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Borderline Personality Features Mediate the Association between ADHD, ODD, and Relational and Physical Aggression in Girls

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Abstract

Objective: This study investigates borderline personality features (BPF) as a mediator of the association between ADHD and ODD symptoms and aggression in girls.

Method: Parents of 118 girls ($M_{\text{age}}=11.40$ years old) with and without ADHD completed ratings of ADHD and ODD severity, and parents and youth provided ratings of physical and relational aggression.

Results: ADHD, ODD, and their subfactors were significantly correlated with BPF, and these variables were associated with aggression measures. BPF fully mediated the association between total ODD symptom severity and relational and physical aggression by parent and youth report. At the subfactor level, BPF fully mediated the association between hyperactivity/impulsivity and oppositional behavior and physical and relational aggression.

Conclusion: These findings add to a growing literature showing the relevance of BPF as a risk factor for poor social functioning in youth, and point to the importance of continued work examining BPF among girls with ADHD and ODD.

Decades of research have examined the risk for aggression in youth with ADHD (McKay & Halperin, 2001). However, the majority of research has included predominantly male samples and focused on physical forms of aggression that are more characteristic of boys (Card et al., 2008); thus, very little is known about the risk factors or mechanisms underlying aggression in girls with ADHD. Available evidence shows that girls with ADHD can be aggressive (e.g., Zalecki & Hinshaw, 2004), with their aggression taking both physical (e.g., hitting, pushing) and relational forms (e.g., spreading rumors, excluding others; Card et al., 2008). Attention to identifying factors that contribute to physical and relational aggression in girls with ADHD is greatly needed, as both forms of aggression are associated with a broad range of long-term negative social-emotional difficulties (Becker, Luebke, & Langberg, 2012).

Despite consistent links between ADHD and aggression (McKay & Halperin, 2001), it is unclear if risk stems directly from ADHD or from other disorders that commonly co-occur with ADHD. Extant literature, using majority male samples, has focused on the role of comorbid oppositional defiant disorder (ODD) in explaining risk for aggression in youth with ADHD. Relative to a diagnosis of ADHD alone, the combination of ADHD and ODD

is generally associated with higher levels of physically and relationally aggressive behavior in both boys (McKay & Halperin, 2001; Waschbusch et al., 2002) and girls (Ohan & Johnston, 2007). When overlapping variance is controlled, ODD severity, rather than ADHD severity, also is found to uniquely predict engagement in physical and relational aggression (Becker, Luebke, Stoppelbein, Greening, & Fite, 2012). Some evidence suggests that ADHD and ODD may differentially impact physical and relational aggression in boys and girls. For example, in a community sample of preadolescent youth with and without ADHD, ODD severity, but not ADHD severity, was associated with relational aggression in girls only. In contrast, ADHD and ODD severity were associated with physical aggression in boys only (McQuade, Breaux, Miller, & Mathias, 2017). There is also evidence that the mechanisms underlying relational and physical aggression may differ by gender. Notably, social cognitive biases, which have long been identified in prominent models of child aggression, did not explain relational and physical aggression in girls with ADHD (Mikami, Lee, Hinshaw, & Mullin, 2008). Thus there may be gender-specific risks for aggression in girls with ADHD that have not been identified.

One risk factor for aggression that may be highly relevant for girls is borderline personality features (BPF). Borderline personality disorder is diagnosed disproportionately in women and is characterized by risky and impulsive behavior, chronic anger, and sensitivity to interpersonal rejection (Storebø & Simonsen, 2014). In adulthood, it is well documented that ADHD and borderline personality disorder co-occur (Storebø & Simonsen, 2014) and together are associated with heightened aggression (Prada et al., 2014). Although borderline personality disorder is traditionally diagnosed in adults (Kaess, Brunner, & Chanen, 2014), features of the disorder, including unstable and impulsive emotions, identity confusion, volatile relationships, and self-harm, can emerge during childhood and early adolescence (e.g., Crick, Murray-Close, & Woods, 2005). Emerging work demonstrates that the co-occurrence of ADHD and BPF may first appear in childhood (Babinski, Mills, & Bansal, 2018), with ADHD described as a developmental precursor to borderline personality disorder (Storebø & Simonsen, 2014).

Recent research suggests that links between ADHD and BPF (Fossati et al., 2015) and between BPF and aggression may be specific to females (Mancke, Bertsch, & Herpertz, 2015). Thus, BPF may be a highly relevant risk factor for aggression in girls with ADHD. Specifically, girls with ADHD are characterized by problems with emotion regulation, hostile cognitions, and peer problems (McQuade & Hoza, 2014), which may increase the likelihood that they display BPF. In turn, the emotional impulsivity and interpersonal sensitivity characteristic of BPF, may make girls with ADHD more likely to respond to peers with retaliatory aggression. Despite these possibilities, researchers have not examined whether high levels of BPF explain why girls with ADHD tend to be aggressive. It is also possible that ODD contributes to the development of BPF. Youth with ODD also may be emotionally dysregulated, hostile, and socially impaired (Burke, Hipwell, & Loeber, 2010), and some evidence suggests that childhood ADHD and ODD symptoms are both uniquely associated with increased risk for BPF in adolescence (Stepp, Burke, Hipwell, & Loeber, 2012). Thus ODD symptoms may also be associated with BPF and subsequent aggression. Consequently, in the present study, BPF was examined as a mediator of the associations between both ADHD and ODD severity and girls' aggressive behavior.

There also may be differential associations between subfactors of ADHD and ODD, BPF, and aggression. ADHD is comprised of inattention and hyperactivity/impulsivity subfactors (Molina, Smith, & Pelham, 2001), and evidence suggests that hyperactivity/impulsivity is more strongly associated with aggression than inattention (Evans, Fite, Hendrickson, Rubens, & Mages, 2015). To our knowledge, research has not examined associations between subfactors of ADHD and BPF, though given the interpersonal, affective, and impulsive characteristics of BPF, it may be that hyperactivity/impulsivity is more directly linked to BPF. Oppositional behavior and irritability have most consistently emerged as distinct subfactors of ODD (Burke et al., 2010; Herzhoff & Tackett, 2016; Lavigne, Bryant, Hopkins, & Gouze, 2015). The oppositional behavior subfactor, which includes arguing with adults, defiance, and losing one's temper, has been frequently associated with antisocial, aggressive, and criminal behavior; the irritability subfactor, which includes being touchy, angry, and spiteful, has more frequently been associated with mood problems (Burke et al., 2010). Recent research examining links between ODD subfactors and BPF has produced mixed results, with oppositional behavior emerging as predictive of borderline personality symptoms in young adult men (Burke & Stepp, 2012) but irritability predicting borderline personality symptoms in a community sample of adolescent girls (Scott et al., 2015). Given the risk for mood problems documented among girls with ADHD (Hinshaw, 2015), it may be expected that irritability would be more relevant to BPF in girls. To our knowledge, research has not examined unique associations of both ADHD and ODD subfactors with BPF in girls or whether distinct pathways to aggression exist.

This study investigates BPF as a mediator of the associations between ADHD, ODD, and aggression in girls. To obtain a broad distribution of symptom and impairment levels, we included girls assessed through an outpatient psychiatry clinic as well as girls recruited from the community. A dimensional approach to assessing symptoms was taken, which is consistent with recent perspectives that categorical diagnostic groupings create false distinctions between risk factors that are actually dimensional (e.g., Research Domain Criteria [RDoC]; Sanislow et al., 2010). The unique effects of ADHD and ODD severity on aggression and the indirect effect via BPF were examined. We examined the effects of the DSM-5 ADHD and ODD total symptom scores on BPF and aggression as well as whether there were distinct associations across the subfactors of inattention, hyperactivity/impulsivity, oppositional behavior, and irritability. To assure a gender-appropriate assessment of aggression, we included measures of both physical and relational aggression. Based on research showing that both ADHD and ODD are uniquely associated with BPF (Stepp et al., 2012), we hypothesized that BPF would mediate the relationship between ADHD and aggression and between ODD and aggression. For parallel analyses examining subfactors of ADHD and ODD, we hypothesized that hyperactivity/impulsivity and irritability would be relatively more strongly associated with BPF and indirectly with aggression compared to inattention and oppositional behavior.

Methods

Participants

Girls with and without ADHD were included in this study. Recruitment was conducted independently at two sites, with 62 girls recruited from an outpatient psychiatry clinic in the mid-Atlantic United States and 56 girls recruited in the Northeast United States. Both sites included suburban and rural communities with comparable median household income levels and racial distributions. All procedures were approved by the respective site's Institutional Review Board and were consistent with the 1964 Declaration of Helsinki. Consent and assent were obtained.

Clinic sample.

Girls in the outpatient sample were recruited using advertisements posted within an academic medical center and the surrounding community. Most girls presented to complete behavioral treatment research focused on addressing social-emotional difficulties. A smaller proportion ($n=7$) presented for an assessment study examining interpersonal functioning in girls with attention and behavior problems. Girls were required to be between 7 to 16 years old (inclusive) and have an $IQ>70$ based on the Wechsler Abbreviated Scales of Intelligence (Wechsler, 2011). ADHD, ODD, and CD diagnoses were assigned based on parent report on the Disruptive Behavior Disorders Interview (DBD-I; Pelham, Fabiano, & Massetti, 2005). The DBD-I is a semi-structured interview examining DSM-5 symptoms of ADHD, ODD, and CD, with supplemental probes for symptom severity and situational variability; the DBD-I was conducted by masters and doctoral level therapists who received training requiring at least 80% agreement in two cases with a senior clinician. Weekly supervision was also provided to review diagnoses with a senior clinician. In addition, parents (100% mothers), and teachers when available, completed the Disruptive Behavior Disorders Rating Scale (Pelham, Gnagy, Greenslade, & Milich, 1992). Diagnoses were made if a sufficient number of symptoms were endorsed (considering all available diagnostic information). A total of 60 (96.8%) girls met full diagnostic criteria for DSM-5 ADHD. A total of 27 girls met DSM-5 criteria for ODD and three girls met diagnosis for CD. Autism, schizophrenia, psychosis, and non-English speaking were assessed in a phone screen prior to study participation and were exclusionary. Data were collected from July 2015 through November 2017 during an initial assessment (i.e., prior to treatment for the girls presenting for treatment). A total of 34 (54.64%) girls were medicated for ADHD. Individuals were told to rate girls' functioning when not medicated for ADHD.

Community sample.

Girls in the community sample were part of a larger mixed gender study characterizing emotion regulation and social functioning in typically developing children. Participants were recruited through advertisements posted in the community and fliers sent home through local schools and summer camps. Participants were required to be 10 to 12 years old (inclusive). A formal assessment of ADHD was not conducted; however, by parent report, six girls had previously been diagnosed by a healthcare professional with ADHD. In order to obtain a representative sample of children in the general population, there were no exclusion criteria beyond severe Autism and non-English speaking. Children with severe Autism were

excluded because an additional aspect of the larger study was the completion of a social interaction task that involved peer rejection, and there were concerns that children with Autism and a high level of impairment would not understand the task. Non-English speakers were excluded because several measures were normed in English. Data were collected from July 2016 to August 2017. Girls and a parent (87.5% mothers) completed study measures during one 2-hour visit.

Demographic information are presented for the full sample and separately by clinic and community sample in Table 1. Preliminary analyses were conducted to examine demographic differences across child age, race, ethnicity, parent education level, and income; only parental education level emerged as statistically different across groups, with parents of girls from the clinic sample having significantly less education than parents from the community sample.

Measures

ADHD and ODD symptom severity.

Parent report on the Disruptive Behavior Disorders Rating Scale (DBDRS; Pelham et al., 1992) assessed DSM ADHD and ODD symptom severity. The DBDRS has strong psychometric properties (Pelham et al., 2005). Items on the DBDRS are rated on a 4-point Likert scale from 0 (*Not at All*) to 3 (*Very Much*). Total ADHD severity was calculated by averaging ratings across all 18 DSM ADHD symptoms ($\alpha=.96$). Inattentive ($\alpha=.95$) and hyperactive/impulsive ($\alpha=.92$) subfactors were also calculated. Total ODD severity was calculated by averaging all eight DSM ODD symptoms ($\alpha=.92$). For ODD subfactors (Burke et al., 2010), oppositional behavior was calculated by averaging scores on the following three items: loses temper, argues, and defies ($\alpha=.86$) and irritability was calculated by averaging item scores on the following three items: touchy, angry, and spiteful ($\alpha=.76$). Although the DBDRS also assesses CD symptoms, these were not included in the current study due to the very low base rate within the sample.

BPF.

Parent and child report on the Borderline Personality Features Scale for Children (BPFS-C; Crick et al., 2005) was used to assess girl's BPF. The BPFS-C is a 24-item measure with four subscales: affective instability ("go back and forth between different feelings, like being mad or sad or happy"), identity problems ("get upset when friends or family leave town for a few days"), negative relationships ("feel very lonely"), and self-harm ("do things others would consider wild or out of control"). There are parallel parent and child versions of the measure. Items are scored on a 1 (*not at all true*) to 5 (*always true*) Likert scale. Parent and child self-report ratings were combined by taking the maximum score on an item-by-item basis, as has been done in past research (Babinski et al., 2018). The BPFS-C has established psychometric properties (Crick et al., 2005), with an alpha of .88 in the current sample.

Relational and physical aggression.

The Children's Social Behavior Scale (CSBS; Crick, 1996) was used to examine self-reported aggression. The CSBS includes five relational aggression items and two physical

aggression items rated on a 5-point Likert scale from 1 (*Never*) to 5 (*All the time*). Items were averaged to calculate physical aggression ($\alpha=.89$) and relational aggression scores ($\alpha=.84$). Parent-reported aggression was also assessed using the CSBS. In the clinic sample, parents rated the same items from the child version. In the community sample, parents rated items from the teacher version (Crick, 1996). In both versions items are rated on a 1 (*Never*) to 5 (*All the time/Almost Always*) scale. The two versions differ in wording, but both included relational aggression items describing slanderous gossip (“*keep others from liking a classmate by saying mean things about the classmate*” in the child version and “*spreads rumors or gossips about some peers*” in the teacher version), systematic exclusion (“*when they are mad at someone, some kids get back at the person by not letting the person be in their group anymore*” in the child version and “*when this child is mad at a peer, s/he gets even by excluding the peer from his or her clique or play group*” in the teacher version), and threats to friendship (“*tell their friends that they will stop liking them unless the friends do what they say*” in the child version and “*threatens to stop being a peer’s friend in order to hurt the peer or to get what s/he wants from the peer*” in the teacher version). The two versions also included physical aggression items describing hitting (“*hit other kids at school*” in the child version and “*threatens to hit or beat up peers*” in the teacher version) and pushing (“*push and shove other kids at school*” in the child version and “*pushes or shoves peers*” in the teacher version). The three relational aggression items were averaged ($\alpha=.69$) and the two physical aggression items were averaged ($\alpha=.81$) to create physical and relational aggression scores.

Data Analytic Plan

To examine associations between variables, bivariate correlations between ADHD severity (overall score, hyperactive/impulsive, and inattentive), ODD severity (overall score, oppositional behavior and irritability), BPF, and physical and relational aggression were conducted. To examine the unique effects of ADHD and ODD severity on forms of aggression and the indirect effect via BPF, path analysis models were then run in Mplus Version 7 (Muthén & Muthén, 2012) with alpha set to .05. A small subset of participants had missing parent ($n = 14$) or self-reports of aggression ($n = 12$); maximum likelihood estimation was used to address this missing data (Muthén & Muthén, 2012). Demographic characteristics significantly associated with study variables were accounted for in analyses using the multiple indicators multiple causes model (MIMIC; Muthén, 1989). Relational and physical aggression were included as dependent variables within the same model, with separate models run predicting parent-rated and child-rated aggression. Initial models examined overall ADHD and ODD severity as two distinct independent variables and BPF as the mediator. To examine the specificity of effects, a second set of mediational models examined the subfactors of ADHD (hyperactive/impulsive and inattentive) and ODD (oppositional behavior and irritability) together as four independent variables with BPF as the mediator. Each model accounted for correlations between ADHD and ODD measures and between relational and physical aggression measures. Indirect effects were tested using bootstrap estimation with 1,000 bootstrap resamples and bias-corrected (BC) bootstrap estimates. Significance of unstandardized direct and indirect effects were interpreted based on BC 95% confidence intervals; standardized coefficients are reported in figures for interpretability. Because the models were saturated, fit indices were not interpreted.

Results

Preliminary Analyses

Preliminary analyses were conducted to examine whether child age, family income, parental education, race (white versus non-white), or ethnicity (Hispanic/Latino versus non-Hispanic/Latino) were systematically related to aggression variables or symptom measures. Older child age was significantly associated with less parent-rated physical aggression and hyperactivity/impulsivity, but greater self-reported relational and physical aggression. Lower parent education level was significantly associated with greater ADHD, ODD, BPF, and aggression. Lower household income also was significantly associated with greater ODD, BPF, and parent-rated relational aggression, although these correlations did not remain significant when also controlling for parent education level. Given these correlations, child age and parent education were included as covariates in the models tested.

Bivariate Correlations

Descriptive statistics and bivariate correlations of study variables are presented in Table 2. There were large and significant positive correlations between ADHD, ODD, and BPF, as well as between the subfactors of ADHD and ODD and BPF. ADHD severity and inattention were significantly associated with greater parent-rated relational aggression and child-rated relational and physical aggression; hyperactivity/impulsivity was only significantly correlated with parent-rated relational aggression. ODD, oppositional behavior, and irritability were each significantly correlated with parent-rated physical and relational aggression and child-rated physical aggression; ODD and irritability were also significantly correlated with child-rated relational aggression. Although ADHD and irritability were not directly associated with all aggression measures, these symptom domains were retained in the mediational models because indirect effects can exist without a direct effect (Hayes, 2013). Symptom measures and BPF were normally distributed, suggesting good representation and variability within the sample.

Indirect Effects of ADHD and ODD Severity on Forms of Aggression

By parent report (Figure 1A), ODD and BPF significantly predicted relational aggression. Greater BPF and lower levels of ADHD were uniquely and significantly associated with physical aggression. ODD severity was significantly associated with BPF and there was a significant indirect effect of ODD on both relational aggression, BC indirect = .10; 95% CI [.04, .22], and physical aggression, BC indirect = .08; 95% CI [.03, .17], via BPF. ADHD severity was unrelated to BPF and aggression and the indirect effects via BPF were not significant for relational aggression, BC indirect = .04; 95% CI [−.003, .12], or physical aggression, BC indirect = .03; 95% CI [−.003, .08]. Within the model, older child age was associated with less physical aggression and lower parent education was significantly associated with BPF; no other significant covariates emerged. The complete path model explained 33.3%, $p < .001$, of the variance in parent-rated relational aggression and 30.0%, $p = .004$, of the variance in parent-rated physical aggression.

By child self-report (Figure 2A), BPF were the only significant predictor of engagement in relational and physical aggression. ODD significantly predicted BPF and there were

significant indirect effects of ODD on relational aggression, BC indirect = .12; 95% CI [.05, .25], and physical aggression, BC indirect = .10; 95% CI [.02, .25], via BPF. ADHD was not directly related to aggression or to BPF within the model; indirect effects of ADHD on relational aggression, BC indirect = .05; 95% CI [−.01, .13], and physical aggression, BC indirect = .04; 95% CI [−.001, .14], via BPF were non-significant. Older child age was significantly associated with greater self-reported relational aggression and lower parent education was significantly associated with greater BPF. The path model explained 39.3%, $p < .001$, of the variance in self-reported relational aggression and 22.6%, $p = .018$, of the variance in self-reported physical aggression.

Indirect Effects of ADHD and ODD Subfactors on Forms of Aggression

For parent-report, BPF were significantly associated with relational and physical aggression (Figure 2); ADHD and ODD subfactors did not independently predict aggression in the model. Greater hyperactivity/impulsivity and oppositional behavior were associated with greater BPF; whereas inattention and irritability were not predictors of BPF. There were significant indirect effects of hyperactivity/impulsivity on parent-rated relational aggression, BC indirect = .05; 95% CI [.01, .17], and physical aggression, BC indirect = .04; 95% CI [.01, .13], via BPF. Significant indirect effects of oppositional behavior on relational aggression, BC indirect = .05; 95% CI [.01, .13], and on physical aggression, BC indirect = .04; 95% CI [.01, .11], also emerged via BPF. Indirect effects of inattention on relational and physical aggression via BPF were non-significant, BC indirect = .00; 95% CI [−.05, .05] and BC indirect = .00; 95% CI [−.04, .04], respectively. Non-significant indirect effects of irritability on relational aggression, BC indirect = .04; 95% CI [−.01, .14], and physical aggression, BC indirect = .03; 95% CI [−.01, .11], emerged. Younger child age significantly predicted greater physical aggression and lower parent education significantly predicted greater BPF. The model explained 38.3%, $p < .001$, of the variance in relational aggression and 30.5%, $p = .004$, of the variance in physical aggression by parent report.

Using self-report (Figure 3), BPF and irritability were significantly associated with greater relational and physical aggression. Oppositional behavior was uniquely and significantly associated with less relational aggression in the model. Hyperactivity/impulsivity and oppositional behavior were significantly associated with greater BPF; inattention and irritability were not uniquely associated with BPF. Indirect effects of hyperactivity/impulsivity on relational and physical aggression via BPF were significant, BC indirect = .07; 95% CI [.01, .17], and BC indirect = .05; 95% CI [.003, .20], respectively. There were also significant indirect effects of oppositional behavior on relational aggression, BC indirect = .06; 95% CI [.01, .16], and on physical aggression, BC indirect = .05; 95% CI [.003, .15], via BPF. Indirect effects of inattention on relational aggression, BC indirect = .00; 95% CI [−.06, .05], and physical aggression, BC indirect = .00; 95% CI [−.05, .05], were non-significant. The indirect effects of irritability on relational aggression, BC indirect = .04; 95% CI [−.02, .16], and physical aggression, BC indirect = .03; 95% CI [−.01, .19], were also non-significant. Older child age was significantly associated with greater relational aggression; lower parent education was significantly associated with BPF. The path model explained 43.1%, $p < .001$, of the variance in relational aggression and 23.2%, $p = .015$, of the variance in physical aggression.

Discussion

This is the first study to examine BPF as a potential mediator in the association between ADHD, ODD, and physical and relational aggression in girls ranging broadly in ADHD symptom level. At the bivariate level, ADHD severity, ODD severity, and the subfactors of ADHD and ODD, were each associated with BPF. Yet within mediational models that accounted for overlapping variance, a unique association between ODD severity and BPF emerged. At the subfactor level, oppositional behavior and hyperactivity/impulsivity each explained unique variance in BPF when accounting for inattention and irritability subfactors. In addition, BPF fully mediated the association between ODD and aggression and, at the subfactor level, between both hyperactive/impulsive symptoms and oppositional behavior symptoms and aggression. Results were largely consistent when using parent and self-reports of aggression and predicting physical and relational forms. Taken together, these results suggest that girls high in hyperactivity/impulsivity and oppositional behavior may be most likely to display elevations in BPF and that these elevations, in turn, may be associated with increased use of physical and relational aggression.

Significant associations that emerged at the bivariate level between ADHD and BPF and ODD and BPF suggest that BPF are particularly relevant to girls exhibiting ADHD and ODD symptoms (Stepp et al., 2012). Our findings extend this work by pointing to specificity in these associations. That is, hyperactivity/impulsivity and oppositional behavior were uniquely associated with BPF in girls. It had been expected that hyperactivity/impulsivity would be associated with BPF, as impulsivity is characteristic of both BPF and ADHD, and there is growing evidence that girls manifesting hyperactive/impulsive symptoms are at relatively greater risk than girls with predominantly inattentive symptoms for interpersonal and affective difficulties, which are characteristic of borderline personality disorder (e.g., self-harm and suicide attempts; Hinshaw, 2015). While we had expected irritability, the affective subfactor of ODD, to be particularly relevant to BPF, we instead found that oppositional behavior was uniquely predictive. This finding is consistent with work by Burke and Stepp (2014) who found that in a male community sample, childhood oppositional behavior, rather than irritability, was associated with borderline personality disorder symptoms. Thus in girls ranging broadly in symptom profiles, it may be that hyperactivity, impulsivity, and a more antagonistic interaction style are most strongly linked to BPF.

Consistent with previous work examining aggression in girls with ADHD (Ohan & Johnston, 2007; Zalecki et al., 2004), we also found that at the bivariate level, ADHD and ODD severity were associated with both physical and relational aggression in our sample. We also found that BPF were associated with youth and parent ratings of relational and physical aggression. Indeed, our findings fit with accumulating evidence showing that BPF measured in youth are a significant predictor of social functioning (Banny, Tseng, Murray-Close, Pitula, & Crick, 2014; Crick et al., 2005). While some previous work in community samples suggests that girls' poor social adjustment may be associated more with relational versus physical aggression (e.g., Crick, 1997), and BPF in girls may link more strongly to relational versus physical aggression (Banny et al., 2014), in our sample, associations with both forms of aggression were significant. Links to both forms of aggression may result

from the fact that over 50% of the girls in our sample had a diagnosis of ADHD. Indeed, in clinical samples, girls with ADHD and ODD have been shown to engage in elevated levels of both relational and physical aggression (Mikami et al., 2008; Zalecki et al., 2004), with the co-occurrence of relational and physical aggression associated with substantial social-emotional dysfunction (Zalecki & Hinshaw, 2004). The associations between symptoms and physical forms of aggression may be particularly concerning in girls, as peers may be more intolerant of physically aggressive behavior that is gender atypical for females. It will be important for future research to examine if there are distinct consequences for engagement in physical versus relational aggression, particularly among girls with ADHD.

To our knowledge, this is the first study to examine BPF as a mediating variable in the relation between ADHD, ODD, and forms of aggression in girls. Despite common co-occurring challenges in youth with BPF, ADHD and ODD (e.g., peer problems, emotion dysregulation), BPF contributed unique variance to both relational and physical aggression. In addition, BPF fully mediated effects of ODD severity, oppositional behavior, and hyperactivity/impulsivity on both physical and relational aggression, suggesting that BPF may be a critical additional risk factor for aggression in girls high in externalizing problems. As noted above, hyperactive, impulsive, and oppositional behavior may increase the likelihood that girls manifest BPF, perhaps because of heightened impulsivity, emotion dysregulation, or social problems. BPF, in turn, may result in a greater likelihood of reacting to peers with aggression. Girls high in BPF may be highly sensitive and emotionally reactive during social interactions; this may increase the likelihood that they infer hostility in peers, fail to use effective social problem solving, and ultimately react with aggression. However, as this was a cross-sectional study, the directionality of effects cannot be assumed. It is also possible that aggression increases risk for psychiatric symptoms including ADHD, ODD and BPF. To clarify the temporal nature of these variables, prospective longitudinal research is needed.

It is noteworthy that within the mediational models, there continued to be some direct associations between symptom measures and aggression. ODD severity remained uniquely associated with parent-rated relational aggression, even when accounting for the co-occurrence of ADHD severity and BPF. Yet within this model, greater ADHD severity was also uniquely associated with lower levels of physical aggression. Greater irritability was uniquely associated with greater self-reported relational and physical aggression whereas greater oppositional behavior was actually uniquely associated with lower levels of relational aggression. There are several interpretations of these direct effects. Given the correlations between ADHD and ODD severity and between subfactors, it is possible that the surprising negative associations with aggression are the result of suppressor effects and should be interpreted as statistical artifacts. However, it is also possible that girls with exclusive elevations in ADHD (without co-occurring ODD) are actually less likely to be physically aggressive, as reported by parents. Girls with elevated ADHD in the absence of ODD symptoms may tend to be more socially withdrawn, rather than overt in their social behavior. It also is possible that girls with oppositional behavior, without the co-occurrence of irritability, hyperactivity/impulsivity, or inattention, are unlikely to use relational aggression. These girls may be particularly low in emotionality, a feature that is characteristic of ADHD and the irritability subfactor (Burke et al., 2010); low emotionality

could limit social connectedness, which may be critical for girls to manipulate social relationships and therefore use relational aggression. In order to explore these possibilities, additional research will be needed. An examination of comorbidity subgroups or the use of person-centered approaches may be particularly useful in ascertaining whether there are indeed symptom profiles that are characterized by low rates of aggression in girls.

Several limitations should be discussed. First, for this work we combined two independently collected samples. Although not statistically different, the clinic sample included a broader age range, which could influence results. The community sample also did not include diagnostic evaluations; thus it cannot be assured that elevations in ADHD or ODD symptoms are representative of a DSM diagnosis for all children. Second, our findings rely on parent and youth self-report, which could be biased. Teacher ratings were not routinely collected and the addition of teacher ratings or objective measures of aggression may provide additional, or even different, information about the associations between variables (Narad et al., 2015). Third, we focused on forms of aggression, but did not consider the function of aggression (e.g., reactive versus proactive), which may also be relevant to understanding links between ADHD, ODD, and BPF (e.g., Banny et al., 2014). Lastly, we focused only on girls; thus, gender differences in risk factors could not be examined.

Despite these limitations, we believe findings meaningfully extend the limited research on girls with ADHD. Indeed, the mean BPF score of 69.52 in our sample is notably higher than BPF scores reported in a community sample of fourth graders (i.e., $M=59.39$, $SD=13.05$; Crick et al., 2005) and the clinical cut-off of 66 identified for diagnosis of borderline personality disorder in older adolescents (Chang et al., 2011). While this may be partly due to our use of combined parent and child ratings, the high levels of BPF documented herein point to the relevance of BPF for girls with ADHD. Results also point to the importance of considering the impact of BPF in the aggressive behavior of youth. Despite decades of research aimed at improving the peer behavior of youth with ADHD, very little is known about mechanisms underlying the peer dysfunction of girls with ADHD. Focusing on the role of BPF may offer new insight into mechanisms of risk for social difficulties in girls with ADHD.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Direct and indirect effects of ADHD and ODD on parent-rated aggression (1A) and self-reported aggression (1B).

Figure 2.
Direct and indirect effects of hyperactivity/impulsivity, inattentive, oppositional behavior, and irritability on parent-rated aggression.

Figure 3.
Direct and indirect effects of hyperactivity/impulsivity, inattentive, oppositional behavior, and irritability on self-reported aggression.

Table 1

Demographic characteristics of the clinic, community, and total samples

	Clinical sample (<i>n</i> =62)	Community Sample (<i>n</i> =56)	Community vs. clinical sample p-value	Total sample (<i>n</i> =118)
Child age, <i>M</i> (<i>SD</i>)	11.43 (2.68)	11.37 (0.91)	.86	11.40 (2.03)
Child race, % white	87.1 %	78.6 %	.23	83.1 %
Child ethnicity, % Hispanic/Latina	6.5 %	7.1 %		6.8 %
Parent education, % 4-year college graduate	49.2 %	96.4 %	.00	71.8 %
Family income, <i>M</i> (<i>SD</i>)	3.72 (2.18)	4.54 (2.02)	.05	4.14 (2.13)

Note. Family income was assessed from 1=Less than 25K, 2=25K to 50K, 3=50K-75K, 4=75K-100K, 5=100K-125K, 6=125K-150K, 7=150K-175K, 8=175 and above.

Table 2

Descriptive Statistics and Bivariate Correlations of Study Variables

	Mean (SD)	Range	1a	1b	2	2a	2b	3	4	5	6	7
1. ADHD severity	1.22 (.79)	0.00 - 2.89	.92	.94	.68	.65	.60	.53	.41	.13	.23	.22
1a. HI	1.05 (.78)	0.00 - 2.78	-	.73	.63	.60	.54	.51	.45	.14	.18 ⁺	.16 ⁺
1b. IN	1.39 (.92)	0.00 - 3.00	-	-	.64	.60	.57	.47	.32	.11	.24	.24
2. ODD severity	.98 (.70)	0.00 - 2.88			-	.95	.92	.59	.54	.28	.28	.27
2a. OB	1.09 (.81)	0.00 - 3.00				-	.79	.55	.54	.27	.19 ⁺	.22
2b. IRR	.87 (.71)	0.00 - 3.00					-	.54	.48	.28	.36	.32
3. BPF	69.56 (12.79)	39.00 - 105.00						-	.47	.32	.44	.36
Parent-report:												
4. Relational aggression	1.53 (.62)	1.00 - 3.67							-	.40	.23	.09
5. Physical aggression	1.12 (.41)	1.00 - 4.00								-	.03	.22
Self-report:												
6. Relational aggression	1.49 (.55)	1.00 - 3.20									-	.60
7. Physical aggression	1.33 (.66)	1.00 - 5.00										-

Note. ADHD = attention-deficit/hyperactivity disorder; HI = hyperactive/impulsive subdomain; IN = inattentive subdomain; ODD = oppositional defiant disorder; OB = oppositional behavior subdomain; IRR = irritability subdomain; BPF = borderline personality features;

⁺ $p < .10$;

* $p < .05$;

** $p < .01$;

*** $p < .001$.