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**COMORBIDITY OF PERSONALITY DISORDER WITH
INTERMITTENT EXPLOSIVE DISORDER**

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ABSTRACT

There is ambiguity in how recurrent anger and aggression are accounted for by psychiatric nosology. One area of uncertainty is the extent to which Intermittent Explosive Disorder (IED) overlaps with and is distinct from Personality Disorder (PD). Accordingly, we conducted a study of individuals with IED and PD in order to understand the nature of comorbidity relationships seen across these two areas of psychopathology. One-thousand-five-hundred-twenty-one adults were studied (453 Healthy Controls (HC), 436 Psychiatric Controls (PC), and 651 IED subjects) and assessed for DSM-5 psychiatric disorders, life history of aggressive behavior, trait aggression, state and trait anger reactivity, and impulsivity. While nearly half of IED study participants had a comorbid PD diagnosis, nearly half with a Cluster B PD, almost as many had other personality disorders. IED predicted anger symptoms and history of aggressive behavior above and beyond a PD diagnosis. Comorbidity between IED and either Antisocial (AsPD) or Borderline (BPD) PD was associated with the highest levels of aggressive behavior. However, having IED comorbid with either AsPD and/or BPD PD was not associated with higher levels of impulsivity. Underlying personality traits related to anger, affect, and social behavior, but not identity disturbance, contribute to the shared symptom profile of IED and PD. IED is usually comorbid with PD, but does not have a unique relationship with any single PD. When comorbid with PD, a diagnosis of IED predicts more severe anger and aggression, but not necessarily increased impulsivity. These results suggest that IED and PD diagnoses retain clinical utility when made in cases meeting criteria for both.

1.0 INTRODUCTION

Symptoms of anger are as commonly encountered in psychiatric outpatients as depressed mood and anxiety (Genovese et al., 2017). Anger is most commonly associated with Major Depression, Panic Disorder, PTSD, Intermittent Explosive Disorder (IED), and Cluster B Personality Disorders. Only the last two, IED and Cluster B Personality Disorders, have been theorized to reflect inherently high traits of interpersonal aggression. Despite this overlap, very little is known about the relationship between IED and Cluster B, and other, personality disorders. IED is characterized by recurrent impulsive aggressive outbursts associated with distress and psychosocial dysfunction (Coccaro, 2012).

Aggression in IED is defined as verbal or physical acts that are reactive in nature that cause emotional or physical harm. Over the past three decades, research has led to changes in the diagnostic criteria for IED so as to best operationalize the nature, severity, and frequency of aggressive acts, while adding the requirement of functional impairment and a refinement of its exclusion criteria (Coccaro, 2011).

Initially, impulsive aggressive behaviors (now observed in IED) were thought to be due to the presence of other comorbid psychiatric disorders. An early study, however, demonstrated that IED, even by DSM-III criteria, can exist in “pure form”, although in very low numbers (Felthous et al., 1991). The low rate of IED by DSM-III criteria was largely due to the fact that DSM-III criteria excluded the diagnosis for individuals with generalized aggression and/or impulsiveness between the signature aggressive outbursts and because DSM-III criteria excluded a comorbid diagnosis of Antisocial (AsPD), and/or Borderline (BPD), Personality Disorder.

The first exclusion was eliminated in DSM-IV because it was recognized that impulsive aggressive individuals display these kinds of behaviors in between outbursts and excluding such individuals was preventing research in IED. The second exclusion was relaxed in DSM-IV by stating that if aggressiveness was not better explained by another disorder (e.g., AsPD/BPD), the diagnosis of IED could be given to the individual. Despite this change in the criteria set, many continue to view AsPD/BPD comorbidity as exclusionary for IED despite the fact that studies have demonstrated that AsPD can be predicted using measures of aggressiveness (Fossati et al., 2007) and that BPD can be predicted using measures of impulsivity (Fossati et al., 2007), behavioral traits that are core to IED (Coccaro, 2012), and, finally, that many AsPD/BPD individuals are neither particularly aggressive or impulsive.

These changes in diagnostic criteria resulted in the discovery that DSM-IV IED was far from rare in prevalence. In 2006, the National Comorbidity-Replication Study (NCR-S) reported a lifetime prevalence of DSM-IV IED at 5.4% using the “narrow criteria” of at least three outbursts in any given year [(Kessler et al., 2006); DSM-IV only specified three outbursts lifetime]. Re-examination of these data, using DSM-5 criteria, revised this lifetime rate to 3.6% (Coccaro et al., 2017), a rate still greater than for schizophrenia and bipolar disorder combined. Other changes to the DSM-IV IED criteria for DSM-5 included: a) specific criteria about the number and type of aggressive outbursts, not specified in DSM-IV, that required frequent low-intensity non-destructive/non-injurious (twice weekly for three months) or high-intensity destructive/injurious (three times in a year), aggressive outbursts; b) aggressive

outbursts should be predominantly impulsive in nature; and, c) aggressive outbursts are associated with distress and impairment.

Finally, an additional reason to examine the relationship between IED and personality disorder is the fact that many, if not most, individuals with IED will meet general criteria for personality disorder. This is because these general criteria require dysfunction in at least two of four areas in which aberrations in three (i.e., affectivity, impulse control, interpersonal functioning) are typically present in those with IED. Thus, a high rate of comorbidity between IED and personality disorder is expected. That said, are there differences in the nature of this potential comorbidity that justify making the diagnosis of IED in the context of personality disorder? This can only be answered with empiric data.

In this study, we analyzed data from extensive diagnostic interviews and psychometric assessment in over 1500 study participants conducted in the context of a larger clinical research program of impulsive aggression in order to examine the relationship between IED and Personality Disorder (PD). We hypothesized that study participants with IED will: (a) have a high rate of any personality disorder, (b) have higher comorbidity rates of AsPD/BPD (and other PDs) and will have higher odds of select PD traits (e.g., aggression, anger, etc.), (c) study participants with IED and PD will score higher on measures of anger, aggression, and impulsivity compared with IED Alone and compared with PD Alone and, (d) study participants with IED and AsPD/BPD will score higher on measures of anger, aggression, and impulsivity compared with IED alone and compared with AsPD/BPD alone. Finally, we hypothesized that these results would not be altered by comorbidity with syndromal disorders.

2.0 METHODS

2.1 Participants. 1,521 adult individuals participated in this study. All participants were physically healthy and were systematically evaluated in regard to aggressive and other behaviors as part of a larger program designed to study correlates of impulsive aggressive, and other personality-related, behaviors in human subjects. Subjects were recruited through public service announcements, newspaper, and other media, advertisements seeking out individuals who: a) reported psychosocial difficulty related to one or more psychiatric conditions or, b) had little evidence of psychopathology. All subjects gave informed consent and signed the informed consent document approved by our Institutional Review Board.

2.2 Diagnostic Assessment. Syndromal and personality disorder diagnoses were made according to DSM-5 criteria (American Psychaitric Association, 2013). Diagnoses were made using information from: (a) the Structured Clinical Interview for DSM Diagnoses [SCID-I; (First et al., 1997)] for syndromal (formerly Axis I) disorders and the Structured Interview for the Diagnosis of DSM Personality Disorder [SIDP; (Pfohl et al., 1997)] for personality (formerly Axis II) disorders; (b) clinical interview by a research psychiatrist; and, (c) review of all other available clinical data. This process resulted in good to excellent inter-rater reliabilities (mean kappa of $.84 \pm .05$; range: .79 to .93) across anxiety, mood, substance use, impulse control, and personality disorders. Final diagnoses were assigned by team best-estimate consensus procedures involving research psychiatrists and clinical psychologists as previously described. Subjects with a current history of a substance use disorder or of a life history of any bipolar disorder,

schizophrenia (or other psychotic disorder), or mental retardation, were excluded from study.

After diagnostic assignment, 441 study participants had no evidence of any psychiatric diagnosis (Healthy Controls: HC); 430 study participants met criteria for a lifetime diagnosis of a Syndromal Psychiatric Disorder and/or Personality Disorder but not IED (Psychiatric Controls: PC), and 650 study participants met criteria for IED. Of the 1,080 participants with a psychiatric disorder, most (73.1%) reported: a) history of formal psychiatric evaluation and/or treatment (57.8%) or, b) history of behavioral disturbance during which the subject, or others, thought they should have sought mental health services but did not (15.3%). Table 1 listed the means (\pm SD) for demographic, psychosocial functional/life satisfaction, and psychometric behavioral variables for the five groups; Table 2 lists the Personality Disorder and Syndromal Disorder diagnoses for the PD and IED groups.

2.3 Assessment of Aggression, Impulsivity, and Related Behaviors.

Aggression was assessed with the aggression scales of the Life History of Aggression [LHA; (Coccaro et al., 1997)] assessment and of the Buss-Perry Aggression [(BPA) (Buss and Perry, 1992)] questionnaire. LHA Aggression assesses history of actual aggressive behavior while the BPA assesses aggressive tendencies as a personality trait. LHA Aggression is a widely used five-item measure that quantitatively assesses one's life history of overt aggressive behavior (i.e., aggressive thoughts/urges are not counted). It is conducted as a semi-structured interview. Internal consistency ($\alpha = 0.87$), inter-rater reliability ($r = 0.94$), and test-retest reliability ($r = 0.80$) is good-to-excellent. BPA Aggression, also a widely used assessment of trait aggression, is

composed of the BPA's Verbal Aggression and Physical Aggression subscales and has good psychometric properties. Trait Anger was assessed with Anger scale of the BPAQ and with the trait anger scale of the Spielberger State-Trait Anger and Expression of Anger [STAXI-2; (Spielberger, 1999)] assessment. The BPA anger scale has seven items ("when frustrated, I let my irritation show") scored on a five-point Likert scale (1 = extremely uncharacteristic, 5 = extremely characteristic) with a published internal consistency of $\alpha = 0.83$. The STAXI Anger scale has fifteen items with an internal consistency of .92. Impulsivity was assessed with the Life History of Impulsive Behavior [LHIB; (Coccaro and Schmidt-Kaplan, 2012)] and with the Barratt Impulsiveness Scale [BIS-11; (Patton et al., 1995)]. The LHIB assesses history of actual impulsive behavior and is conceptually similar to the LHA (Coccaro and Schmidt-Kaplan, 2012). It includes 20 items regarding impulsive behavior and is scored on a five point ordinal scale (as is the LHA). The LHIB demonstrates good internal consistency ($\alpha = .96$) and test-retest reliability ($r = .88$). Trait anger was assessed with the Anger subscale of the BPA. This sub-scale has seven items ("when frustrated, I let my irritation show") scored on a five-point Likert scale (1 = extremely uncharacteristic, 5 = extremely characteristic) with a published internal consistency of $\alpha = 0.83$. State depression and state anxiety were assessed with the Beck Depression Inventory-2 [BDI-2; (Beck and Brown, 1996)] and the Beck Anxiety Inventory [BAI; (Beck and Steer, 1993)]. Psychosocial function was assessed with the Global Assessment of Function [GAF; (American Psychiatric Association, 1994)] scale and satisfaction of life experience was assessed by the Quality of Life Experience and Satisfaction Questionnaire [Q-LES-Q; (Endicott et al., 1993)].

2.4 Severity of Personality Disorder. Severity of personality disorder was assessed by the raw SIDP score (0-3) for each separate personality disorder symptom/trait where 0 = no evidence of trait, 1 = subthreshold presence of trait, 2 = presence of trait at threshold, 3 = strong presence of trait. Scores of 2 and 3 were evidence of the presence of the personality disorder trait in question. Overall severity of personality disorder was measured by calculating the mean of all SIDP symptom/trait scores.

2.5 Statistical Analysis and Data Reduction. To determine which personality disorders are associated with IED, binary logistic regression was conducted in the entire sample, with IED as the dependent variable and DSM-5 Personality Disorder as independent variables, first by Cluster and then by each individual diagnosis. Next, to determine which personality traits predict IED, binary logistic regression was conducted, with symptom traits as independent variables. Comparison of IED and Personality Disorder diagnosis as predictors of aggression were conducted with ANCOVA, dividing the PC group into those with Syndromal, non-Personality Disorder diagnoses (SDC), and those with Personality Disorder (PDC). To conduct specific comparisons between IED and Borderline and Antisocial Personality Disorder with respect to aggressive behavior, the PDC group was further divided into a group with either Borderline or Antisocial PD (+BPD/AsPD) or with PD diagnoses other than Borderline or Antisocial (-BPD/AsPD), using ANCOVA with the dependent variable being aggressive behavior. Finally, Syndromal, Non-PD diagnoses were examined as predictors of IED in the entire sample using binary, logistic regression. All reported odds ratios were adjusted for age, sex, ethnicity, and socio-economic status. A two-tailed alpha value of 0.05 was used to

denote statistical significance for all analyses except in cases where a correction for multiple comparisons was more appropriate. Data reduction involved the creation of composite variables for trait aggression, trait anger, and trait impulsivity. Since each of the individual variables related to these dimensions were highly correlated with each other, composite variables were created by z-transforming each individual variable and taking the mean z-score of each of the related variables.

3.0 RESULTS

3.1 Demographic, Psychometric, and Diagnostic Characteristics of the Sample (Table 1 and Table 2). The three diagnostic groups differed modestly, but at statistically significant levels, in age, in socioeconomic score and in the distribution of ethnicity but not sex. Accordingly, all relevant analyses accounted for the demographic differences as covariates. The three groups also differed in psychosocial function/satisfaction and in psychometric behavioral scores, as expected. Table 2 displays the rates of personality disorder by cluster, and rates of current and lifetime Syndromal disorders, among the two psychiatric groups. After correction for multiple comparisons, all IED participants differed from all PC participants (to control for personality and Syndromal disorders) in having higher rates of Cluster A and Cluster B personality disorders and in having higher rates of lifetime depressive, substance use, and stress/trauma disorders.

3.2 IED Comorbidity by Syndromal Disorder (Table 3). Before examining the comorbidity of IED with the personality disorders, we conducted a single, stepwise, binary, logistic regression analysis with IED as the dependent variable and each of the

current and lifetime Syndromal Disorders as predictor variables (with age, sex, ethnicity, SES score as covariates on Step 1) to determine how Syndromal Disorders related to IED in this sample. The analysis revealed that three lifetime Syndromal Disorders (i.e., depressive disorders, substance use disorders, stress/trauma disorders) had an elevated odds ratio for IED at a high degree of statistical significance (all $p \leq 0.001$). Next, we examined the comorbidity between IED and the Personality Disorders both without, and with, these lifetime Syndromal Disorders added to the statistical model.

3.3 IED and Personality Disorder Comorbidity. The vast majority of IED study participants ($n = 599$ of 650 ; 92.2%) met general criteria for a DSM-5 Personality Disorder (Table 2). Including all study participants, binary, logistic regression analysis with IED as the dependent variable and presence of any Personality Disorder as predictor variable (with age, sex, ethnicity, SES score as covariates) revealed a very high odds ratio for IED [21.74 (95% CI: $15.63 - 30.30$)]. Adding the three lifetime Syndromal Disorders to the statistical model reduced this odds ratio but it remained high even when accounting for Syndromal Disorder comorbidity with IED [13.37 (95% CI: $9.38-19.07$)]. Similar analysis revealed significantly elevated odds ratios for each PD Cluster, including PD-NOS (Table 4) and for, in descending order, Antisocial PD, Borderline PD, Paranoid PD, Obsessive-Compulsive PD, and Narcissistic PD; only Schizotypal PD displayed a significantly reduced odds ratio for IED (Table 4). As with PD of any kind, neither set of results were affected by adding the three lifetime Syndromal Disorders (above) to the statistical model.

3.4 Specific Personality Disorder Traits Associated with Increased Comorbidity of IED (Table 5). A single, stepwise, binary, logistic regression analysis

with IED as the dependent variable and all of the SIDP personality disorder traits (i.e., SIDP score ≥ 2 on individual SIDP items for 79 total traits) as predictor variables (with age, sex, ethnicity, SES score as covariates on Step 1) revealed nine separate personality disorder traits with a statistically significant association with IED. Seven of the traits [problems with anger (BPD-8), irritability/aggressiveness (AsPD-4), affective instability (BPD-6), rigidity/stubbornness (OCPD-8), arrogant/haughty behaviors (NARC-PD-9), suspiciousness (STYP-PD-5), and bears grudges (PAR-PD-5)] were associated with an elevated odds ratio, and two traits (reluctance to confide in others and rapidly shifting (PAR-PD-3) and shallow expression of emotion (HIST-PD-3)] were associated with a lower odds ratio, for IED. Adding the three lifetime Syndromal Disorders (see above) to the statistical model did not affect these results with the exception of affective instability (BPD-6) and suspiciousness (STYP-PD-5) where the resulting odds ratios were non-significant in the context of the influence of the three lifetime Syndromal Disorders.

3.5 Psychometric Personality Dimension Variables as a Function of Group Status (Figure 1). In order to observe how *a priori* personality dimensions, that are core to IED (i.e., aggression, anger, impulsiveness), vary as a function of diagnostic group, we conducted ANCOVA analyses of composite scores for aggression, anger, and impulsivity. For these analyses we divided up the PC group into those with only Syndromal Disorders (SDC) and those with Personality Disorders (PDC) disorders; we similarly divided up the IED group into those with IED and no Personality Disorder (IED-Alone) and IED with Personality Disorder (IED+PD). Overall, each personality dimension varied in a stepwise fashion from HC participants with the lowest scores to

IED+PD participants with the highest scores. Minor differences in this pattern were observed between IED-Alone and IED+PDC, and between HC and SDC, study participants for composite anger scores and between PDC and IED-Only participants for composite impulsivity scores in which case the groups did not differ from each other. Notably, IED-Alone participants had significantly higher composite scores for aggression and anger compared with PDC (as well as SDC and HC) participants and lower composite scores for anger and impulsivity compared with IED+PDC participants. These results were not altered by including composite state depression, composite state anxiety, and total SIDP scores in the analysis.

3.6 Psychometric Variables as a Function of Group Status: Relationship Between BPD/AsPD and IED. These analyses were performed because: a) previous editions of the DSM stated that IED cannot (DSM-III), or may not (DSM-IV), be diagnosed in individuals with BPD and/or AsPD, b) participants with these two Personality Disorders made up a sizable proportion of the overall IED group (43.0%; BPD Alone: 21.9%; AsPD Alone: 9.8%; Both BPD and AsPD: 11.3%) and, c) presence of “problems with anger” (odds ratio: 62.50), “irritability/aggressiveness” (odds ratio: 8.55) from the BPD and AsPD criteria sets had the highest odds ratios for IED among all relevant PD traits.

For these analyses, we divided up the PC group into those with Syndromal Disorders only (SDC) and those with Personality Disorders (PDC). The latter group was further divided into those with (BPD/AsPD), and without (PD-Alone), BPD/AsPD. The IED group was divided into those with (IED+BPD/AsPD) and without BPD/AsPD (IED+PD); the last group was composed of those with IED but without any personality

disorder (IED-Alone). As such, BPD/AsPD, IED-Alone, and PD participants serve as controls for participants in the IED+BPD/AsPD group. Figure 2 reveals that BPD/AsPD (i.e., without IED) participants had higher composite aggression scores than HC and SDC participants, but similar aggression scores to those of PD-Alone (i.e., without BPD/AsPD) participants. While aggression scores among IED-Alone and IED+PD participants were lower than those of IED+BPD/AsPD participants, each IED group displayed higher aggression scores compared with the remaining groups of participants. Composite anger scores demonstrated a similar pattern to those of composite aggression scores except that IED-Alone and IED+PDC had similar composite anger scores. Finally, HC participants had lower composite impulsivity scores than SDC participants whose scores were similar to those of PDC participants, whose scores were lower than those of IED+PDC and IED+BPD/AsPD study participants. Finally, composite impulsivity scores of BPD/AsPD and IED+BPD/AsPD were greater than those of all other groups and equal to each other. These results were not altered by including composite state depression, composite state anxiety, and total SIDP scores in the analysis.

4.0 DISCUSSION

This is the first study to examine the relationship between DSM-5 IED and personality disorder. While aggression and impulsivity are features of the diagnostic criteria for several personality disorders, the extent to which these disorders co-occur with IED has not previously been studied. In addition, there been not been any published work examining the interactive effects of IED and personality disorder

diagnosis, as reflected by related symptoms such as aggression, anger, impulsivity, and overall severity.

Several novel findings are reported. We found that the presence of IED was associated with significantly increased rates of personality disorder in general, and 5 out of 10 personality disorders specifically (Borderline, Antisocial, Paranoid, Narcissistic, and Obsessive-Compulsive) with one disorder (Schizotypal PD) associated with a significantly reduced odds ratio for IED. Drilling down to the level of traits, IED was associated with the presence of five specific personality disorder traits each of which had significantly elevated odds ratios after accounting for comorbidity associated with lifetime Syndromal Disorders. These traits included problems with anger, irritability/aggressiveness, rigidity/stubbornness, arrogant/haughty behaviors, and bearing grudges. Two personality disorder traits were associated with a significantly reduced odds ratio for IED (i.e., reluctance to confide in others and rapidly shifting, shallow expression of emotion). These results can be compared with a previously published dimensional analysis of the relationship between personality psychopathology and aggressive behavior, as measured by the Life History of Aggression (LHA) scale (Berman et al., 1998). This previous study, using an entirely different sample of subjects, found that history of aggressive behavior was positively correlated with 7 out of 11 personality disorders (antisocial, borderline, histrionic, narcissistic, obsessive-compulsive, paranoid, passive aggressive, and schizoid). In that study, no specificity was found with BPD or ASPD, although some evidence of specificity was found for the relationship between aggression and Paranoid and Passive Aggressive PD.

IED was also associated with a higher odds ratio for lifetime substance use, depressive, and stress/trauma, disorders at a high level of statistical significance. These findings are not surprising and have been reported previously (Coccaro, 2011, 2012; Coccaro et al., 2016; Fanning et al., 2014, 2016; Keyes et al., 2016). Despite this, it is notable that these Syndromal comorbidities did not alter the results regarding the overall comorbidity of IED and personality disorder.

The availability of measures related to core dimensions of IED (and PD) including aggression, anger, and impulsivity is one of the most important features of this study. These data allowed us to compare each behavioral dimension across each of the five diagnostic groups. We found that PD comorbidity with IED was associated with elevated levels of anger and impulsivity, but not aggression, when compared to IED without PD. This is consistent with the idea that those with IED alone are as aggressive as those with IED and a comorbid Personality Disorder. In addition, IED-Alone participants had higher levels of aggression, anger, and impulsivity than PDC participants. These results indicate that IED and PD diagnoses have predictive value with regards to severity of aggression related traits, despite some overlap.

Because BPD and AsPD have ostensibly more overlap with IED than other PD diagnoses, comorbidity with these Cluster B diagnoses was further analyzed. The results again demonstrated that the IED and BPD/AsPD diagnoses retained some predictive value with regards to aggression related traits. BPD/AsPD-Alone participants have significantly less trait aggression and trait anger than participants who have IED and a Non-BPD/AsPD personality disorder. This finding was not accounted for by severity of PD because, while IED-Only and PDC participants had high

aggression/anger scores (compared with HC and SDC study participants) each had substantially lower PD severity scores compared with BPD/AsPD-Alone participants whose PD severity scores were as high as those in IED+BPD/AsPD participants. BPD/AsPD-Alone participants, in contrast, had equally high trait impulsivity scores as the IED+BPD/AsPD participants, and higher trait impulsivity scores than those among IED-Alone and PD-Alone participants. This suggests that the high impulsivity scores among IED+BPD/AsPD participants were accounted for by Cluster B personality psychopathology rather than IED. Thus, the IED diagnosis provides important information about aggressive behavior, even when applied to BPD/AsPD participants. Conversely, a BPD/AsPD diagnosis provides additional information about impulsivity, outside of impulsive behavior, that is not captured by the IED diagnosis.

Finally, though we used the Structured Interview for DSM Personality Disorder (SIDP), based on current personality disorder categories, we note that these data also support the idea of the potential usefulness of the Alternative Model for Personality Disorders in Section III of the DSM-5. This alternate model highlights pathological personality traits in five domains and 25 trait facets. Accordingly, future research, in this area may, benefit from using the recently published Structured Clinical Interview for the DSM-5 Alternative Model for Personality Disorders (SCID-5-AMPD).

Strengths of this study include the large sample size and comprehensive assessments of each participant with psychometrically appropriate and validated measures of aggression, anger, impulsivity, and severity of personality disorder. Limitations include the fact that the study participants were not ascertained through a population-based method. Thus, the relevant incidence/prevalence and pattern of

comorbidities reported herein may be different than in an epidemiologically derived sample. In addition, our participants were not exclusively recruited as part of a treatment study and, again, our results may differ from what might be found in that type of group. That said, most of our study participants reported a history of formal psychiatric evaluation and treatment and/or a history of behavioral disturbance in which they or others thought they should have sought treatment, and as such may be similar to individuals that would have been recruited from a clinical setting. Finally, the IED-Alone group was relatively small in size and a larger group could have rendered different results.

5.0 CONCLUSION

This study found that the comorbid presence of both IED and personality disorder is common and associated with higher personality disorder disease burden, increased aggression, and increased anger. In addition, when IED occurs specifically with BPD or AsPD, higher anger and aggressiveness traits are expressed than in either diagnosis alone. This suggests that IED should be diagnosed co-morbidly with BPD or AsPD as it represents a distinct population with a more severe disorder, and higher risk for aggressive behavior. It will be useful to investigate with further research how aggressive and anger traits respond to pharmacological and psychotherapeutic treatment modalities in these differing groups, and to further replicate these findings with future studies on intermittent explosive disorder and personality disorders.

The overlap of IED and personality disorders is not surprising, given the overlap between IED and personality disorders with respect to longitudinal course, trait-like

stability, and shared risk factors. It could be that IED shares overlapping biological or psychological mechanisms with personality disorder, such as impulsivity, anger, or social cognition.

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DISCLOSURES

Dr. Coccaro reports being a consultant to and being on the Scientific Advisory Boards of Azevan Pharmaceuticals, Inc. and of Avanir Pharmaceuticals, Inc., and being a current recipient of a grant award from the NIMH. Dr. Lee reports being a recipient of a grant award from Azevan Pharmaceuticals, Inc. Dr. Shima reports no conflicts of interest regarding this work.

Legend for Figure 1.

Marginal means (\pm SEM) for severity of personality disorder and composite measures of aggression, anger, and impulsivity as a function of PD. Asterisk (*) designates $p < 0.05$ compared with contrasting groups.

Legend for Figure 2.

Marginal means (\pm SEM) for severity of personality disorder and composite measures of aggression, anger, and impulsivity as a function of BPD/AsPD. Asterisk (*) designates $p < 0.05$ compared with contrasting groups. NS designates a non-significant difference between groups.

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TABLE 1

Demographic, Functional, and Psychometric Characteristics of Study Participants

	HC (N = 441)	PC (N = 430)	IED (N = 650)	P*	Group Differences
<u>Demographic Variables</u>					
Age	30.5 ± 9.0	32.3 ± 9.3	36.0 ± 10.1	< 0.001 ^a	IED > PC > HC
Gender (% Male)	56.5%	57.2%	52.3%	= 0.210 ^b	HC = PC = IED
Race (% White)	56.0%	55.3%	49.8%	= 0.032 ^b	HC > IED
SES Score	40.4 ± 13.6	33.8 ± 14.2	36.2 ± 13.2	< 0.001 ^a	HC > PC; HC > IED; IED > PC
<u>Psychosocial Function</u>					
GAF Score	83.2 ± 5.5	64.1 ± 11.1	55.6 ± 8.0	< 0.001 ^a	HC > PC > IED
Q-LES-Q Score	52.1 ± 7.9	45.3 ± 10.0	38.9 ± 10.4	< 0.001 ^a	HC > PC > IED

TABLE 1 (Continued)

Demographic, Functional, and Psychometric Characteristics of Study Participants

<u>Psychometric Variables</u>	HC (N = 441)	PC (N = 430)	IED (N = 650)	P*	Group Differences
Total PD Traits	0.9 \pm 1.4	9.0 \pm 7.3	14.1 \pm 8.5	< .001	IED > PC > HC
Total SIDP Score	7.3 \pm 5.8	28.1 \pm 20.0	44.0 \pm 22.1	< .001	IED > PC > HC
Aggression: LHA	4.7 \pm 3.7	8.2 \pm 5.6	17.9 \pm 4.5	< .001	IED > PC > HC
Aggression: BPA	28.0 \pm 10.2	32.9 \pm 11.5	46.4 \pm 12.0	< .001	IED > PC > HC
Anger: BPA	12.2 \pm 6.4	15.6 \pm 8.8	24.4 \pm 6.9	< .001	IED > PC > HC
Anger: STAXI-2	13.5 \pm 3.0	17.7 \pm 6.5	26.3 \pm 7.2	< .001	IED > PC > HC
Impulsivity: LHIB	22.7 \pm 15.6	35.8 \pm 20.5	52.8 \pm 20.0	< .001	IED > PC > HC
Impulsivity: BIS-11	55.4 \pm 9.1	63.2 \pm 10.9	68.8 \pm 11.6	< .001	IED > PC > HC
State Depression	3.0 \pm 8.8	11.5 \pm 12.5	16.7 \pm 12.5	< .001	IED > PC > HC
State Anxiety	22.5 \pm 2.2	27.2 \pm 7.8	29.9 \pm 8.3	< .001	IED > PC > HC

* Means \pm SD based on raw data; statistics based on one-way ANCOVA (age, sex, ethnicity, and SES score as covariates).

TABLE 2

Personality Disorder and Syndromal Disorder Diagnoses Among Psychiatric Study Participants

	PC (N = 430)	IED (N = 650)	P
<u>PD of Any Type:</u>	316 (73.5%)	599 (92.2%)	< 0.001**
<u>Personality Disorder Clusters:</u>			
Cluster A (Odd)	39 (9.1%)	116 (17.8%)	< 0.001**
Cluster B (Dramatic)	90 (20.9%)	313 (48.2%)	< 0.001**
Cluster C (Anxious)	108 (25.1%)	173 (26.6%)	< 0.583
PD-NOS	128 (29.8%)	201 (30.9%)	< 0.686
<u>Current Syndromal Disorders:</u>			
Any Depressive Disorder	72 (16.7%)	140 (21.5%)	= 0.052
Any Anxiety Disorder	85 (19.8%)	162 (24.9%)	= 0.048
Stress and Trauma Disorders	22 (5.1%)	85 (13.1%)	< 0.001**
Obsessive-Compulsive Disorders	4 (0.9%)	26 (4.0%)	= 0.003**
Eating Disorders	13 (3.0%)	37 (5.7%)	= 0.041
Somatoform Disorders	7 (1.6%)	12 (1.8%)	= 0.789
Non-IED Impulse Control Disorders	2 (0.5%)	10 (1.5%)	= 0.100
<u>Lifetime Syndromal Disorders:</u>			
Any Depressive Disorder	199 (46.3%)	399 (61.4%)	< 0.001**
Any Anxiety Disorder	113 (26.3%)	203 (31.2%)	= 0.080
Any Substance Use Disorder	159 (37.0%)	343 (52.8%)	< 0.001**
Stress and Trauma Disorders	54 (12.6%)	144 (22.2%)	< 0.001**
Obsessive-Compulsive Disorders	8 (1.9%)	35 (5.4%)	= 0.004**
Eating Disorders	34 (7.9%)	75 (11.5%)	= 0.052
Somatoform Disorders	7 (1.6%)	13 (2.0%)	= 0.657
Non-IED Impulse Control Disorders	5 (1.2%)	25 (3.8%)	= 0.009

* $p \leq 0.05$ after correction for multiple comparisons (uncorrected $p \leq 0.004$).

TABLE 3**Significant Odds Ratios for IED and Syndromal Disorders (All Subjects)**

Syndromal Disorder	Odds Ratio (95% CI)*	P
Any Lifetime Depressive Disorder	3.71 (2.76 - 4.99)	< 0.001
Any Lifetime Substance Use Disorder	3.59 (2.76 - 4.67)	< 0.001
Any Lifetime Stress / Trauma Disorder	2.34 (1.40 - 3.91)	= 0.001

* Odds ratios by a single stepwise binary logistic regression with current and lifetime syndromal disorders (age, sex, ethnicity, and SES score as covariates).

Table 4

Odds Ratios for IED and Personality Disorders (All Subjects)

Personality Disorder	Odds Ratio* (95% CI)	P
<u>PD of Any Type:</u>	21.74 (15.63 - 30.30)	< 0.001
<u>PD Clusters:</u>		
Cluster A	5.75 (3.53 - 9.35)	< 0.001
Cluster B	16.39 (11.76 - 22.73)	< 0.001
Cluster C	3.05 (2.14 - 4.35)	< 0.001
PD-NOS	12.82 (9.09 - 17.86)	< 0.001
<u>Individual PDs:</u>		
<u>Aggressive PDs</u>		
Antisocial PD	9.35 (5.13 - 17.24)	< 0.001
Borderline PD	6.13 (4.12 - 9.09)	< 0.001
Narcissistic PD	2.13 (1.26 - 3.60)	= 0.005
Obsessive-Compulsive PD	2.42 (1.63 - 3.58)	< 0.001
Paranoid PD	4.24 (2.51 - 7.14)	< 0.001
<u>Non-Aggressive PDs</u>		
Avoidant	0.74 (0.46 - 1.18)	= 0.206
Dependent PD	0.59 (0.14 - 1.74)	= 0.273
Histrionic PD	0.69 (0.26 - 1.78)	= 0.440
Schizoid PD	0.68 (0.21 - 2.23)	= 0.527
Schizotypal PD	0.08 (0.01 - 0.51)	= 0.008

* Odds ratios by three, separate and sequential, binary logistic regressions (By PD Cluster and by Individual PD) with age, sex, ethnicity, and SES score as covariates.

Table 5

Odds Ratios for IED and Specific PD Traits (All Subjects)

Personality Disorder	Odds Ratio* (95% CI)	P
Elevated Odds Ratio for IED:		
Problems with Anger (Borderline PD - 8)	62.50 (37.04 - 111.11)	< 0.001**
Irritability / Aggressiveness (Antisocial PD - 4)	8.06 (4.18 - 15.63)	< 0.001**
Affective Instability (Borderline PD - 6)	2.38 (1.33 - 4.26)	= 0.004
Rigidity / Stubbornness (Obsessive-Compulsive PD - 8)	2.79 (1.71 - 4.55)	< 0.001**
Arrogant / Haughty Behaviors (Narcissistic PD - 9)	2.25 (1.10 - 4.59)	= 0.025**
Suspiciousness (Schizotypal PD - 5)	2.30 (1.10 - 4.78)	= 0.026
Bears Grudges (Paranoid PD - 5)	2.27 (1.29 - 3.98)	= 0.004**
Reduced Odds Ratio for IED:		
Reluctance to Confide in Others (Paranoid PD - 3)	0.52 (0.28 - 0.94)	= 0.030**
Rapidly Shifting, Shallow Expression of Emotion (Histrionic PD - 3)	0.47 (0.23 - 0.95)	= 0.035**

* Odds ratios by a single stepwise binary logistic regression with all personality traits (age, sex, ethnicity, and SES score as covariates).

** Also statistically significant after adding lifetime Syndromal Disorders to statistical model.

Figure 1.

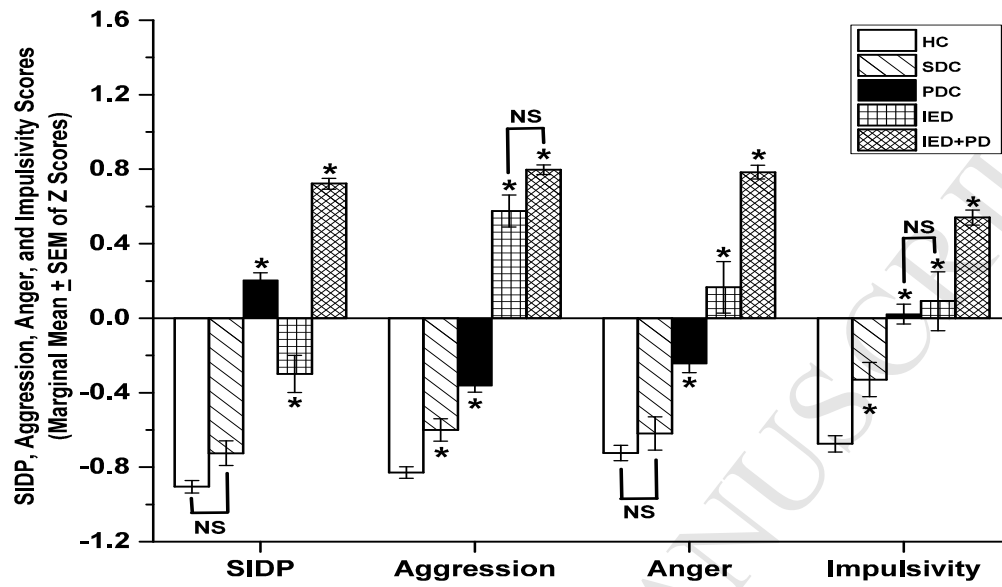


Figure 2.

