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RESEARCH ARTICLE

WILEY AGGRESSIVE BEHAVIOR

The co-occurrence and correlates of anxiety disorders among adolescents with intermittent explosive disorder

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We examined the lifetime prevalence of anxiety disorders (ADs) among adolescents with lifetime intermittent explosive disorder (IED), as well as the impact of co-occurring ADs on anger attack frequency and persistence, additional comorbidity, impairment, and treatment utilization among adolescents with IED. IED was defined by the occurrence of at least three anger attacks that were disproportionate to the provocation within a single year. Data were drawn from the National Comorbidity Survey-Adolescent Supplement (N = 6,140), and diagnoses were based on structured lay-administered interviews. Over half (51.89%) of adolescents with IED had an AD, compared to only 22.88% of adolescents without IED. Compared to adolescents with IED alone, adolescents with IED and comorbid ADs: (a) were more likely to be female; (b) reported greater impairment in work/school, social, and overall functioning; (c) were more likely to receive an additional psychiatric diagnosis, a depressive or drug abuse diagnosis, or diagnoses of three or more additional disorders; and (d) had higher odds of receiving any mental/behavioral health treatment as well as treatment specifically focused on aggression. Adolescents with IED alone and those with comorbid ADs did not differ in the number of years experiencing anger attacks or the highest number of anger attacks in a given year. ADs frequently co-occur with IED and are associated with elevated comorbidity and greater impairment compared to IED alone. Gaining a better understanding of this comorbidity is essential for developing specialized and effective methods to screen and treat comorbid anxiety in adolescents with aggressive behavior problems.

KEYWORDS
aggression, anxiety disorders, adolescents, IED, anxiety

1 | INTRODUCTION

Occasional acts of aggression are normative among adolescents with most engaging in one or more aggressive outbursts (McLaughlin et al., 2012). However, when it becomes excessive in intensity or frequency, clinically distressing, or impairing aggression may be present. Aggression of this nature, which falls outside the range of normative developmental behavior, may warrant a diagnosis of intermittent explosive disorder (IED). IED is a common and serious mental health concern among adolescents, often resulting in serious, long-term impairment in social, occupational, legal, and/or health domains (Kulper, Kleiman, McCloskey, Berman, & Coccaro, 2015; McLaughlin et al., 2012).

Although aggression is evident as early as infancy (Tremblay et al., 2004), adolescence is an important period in the development of aggressive behavior and the primary onset period for IED (mean age of 12) (Kessler et al., 2005; McLaughlin et al., 2012). Aggression during adolescence has also been associated with a number of maladaptive

outcomes in adulthood, including negative emotionality, substance use problems, and physical violence (Fite, Raine, Stouthamer-Loeber, Loeber, & Pardini, 2010), and IED is specifically associated with several classes of psychiatric disorders including substance use, depressive, personality, and anxiety disorders (Kessler et al., 2006). For example, of those with a lifetime diagnosis of IED, the overwhelming majority (81.8%) had at least one additional lifetime diagnosis, with prevalence rates of 37.4, 35.1, and 58.1% for comorbid depressive, substance use, and anxiety disorders, respectively (Kessler et al., 2006). Anxiety disorders (ADs) are of particular interest as they are the most common class of disorders in adolescence (31.9%) and represent one of the few classes of comorbid disorders with an earlier age of onset than mood and behavior disorders (Kessler et al., 2005; Merikangas et al., 2010). Furthermore, ADs share the same core deficits as aggression, including physiological hyper-arousal and cognitive bias to perceived threat (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007; van Honk, Tuiten, de Haan, van den Hout, & Stam, 2001), but are typically associated with different emotional and behavioral responses.

The social information processing (SIP) model (Crick & Dodge, 1994; Dodge, 1986) may help to explain why anxiety and aggression frequently co-occur. This model suggests that a child's social behavior is the product of a set of sequential steps, including encoding social cues, interpretation of social cues, clarification of social goals, response generation and access, decision-making, and behavioral enactment. Previous research has shown that at least two SIP characteristics are evident in aggressive children. First, aggressive children tend to misinterpret ambiguous social cues in the form of a hostile attribution bias (Dodge & Frame, 1982), and second, aggressive children have more confidence in their ability to perform aggressive acts and are more likely to expect positive outcomes of aggression than their peers (Crick & Ladd, 1990).

Studies have also shown that reactively aggressive children (i.e., those who use aggression defensively and in retaliation to frustration or provocation) are more anxious than their proactively aggressive or nonaggressive peers (Marsee, Weems, & Taylor, 2008; Vitaro, Brendgen, & Tremblay, 2002). In addition, high anxiety boys have shown higher levels of reactive relational aggression than low anxiety boys, and the use of negative cognitive errors (e.g., catastrophizing, personalizing, etc.) when interpreting social situations mediated this association (Marsee et al., 2008).

Although there has been abundant research examining the underlying mechanisms of anxiety and aggression independently (e.g., Bar-Haim et al., 2007; Berkowitz, 1989; Crick & Dodge, 1996), only a few studies have examined the co-occurrence of ADs and IED (e.g., Coccaro, Posternak, & Zimmerman, 2005; Kessler et al., 2006; McLaughlin et al., 2012), and while the influence of aggression among those with ADs has been explored previously (e.g., Keyes, McLaughlin, Vo, Galbraith, & Heimberg, 2016), no research to date has assessed how AD comorbidity impacts the characteristics and consequences of IED in adolescence. Additionally, the current study's criteria for IED (e.g., three or more anger attacks occurring in a single year) are stricter than those used by Keyes et al. (2016) (e.g., 3 or more lifetime anger attacks), and this aligns better with how IED is currently conceptualized (Coccaro, 2012) and is more indicative of aggression that is both pervasive and interfering.

Given that differences in externalizing behavior often characterize and distinguish anxious and aggressive individuals, one overarching question is whether the co-occurrence of ADs with IED would be prominent in adolescents, and if so, would the presence of ADs counteract, exacerbate, or have no effect on the symptoms and outcomes for individuals with IED? Based on Berkowitz's (1989) reformulation of the frustration-aggression hypothesis, which proposed that frustrations produce aggressive behavior to the degree that they arouse negative affect, as well as previous research on the relationship between anxiety and reactive aggression (Card & Little, 2006; Marsee et al., 2008), we predicted that those with comorbid AD-IED would experience anger attacks with greater frequency and persistence. Additionally, given greater disorder severity, functional impairment, and treatment utilization among adolescents with comorbid psychiatric disorders than those with a single disorder (Kessler et al., 2012; Merikangas et al., 2011), we further predicted that those with comorbid AD-IED would experience heightened levels of functional impairment and psychiatric comorbidity and increased treatment utilization than adolescents with IED alone.

The present study examined the prevalence of ADs among adolescents with and without IED and compared the correlates and characteristics of comorbid AD-IED to IED alone in the National Comorbidity Survey-Adolescent Supplement (NCS-A). Specifically, aggression (referred to as "anger attacks" in the NCS-A) frequency and persistence, functional impairment, treatment utilization, and psychiatric comorbidity were the primary outcomes. ADs examined included social phobia, specific phobia, panic disorder, and generalized anxiety disorder (GAD) due to their demonstrated associations with anger expression or aggression in previous research (Kessler et al., 2006; Moscovitch, McCabe, Antony, Rocca, & Swinson, 2008).

2 | METHODS

2.1 | Study design and sample

The NCS-A was conducted between 2001 and 2004. Adolescents were selected from households participating in the National Comorbidity Survey Replication (NCS-R), at a response rate of 86.8% (879 adolescents). An additional school-based sample had a response rate of 82.6% (9,244 adolescents), for a total sample of 10,123 English-speaking adolescents, 13–18 years old. Additional details are provided elsewhere (Kessler, Avenevoli, Costello et al., 2009; Merikangas, Avenevoli, Costello, Koretz, & Kessler, 2009). In line with previous research (Kessler et al., 2006; McLaughlin et al., 2012), individuals with a diagnosis of bipolar I or II disorder were excluded from the current analyses. IED and bipolar disorder are both characterized by affective instability and have been shown to have a particularly strong relationship (McElroy, 1999; Perlis et al., 2004). To minimize the potential for misleading associations with bipolar disorder, we excluded participants reporting manic or hypomanic episodes and limited our analyses of mood disorders to strictly depressive disorders.

In addition, we excluded adolescents missing a questionnaire completed by a parent or guardian, which was used for the assessment of comorbid psychiatric disorders (see below). The final analytic sample comprised 6,140 adolescents.

Written informed consent from adults and assent from adolescents were obtained from all participants. Study procedures were approved by Human Subjects Committees at Harvard Medical School and the University of Michigan. The current study was approved by the Human Subjects Committee at Columbia University.

2.2 | Measures

Lifetime psychiatric diagnoses were assessed with the Composite International Diagnostic Interview (CIDI) for *DSM-IV*, a fully-structured diagnostic instrument administered by trained lay interviewers (Kessler & Üstün, 2004; Kessler, Avenevoli, Costello et al., 2009). A blinded clinical reappraisal study compared CIDI diagnoses with clinician diagnoses using the Schedule for Affective Disorders and Schizophrenia for School-Age Children—Lifetime Version (K-SADS) (Kaufman et al., 1997), indicating generally good concordance (Kessler, Avenevoli, Green, et al., 2009). In addition to diagnostic variables, other variables in the study (e.g., anger attacks, functional impairment, treatment utilization, etc.) were selected due to their common use in epidemiological studies, particularly those that have examined aggression using data from the NCS-R or the NCS-A (Kessler et al., 2006; Keyes et al., 2016; McLaughlin et al., 2012).

2.2.1 | Intermittent explosive disorder

IED was operationalized by report of at least three of the following types of anger attacks within a single year, "when all of a sudden you lost control and. . . (1) broke or smashed something worth more than a few dollars, (2) hit or tried to hurt someone, or (3) threatened to hit or hurt someone." Additionally, to determine that the aggression was disproportionate to the provocation, the participant had to respond that he/she "got a lot more angry than most people would have been in the same situation" or report that anger attacks occurred "without good reason" or "in situations where most people would not have had an anger attack." These criteria are similar to those used in previous IED studies using data from the NCS-R or the NCS-A (Kessler et al., 2006; McLaughlin et al., 2012) but required that three attacks happen within a single year rather than over the course of one's lifetime.

2.2.2 | Anxiety disorders

ADs were assessed using the CIDI criteria for *DSM-IV*. Based on prior research on the overlap of anger expression and ADs (Kashdan & McKnight, 2010; Moscovitch et al., 2008), four specific lifetime ADs were assessed: GAD, panic disorder, social phobia, and specific phobia. A variable was also created to assess history of any lifetime AD. Results for any AD are reported in text, and results for specific ADs are included in supplementary text and tables online.

2.2.3 | Other psychiatric disorders

CIDI *DSM-IV* criteria were also used to assess comorbid lifetime disorders, including: mood disorders (dysthymia, major depressive disorder [MDD]), substance disorders (drug and alcohol abuse; alcohol, drug, or nicotine dependence), eating disorders (anorexia nervosa, binge eating disorder, bulimia nervosa), and impulse control disorders (attention deficit hyperactivity disorder [ADHD], conduct disorder [CD], oppositional defiant disorder [ODD]). Parent reports were combined with adolescents' self-reports for the diagnosis of dysthymia, MDD, CD, and ODD, since this procedure has been more accurate than adolescent self-report in previous studies (Bird, Gould, & Staghezza, 1992; Braaten et al., 2001; Johnston & Murray, 2003). Parent reports alone were used for the diagnosis of ADHD, based on previous validity studies (Johnston & Murray, 2003). *DSM-IV* hierarchy and exclusion rules were applied for all disorders assessed.

2.2.4 | Anger attacks and functional impairment

Characteristics of anger attacks were based on self-reports about the number of years when an anger attack occurred and the highest number of attacks in a single year. Because the distributions of these variables were highly skewed, we categorized responses and treated these variables as ordinal. Functional impairment associated with IED was assessed with the Sheehan Disability Scale (Leon, Olfson, Portera, Farber, & Sheehan, 1997). Respondents rated the extent to which aggression interfered with their life and activities during the worst month of attacks in the previous year, in the following domains: home, school or work, family, and social. Severity for each domain was rated between 0 and 10. Response options were none (0), mild (1–3), moderate (4–6), severe (7–9), and very severe (10). Consistent with previous research (Kessler et al., 2006; Keyes et al., 2016; McLaughlin et al., 2012), severe impairment was operationalized as a score of 7 or higher. A variable was also created indicating severe impairment in any domain.

2.2.5 | Treatment utilization

Respondents with IED or any of the four ADs of interest were asked if they ever received treatment for each of these problems. They were also asked if they had ever received treatment for "problems with your emotions or nerves or your use of alcohol or drugs." These responses were combined into a single variable indicating any lifetime mental, behavioral, or emotional health treatment (e.g., psychotherapy, medication management, general medical, and complementary-alternative medicine).

2.2.6 | Socio-demographic characteristics

Socio-demographic variables assessed in these analyses included sex, age (13, 14, 15–16, 17–18 years old), race/ethnicity (non-Hispanic Black, non-Hispanic White, Hispanic, other), and years of education completed by parent (0–11, 12, 13–15, 16+).

2.3 | Statistical analysis

First, we assessed prevalence of ADs among respondents with and without IED. Logistic regression models estimated whether aggression was associated with higher odds for each AD. Adjusted models controlled for sex, age, race/ethnicity, and education. Second, we examined the socio-demographic characteristics associated with having comorbid AD-IED versus having IED alone, using adjusted logistic regression models. Third, we estimated the risk for other relevant outcomes, described above, for participants with IED alone compared to IED with comorbid anxiety, controlling for sex, age, race/ethnicity, and education. Logistic regression models were used for dichotomous outcomes, ordered logit models for ordinal outcomes, and linear regression models for continuous outcomes. Analyses were conducted for any AD, as well as for each specific disorder comorbid with IED. All analyses were conducted using SAS version 9.3 (SAS Institute Inc, 2011) and reflect the complex survey design of the studies, using sample weights to be nationally representative based on socio-demographic characteristics.

3 | RESULTS

3.1 | Comorbidity of anxiety disorders with IED

Of the 486 adolescents with IED, over half also had a lifetime AD, whereas among the 5,654 adolescents without IED, less than one quarter had an AD (Table 1). The most common comorbid AD was specific phobia and the least common was GAD. In adjusted models, adolescents with IED had three and a half times higher odds for any AD than adolescents without IED (CI: 2.60–5.06) and 2–4 times higher odds for panic disorder, social phobia, and specific phobia, in particular.

3.2 | Socio-demographic correlates of IED with and without anxiety disorders

IED alone was more common in boys; however, comorbid AD-IED was more common in girls (OR = 0.57, CI: 0.35–0.95) (Table 2). Only adolescents with IED with a race/ethnicity of "other" had higher odds for comorbid ADs than Whites. There were no significant differences in odds for comorbid ADs among adolescents with IED by age or parent education level.

3.3 | Characteristics and consequences of IED with and without comorbid anxiety disorders

Compared to adolescents with IED alone, those with comorbid ADs showed no significant differences in the number of years they reported experiencing anger attacks (OR = 1.35, CI: 0.81–2.25) or the highest number of anger attacks in a given year (OR = 1.51, CI: 0.94–2.41) (Table 3). However, adolescents with comorbid ADs reported more problems with daily functioning due to anger attacks in the domains of work/school, social life, and overall functioning (ORs, 2.13–3.53). Adolescents with comorbid ADs also had higher odds for receiving any type of mental/behavioral health treatment (OR, 1.85, CI: 1.00–3.43) and were two and a half times more likely to receive treatment for aggression (OR = 2.53, CI: 1.26–5.05) than those with IED alone (Table 3).

3.4 | Comorbidity of other disorders with IED with and without anxiety disorders

Among adolescents with IED, those with a comorbid AD were almost twice as likely to have at least one other psychiatric disorder (OR = 1.88, CI:1.03–3.44). Additionally, those in the AD-IED group were twice as likely to meet criteria for three or more other disorders (Table 4). With regard to individual (non-anxiety) diagnoses among adolescents with IED, the comorbid AD group was twice as likely to have a co-occurring mood disorder, specifically MDD (OR = 2.10, CI: 1.20–3.67), as well as to meet criteria for drug abuse (OR = 2.09, CI: 1.04–4.18).

3.5 | IED with and without specific anxiety disorders

Noteworthy results for IED with and without specific ADs are included in supplemental text and tables online (see Supplement 1 and Tables S1-S8, available online).

4 | DISCUSSION

The co-occurrence of ADs with IED was extraordinarily common and associated with greater impairment, treatment utilization, and psychiatric comorbidity. Six predominant findings emerged from our

TABLE 1 Weighted lifetime comorbidity of anxiety disorders with intermittent explosive disorder (IED)

	IED (*n* = 486)	No IED (*n* = 5 654)	Proportion with IED onset prior to anxiety onset (%, SE)	Adjusted odds ratio[a] (95%CI)
Generalized anxiety disorder (% [SE])	4.07 (1.70)	2.03 (0.29)	63.00 (5.80)	2.05 (0.84-5.02)
Panic disorder (% [SE])[b]	6.84 (1.74)	1.73 (0.25)	43.94 (9.58)	4.13 (2.30-7.39)*
Social phobia (% [SE])	14.87 (2.04)	7.33 (0.63)	17.78 (4.34)	2.18 (1.57-3.03)*
Specific phobia (% [SE])	41.22 (3.63)	16.57 (0.95)	11.59 (2.21)	3.57 (2.54-5.02)*
Any anxiety disorder of interest (% [SE])	51.89 (3.61)	22.88 (0.95)	15.81 (3.00)	3.62 (2.60-5.06)*

SE = Standard Error; CI = Confidence Interval.
[a]Adjusted by age, race, sex, parent education.
[b]Panic disorder with or without agoraphobia.
*$p < .05$.

TABLE 2 Socio-demographic correlates of lifetime intermittent explosive disorder (IED) with comorbid anxiety disorders (ADs)

	ADs-IED (*n* = 232)	IED only (*n* = 254)	Adjusted odds ratio[a]
	% (SE)	% (SE)	(95%CI)
Sex			
Male	45.02 (5.25)	58.14 (3.66)	0.57 (0.35-0.95)*
Female	54.98 (5.25)	41.86 (3.66)	REF
χ^2 (*p*-value)	4.70 (.03)		
Age			
13	17.14 (4.37)	16.23 (3.19)	0.82 (0.35 - 1.92)
14	16.52 (3.53)	15.13 (2.93)	0.85 (0.42-1.73)
15-16	40.32 (6.13)	46.18 (4.85)	0.71 (0.31-1.63)
17-18	26.02 (4.38)	22.46 (3.58)	REF
χ^2 (*p*-value)	0.67 (.88)		
Race/ethnicity			
Non-hispanic black	21.02 (4.30)	12.98 (2.99)	1.78 (0.75-4.20)
Non-hispanic white	56.07 (4.79)	66.42 (5.72)	REF
Hispanic	13.06 (2.30)	17.12 (3.46)	0.87 (0.48-1.58)
Other	9.85 (3.07)	3.49 (1.04)	3.48 (1.14-10.64)*
χ^2 (*p*-value)	10.59 (.01)		
Grades of education completed by Parent			
0-11	17.98 (5.21)	12.91 (3.24)	1.22 (0.52-2.84)
12	29.85 (3.77)	30.37 (3.59)	1.00 (0.61-1.64)
13-15	21.90 (4.22)	23.88 (3.73)	REF
16+	30.27 (4.06)	32.85 (4.17)	0.96 (0.52-1.78)
χ^2 (*p*-value)	0.28 (0.96)		
Overall			
χ^2 LRT (*p*-value)	25.43, df = 13 (.02)		

SE = Standard Error; CI = Confidence Interval; REF = Reference Group; df = degrees of freedom
[a]Adjusted by age, race, sex, parent education. Individual χ^2 values represent unadjusted associations.
*$p < .05$.

analysis. First, the odds of having at least one AD were over 3.5 times greater for those with IED than those without, with over half of IED participants having at least one AD. Second, comorbid AD-IED was more prevalent among girls, whereas IED alone was more prevalent among boys. Third, ADs among those with IED were associated with greater functional impairment, particularly in work/school and social domains, than IED alone. Heightened impairment was especially prominent among those with social or specific phobia. Fourth, adolescents with comorbid ADs-IED were at greater risk for MDD, drug abuse, the presence of at least one additional disorder, and 3+ additional disorders than those with IED alone. Notably, those with IED and co-occurring social phobia had almost five times greater odds of drug abuse. Fifth, those with IED symptoms and co-occurring ADs were more likely to receive treatment for aggression and mental/behavioral health treatment in general than adolescents with IED alone. Finally, no significant differences emerged in the frequency and persistence of anger attacks.

These findings suggest that the co-occurrence of affective aggression with ADs is commonplace. Although IED often co-occurs with other externalizing disorders (e.g., substance use disorders, ODD) (Kessler et al., 2006; Lejoyeux, Feuche, Loi, Solomon, & Ades, 1999), we found that a substantial proportion of adolescents with IED also experience significant anxiety. Thus, it is important that mental health professionals assess aggressive and anger-prone adolescents for the signs and symptoms of anxiety. Numerous potential explanations exist for the high prevalence of ADs among adolescents with IED. Both anger and ADs are associated with deficits in emotion regulation (Fettich, McCloskey, Look, & Coccaro, 2014; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005) and dysregulated amygdala response to threatening stimuli (Coccaro, McCloskey, Fitzgerald, & Phan, 2007; Monk et al., 2008). Perhaps adolescents with IED and comorbid ADs are particularly sensitive to threatening stimuli but respond with either anger or anxiety depending on the situational context. Thus, adolescents with IED and comorbid ADs may be more likely to have disproportionate reactions on both sides of the "fight or flight" spectrum. Anger and anxiety problems have also been linked to a diminished ability to tolerate distress (Hawkins, Macatee, Guthrie, & Cougle, 2013; Keough, Riccardi, Timpano, Mitchell, & Schmidt, 2010).

TABLE 3 Characteristics and consequences of lifetime intermittent explosive disorder (IED) with comorbid anxiety disorders (ADs)

	ADs-IED (n = 232)	IED only (n = 254)	Adjusted odds ratio[a]
	% (SE)	% (SE)	(95%CI)
Anger attacks[b]			
No. of years with anger attacks			1.35 (0.81-2.25)
1-2	20.96 (5.13)	25.92 (3.52)	
3-4	31.00 (5.51)	29.96 (4.67)	
5-9	35.44 (4.81)	35.15 (3.66)	
10+	12.60 (4.32)	8.97 (3.35)	
Highest no. of annual anger attacks			1.51 (0.94-2.41)
3	16.11 (3.57)	17.27 (3.62)	
4-9	28.08 (4.43)	42.19 (3.37)	
10-19	30.86 (4.23)	18.58 (3.23)	
20-99	19.30 (3.26)	17.63 (3.03)	
100+	5.66 (1.89)	4.32 (2.16)	
Severe impairment on sheehan disability scales[c]			
Home	9.67 (2.58)	8.05 (2.70)	1.67 (0.67-4.17)
Work/school	19.60 (4.61)	6.28 (2.05)	3.53 (1.31-9.49)*
Family	31.21 (4.85)	19.81 (4.44)	1.69 (0.85-3.36)
Social	18.65 (4.94)	7.24 (2.44)	3.10 (1.26-7.58)*
Summary	48.15 (5.62)	28.19 (4.93)	2.13 (1.13-4.00)*
Treatment modality			
Any mental/behavioral health treatment	64.55 (4.45)	49.23 (4.99)	1.85 (1.00-3.43) *
Any aggression treatment	27.89 (4.38)	15.53 (2.87)	2.53 (1.26-5.05) *
Any anxiety treatment	26.14 (3.67)	3.67 (1.05)	9.59 (4.8-19.14) *

SE = Standard Error; CI = Confidence Interval. aAdjusted by age, race, sex, parent education; bOrdinal logistic regression models adjusted by age, race, sex, parent education; cExtent that anger attacks in the past year caused problems with functioning. Home: doing chores, Work/school: ability to do well with responsibilities, Family (sometimes referred to as "interpersonal"): ability to get along with family, Social: problems in social life.
*$p < .05$.

Difficulty tolerating negative emotions may help to explain the shared behavioral tendencies among angry and anxious individuals, such as avoiding emotionally evocative stimuli (Kashdan, Breen, Afram, & Terhar, 2010; Keough et al., 2010) and the use of substances as a coping strategy (Bolton, Cox, Clara, & Sareen, 2006; Buckner et al., 2008; Lejoyeux et al., 1999). This potential explanation is also in line with the reformulated frustration-aggression hypothesis, which posits that frustration results in aggression to the degree that negative emotions are experienced (Berkowitz, 1989).

An attentional bias for threatening stimuli is another possible explanation for the high co-occurrence of these disorders. Previous studies have demonstrated that individuals with anxiety and anger disorders each display a heightened bias for threatening stimuli or negative feedback (Bar-Haim et al., 2007; van Honk et al., 2001). Compared to those without IED, a heightened bias for threatening stimuli may cause adolescents with IED to appraise a broader range of situations as potentially provoking (i.e., aggression-eliciting) and/or dangerous (i.e., anxiety-eliciting) (van Honk et al., 2001).

Finally, another possibility is that adolescents with IED may have diminished cognitive-behavioral skills, which could increase their likelihood for misunderstandings and conflict escalation in interpersonal relationships. This idea is consistent with the finding that anger-prone individuals are less appropriate and effective in difficult social situations (Edmondson, Conger, & Tescher, 2000). Although various therapeutic treatments (e.g., cognitive-behavioral therapy, dialectical behavior therapy) have had success targeting anger and aggression (Koons et al., 2001; McCloskey, Noblett, Deffenbacher, Gollan, & Coccaro, 2008), adolescents with IED and co-occurring ADs may require specialized treatments that further emphasize specific problem areas (e.g., threat appraisal, emotion regulation, distress tolerance, attentional control).

Consistent with previous research (Kessler et al., 2006), boys were more likely than girls to experience IED alone. However, this relationship flipped for the comorbid AD-IED group, with girls being more likely to experience co-occurring anxiety and IED. Given that anxiety disorders are more common among girls than boys, it is reasonable to assume that girls would be at greater risk for comorbid symptoms of anxiety and aggression. However, the function that the aggressive behavior serves (i.e., reactive vs. proactive) may further help to explain this disparity. Proactive aggression is unprovoked

TABLE 4 Lifetime comorbidity of intermittent explosive disorder (IED) and anxiety disorders (ADs) with other DSM-IV disorders

	ADs-IED (n = 232)	IED only (n = 254)	Adjusted odds ratio[a]
	% (SE)	% (SE)	(95%CI)
Mood disorders	42.00 (5.08)	26.41 (3.63)	1.98 (1.12-3.51)*
Dysthymia	11.44 (5.14)	4.50 (1.61)	2.74 (0.87-8.65)
Major depressive disorder	41.68 (5.06)	25.27 (3.37)	2.10 (1.20-3.67)*
Substance disorders	32.62 (5.41)	24.11 (3.56)	1.77 (0.92-3.39)
Alcohol abuse	13.82 (3.29)	9.11 (2.74)	1.74 (0.82-3.67)
Alcohol dependence	3.13 (1.91)	1.93 (0.73)	1.66 (0.44-6.23)
Drug abuse	21.58 (4.14)	13.24 (2.93)	2.09 (1.04-4.18)*
Drug dependence	3.67 (1.57)	2.44 (1.39)	1.69 (0.40-7.12)
Nicotine dependence	21.60 (3.63)	15.73 (3.07)	1.78 (0.84-3.76)
Eating disorders	8.67 (2.30)	6.57 (2.75)	1.24 (0.36-4.30)
Impulse control disorders	48.27 (4.93)	43.25 (5.38)	1.33 (0.79-2.25)
Attention deficit disorder	16.77 (3.46)	16.18 (3.66)	1.37 (0.62-3.00)
Conduct disorder	12.65 (2.95)	13.69 (3.54)	0.83 (0.37-1.84)
Oppositional-defiant disorder	37.53 (4.81)	35.49 (5.00)	1.19 (0.73-1.94)
At least 1 disorder	75.55 (5.41)	64.26 (4.35)	1.88 (1.03-3.44)*
Exactly 1 disorder	25.53 (4.62)	27.60 (4.45)	0.97 (0.45-2.08)
Exactly 2 disorders	18.25 (3.23)	14.87 (3.37)	1.14 (0.55-2.37)
3+ disorders	31.77 (5.07)	21.79 (3.71)	2.00 (1.14-3.49)*

SE = Standard Error; CI = Confidence Interval.
[a]Adjusted by age, race, sex, parent education.
*$p < .05$.

aggression that is used to achieve instrumental gains and dominance over others (as opposed to reactive or defensive aggression). Proactive aggression has been associated with callous and unemotional traits (Frick, Cornell, Barry, Bodin, & Dane, 2003), which are more commonly displayed in boys, whereas reactively aggressive children are more likely to have problems with emotion regulation (Vitaro et al., 2002). Concordantly, it seems plausible that a higher percentage of aggressive boys may employ proactive aggression.

Heightened impairment, particularly in school and social functioning, was pronounced among those with co-occurring ADs and IED. Although school and social functioning tend to overlap a great deal during adolescence, given the pervasive nature of anxiety disorders, especially GAD and social phobia, it is not surprising that the comorbid group would experience greater impairment. The lack of differences in impairment in the home and family domains points to the influence of peer interactions, which may be less stable and forgiving during adolescence than relationships in the home. This finding supports previous research, which has shown that reactively aggressive children report having fewer friends and lower friendship quality than their proactively aggressive peers (Boivin, Vitaro, Hodges, & Poulin, 1998; Poulin & Boivin, 1999).

Elevated risk for comorbid disorders in the AD-IED group is especially concerning as it is likely a strong contributor to the greater impairment these individuals experience. Although a higher likelihood of depressive disorders in this group is not unexpected given the well-documented overlap of depressive and anxiety disorders (Essau, 2003), it still warrants serious attention among mental health professionals. In addition, this result is consistent with previous studies of reactive aggression and anxiety, which have shown that compared to proactive aggression, reactively aggressive children are more likely to experience depressive feelings, engage in suicidal behaviors, and have difficulty regulating their emotions (Card & Little, 2006; Fite, Stoppelbein, & Greening, 2009; Vitaro et al., 2002). A potential explanation for higher levels of depression in the comorbid group may tie back to our previous finding about social and school impairment since reactively aggressive children are more at risk for social isolation and rejection (Day, Bream, & Pal, 1992; Poulin & Boivin, 1999).

Similarly concerning was the heightened risk for drug abuse among adolescents in the comorbid group. Previous research has shown that the presence of IED significantly increases the likelihood of comorbid substance use disorders (Lejoyeux et al., 1999; McLaughlin et al., 2012) and the addition of at least one AD, especially social phobia, further increases this risk. Additionally, those with social phobia have considerably higher odds of developing subsequent substance dependence than those with other ADs (Buckner et al., 2008). Reactively aggressive individuals with ADs often use substances as a way to self-medicate (Bolton et al., 2006), and individuals with comorbid AD-IED might abuse drugs to achieve similar relief from a combination of distressing symptoms and negative emotions. Given the propensity for adolescent drug use to develop into drug dependence in adulthood

(Koons et al., 2001), and findings that reactive (not proactive) aggression is uniquely linked to marijuana and hard drug use in early adulthood (Fite et al., 2010), early identification and intervention with substance use for those with comorbid AD-IED is critical.

Whereas comorbid AD-IED was associated with higher comorbidity and greater impairment, especially among those with social or specific phobia, it is somewhat encouraging that the rates of treatment utilization were elevated for this group as well. However, an alternative interpretation is that higher rates of treatment utilization correspond directly to a greater need for treatment due to heightened impairment. Although anxiety and aggression problems are regularly characterized by dissimilar, and often conflicting behavioral traits, the presence of ADs does not reduce the frequency or persistence of the anger attacks.

The current findings should be considered along with the following limitations. First, although overall diagnoses in the NCS-A have demonstrated good concordance with blinded clinical reappraisals (Kessler, Avenevoli, Green et al., 2009), they were obtained using self-report and a lay-administered design. Thus, the typical cautions associated with self-report data should be applied. Second, IED was defined using only three items to measure anger attacks. Although similar approaches have been used in previous studies (Kessler et al., 2006; Keyes et al., 2016; McLaughlin et al., 2012), there are clearly many ways for individuals to exhibit aggressive behavior. Third, given that the NCS-A did not assess for obsessive-compulsive disorder (OCD), we were unable to examine this particular comorbidity. Future research should make an effort to examine OCD given its associated symptoms of worry and perseveration and their potential to result in frustration and aggression. OCD may be of particular interest since obsessions are sometimes focused on the potential to cause harm to others. Lastly, subtypes of aggression (e.g., reactive, proactive, relational) were not examined in this study. Given that past research has shown that anxious children are more inclined to use reactive (vs. proactive) forms of aggression (Marsee et al., 2008; Vitaro et al., 2002), and girls are more likely to use relational (as opposed to physical) aggression (Crick & Grotpeter, 1995), future research should explore whether the findings in the current study remain consistent across various aggression subtypes.

Our findings suggest that the presence of ADs is common among adolescents with aggression. Comorbid AD-IED was associated with greater impairment, comorbidity, and treatment utilization, but not a higher frequency or more persistent course of anger attacks. Additional research is required to further examine the characteristics and implications of this comorbidity, as well as its underlying mechanisms. Principally, these findings emphasize the importance of early detection of ADs, particularly among adolescents with aggression problems and the increased need for treatments that can effectively address the complexities of this co-occurrence.

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CONFLICTS OF INTEREST

The authors report no conflicts of interest and have no financial relationships with commercial interests.

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