULTS

Descriptive Analysis

The demographic and clinical characteristics of the sample, split by sex, are presented in Table 1. The CD and control groups differed in age (CD: $M = 14.95$, $SD = 2.18$; CG: $M = 14.53$, $SD = 2.50$; $t(1509) = 3.39$, $d = 0.18$, $p < .001$), IQ (CD: $M = 94.29$, $SD = 12.11$; CG: $M = 103.85$, $SD = 13.11$; $t(1509) = -14.53$, $d = -0.75$, $p < .001$), and parental educational status (CD: $M = 2.89$, $SD = 1.06$; CG: $M = 3.76$, $SD = 1.08$; $t(1306) = -14.38$, $d = -0.81$, $p < .001$). The CD group was lower in IQ and parental educational status, but was significantly older, than controls. With respect to sex differences within the CD and CG group, respectively, females and males with CD differed in estimated full-scale IQ, with females showing lower mean scores than males. A difference in the same direction was found in the control group. Females with CD were significantly older than males with CD, whereas no significant sex difference in age was found in control participants. With respect to current comorbid diagnoses (see Table 1), which were only allowed in the CD group, females and males with CD showed comparable rates of comorbid ODD and AD. In contrast, females with CD showed significantly higher rates of MDD and males showed significantly higher rates of ADHD.

Relational aggression scores did not differ between CD individuals with and without comorbid ADHD (ADHD: $M = 2.95$, $SD = 4.44$; no ADHD $M = 3.59$, $SD = 5.40$; $r = -.05$, $p = .180$), nor with and without comorbid MDD (MDD $M = 3.28$, $SD = 4.80$, no MDD $M = 3.35$, $SD = 5.10$; $r = .02$, $p = .569$), or with and without comorbid AD (AD: $M = 2.94$, $SD = 4.84$, no AD $M = 3.40$, $SD = 5.09$; $r = -.001$, $p = .813$). Individuals with CD and comorbid

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ODD showed higher relational aggression scores compared to individuals with CD and no comorbid ODD (ODD $M = 3.57$, $SD = 5.21$; no ODD $M = 2.35$, $SD = 4.20$, $r = .098$, $p = .011$).

Table 2 reports mean scores, standard deviations, and ranges of sum scores for relational aggression, physical aggression, cognitive and affective empathy, callous-unemotional traits, and relational victimization for the two groups (CD, CG) stratified by sex (female, male).

Sex Differences in Relational Aggression

To test for sex differences in relational aggression comparing females and males with CD to typically developing youth, a generalized linear mixed model for ordered response data was applied on the imputed data set. The sex x group interaction effect was significant [OR = 1.51, 95% CI = (1.02, 2.25), $p = .041$]. As shown in Figure 1, results indicate a sex effect in the CD group [OR = 1.67, 95% CI = (1.24, 2.26), $p < .001$], with CD females showing higher relational aggression scores than their male counterparts. In contrast, no sex effect was found in control participants [OR = 1.11, 95% CI = (0.84, 1.46), $p = .470$]. Higher physical aggression predicted higher relational aggression [OR = 1.19, 95% CI = (1.16, 1.23), $p < .001$], across females and males equally. Neither age ($p = .187$), nor IQ ($p = .170$) were significantly related to relational aggression. Similar results were obtained in the analysis of the data set without missing values (available upon request). Assessing effect sizes (ORs) separately in children aged 9-12 years (ESM, Table 2a) and adolescents aged 13-18 years (ESM, Table 3a) resulted in comparable effect sizes to those obtained in the full sample.

Correlates of Relational Aggression in the CD group: CU Traits, Empathy, and Relational Victimization

The second generalized linear mixed model for ordered response data was applied to analyze associations of relational aggression with CU traits, cognitive and affective empathy,

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relational victimization, and the interaction between each of these variables with sex, in the CD group only. This is because no sex differences in relational aggression were found for control participants. In addition, Spearman correlations for subscale scores of all questionnaires included in this analysis were performed and are presented in the ESM Table 1. With respect to the correlates of relational aggression, only relational victimization and cognitive empathy showed significant interactions with sex ($p < .05$). Therefore these two interaction terms were left in the final model. Regression coefficient B , SE , p -value and OR with 95% CIs for each single variable are presented in Table 3.

As expected, although the effects were small, higher levels of CU traits [OR = 1.02, 95% CI = (1.00, 1.05), $p = .034$] and higher physical aggression [OR = 1.11, 95% CI = (1.07, 1.15) $p < .001$] predicted a higher probability of relational aggression in both females and males with CD. Although in the predicted direction, no main effect of affective empathy was observed in the overall sample [OR = .97, 95% CI = (.94, 1.00), $p = .068$]. However, this small effect reached significance in the adolescent sample [OR = .96, 95% CI = (.93, .99), $p = .037$]. For cognitive empathy, an interaction with sex was found [OR = .93, 95% CI = (.87, .98), $p = .012$]. In females with CD, higher cognitive empathy [OR = .96, 95% CI = (.92, 1.00), $p = .038$] was associated with lower levels of relational aggression. For males with CD, this effect was not observed [OR = 1.03, 95% CI = (.98, 1.10), $p = .180$] (see Figure 2). Also, for relational victimization (see Figure 3), an interaction with sex was observed [OR = .95, 95% CI = (.90, 1.00), $p = .032$]. Both females [OR = 1.06, 95% CI = (1.04, 1.09), $p < .001$] and males with CD [OR = 1.12, 95% CI = (1.07, 1.17), $p < .001$] had a small, but higher probability to show relational aggression when they experienced relational victimization, but this effect was significantly stronger in males than in females. Similar results were obtained in the sensitivity analysis including the non-imputed dataset (available upon request). Again, similar effect sizes (ORs) were found in the older subgroup (13-18 years) compared to the

entire CD group (ESM 3b). Descriptively, the effect sizes in the younger group (ESM 2b) were similar compared to the overall sample, too, but mostly did not reach significance. Of note, the association of cognitive empathy and relational aggression was strongest in females aged 9-12 years [OR = .72, 95% CI = (0.57, 0.92), $p = .009$], compared to a non-significant effect in males aged 9-12 years [OR = .99, 95% CI = (0.87, 1.13), $p = .944$] and both females [OR = .97, 95% CI = (0.93, 1.01), $p = .156$] and males [OR = 1.04, 95% CI = (0.98, 1.10), $p = .167$] aged 13-18 years.

DISCUSSION

The present study extends existing research on relational aggression in two important ways. First, it shows that relational aggression is indeed more frequent in females compared to males with CD. Second, it provides further evidence regarding the correlates of relational aggression in females compared to males with CD. In particular, our results partly confirm the idea that the correlates of relational aggression overlap with those reported for proactive aggressive behavior in CD.

With respect to the differences in the severity of relational aggression between the sexes, females showed higher levels of relational aggression than males with CD after controlling for physical aggression, albeit with a small effect size (OR = 1.67). As hypothesized, this sex difference was only evident within the CD group; no sex differences in relational aggression were observed in the control group and generally relational aggression was reported to be rare in the latter group (with median scores of 0 on scale ranging from 0-35). Interestingly, females and males with CD did not differ in mean levels of physical aggression, whereas female and male controls did differ in the latter variable. This is in line with previous literature, indicating that, although in community samples males generally show more physical aggression than females, in samples of highly impaired adolescents with CD, females show equally high levels of physical aggression as males (e.g., Marsee et al.,

2011). This demonstrates that females and males with CD resemble each other in terms of physical aggression, whereas females with CD slightly exceed males in terms of relational aggression. This supports the importance of considering relational aggression in females with CD.

With respect to the second study aim, considering Blair's (2013) neurocognitive model of CD, the study partly supports the hypothesis that relational aggression is associated with the correlates of proactive aggression, especially in adolescence. In both females and males with CD, CU traits correlated positively with relational aggression, although the association was weak ($OR = 1.03$). In addition, results with regard to affective empathy were in the expected direction and in line with previous literature (Batanova & Loukas, 2011; van Noorden, Haselager, Cillessen, & Bukowski, 2015). Especially in the adolescent subsample affective empathy showed a negative correlation with relational aggression, again similarly in both females and males. Previous studies on CU traits have similarly reported a positive association of CU traits with relational aggression beyond empathy and physical aggression (Czar, Dahlen, Bullock, & Nicholson, 2010), especially in females showing proactive relational aggression (Crapanzano, Frick, & Terranova, 2009). Social learning processes, which have been implicated in the development of proactive aggression, might therefore also be relevant in the etiology of relational aggression (Voulgaridou & Kokkinos, 2015). In social learning models it is proposed that the perpetrator learns that aggressive acts towards their peers can be beneficial in achieving self-oriented goals (e.g. high standing and popularity in the peer group) without apparent negative consequences, due to its mostly covert nature (Dodge & Coie, 1987; Heilbron & Prinstein, 2008). Again in line with social learning processes, due to reduced affective empathy, females and males with CD may be less concerned about the negative consequences of their behavior on the victim. That is, they may not perceive relational aggression as something negative, a perception which in typically

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developing individuals inhibits relational aggressive behavior (Crick, Grotpeter, & Bigbee, 2002; Espelage, Hong, Kim, & Nan, 2017; Loudin et al., 2003; White et al., 2015). Our findings on the effect of CU traits and affective empathy on relational aggression support the notion that relational aggression is related to correlates of proactive aggression. Therefore relational aggression may serve the function of proactive, rather than reactive aggression in adolescents with CD (Blair, 2013; Euler, Steinlin, & Stadler, 2017).

Interestingly, with respect to cognitive empathy, the only construct not explicitly included as a correlate of proactive aggression in Blairs' neurocognitive model, sex differences as well as preliminary age effects emerged. Adolescent females with CD with high perspective-taking abilities showed decreased relational aggression, an association not observed in males with CD. This effect was strongest in females aged nine to 12 years old (OR = .72). In this sample perspective-taking ability does not seem to facilitate relational aggressive behavior, as has been suggested by some earlier authors (Batanova & Loukas, 2011; Sutton et al., 1999). This sex-specific correlation may be due to a differential course of pro- and antisocial behavior in females compared to males (Van der Graaff, Carlo, Crocetti, Koot, & Branje, 2018). This was supported by longitudinal, population-based studies that have found an earlier development of social cognitive functioning and perspective taking abilities in females compared to males (Smith, Shepperd, Miller, & Graber, 2016; Van der Graaff et al., 2014). The negligible effect of cognitive empathy on relational aggression in males may be explained in light of a gender consistent stereotype notion of relationships and prosocial behavior. That is, females in general value close relationships (Maccoby, 1990), are more strongly encouraged to put themselves into the perspective of others (see Van der Graaff et al., 2018) and therefore judge aggressive acts towards those relationships as more harmful compared to males (Murray Close, Crick, & Galotti, 2006).

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In both females and males with CD, the strongest association was observed between relational aggression and the participants' own experiences of relational victimization. Social learning processes again may explain this. Longitudinal and retrospective studies on bullying behavior state that victims of bullying have a high probability of becoming perpetrators of bullying themselves (Barker et al., 2008; Kljakovic & Hunt, 2016; Lereya, Copeland, Zammit, & Wolke, 2015; Sansone, Leung, & Wiederman, 2013). This direction may be explained by the positive consequences of aggressive response styles (Crick & Dodge, 1996). That is, victimized children and adolescents may have learned that relational aggression in the context of bullying will have positive consequences for themselves within the peer group, thus stabilizing this behavior. Notably, relational victimization showed a stronger positive association with relational aggression in males than in females with CD.

Limitations and Future Directions

The present results should be interpreted in the light of several limitations. First, no information was available on recruitment success – the proportion of those who took part relative to those who were initially invited to do so. Thus, no information is available on demographic characteristics on those who were not able or willing to take part in the study. It is plausible that the most severely impaired youth and their families may have been most likely to refuse to participate. Second, observed correlations were small, and odds ratios of predictors in the model were all close to one in this sample, indicating very small effects. Thus, despite being a more female specific behavior, the clinical relevance of relational aggression for sex specific methodological, diagnostic and intervention approaches seems to be limited. Given the small sample size of the younger subgroup, power was not sufficient to detect these small effects and the small effects were not in the same direction as were observed in the adolescent group. However, when the younger group was removed from all analyses, similar results to those observed in the overall group emerged; thus, the study results

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may pertain mainly to an adolescent sample. Third, these analyses do not include a measure of proactive aggression. However, the focus of this study was on forms of aggressive behavior. As there are no existing models on forms of aggressive behavior, models on functions of aggressive behavior served as an outline. Fourth, the results of this study are based on self-report measures only (with the exception of the K-SADS diagnostic interview). It is possible that the adolescents tried to downplay some of their behaviors by answering in a socially desirable fashion (Archer & Coyne, 2005). Furthermore, sex effects could have been diminished due to fewer sex differences in self-reports compared to peer or parent reports of relational aggression (Card et al., 2008). However, there are also major advantages of using self-report measures of relational aggression because of its mostly covert nature, and expression in different settings (Soenens, Vansteenkiste, Goossens, Duriez, & Niemiec, 2008). Fifth, the cross-sectional nature of the study means that we cannot draw causal conclusions about whether CU traits, empathic abilities, and relational victimization lead to relational aggression or vice-versa. This would need to be tested in future studies using a prospective longitudinal design. Lastly, the empathic concern and perspective taking subscale of the IRI, assessing empathy, showed only moderate internal consistency and have not been extensively validated across all age ranges included in this study. However, the IRI and especially the perspective-taking and empathic concern subscales are widely used self-report measures of trait empathy and were thus chosen to ensure comparability with previous studies.

Conclusions

This is the largest study to investigate relational aggression in children and adolescents and one of the first to include clinically diagnosed females and males with CD as well as a typically-developing sample. In addition, it is the first study to test for possible sex differences in the relationship between relational aggression in CD and its associations with

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the correlates of proactive aggression. We found slightly higher rates of relational aggression in females with CD compared to males. We also showed that relational aggression – at least in adolescents – is positively associated with CU traits and relational victimization in both sexes. The overall small effects observed here suggest that females and males with CD may be more similar than different with respect to correlates of aggression. Nevertheless, the specific negative correlation between cognitive empathy and relational aggression seen in females with CD may hint to sex-specific development of prosocial behavior and its association with relational aggression.

LEGEND FIGURES

Figure 1. Sex differences in relational aggression in adolescents with conduct disorder and in the control group. Generalized linear mixed model with fit computed at physical aggression = 4.5, age = 14.7, IQ = 99.7. The y-axis indicates the probability (in percent) of having a score of at least 2 on the Relational Aggression Questionnaire.

Figure 2. Interaction of cognitive empathy with sex on the probability to show relational aggression among adolescents with CD. Generalized linear mixed model with fit computed at CU-traits = 32.33, affective empathy = 16.59, relational victimization = 5.73, physical aggression = 7.42, age = 14.95, IQ = 94.29. The x-axis presents the sum scores of cognitive empathy. The y-axis indicates the probability (in percent) of having a score of at least 2 on the Relational Aggression Questionnaire.

Figure 3. Interaction of relational victimization with sex on the probability to show relational aggression amongst adolescents with CD. Generalized linear mixed model with fit computed at CU-traits = 32.33, cognitive empathy = 13.46, affective empathy = 16.59, physical aggression = 7.42, age = 14.95, IQ = 94.29. The x-axis presents the sum scores of relational victimization. The y-axis indicates the probability (in percent) of having a score of at least 2 on the Relational Aggression Questionnaire.

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