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The phenomenology of non-aggressive antisocial behavior during childhood

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Abstract

Although the phenomenology of overt or aggressive antisocial behavior during childhood is well-documented, far less is known about covert or non-aggressive, rule-breaking (RB) antisocial behavior. Gaps in knowledge include issues as basic as RB's typical symptom presentation during childhood and which symptoms differ across sex. The current study sought to fill these gaps in the literature by establishing the prevalence and psychometric properties of specific RB behaviors in a sample of 1,022 twin boys and 1,010 twin girls between the ages of 6 and 10 years. Legal RB behaviors (e.g., breaking rules, swears, lying or cheating) were present to varying degrees in most children, regardless of whether or not they passed the clinical threshold for RB. They were also more common in boys than in girls regardless of their clinical status. In sharp contrast, illegal RB behaviors (e.g., stealing, vandalism, setting fires) were rarely observed in typically-developing children, but were seen at moderate levels in boys and girls with clinically-significant levels of RB. Moreover, sex differences in illegal RB behaviors were observed only for those youth with clinically meaningful levels of RB. Such findings collectively imply that while legal RB behaviors can be found (albeit at different frequencies) in children with and without clinically meaningful levels of RB, illegal RB behaviors may function as relatively 'unambiguous' indicator of clinically-significant levels of RB.

Keywords

non-aggressive rule-breaking; antisocial behavior; children

Antisocial behavior is defined as actions that violate societal norms and the personal or property rights of others (e.g., running away, vandalism, hurting animals, setting fires, theft, and bullying/assault), and includes at least two correlated symptom dimensions, an overt or aggressive and oppositional dimension (fighting, hitting, bullying, anger, defiance) and a covert or non-aggressive/rule-breaking dimension (stealing, lying, vandalism). The relative importance of these two dimensions appears to shift during and after puberty (Tremblay, 2010). During childhood, antisocial behavior is most often characterized by acts of physical aggression and defiance (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007; Tremblay,

2010). During the transition into adolescence, however, aggressive symptoms become less and less frequent (Broidy et al., 2003; Stranger, Achenbach, & Verhulst, 1997; Tremblay, 2003; van Lier, Vitaro, Barker, Koot, & Tremblay, 2009; Verhulst & van der Ende, 1995). In contrast, non-aggressive antisocial behaviors increase dramatically during mid-adolescence (Barker et al., 2007; Bongers, Koot, van der Ende, & Verhulst, 2004; Moffitt, 1993; Stranger et al., 1997; van Lier et al., 2009). Barker et al. (2007), for example, found that upwards of 55% of the participants demonstrated a trajectory of increasing theft over the course of adolescence in a population-based sample of nearly 700 men.

The high prevalence of aggression during childhood, combined with the high prevalence of rule-breaking during adolescence (Moffitt, 2003; Tremblay, 2010), has had a number of downstream consequences for research. In particular, nearly all available studies of the prevalence and development of antisocial behavior during early and middle childhood have focused on aggressive/general antisocial behavior (Broidy et al., 2003; Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Stranger et al., 1997; Tremblay, 2003; van Lier et al., 2009; Verhulst & van der Ende, 1995). As one example, Côté and colleagues (2006) examined the developmental trajectories of physical aggression from toddlerhood through late childhood. Results revealed that most toddlers (68.8%) were engaging in at least some physical aggression (defined as kicking, biting, hitting, or fighting). However, only a small subset of these children (i.e., 16.6% of the total sample) continued to engage in high levels of these behaviors up through late childhood (Côté et al., 2006). Such findings are important for many reasons, not least of which is that they pinpoint the prevalence of physical aggression at specific points in development, and therefore inform our basic understanding of the behavior.

By contrast, very few studies have sought to characterize the phenomenology of covert rule-breaking prior to adolescence. Indeed, Tremblay (2010, pg. 349) noted that “there is almost no developmental study of the Conduct Disorder ‘rule-breaking symptoms’” (the primary exception is noted below). This is not to say that studies have ignored non-aggressive forms of antisocial behavior prior to adolescence. Indeed, there is a small but rich literature examining non-aggressive, but still overt, oppositional and disruptive behaviors during preschool/early childhood (see, for example, Wakschlag, Tolan, & Leventhal, 2010), including *temper loss* (temper tantrums) and *non-compliance* (or failure to comply with directives, rules, and social norms). Although these sorts of oppositional behaviors are rightly characterized as non-aggressive, they are nevertheless more overt in nature, and are thus distinguishable from covert rule-breaking behaviors (as shown convincingly in the Figure 2 meta-analytic results of Frick et al., 1993). There is one noteworthy exception to this all but exclusive focus on overt behaviors in childhood. Bongers and colleagues (2004) examined developmental trajectories of ‘property’ and ‘status’ violations beginning at age 4 (Bongers et al., 2004). They found that both classes of illegal rule-breaking were rare during childhood (i.e., they were seen at high levels in only 1.2 to 5.2% of children).

Although these results are useful for confirming the low base rate of covert rule-breaking prior to adolescence, they remain relatively silent on the typical presentation of specific rule-breaking behaviors during childhood. This gap in the literature includes such basic questions as: what are the prevalences of specific covert rule-breaking behaviors during middle

childhood? Are there specific behaviors that allow us to differentiate typically developing youth from those with clinically-significant levels of non-aggressive antisocial behavior? In short, there is a clear need for basic phenomenological research on rule-breaking during middle childhood.

A related issue concerns sex differences in the prevalence of specific rule-breaking behaviors. Namely, available data has robustly indicated that boys engage in more rule-breaking than do girls (with odds ratios for boys to girls ranging from 2.0 to 3.0; Bongers et al., 2004; Li & Lee, 2010; Monuteaux, Fitzmaurice, Blacker, Buka, & Biederman, 2004; van Lier et al., 2009). It is as yet unclear, however, whether this general pattern persists across the full range of covert rule-breaking behaviors, or whether some behaviors are equally common in boys and girls. There are hints that sex differences may vary across specific behaviors. van Lier et al. (2009), for example, examined vandalism and theft in a community-based sample of Canadian youth ages 10- to 15-years with evidence of child-onset antisocial behavior. They calculated the probability of membership in adolescent increasers and moderate developmental trajectories (compared to the low trajectory). These probabilities were then contrasted across boys and girls. As compared to girls, boys had a higher probability of membership in the moderate trajectory (odds ratios were 2.72 for theft and 3.08 for vandalism) In the adolescent increasers trajectory, however, significant sex differences were observed for vandalism (odds ratio = 4.74) but not for theft (odds ratio = 1.48, ns). In short, there is some evidence that mean sex differences may vary across specific non-aggressive antisocial behaviors. To date, however, we know of no studies examining this possibility during middle childhood.

The current study sought to fill some of these gaps in the literature. We specifically investigated the prevalence and psychometric properties of specific rule-breaking behaviors in a large, mixed sex sample. We expected that, consistent with the dimensional nature of antisocial behavior (Krueger, Markon, Patrick, & Iacono, 2005; Walters, 2010; Walton, Ormel, & Krueger, 2011), children with and without clinically-meaningful levels of non-aggressive antisocial behavior would engage in similar behaviors, but at different frequencies. Because boys engage in higher levels of non-aggressive antisocial behavior overall, we further expected the specific behaviors that comprise the overall construct of rule-breaking to also be more common in boys. However, consistent with prior literature in adolescence (van Lier et al., 2009), we hypothesized that the size of these sex differences may vary across specific types of behaviors. We specifically expected that sex differences would be smaller for less severe, garden-variety behaviors (e.g., lying and cheating) than for more severe/illegal behaviors (e.g., vandalism and fire-setting).

Method

Participants

The Michigan State University Twin Registry (MSUTR) includes several independent twin projects (Burt & Klump, 2013; Klump & Burt, 2006). The current study included 2,032 twins, nested in 1,016 pairs, who were assessed as part of the on-going Twin Study of Behavioral and Emotional Development in Children (TBED-C) within the MSUTR. The TBED-C includes a completed population-based sample (N=1,000 twins in 500 families), an

on-going, independent ‘at-risk’ sample for which inclusion criteria also specified that participating twin families lived in moderately to severely disadvantaged neighborhoods (current N=988 twins in 494 families), and an auxiliary sample of 44 twins (from 22 families) assessed since the population-based study was completed but who do not quite meet our at-risk study inclusion criterion. Across the total sample, 423 twin pairs were monozygotic (223 male-male and 200 female-female pairs) and 593 were dizygotic (210 male-male, 204 female-female, and 179 female-male pairs). Children gave informed assent, while parents gave informed consent for themselves and their children. To be eligible for participation, neither twin could have a cognitive or physical condition (e.g., significant developmental delays) that would preclude completion of the roughly 4-hour assessment (as assessed via parental report during the initial phone screen). Participating twins ranged from in age 6 to 10 years, although a small handful (n=27 pairs) had turned 11 by the time the family participated (mean age = 8.06 years, SD = 1.46). All families were reimbursed for their participation.

The Department of Vital Records in the Michigan Department of Community Health identified twins in our age-range either directly from birth records or via the Michigan Twins Project, a large-scale population-based registry of twins in lower Michigan that were themselves recruited via birth records. The Michigan Bureau of Integration, Information, and Planning Services database was used to locate family addresses within 120 miles of East Lansing, MI through parent drivers’ license information. Pre-made recruitment packets were then mailed to parents on our behalf. A reply postcard was included for parents to indicate their interest in participating. Interested families were contacted directly by project staff. Parents who did not respond to the first mailing were sent additional mailings approximately one month apart until either a reply was received or up to four letters had been mailed.

This recruitment strategy yielded overall response rates of 62% for the population-based sample and 54% for the at-risk sample, which are similar to or better than those of other twin registries that use anonymous recruitment mailings (Baker, Barton, & Raine, 2002; Hay, McStephen, Levy, & Pearsall-Jones, 2002). Twins participating in our population-based study belonged to particular ethnic groups at rates comparable to area inhabitants (e.g., Black: 5.4% and 6.3%, White: 86.4% and 85.5% for the participating families and the local census, respectively). Compared to the population-based sample, the at-risk sample was significantly more racially diverse (14.2% Black and 76.3% White), reported lower family incomes (the means were \$72,027 and \$57,281, respectively; Cohen’s d effect size = $-.38$), higher paternal felony convictions ($d = .30$), and higher rates of youth conduct problems¹ and hyperactivity ($d = .34$ and $.27$, respectively), although they did not differ in youth emotional problems ($d = .08$, ns).

Both samples appear to be representative of recruited families (as assessed via a brief questionnaire screen administered to 80% of non-participating families). As compared to non-participating twins, participating twins were experiencing similar levels of conduct

¹Note that these mean differences in conduct problems are largely specific to aggressive behaviors, and do not extend to non-aggressive rule-breaking ($d = .067$, ns). Thus, we collapsed the two samples for analysis herein to maximize statistical power and minimize reporting clutter.

problems, emotional symptoms, or hyperactivity (d ranged from $-.08$ to $.01$ in the population-based sample and $.01$ to $.09$ in the at-risk sample; all ns). Participating families also did not differ from non-participating families in paternal felony convictions ($d = -.01$ and $.13$ for the population-based and the at-risk samples, respectively), rate of single parent homes ($d = .10$ and $-.01$ for the population-based and the at-risk samples, respectively), paternal years of education (both $d = .12$), or maternal and paternal alcohol problems (d ranged from $.03$ to $.05$ across the two samples). However, participating mothers in both samples reported slightly more years of education ($d = .17$ and $.26$, both $p < .05$) than non-participating mothers. Maternal felony convictions differed across participating and non-participating families in the population-based sample ($d = -.20$; $p < .05$) but not in the at-risk sample ($d = .02$). All told, we do not believe these differences significantly compromise the generalizability of these data.

Measures

Mothers and fathers completed the Achenbach Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001) separately for each twin, while the twins' teacher(s) completed the corresponding Achenbach Teacher Report Form (TRF; Achenbach & Rescorla, 2001), the most commonly used family of instruments for assessing antisocial behavior prior to adulthood. In the current study, we focused on the individual items and overall scores of the covert Rule-breaking Behavior (RB) scale (e.g., lacks guilt, breaks rules, steals, truant; 17 items on the CBCL and 12 items on the TRF; $\alpha = .70$, $.65$, and $.63$ for teacher, mother, and father informant-reports, respectively). Prior validation work has indicated that the RB scale is highly correlated ($r = .63$, $p < .001$) with DSM-IV Conduct Disorder as assessed via diagnostic interview (Achenbach & Rescorla, 2001).

Maternal-reports were available for 2,012 of the 2,032 participants, paternal-reports were available for 1,678 participants, and teacher reports were available for 1,351 participants. Note that the teachers of 115 participants were not available for assessment (because the children were home-schooled, parental consents to contact the teachers were completed incorrectly, etc.). Data collection/data entry with the remaining teacher reports is on-going. As of now, however, our teacher response rate is 82.9%. Consistent with prior meta-analytic work (Achenbach, McConaughy, & Howell, 1987), the various informant-reports were moderately intercorrelated (r 's ranged from $.27$ – $.43$; all $ps < .01$).

Analyses

Because twins are nested within families, our data have a two-level structure with the child as the lower-level unit and the family as the upper-level unit. Analyses were thus conducted with either the family as the unit of analysis in a multilevel modeling framework or using estimation techniques to account for the nested structure of the data. We first examined the prevalence of specific RB behaviors in boys and girls, respectively, computing estimated marginal means of each behavior in boys and girls within a multilevel modeling framework. Age and ethnicity were added as covariates to evaluate the effect of sex independent of those demographic variables². We then examined the prevalence of specific RB behaviors in those with and without clinically-significant levels of RB, again using a multilevel modeling framework. Clinically-significant RB was operationalized via a t-score of 65 or higher (i.e.,

the manual's formal cut-point for marginally- and clinically-significant RB; Achenbach & Rescorla, 2001) according to any informant. We then compared sex differences in the prevalences of specific behaviors using a risk ratio (i.e., risk of a given behavior in those with clinically-significant RB divided by the risk of the same behavior in those without). This approach allowed us to quantify the extent to which a given behavior differentiated those with and without clinically-significant levels of RB.

For our final analyses, we conducted a more formal investigation of the psychometric properties of each RB item and the overall scale via item response theory (IRT; see e.g., Embretson & Reise, 2000). We used Mplus 7.2 (Muthén & Muthén, 1998–2012) to specify a series of single-factor CFA models for the three RB scales (mother, father, and teacher) with MLR estimation. To account for the nesting of twins within families, we used the sandwich estimator to calculate standard errors as implemented in Mplus (Analysis: TYPE = COMPLEX with CLUSTER IS FAMILY ID). Although parents and teachers respond to the CBCL and TRF items using a three point scale, the relative infrequency of item endorsement made the IRT model intractable. We thus collapsed responses of 1 or 2 into a single "present" category (i.e., 0 = behavior absent; 1 = behavior present), making our analyses equivalent to the traditional 2-parameter logistic (2PL) IRT model. The item discrimination and item difficulty parameter estimates are thus of particular interest. Item discrimination parameter estimates are equivalent to factor loadings and index how strongly each item is related to the underlying latent construct. Item difficulty parameter estimates reflect the level of standing on the latent continuum needed to have a 50% chance of receiving a score of 1 (i.e., the behavior is present). The underlying latent continuum is scaled so that zero indicates the average trait level, much like a z-score of 0 indicates an average score. Accordingly, a score of zero for an item difficulty means a child with an average trait level has a 50% chance of receiving a 1 for that item. A positive item difficulty parameter estimate means that children with above average standing on the latent continuum have a 50% chance of receiving a 1 for that item. A positive difficulty parameter estimate therefore indicates a "harder" item in the sense that a child would need a relatively high trait level to receive a 1 whereas negative parameter estimates indicate a relatively easy item. In other words, a larger positive difficulty parameter item would indicate that a given item was diagnostic of high levels of RB.

RESULTS

1) What are the prevalences of specific rule-breaking behaviors during childhood, and do they differ across boys and girls?

Prevalences for the specific RB behaviors are reported in Table 1. As seen there, some behaviors were relatively common, occurring in 10 to 40% of the participants. These included lacks guilt, breaks rules, delinquent friends, lies or cheats, prefers older kids, and swears. Not surprisingly, behaviors that could be considered illegal (e.g., vandalism, truancy, setting fires and stealing outside the home) were much less common, typically occurring in

²Although prior work has indicated that the frequencies of non-aggressive antisocial behaviors increase dramatically following puberty, we are not aware of consistent changes in frequency during the developmental period of middle childhood. Given this, along with the cross-sectional nature of our dataset, age was not a focus of the current analyses.

less than 1–3% of the participants. Nearly all of the items were more common in boys than in girls according to at least one informant. The three exceptions to this general pattern were ‘sets fires’ and ‘steals at home’, which trended towards a higher prevalence in boys according to both mother- and father-reports, and ‘truancy’, which was actually more common in girls than in boys according to teachers.

2) How do behavior prevalences differ across those with and without clinically-meaningful levels of RB?

A relatively small fraction of children, 8.6% of the boys (N=88) and 8.1% of the girls (N=82), evidenced clinically meaningful levels of RB, as defined via a t-score of 65 or higher on the scale (Achenbach & Rescorla, 2001). Note that, using these cut-offs, boys are required to have a score of 6 to qualify for entry into the ‘clinically meaningful’ group (out of up to 34 on the CBCL and 24 on the TRF, since item scores range from 0 – 2), whereas girls are required to have a 4 on the TRF and a 5 on the CBCL. Put differently, participants need only endorse as few as 14.7% of the CBCL items in order to have ‘clinically significant’ RB. Given the relatively low level of item endorsement needed to cross the clinical threshold for RB, we were able to evaluate whether those children passing this cut-point were simply engaging in *more* RB behaviors than children who did not pass the clinical cut-point, or whether they were engaging in *different types* of RB behaviors. To evaluate these competing possibilities, we computed the prevalence of each of the specific RB behaviors in boys and girls with and without clinically meaningful levels of RB, respectively. As seen in Table 2, prevalences appeared to vary across ‘legal’ RB behaviors (e.g., breaking rules, lying or cheating) and ‘illegal’ RB behaviors (e.g., setting fires, stealing). Roughly 40–85% of boys with clinical levels of RB were engaging in each of the less severe/legal RB behaviors. Boys without clinical levels of RB were also engaging in these behaviors, albeit somewhat less often (prevalences were typically in the 10–30% range). This pattern of results generally persisted across all three informants, and was also seen in the girls (see Table 3). Such results speak to the dimensional nature of the legal RB behaviors prior to adolescence, as well as to the appropriateness of these items for childhood assessments of RB. The more severe or ‘illegal’ RB behaviors evidenced a different pattern of prevalences. Whereas 5–30% of children with clinical levels of RB were engaging in a given illegal behavior, the same behaviors were effectively absent in children without clinical levels of RB (the typical prevalence was in the 0–1% range). This pattern was observed in boys and girls.

In short, illegal RB behaviors (e.g., stealing, setting fires) appeared to be present almost exclusively in children with clinically-significant levels of RB. To empirically confirm this observation, we created composites of the legal behaviors (i.e., breaking rules, lacking guilt, lying or cheating, preferring the company of older peers, swearing, and having delinquent friends) and the rarer illegal behaviors (i.e., setting fires, stealing at home or outside the home, running away, vandalism, and truancy), and compared the prevalence of each group of behaviors across their clinical RB status using risk ratios. As seen in Table 4, the composite risk ratio results bear out our item-level observations. Legal behaviors were more common in boys and girls with clinically meaningful levels of RB than in those without, but the differences were relatively small in magnitude, such that boys with clinical levels of RB

were 1.3 to 3.4 times as likely to engage in legal RB behaviors. In sharp contrast, children with clinically meaningful RB were 7.2 to 10.1 times as likely to engage in illegal RB behaviors.

3) Do sex differences vary across RB clinical status?

The legal and illegal behavior prevalences reported in Table 4 highlighted a potentially interesting, and unexpected, sex difference as well. Namely, legal RB behaviors appeared to more or less consistently vary across sex, such that boys evidenced higher levels of legal RB behaviors than girls regardless of RB status. Boys without clinically significant RB engaged in more legal RB behaviors than did girls without clinically significant RB ($d = .24, .10$, and $.34$ for mother-report, father-report, and teacher-report respectively, all $p < .05$). Similar effect sizes were reported when restricting analyses to children with clinically meaningful levels of RB ($d = .15, .18$, and $.24$ for mother-report, father-report, and teacher-report, respectively, although only the latter approached significance given the small sample size). However, this general pattern did not extend to illegal RB behaviors. Boys with clinically meaningful levels of RB were engaging in more illegal RB behaviors than girls with clinically meaningful levels of RB ($d = .46$ for mother-report and $.31$ for father-report, $p < .05$ and $.10$, respectively). When examining children without clinically meaningful levels of RB, however, illegal RB behaviors did not vary across sex ($d = .03$ for mother-report and $.05$ for father report). To statistically confirm these early impressions, we conducted a series of moderated regressions using a multi-level modeling framework to account for the nesting of twins within families. Age and ethnicity were added as covariates. As expected, RB status was found to moderate the effect of sex on illegal behaviors (the estimates for mother- and father-reports were $.19$ ($SE = .04$) and $.12$ ($SE = .04$), $p = .002$), but not on legal behaviors (all ns). Put differently, legal RB behaviors were more common in boys than in girls regardless of their RB status. Sex differences in illegal RB behaviors, by contrast, were observed only for those youth with clinically meaningful levels of RB. As a final observation, we note that girls with clinically meaningful levels of RB were engaging in more RB, both legal and illegal behaviors, than were boys without RB (all $p < .001$). In sum, the presence of sex differences in RB behaviors appears to vary with both the clinical severity of the sample and the legal versus illegal nature of the symptoms.

4) What are the psychometric properties of the rule-breaking items?

The item response theory difficulty estimates are displayed in Table 5 (discrimination parameter estimates are presented in Appendix 1). Although all of the items had significant difficulty and discrimination parameters in boys, several of the items were problematic in girls. In particular, 'runs away', 'truancy', 'prefers older kids', and 'swears' all evidenced item difficulty parameters that were very large (ranging from 3.01 to 17.24) but which were not significantly greater than zero. This is due, in part, to the extremely low prevalence rates for these items for girls. Moreover, 'runs away', 'truancy', and 'prefers older' did not have a statistically meaningful discrimination parameters and had relatively low factor loadings in a traditional CFA framework (for maternal-reports: 0.34, 0.58, and 0.26, respectively; for paternal reports: 0.18, 0.41, and 0.39, respectively). This pattern of results implies that these may be relatively "bad" items in girls (i.e., not informative), at least in this sample, and so these items were excluded when computing the mean item discrimination and difficulty

estimates. In general, the RB items were difficult. For boys, the average item difficulties were 2.14 for mothers, 2.38 for fathers, and 2.52 for teachers. Difficulty parameters looked similar for the girls, with average item difficulties of 2.35 for mothers, 2.69 for fathers, and 2.15 for teachers (excluding the bad items). As noted, however, the mean difficulty levels appeared to vary across 'legal' RB behaviors (i.e., breaking rules, lacking guilt, lying or cheating, preferring the company of older peers, and having delinquent friends) and 'illegal' RB behaviors (i.e., setting fires, stealing at home or outside the home, running away, vandalism, and truancy). For boys, the average items difficulties ranged from 1.22 to 1.98 for the legal RB items, and 3.07 to 4.13 for the illegal items. For girls, the average items difficulties ranged from 1.35 to 2.14 for the legal RB items, and 2.17 to 4.38 for the illegal items. Consistent with this observation, the 'runs away', 'sets fires', and 'truancy' items were the hardest for boys within the various informant-reports, with item difficulty parameters that were uniformly higher than 3.0. Such results indicate that boys who run away from home, are truant, and/or set fires are likely to have a particularly high standing on the underlying dimension of RB. The 'breaking rules' and 'lies and cheats' items, by contrast, were not especially diagnostic of high levels of the underlying dimension when viewed from the perspective of parents.

Discussion

The broad objective of the current study was to characterize the phenomenology of RB during childhood from the perspective of the commonly-used CBCL and TRF questionnaires. We specifically evaluated whether children with clinically-significant levels of childhood RB were simply engaging in RB behaviors more frequently than were children without RB, or whether they were engaging in different types of RB behaviors. Results were clearly suggestive of both processes. Legal RB behaviors (e.g., swears, lying or cheating) were present in children with and without clinically-significant levels of RB, but were more common in children with clinically-significant levels of RB. Illegal RB behaviors (e.g., stealing, setting fires), by contrast, were all but absent in typically-developing children, but were seen at moderate levels in children with clinically-significant levels of RB. Indeed, roughly a third of boys and girls with clinically-significant levels of RB were engaging in at least one illegal RB behavior, whereas very few children without clinical levels of RB (3–5%) were doing so. The IRT results provided additional support for these findings, as the illegal RB activities appeared to have higher difficulty parameter estimates than did the legal items. Collectively then, these results imply that while legal RB behaviors can be found (albeit at different frequencies) in children with and without clinically meaningful levels of RB, the presence of illegal RB behavior(s) are so rare in typically-developing youth that they appear to function as 'unambiguous' indicators of clinically-significant levels of RB.

We also evaluated sex differences in the prevalence of specific RB behaviors. Results revealed that legal RB behaviors were more common in boys than in girls, regardless of their RB status. Sex differences in illegal RB behaviors, by contrast, were observed only for those youth with clinically meaningful levels of RB, results which likely reflect the low frequency of illegal RB behaviors in typically developing children. Clinical RB status also appeared to 'trump' sex effects, such that girls with clinically meaningful levels of RB were engaging in more legal and illegal RB than were boys without RB. In sum, the presence of sex

differences in RB behaviors appears to vary with both the clinical severity of the sample and the legal versus illegal nature of the symptoms.

The strength of these conclusions is bolstered by a number of features of the current study. The sample is large (just over 2,000 twins) and includes both population-based and at-risk youth, suggesting that results are likely to generalize to other samples. Moreover, conclusions were similar across the three informant-reports most commonly collected in samples of children (i.e., mothers, fathers, and teachers), a pattern of results that argues against the possibility of spurious findings. Despite these key advantages, however, there are a number of limitations to the current study that warrant further consideration. First, although results were similar across informants, they were not identical. Mothers and father reported higher rates of nearly all non-aggressive antisocial behaviors relative to teachers. Although it is not clear what accounts for this pattern of results, it may reflect situational specificity in child behavior (Achenbach et al., 1987), such that children act out less in structured school environments than they do at home. Alternately, it may reflect a tendency on the part of parents to over-report child behavior problems (or a tendency on the part of teachers to under-report child behavior problems). Building on the above, our results are specific to mother-, father-, and teacher-informant reports of child RB. It is unclear whether the examination of youth self-report data would yield similar results, since adolescents have knowledge of covert antisocial acts that their parents and teachers do not (i.e., those they have successfully concealed). Consistent with this, children above age 11 typically report twice as many symptoms of conduct problems as do their parents (Burt et al., 2015; Hewitt et al., 1997; Rescorla et al., 2013). It would thus be important to constructively replicate these results using child reports.

Next, our results are restricted to the Achenbach Child Behavior Checklist and the Teacher Report Form. Although these measures are in many ways ideal for the current study, in that they assess both normal-range and more extreme behaviors, are very widely used in child developmental research (e.g., Burt, 2009), and are comparable across the various informant-reports, the exclusive use of these measures does have two consequences for the current study. First, it is unclear whether or how our results extend to the non-aggressive symptoms of Conduct Disorder in the DSM-5 or to other dimensional measures of youth conduct problems. Future work should endeavor to extend these results to other measures of conduct problems. Second, the legal portion of the RB scale in the Achenbach family of instruments contains some items with less face validity (i.e., prefers older peers, lack of guilt, deviant peers) and other items with clear face validity (e.g., lies and cheats, breaks rules). To evaluate whether the former were indeed part of the overall construct of legal RB, we conducted an exploratory factor analysis (EFA) of the legal RB items using MLR estimation in Mplus 6.1. Only one eigenvalue was above 1.0 for each informant (e.g., the first eigenvalue ranged from 2.09 to 2.50, while the second ranged from .94 to .98, and the third ranged from .82 to .91). Moreover, the fit of the one-factor EFA was good (RMSEA = .052 for mothers, .038 for fathers, and .063 for teachers). Mean loadings across informants were .59, .68, .42, .60, .23, and .37, respectively, for lacks guilt, breaks rules, deviant peers, lies and cheats, prefers older peers, and swears. Thus, the only item with a relatively low loading was 'prefers older peers', although the factor loading could still be described as non-trivial (.23). For their part, 'lacks guilt' and 'deviant peers' appeared to share a moderate-to-high

amount of variance with the behaviorally-oriented legal RB items. We thus conclude that our decision to evaluate all legal RB items in our analyses was a reasonable one.

Another possible caveat relates to the fact that our sample consists of twin siblings rather than singletons. Although neither the rates nor the developmental trajectories of conduct problems vary across twins and singletons (Robbers et al., 2010; Rutter & Redshaw, 1991), future studies should confirm that these results generalize to non-twin populations as well. Finally, the current study does not answer key questions regarding the origins of the unique developmental trajectory of rule-breaking as compared to aggression. Namely, why is RB rare during childhood but common during adolescence? Because our data are cross-sectional and confined to childhood, they cannot speak to this issue (although they do indicate that the increase in RB is not primarily attributable to childhood-inappropriate item content, since nearly all twelve RB items examined herein, with the possible exceptions of truancy and setting fires, were present at non-trivial levels in our male participants). Future longitudinal studies should seek to answer this important question.

Despite these limitations, the results of the current study have important implications for future clinical and research endeavors. Namely, although the RB items were generally difficult from an item response theory perspective, their difficulty appeared to vary considerably across legal and illegal items. Legal RB behaviors were more common in children with clinically-significant levels of RB, but were relatively frequent in children without clinically-significant levels of RB as well. Illegal RB behaviors, by contrast, were all but absent in typically-developing children, but were seen at moderate levels in children with clinically-significant levels of RB. Indeed, youth who ran away from home, were truant, vandalized, stole, and/or set fires were likely to have a particularly high standing on the underlying dimension of RB. Such results collectively indicate that illegal RB behavior(s) may effectively function as an ‘unambiguous’ indicator of clinically-significant levels of RB. Put differently, parents, researchers, and clinicians should pay particular attention to the presence of one or more illegal RB behaviors, as these symptoms may well index unusually high levels of RB that require treatment.

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Appendix 1 IRT Discrimination Parameter Estimates by Sex

	Mother-Report		Father-Report		Teacher-Report	
	Girls	Boys	Girls	Boys	Girls	Boys
Lacks guilt	1.848	1.543	1.250	1.516	3.879	3.557
Breaks rules	1.870	2.192	2.168	2.367	3.080	4.895
Delinquent friends	1.134	1.211	1.302	1.131	1.850	1.746
Lies or cheats	2.124	2.406	2.314	2.136	4.811	3.055
Prefers older kids	0.478	0.516	0.768	0.568	0.419 [†]	0.621
Swears	1.267	1.525	1.493	1.447	2.379	3.295
Sets fires	0.635	1.509	-	2.266	-	-
Steals at home	2.778	2.296	2.691	4.672	-	-
Steals outside the home	1.914	3.165	1.713	3.719	5.925	2.041
Runs away	0.652 [†]	1.101	0.329 [†]	0.905	-	-
Vandalism	1.999	2.804	1.682	2.091	-	-
Truancy	1.279	1.981	0.821 [†]	1.369	0.576 [†]	0.865

	Mother-Report		Father-Report		Teacher-Report	
	Girls	Boys	Girls	Boys	Girls	Boys
Mean for all RB items	1.575	1.854	1.709	2.016	3.654	2.509
Mean for legal items	1.454	1.566	1.549	1.528	3.200	2.862
Mean for illegal items	1.721	2.143	2.029	2.504	--	--

Note. Several items ('sets fires', 'runs away', 'vandalism', and 'steals at home') are assessed only on the CBCL, and thus no teacher informant-reports were available for those items. Illegal item means for teachers are accordingly omitted. Only one father reported that his daughter set fires, and thus this item was omitted for girls. The top portion of the table contains the more normative/legal RB behaviors (e.g., swearing, lying). The middle portion of the table contains the less normative/illegal behaviors (e.g., stealing, fire setting). All estimates in boys were significantly greater than zero at $p < .05$. All estimates in girls were significantly greater than zero at $p < .05$, with the exception of the parameters marked with a † (i.e., truancy, runs away, prefers older kids)

Table 1

Prevalence of specific RB behaviors in boys and girls

	Mother-Report		Father-Report		Teacher-Report	
	Boys	Girls	Boys	Girls	Boys	Girls
Lacks guilt	18.3% **	13.0% **	24.6%	21.7%	12.1% **	7.0% **
Breaks rules	40.2% **	31.1% **	39.2%	34.1%	15.3% **	8.7% **
Delinquent friends	14.3% **	4.8% **	12.4% **	7.0% **	15.9% **	5.6% **
Lies or cheats	27.8% **	21.1% **	24.4%	23.4%	8.9%	6.4%
Prefers older kids	35.0% *	28.7% *	31.4%	30.5%	7.2% *	3.5% *
Swears	10.9% **	3.8% **	10.1% **	3.1% **	1.6%	1.0%
Sets fires	0.8%	0.4%	0.6%	0.1%	--	--
Steals at home	5.4%	4.5%	3.9%	2.2%	--	--
Steals outside the home	3.3% *	1.7% *	1.9%	1.1%	2.5%	1.5%
Runs away	1.8% *	0.5% *	1.4% *	0.4% *	--	--
Vandalism	1.2%	0.9%	1.7%	0.5%	--	--
Truancy	0.4%	0.6%	0.1%	0.2%	1.0% *	3.0% *

Note. Item responses of 1 or 2 were collapsed into a single "present" category (i.e., 0 = behavior absent; 1 = behavior present). Items assessing substance use and sexual problems are not included, as they were very rarely endorsed in these data. Several items ('sets fires', 'runs away', 'vandalism', and 'steals at home') are assessed only on the CBCL, and thus no teacher informant-reports were available for those items. Prevalences were computed via estimated marginal means in HLM to adjust for the non-independence of twins within families. Age and ethnicity were added as covariates.

** and * indicate that the item prevalence differs across sex at $p = .01$ and $.05$, respectively.

Table 2
Prevalence of specific RB behaviors in boys with and without clinically-significant levels of RB

	Mother-Report		Father-Report		Teacher-Report	
	Boys with RB	Boys without RB	Boys with RB	Boys without RB	Boys with RB	Boys without RB
Lacks guilt	58.4%	14.5%	60.5%	21.7%	48.0%	9.0%
Breaks rules	79.2%	36.6%	77.1%	36.1%	45.6%	12.7%
Delinquent friends	42.3%	11.7%	37.5%	10.3%	44.9%	13.5%
Lies or cheats	73.7%	23.6%	71.7%	20.4%	39.4%	6.3%
Prefers older kids	51.9%	33.4%	47.9%	30.0%	13.5%	6.6%
Swears	40.8%	8.0%	33.8%	8.1%	11.7%	0.7%
Sets fires	3.2%	0.6%	4.1%	0.3%	--	--
Steals at home	30.9%	3.0%	29.9%	1.7%	--	--
Steals outside the home	25.2%	1.3%	17.8%	0.1%	18.2%	1.1%
Runs away	10.6%	0.9%	4.5%	1.2%	--	--
Vandalism	11.3%	0.2%	8.2%	1.1%	--	--
Truancy	3.7%	0.0%	0.0%	0.1%	4.8%	0.7%

Note. Item responses of 1 or 2 were collapsed into a single "present" category (i.e., 0 = behavior absent; 1 = behavior present). Items assessing substance use and sexual problems are not included, as they were very rarely endorsed in these data. Several items ('sets fires', 'runs away', 'vandalism', and 'steals at home') are assessed only on the CBCL, and thus no teacher informant-reports were available for those items. Prevalences were computed via estimated marginal means in HLM to adjust for the non-independence of twins within families. Age and ethnicity were added as covariates.

Table 3
Prevalence of specific RB behaviors in girls with and without clinically-significant levels of RB

	Mother-Report		Father-Report		Teacher-Report	
	Girls with RB	Girls without RB	Girls with RB	Girls without RB	Girls with RB	Girls without RB
Lacks guilt	48.4%	9.8%	63.4%	18.2%	30.6%	4.3%
Breaks rules	63.3%	28.1%	65.5%	31.4%	34.0%	5.7%
Delinquent friends	23.2%	3.2%	35.7%	4.7%	19.7%	4.0%
Lies or cheats	57.3%	17.8%	57.3%	20.6%	31.2%	3.6%
Prefers older kids	43.7%	27.3%	52.1%	28.7%	8.0%	3.3%
Swears	16.3%	2.7%	16.6%	2.0%	4.8%	0.5%
Sets fires	1.3%	0.3%	0.0%	0.1%	--	--
Steals at home	22.7%	2.8%	14.0%	1.2%	--	--
Steals outside the home	10.5%	0.9%	6.3%	0.7%	11.6%	0.4%
Runs away	3.7%	0.2%	0.0%	0.4%	--	--
Vandalism	7.0%	0.4%	1.6%	0.4%	--	--
Truancy	3.7%	0.3%	1.6%	0.1%	13.2%	1.9%

Note. Item responses of 1 or 2 were collapsed into a single "present" category (i.e., 0 = behavior absent; 1 = behavior present). Items assessing substance use and sexual problems are not included, as they were very rarely endorsed in these data. Several items ('sets fires', 'runs away', 'vandalism', and 'steals at home') are assessed only on the CBCL, and thus no teacher informant-reports were available for those items. Prevalences were computed via estimated marginal means in HLM to adjust for the non-independence of twins within families. Age and ethnicity were added as covariates.

Table 4

The prevalence of 'legal', and 'illegal' RB behaviors by RB clinical status.

Type of RB behavior	Prevalence				Boys estimated risk ratio	Girls estimated risk ratio
	Boys with RB	Boys without RB	Girls with RB	Girls without RB		
Legal behaviors, mother report	84.5%	65.8%	82.9%	53.5%	1.28**	1.55**
Legal behaviors, father report	89.8%	63.2%	83.0%	58.3%	1.42**	1.42**
Legal behaviors, teacher report	61.9%	28.1%	49.0%	14.5%	2.20**	3.38**
Illegal behaviors, mother report	52.3%	5.2%	31.0%	4.3%	10.06**	7.21**
Illegal behaviors, father report	35.8%	3.7%	23.6%	2.6%	9.68**	9.08**

Note. Legal RB behaviors are defined to include breaking rules, lacking guilt, lying or cheating, preferring the company of older peers, and having delinquent friends. Illegal RB behaviors are defined to include setting fires, stealing at home or outside the home, running away, vandalism, and truancy. Teacher reports of illegal behaviors are not included here, as four of the six items are not assessed. Prevalences were computed via estimated marginal means in HLM to adjust for the non-independence of twins within families. Age and ethnicity were added as covariates.

* and ** indicate that the risk ratio is significantly greater than zero at $p < .05$ or $p < .01$, respectively.

Table 5

IRT Difficulty Parameter Estimates by Sex

	Mother-Report		Father-Report		Teacher-Report	
	Girls	Boys	Girls	Boys	Girls	Boys
Lacks guilt	1.539	1.375	1.384	0.991	1.681	1.281
Breaks rules	0.714	0.288	0.609	0.274	1.749	1.016
Delinquent friends	3.368	1.784	2.604	2.032	2.263	1.388
Lies or cheats	1.090	0.689	0.938	0.874	1.686	1.531
Prefers older kids	2.013	1.274	1.214	1.465	8.217 [†]	4.355
Swears	3.090	1.887	3.014 [†]	1.977	3.334	2.333
Sets fires	11.144	3.710	-	3.198	-	-
Steals at home	2.072	2.002	2.426	1.873	-	-
Steals outside the home	2.917	2.132	3.561	2.236	2.169	2.712
Runs away	8.396 [†]	4.182	17.244 [†]	5.127	-	-
Vandalism	3.356	2.647	3.811	2.884	-	-
Truancy	4.579	3.732	7.739	5.607	6.460 [†]	5.555
Mean for all RB items	2.353	2.142	2.698	2.378	2.147	2.521
Mean for legal items	1.969	1.216	1.350	1.269	2.143	1.984
Mean for illegal items	2.814	3.068	4.384	3.488	--	--

Note. Several items ('sets fires', 'runs away', 'vandalism', and 'steals at home') are assessed only on the CBCL, and thus no teacher informant-reports were available for those items. Illegal item means for teachers are accordingly omitted. Only one father reported that his daughter set fires, and thus this item was omitted for girls. The top portion of the table contains the more normative/legal RB behaviors (e.g., swearing, lying). The middle portion of the table contains the less normative/illegal behaviors (e.g., stealing, fire setting). All estimates in boys were significantly greater than zero at $p < .05$. All estimates in girls were significantly greater than zero at $p < .05$, with the exception of the parameters marked with a [†] (i.e., truancy, swears runs away, prefers older kids)