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Intermittent explosive disorder and eating disorders: Analysis of national comorbidity and research samples

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Keywords

Intermittent Explosive Disorder; Eating Disorders; Impulsivity; Aggression; Binge Eating

1. Introduction

Clinical presentations of eating disorders (ED) are complex and diverse, and psychiatric comorbidities are commonplace among this population. Empirical evidence suggests that aggression and anger (the emotion corresponding to aggression) [1] are associated with ED [2, 3], severity of ED symptoms [4], and poorer treatment outcomes [5]. Research also suggests that individuals with EDs have increased aggressive behaviors against others and a higher risk of self-directed anger and aggression (e.g., suicidality, self-injurious behaviors) compared to the general population [1, 6]. Studies have revealed that individuals with ED have higher prevalence of anger attacks [3] and higher scores on measures assessing aggressiveness [7] compared to healthy controls. Furthermore, studies in community samples have reported that adolescents with eating disturbances are more likely to report aggressive and disruptive behaviors [8–10], and have higher propensity to display aggressive behavior against others [11].

Aggressive behavior against others and self-directed anger and aggression increase the complexity of clinical presentations, and can significantly influence prognosis and treatment [1]. Additionally, anger and aggression may play a role in the onset and maintenance of ED [1, 2, 12], and are associated with the co-occurrence of other psychiatric disorders. Indeed, epidemiologic studies report that Intermittent Explosive Disorder (IED) is present in individuals with ED, particularly bulimic spectrum disorders [13–16]. IED is characterized by recurrent, problematic, impulsive aggressive behavior [17]. Aggression in IED may be

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displayed as nondestructive or non-injurious, or as destructive and/or injurious [18]. However manifested, aggression in IED is impulsive and/or anger-based.

Although epidemiologic studies have suggested comorbidity of IED among individuals with ED [14–16], only one study has examined the prevalence of ED among adults with IED [19]. Findings from this study suggested that 1.7% and 2.5% of cases had comorbidity of IED and lifetime BN or BED, respectively. Moreover, approximately 50% of individuals with comorbid IED and ED reported that IED onset preceded onset of BN or BED.

Further examination of the relationship between ED and IED may provide a better understanding of underlying mechanisms contributing to the development and maintenance of ED. Thus, the current study aimed to extend previous research by examining categorical IED and ED, and continuous measures of aggression, in two U.S. community samples of adults and adolescents, as well as a clinical research sample of adults. Based on theoretical and empirical data, we hypothesized that: 1) individuals with IED would be more likely to report Any ED compared to individuals without IED; 2) in cases of current IED/ED comorbidity, age of onset of IED would precede that for ED; 3) associations between IED and ED would remain after accounting for other psychiatric disorders; and 4) participants with ED would have greater aggression scores compared to healthy controls or individuals with Non-IED/Non-ED psychiatric disorders but lower scores than participants with IED or IED/ED.

2. Methods

2.1 Sample

This study used cross-sectional data from two community samples (NCS-R and the National Comorbidity Survey – Adolescent Supplement [NCS-R-AS] Studies: $n = 19{,}430$) and a clinical research sample ($n = 1{,}642$). For all samples, onset and course of IED and ED were based on self-reported data including retrospective assessments of age at onset and number of IED outbursts per year. Table 1 provides characteristics of the samples. There was a significant group difference in age, in that the community sample was significantly younger compared to the clinical research sample, $t(df = 21{,}070) = 8.39$, $p < 0.001$. This study was approved by the University of Chicago Institutional Review Board.

2.1.1 Community Samples—The NCS-R and NCS-R-AS are nationally representative surveys of the prevalence and correlates of mental disorders in the United States (US). Fully structured and laptop computer-assisted interviews were administered face-to-face to a sample adults (ages 18 or older) and adolescents (ages 13–17) who were English-speaking and living in the non-institutionalized civilian household population of the coterminous US (excluding Alaska and Hawaii) between 2001 and 2004. Details regarding the design and acquisition of the two NCS-R samples have been published [20, 21]. Participants in the current study ($n = 19{,}430$) were predominantly White (63.5%) and female (53.1%), with a mean age of 29.3 years ($SD = 19.1$; range = 13–99).

The NCS-R and the NCS-R-AS studies were designed to assign DSM-IV diagnoses [22]. However, raw data enabled an updating of DSM-IV to DSM-5 diagnoses. For the diagnosis

of IED, participants reported at least three "anger attacks" in any given year with at least one in the past year (Criteria A_2). In addition, "anger attacks" were out of proportion to the circumstances in which they occurred (Criteria B); impulsive in nature (Criteria C); associated with functional impairment and/or distress (Criteria D); and occurred in the absence of other psychiatric disorders (Criteria F). Finally, all participants were at least six years of age (Criterion E).

2.1.2 Clinical Research Sample—The majority of participants (n = 1,642) were White (56.4%) and male (56.4%), with a mean age of 33.3 years (*SD* = 9.9; range = 18–70). Details regarding the clinical research sample have been published [23]. Psychiatric and personality disorder diagnoses were made using DSM-5 criteria [17]. DSM-5 diagnoses were based on information obtained from: (a) the Structured Clinical Interview for DSM Diagnoses (SCID-I) [24] and the Structured Interview for the Diagnosis of DSM Personality Disorder (SIDP) [25]; (b) clinical interview by a research psychiatrist; and, (c) review of all other available clinical data. The research diagnostic interviews were conducted by individuals with a masters or doctorate degree in Clinical Psychology after a rigorous training program including lectures on DSM diagnoses and rating systems, videos of expert raters conducting SCID/SIDP interviews, and practice interviews/ratings until the raters were deemed reliable with the trainer. This process resulted in good to excellent inter-rater reliabilities (mean kappa = 0.84 ± .05; range: 0.79 – 0.93) across anxiety, mood, substance use, impulse control, and personality disorders. Final DSM-5 diagnoses were assigned by team best-estimate consensus procedures involving research psychiatrists and clinical psychologists as previously described [18]. For participants with any psychiatric diagnosis (*n* = 1,189), 58% (*n* = 690) reported a history of formal psychiatric evaluation and/or treatment, and 14% (*n* = 166) reported a history of behavioral disturbance during which the subject or others thought they should have sought mental health services but did not.

2.2 Materials

Aggression was assessed in the community samples as the maximum number of IED episodes in any year. In the clinical research sample, aggression was measured using the Life History of Aggression (LHA) scale, an 11-item self-report questionnaire. LHA items are rated on a 5-point Likert scale ranging from 0 ("no occurrences") to 5 ("more events than can be counted") [26]. Psychometric properties of the LHA are excellent [26].

Anger and impulsivity also were measured in the clinical research sample using the Anger subscale score of the Buss-Perry Aggression Questionnaire (BPA) [27] and the Impulsivity Total score for the 11th version of the Barratt Impulsivity Scale (BIS-11) [28], respectively. The BPA is a 29-item questionnaire that measures dimensions of aggression. Items are rated on a 5-point scale ranging from one ("extremely uncharacteristic of me") to five ("extremely characteristic of me").

The BIS-11 is a 30–item questionnaire that assesses the personality and behavioral constructs of impulsiveness. Items are rated on a 4-point scale ranging from 1 ("rarely/never") to 4 ("almost always/always"). Psychometric properties of the BIS-11 are excellent [28, 29].

2.3 Statistical Analysis

Statistical procedures included binary logistic regression, analysis of covariance (ANCOVA), and paired t-tests, as appropriate. All reported odds ratios were adjusted for age, sex, ethnicity, and education. A two-tailed alpha of 0.05 was used to denote statistical significance for all analyses. The two community samples were combined for two reasons. First, the frequency of IED/ED comorbid cases in the NCS-R ($n = 12$) and NCS-R-AS ($n = 39$) was relatively low compared with the clinical research sample ($n = 57$). Second, findings did not differ when analyses were conducted in the adolescent community sample only, the adult community sample only, and the combined community sample (adolescents and adults).

3. Results

3.1 Prevalence and demographic characteristics

Table 2 displays the lifetime prevalence of ED in participants with and without IED. As shown, lifetime prevalence of Any ED was significantly greater in participants with IED compared to participants without IED in both the combined community and clinical research samples. With respect to specific ED diagnoses, lifetime prevalence of BED or BN was significantly greater in participants with IED compared to individuals without IED in the community samples, but only lifetime prevalence of BED was significantly greater in participants with IED than individuals without IED in the clinical research sample.

3.2 Age of onset

In the community sample, self-reported onset of IED preceded self-reported onset of Any ED in 75% of participants with comorbid IED/ED ($n = 51$; $z = 3.24$, $p < 0.001$). More specifically, IED preceded Any ED, BN, or BED by an average of at least two years (see Table 3). Similarly, in the clinical research sample, self-reported onset of IED preceded self-reported onset of Any ED in 70% of individuals with IED/ED ($n = 57$; sign test $z = 2.73$, $p < 0.005$). Including all comorbid cases, IED preceded Any ED, BN, or BED by an average of at least five years (see Table 3).

3.2 Other psychiatric disorders

To explore the relationship between IED and ED after considering other psychiatric disorders that are comorbid with IED [6, 7], we performed binary logistic regression analyses with IED diagnosis as the outcome variable and depressive disorders (DEP), anxiety disorders (ANX), substance use disorders (SUD), and disruptive behavior disorder (DBD) as additional covariates. For the community sample, IED remained associated with Any ED (Odds Ratio = 2.12; 95% CI: 1.54–2.92, $p = 0.001$) and BN (Odds Ratio = 2.16; 95% CI: 1.39–3.33, $p = 0.001$) after accounting for DEP/ANX/SUD/DBD comorbidity. The finding was reduced to a trend level of statistical significance for BED (Odds Ratio = 1.58; 95% CI: 0.95–2.62, $p = 0.079$). In the clinical research sample, IED was more prevalent among BED (Odds Ratio = 3.12; 95% CI: 1.30–8.85, $p = 0.012$), but not among Any ED, BN, or AN after accounting for DEP/ANX/SUD/DBD comorbidity.

3.3 Role of IED Outbursts, Aggression, Anger, and Impulsivity

One-way ANCOVA found significant differences in the number of outbursts across groups in the community samples, with age, sex, ethnicity, and education as covariates (see Figure 1). More specifically, the non-IED/non-ED group had the fewest IED outbursts followed by the ED group, and then the IED group. The IED/ED group had the highest mean number of maximum IED outbursts in any year.

One-way ANCOVAs revealed similar results for LHA Aggression, BPA Anger, and BIS Impulsivity scores in the clinical research sample (see Figure 2). Participants with ED had significantly higher aggression, anger, and impulsivity scores compared with healthy control participants. Although there was no difference in aggression scores between psychiatric control participants and participants with ED, anger and impulsivity scores were greater for individuals with ED. In turn, participants with IED had significantly higher aggression and anger scores, but equally high impulsivity scores, compared to participants with ED. Finally, individuals with IED/ED had equally high aggression and anger scores, but significantly higher impulsivity scores, compared with participants with IED.

4. Discussion

This study examined the comorbidity of IED and ED in two nationally representative U.S. community samples and a large clinical research sample. Findings confirmed that ED prevalence is elevated in individuals with IED and onset of IED precedes onset of ED. Additionally, results suggest that IED/ED comorbidity is independent of other psychiatric disorders, particularly in individuals with binge eating as a prominent clinical feature.

The association of IED with BN and BED in the current study is noteworthy. In the community sample, the odds of BN were three times higher and the odds of BED were two times higher in individuals with versus without IED. Moreover, in the clinical research sample, the odds of BED were increased nearly six-fold in individuals with IED compared to those without IED. A potential explanation for these findings might be that IED and BED or BN have similar underlying mechanisms which contribute to the development and maintenance of these disorders. Clinically, the early presence of IED may identify a potential risk factor for the development of ED in later adolescence and adulthood. However, because data were cross-sectional and retrospective assessments were used, this study cannot fully capture whether IED precedes ED. Longitudinal studies are needed to determine whether IED is a correlate that precedes ED and the potential potency of the IED as a risk factor.

The temporal nature of IED/ED comorbidity is critical to understanding how these two disorders intersect. In this study, nearly 80% of individuals with IED/ED comorbidity reported that age of onset of problems due to IED preceded that of problems due to ED. Prior research has also indicated that IED has an earlier onset, on average, than substance use disorder (i.e., mid-second decade of life vs. early third decade of life) [23]. The present study extends these findings to show that for the majority of individuals with comorbid IED and ED, problematic impulsive aggressive behavior may not be due to the onset of ED.

As hypothesized, the findings of the present study suggest that individuals with ED have less aggression than individuals with IED/ED and IED only, but more aggression than healthy controls or individuals without IED and ED. These results are consistent with other research suggesting that individuals with ED have high levels of aggression, hostility, and anger [1]. Aggression may be an important mechanism underlying both disorders but its manifestation may be different. In IED, aggressive behavior is most often provoked in social interactions; hostile cognitive distortions lead to misinterpretations of non-threatening social-emotional cues as threatening and an inappropriately aggressive response [30]. Similarly, individuals with ED misinterpret social-emotional cues as threatening and unpredictable but inappropriately respond with eating disorder behaviors to avoid or suppress feelings of anger [12, 31, 32].

4.1 Limitations

Limitations include the modest number of subjects in sub-analyses which increases risk of Type 1 or 2 errors. In addition, the cross-sectional nature of the data precludes inferences about the causation of IED/ED comorbidity. Finally, data were collected more than a decade ago and may not reflect more recent population wide changes in disorder prevalence, particularly in ED. However, there are no other epidemiologic datasets with recently collected data to address these questions. Additionally, data were collected as part of a large, nationally representative, community sample using state of the art assessment tools which were blind to this study's hypotheses. Furthermore, updating psychiatric diagnoses to meet DSM-5 criteria makes the data currently useful to researchers and clinicians alike.

5. Conclusions

Results from this study suggest that individuals with IED are more likely to report lifetime prevalence of ED, particularly bulimic spectrum disorders, compared to individuals without IED. The relationship between IED and ED does not appear to be due to the presence, or absence, of other major psychiatric disorders, and data suggest that onset of IED occurs prior to the onset of ED in the majority of individuals. Accordingly, individuals with IED may have an increased likelihood of developing BED (and possibly BN). Longitudinal studies are needed to clarify this relationship and determine whether IED is a risk factor for the development of ED. Clinically relevant personality subtypes such as underregulated, overregulated, and low psychopathology have been linked to eating disorders [33, 34], and past research has suggested a complex relationship between anger, personality, and eating disordered behaviors [2, 35, 36]. Thus, personality should also be considered in the clarification of the relationship between IED and ED. The early identification of individuals with IED or impulsive aggression may help clinicians to provide treatment interventions focused on cognitive restructuring and problem solving strategies. Such treatment interventions may help individuals to develop new schematic models for social interactions and facilitate the acceptance and appropriate expression of anger. Moreover, the assessment of IED or aggressive behaviors in the standard eating disorders interview may provide clinically useful information to determine most effective treatment interventions. The presence of both eating disorder and aggressive behaviors is associated with greater risk of suicidality and substance misuse [10]; and self-injurious behaviors and suicidality are related

to inhibited expressions of anger and aggression in ED [1]. Thus, clinicians should assess for the co-occurrence of these behaviors and be attentive to the potentially heightened risk of self-destructive behaviors.

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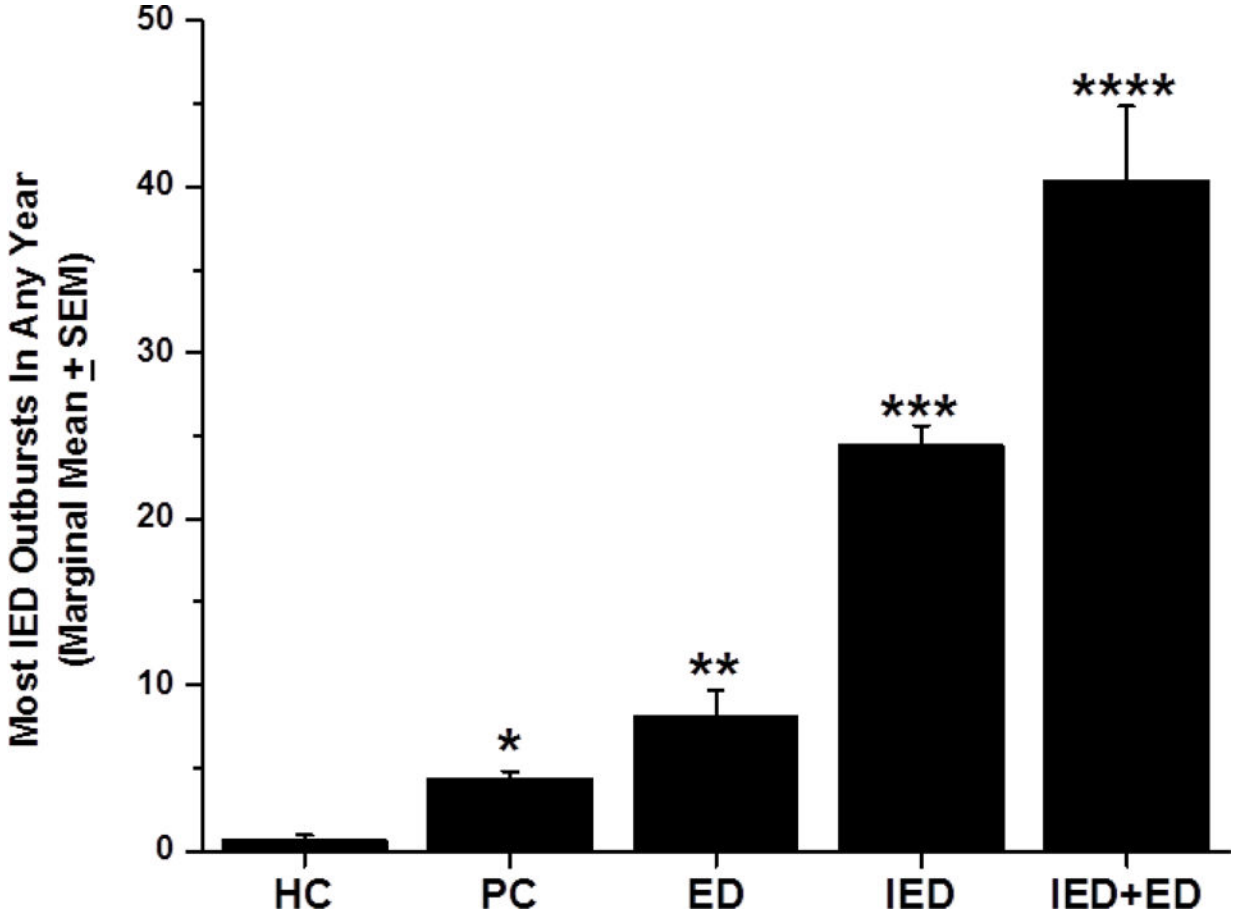

Figure 1.

Marginal means (± SEM) for most Intermittent Explosive Disorder outbursts in any year after ANCOVA (F[3,9273] = 90.87, $p < .001$; F[3,19422] = 144.50, $p < .001$) in the combined community sample. Asterisks: Healthy Control < Psychiatric Control < Eating Disorder < Intermittent Explosive Disorder < Intermittent Explosive Disorder + Eating Disorder ($p < 0.05$).

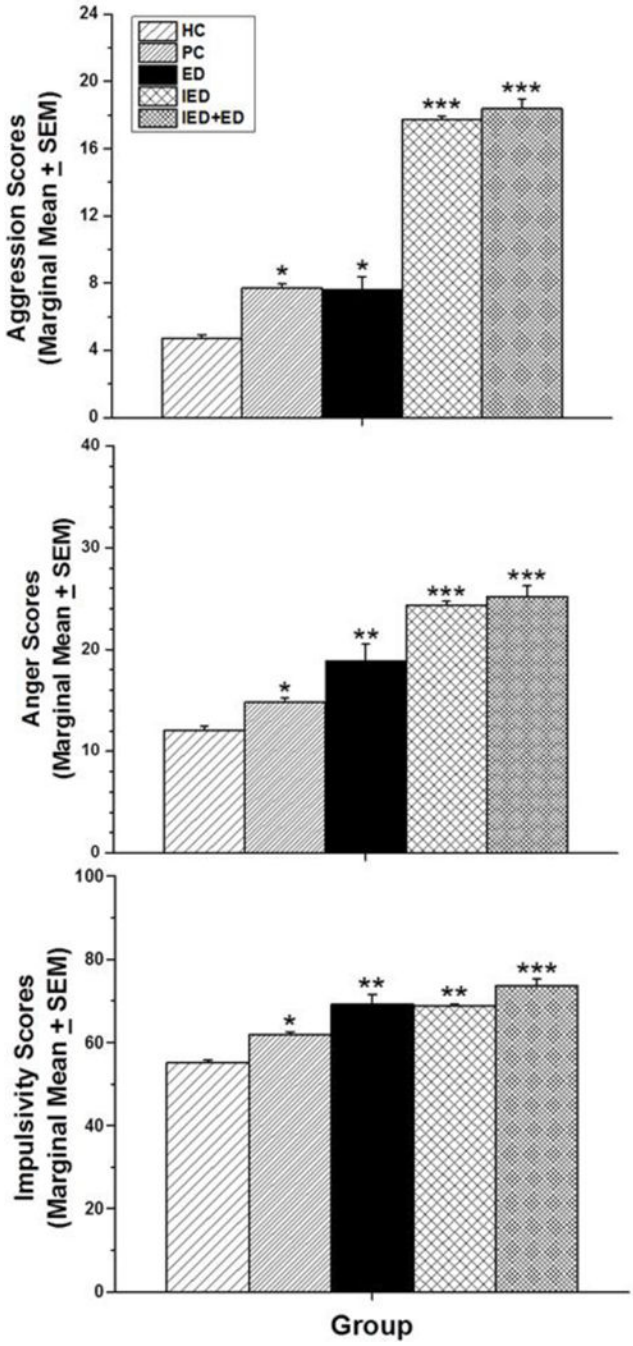

Figure 2.

Marginal means (± SEM) for Aggression (F[4,1428] = 561.38, p < .001; Healthy Control [HC] < Psychiatric Control [PC] = Eating Disorders [ED+] < Intermittent Explosive Disorder [IED+] = Intermittent Explosive Disorder + Eating Disorder [IED+/ED+], Anger (F[4,1111] = 146.68, p < .001; HC < PC = ED+ < IED+ = IED+/ED+), Impulsivity (F[4,1030] = 81.96, p < .001; HC < PC < ED+ = IED+ < IED+/ED+) scores after ANCOVA in the clinical research sample.

Table 1

Demographic Characteristics of the Samples (N = 21,072)

	Community Sample (*n* = 19,430)	**Clinical Research Sample (*n* = 1,642)**
Age (Mean ± SD)	29.3 ± 19.1 years (Range: 13 – 99)	33.3 ± 9.9 years (Range: 18 – 70)
Sex	46.9% Male	56.4% Male
Race / Ethnicity	63.5% White	54.3% White
	16.4% African-American	33.7% African-American
	14.4% Hispanic	5.7% Hispanic
	5.6% Other	6.4% Other
Education	15.8% < HS Degree	25.2% < HS Degree
	30.3% HS Degree	13.5% HS Degree
	24.3% Some College	28.6% Some College
	29.6% ≥ College Degree	32.7% ≥ College Degree

Table 2

Comorbidity Rates of Intermittent Explosive Disorder (IED) and Eating Disorders (ED) in Community and Clinical Research Samples

		Any Eating Disorder	Anorexia Nervosa	Bulimia Nervosa	Binge Eating Disorder
Community Sample	ED in IED	6.3% (51/806)	0.7% (6/806)	3.3% (27/806)	2.2% (18/806)
	ED in Non-IED	1.8% (334/18,624)	0.4% (68/18,624)	0.8% (153/18,624)	0.8% (154/18,624)
	Odds Ratio (95% CI)	3.52[a] (2.58–4.78)	1.93 (0.83–4.46)	3.85[a] (2.52–5.85)	2.55[a] (1.55–4.20)
Clinical Research Sample	ED in IED	7.7% (57/744)	2.4% (18/744)	1.5% (11/744)	4.0% (30/744)
	ED in Non-IED	3.1% (28/898)	1.2% (13/898)	1.1% (10/898)	0.7% (6/898)
	Odds Ratio (95% CI)	2.93[a] (1.77–4.85)	2.51 (1.15–5.49)	1.20 (0.47–3.02)	5.88[a] (2.36–14.71)

Note:

[a] $p < 0.01$;

[b] $p < 0.05$ after Binary Logistic Regression with age, sex, ethnicity, and education level as covariates.

Table 3

Comparative Ages of Onset for Intermittent Explosive Disorder (IED) and Eating Disorders (ED) in Comorbid Participants

Community Sample	Any Eating Disorder	Anorexia Nervosa	Bulimia Nervosa	Binge Eating Disorder
Comorbid Cases	$n = 51$	$n = 6$	$n = 27$	$n = 18$
Mean Onset of IED (Years)	11.6 ± 3.2	10.3 ± 2.9	11.9 ± 3.3	11.5 ± 3.3
Mean Onset of ED (Years)	13.8 ± 3.7	13.0 ± 1.1	14.0 ± 4.7	13.8 ± 2.4
Mean Paired Difference in Age of Onset (Years)	−2.2 ± 4.4[a]	2.7 ± 2.8	−2.1 ± 5.5	−2.2 ± 2.9[b]
Clinical Research Sample				
Comorbid Cases	$n = 57$	$n = 18$	$n = 11$	$n = 30$
Mean Onset of IED (Years)	15.4 ± 8.6	15.4 ± 9.7	15.1 ± 8.1	15.2 ± 8.3
Mean Onset of ED (Years)	21.1 ± 9.0	17.6 ± 5.6	19.8 ± 1.9	23.4 ± 10.0
Mean Paired Difference in Age of Onset (Years)	−5.8 ± 12.2[a]	−2.1 ± 10.9	−4.7 ± 8.5	−8.2 ± 13.5[b]

Note:

[a] $p \leq .01$;

[b] $p < 0.05$ after paired t-test.