



Self-harm behavior among individuals with intermittent explosive disorder and personality disorders



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ABSTRACT

Self-harm behaviors are a major public health concern across the lifespan, particularly among individuals with psychiatric disorders. Little research, however, has examined these behaviors among individuals with a diagnosis characterized by recurrent acts of impulsive aggression, Intermittent Explosive Disorder (IED). Furthermore, extant research has not examined variables that might mediate the relationship between IED and self-harm. The current study examined the rates of non-suicidal self-injury (NSSI) and suicide attempts among individuals with IED as compared to healthy controls, individuals with personality disorders (PDs; which are highly comorbid with IED), and individuals with comorbid IED and PD. The study also examined the indirect effects of aggression, impulsivity, and affective lability in the relationship between diagnosis and self-harm. Participants were 1079 community individuals and prevalence rates among the total sample were 18% for NSSI and 13.2% for suicide attempts. Scores on measures aggression, impulsivity, and affect lability showed significant indirect effects on the relationships between IED + PD and NSSI; scores on aggression showed a significant indirect effect on the relationship between PD and NSSI; scores on impulsivity showed a significant indirect effect on the relationship between IED + PD and suicide attempt. These results suggest that individuals with PDs, and particularly those with comorbid IED and PD, are at increased risk for engagement in self-harm behaviors. Furthermore, traits of aggression, impulsivity, and affect lability significantly accounted for the relationship between diagnostic status and self-harm, particularly in regards to NSSI.

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1. Objectives

Self-harm behaviors are a major public health concern across the lifespan. Between 2% and 9% of people in the U.S. attempt suicide at some point in their lives and 4–38% engage in non-suicidal self-injury (NSSI; Briere and Gill, 1998; Gratz, 2001; Kessler, Borges, & Walters, 1999; Klonsky, 2011; Nock et al., 2008; Whitlock et al., 2006). These rates are higher among individuals with psychiatric

disorders such as mood, anxiety, substance use, eating, and personality disorders (PDs; Beautrais et al., 1996; Black et al., 2004; Nock et al., 2006; Soloff et al., 2000). Recent research on the correlates of self-harm behaviors has identified behavioral and trait aggression as notable risk factors for self-harm (Haavisto et al., 2005; McCloskey et al., 2012; Tang et al., 2013; Turecki, 2005). Such research suggests that individuals with disorders marked by high levels of other-directed aggression may be particularly vulnerable to engagement in self-harm.

Intermittent explosive disorder (IED), a psychiatric condition characterized by recurrent acts of affective aggression, affects approximately 5–7% of the population (Coccaro et al., 2004; Kessler et al., 2006), and up to 63% of clinical samples (Coccaro et al., 2005). Individuals with IED often meet criteria for comorbid Axis II disorders, particularly antisocial personality disorder and borderline personality disorder, which are also characterized by impulsive-aggressive traits (Coccaro, 2012). Despite this, little research has examined self-harm among individuals with IED. Coccaro et al.

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(1998) found that, among 76 IED subjects, 21% endorsed a history of suicide attempt and 9% endorsed NSSI. These rates are somewhat surprising as research typically suggests higher rates of NSSI than suicide in community samples (Briere and Gill, 1998; Nock et al., 2008; Whitlock et al., 2006). Coccaro et al. (1998), however, did not employ a measure specifically designed to assess for NSSI and therefore, the rates of this behavior may have been underreported in that study. Recently, McCloskey et al. (2008a, 2008b) found similar rates of self-harm among a sample of 376 IED subjects without a history of BPD. Results from this study revealed that the presence of (non BPD) co-morbid PDs was a risk factor for suicide attempts among IED subjects, suggesting that comorbidity between IED and PDs increases the risk of self-harm over the presence of IED alone (McCloskey et al., 2008a).

Though McCloskey et al. (2008a, 2008b) suggest that self-harm behaviors among individuals with IED may reflect a combination of emotional lability and aggressive response styles, these constructs were not assessed in that study. Therefore, although research has established a link between IED and self-harm, several core psychological constructs associated with both IED and self-harm have not yet been examined. Extant research on PDs, particularly BPD, has revealed that several key constructs play a role in self-harm behaviors. These include: 1) emotional lability, the tendency towards unstable, disproportionate emotional responses (e.g., Anestis et al., 2011; Linehan, 1993); 2) impulsivity, the tendency towards rapid, unplanned actions without regard for consequences (Anestis et al., 2011; Mann, Waterneux, Haas, & Malone, 1999); and 3) trait levels of anger and aggression (Ribeiro and Joiner, 2009; Selby et al., 2011; Turecki, 2005). Not surprisingly, these traits have also emerged as central to the presence of other-directed aggression in IED (Coccaro et al., 1998). For example, individuals with IED are typically impulsive in their aggression, meaning that they do not usually plan their aggression behavior in advance. These individuals also tend to be highly emotionally labile, with anger and aggression that is disproportionate to the provoking situation. Finally, individuals with IED necessarily have high trait levels of anger and aggression (McCloskey et al., 2008b).

The goals of the current study were twofold. First, we wanted to compare the rates of NSSI and suicide attempts among individuals with IED with and without co-morbid PD to comparison groups of individuals with a PD without IED and those with no history of any Axis I or II psychopathology (Control). We also wanted to examine the possible indirect effects of several key constructs (i.e. aggression, impulsivity, and affective lability) on the relationship between IED, PDs, and self-harm behaviors.

2. Materials and methods

2.1. Participants

Participants in the current study were 1097 (355 Controls, 216 PD, 74 IED, and 452 IED + PD) individuals who were recruited as part of ongoing research studies in the Clinical Neuroscience and Psychopharmacology Unit at the University of Chicago. Participants were recruited from print and radio ads for individuals with interpersonal difficulties (e.g. arguments, unstable relationships), as well as healthy controls. Individuals were excluded from the studies if they reported experiencing traumatic head injury with loss of consciousness, histories of bipolar or psychotic disorders, or current substance dependence. Written informed consent was obtained for all subjects, and all study procedures were approved by the University Institutional Review Board. Participants in the current study were 53.6% female, 58.9% Caucasian, with a mean age of 35.1 ($SD = 10.3$, range 18–81).

2.2. Measures and procedure

Participants completed diagnostic and clinical interviews, which were conducted by trained doctoral-level diagnosticians. Diagnoses and self-aggression history were confirmed using a best estimate procedure (Klein et al., 1994; Leckman et al., 1982), in which the written diagnostic report and raw interview data were reviewed by a multidisciplinary team of psychologists and diagnosticians who were blind to the study hypotheses. This process resulted in good to excellent inter-rater reliabilities (mean $\kappa = .84$ range: .79–.93) across anxiety, mood, substance use, impulse control, and personality disorders.

Axis I disorders (including mood disorders, anxiety disorders, substance use disorders, eating disorders, somatoform disorders, childhood disorders, and adjustment disorder) were assessed with the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 1997). The SCID has adequate inter-rater reliability with kappa values for modules reported to be between .70 and 1.00. Personality disorders were assessed via the Structured Interview for DSM-IV Personality (SIDP-IV; Pfohl et al., 1995). The SIDP-IV shows good inter-rater reliability ($ICC = .88-.99$). Intermittent explosive disorder was assessed with the Intermittent Explosive Disorder Interview – Modified (IED-M; Coccaro, unpublished instrument) which provides quantitative (e.g. frequency) and qualitative (e.g. description of most severe events) information about verbal and physical aggression as well as resulting distress/impairment. Preliminary data suggest the IED interview is a valid and reliable ($\kappa = 0.84$) instrument (McCloskey and Coccaro, 2003).

Several measures were used to assess self-harm. These included the Suicidal Behavior History Form (Spitzer and Enticott, 1978), the Deliberate Self-Harm Inventory (DSHI; Gratz, 2001), and the Life History of Aggression Questionnaire (LHA; Coccaro et al., 1997). All three of these measures have demonstrated adequate psychometric properties. Due to slight methodological variability across the studies, two dichotomous variables (aggregated across all measures) were created for lifetime history of suicide attempt and lifetime history of NSSI. Specifically, if a participant endorsed at least one act of NSSI or at least one suicide attempt (characterized by ambivalent or clear intent to die), on any of the aforementioned measures, he or she was coded as having a lifetime history of NSSI or suicide attempt, respectively.

Questionnaire measures included the Buss–Perry Aggression Questionnaire (BPAQ; Buss and Perry, 1992), the Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995) and the Affect Lability Scale – Short Form (ALS-SF; Oliver and Simmons, 2004). Again, all three of these scales have demonstrated adequate psychometric properties.

2.3. Analytic plan

All analyses conducted were two-tailed at the .05 level of significance. For preliminary analyses, significant main effects were probed using Tukey HSD post-hoc tests (ANOVA) and single $df \chi^2$ tests (χ^2).

Demographic variables (i.e. sex, age, race and education), co-morbid psychopathology empirically associated with self-harm (i.e. major depressive disorder, other mood disorders, any anxiety disorder, any eating disorder, any substance use disorder, borderline personality disorder, any other cluster B personality disorder [PD], any cluster C PD), and related study variables (aggression, impulsivity and affect lability) were assessed as a function of (a) diagnostic group, (b) NSSI status and (c) suicide attempt status. Evaluations of comorbidity included only the clinical groups, as the Control group by definition had no psychiatric disorders. Likewise, Axis-II comorbidity was only compared between PD and IED + PD

Table 1
Pearson correlations between study self-report measures.

	1	2	3
1. Affect Liability Scale	—		
2. Barratt Impulsivity Scale	.54**	—	
3. Buss Perry Aggression Questionnaire	.57**	.50**	—

Note. ** $p < .01$.

groups. Any demographic variable found to differ as function of diagnostic group and be associated with either NSSI or suicidal attempts were controlled for in subsequent analyses.

After these preliminary analyses, the relationship between self-harm and diagnostic status was assessed. First a series of omnibus Pearson χ^2 analyses were used to examine the simple relationship between diagnostic group and likelihood of NSSI and suicide attempts. In the event of significant omnibus effects, single degree of freedom Pearson χ^2 contrasts were then conducted to examine the likelihood of participants in each of the diagnostic groups (Controls, IED, PD, and IED + PD) endorsing NSSI or suicide attempts. Next, a series of hierarchical logistic regressions were conducted to test the relation between diagnosis and self-harm, after controlling for relevant diagnostic correlates. For these analyses, all Axis-I diagnoses significantly associated with both diagnostic status, as well as NSSI or suicide were included as covariates and entered in step 1 and diagnostic status was entered in step 2. The model proceeded in a conditional stepwise fashion (only the variables that emerged as significant when entered together were included in step 2). No Axis-II diagnoses were included in these analyses, as these were used to classify the diagnostic status of the PD and IED + PD groups.

Finally, a series of hierarchical logistic regressions, using Hayes' (2012) PROCESS method, were conducted to test the significance of indirect effects, controlling for relevant demographic and diagnostic correlates. The PROCESS procedure tests for indirect effects of intervening variables regardless of whether X and Y are significantly associated. Modern statistical theories about mediation do

not rely on the significance of individual paths to estimate and test hypotheses about indirect effects (Hayes, 2009). PROCESS creates bias-corrected confidence intervals for the indirect effects using 5000 bootstrap samples. The mediation effect is considered significant at $p < .05$ if the 95% confidence interval does not contain zero. The indirect effects of aggression, impulsivity, and affective liability on NSSI and suicide attempt were examined for each of the three diagnostic groups (IED, PD and IED + PD).

3. Results

3.1. Preliminary analyses

Pearson correlations between self-report measures of aggression (BPAQ), impulsivity (BIS), and affect liability (ALS) were all significant (see Table 1). Comorbid psychopathology and demographic variables differed as a function of diagnostic group (see Table 2). Diagnostic groups differed with respect to both race [$\chi^2(6) = 70.79, p < .001$] and education [$\chi^2(3) = 26.82, p < .001$]. All three clinical groups had a higher proportion of African Americans to Caucasians than the Control group, with the IED + PD group also having a higher proportion of African Americans to Caucasians than the other clinical groups. The IED and IED + PD groups were also less likely to be college educated than the PD or Control groups. Age also differed as a function of diagnostic group [$F(3,1076) = 4.42, p = .004$], with the individuals in the IED + PD group being older than those in the Control group.

Among the three clinical groups, there were significant differences in the lifetime prevalence of several types of psychopathology, including major depressive disorder, any other mood disorder, any anxiety disorder, any eating disorder, and any substance use disorder [$\chi^2(2) = 7.82-31.72$, all $p < .02$] (see Table 2). The IED + PD group were more likely endorse the presence of major depressive disorder, other mood disorder, and substance use disorder than either the IED or PD group. The IED + PD group was also more likely than the IED group (but not the PD group) to endorse a history of an

Table 2
Demographic and study variables as a function of diagnostic group.

	Control	IED only	PD only	IED + PD
% Female	54.4%	58.1%	52.8%	58.1%
Race				
% Caucasian	72.1%	64.9% ^a	62.5% ^a	45.8% ^{a,b,c}
% African-American	12.7%	23.0% ^a	24.5% ^a	25.3% ^{a,b,c}
% Other	15.2%	12.1%	13.0%	18.4% ^{b,c}
Level of education				
% No college	8.4%	21.9% ^{a,c}	9.9%	19.6% ^{a,c}
Mean age (SD)	33.92 (10.51)	35.88 (10.12)	34.16 (9.62)	36.31 (10.33) ^a
Psychopathology				
Major Depressive Disorder	0%	32.4% ^a	43.5% ^a	49.3% ^{a,b,c}
Any other Mood Disorder	0%	5.4% ^a	9.3% ^a	15.9% ^{a,b,c}
Any Anxiety Disorder	0%	16.2% ^a	42.1% ^{a,b}	42.2% ^{a,b}
Any Substance Use Disorder	0%	36.5% ^a	36.1% ^a	48.9% ^{a,b,c}
Any Eating Disorder	0%	1.4%	10.6% ^{a,b}	12.2% ^{a,b}
Cluster A PD	0%	0%	6.5% ^a	17.0% ^{a,c}
Borderline PD	0%	0%	9.7% ^a	36.5% ^{a,c}
Any other Cluster B PD	0%	0%	10.6% ^a	33.8% ^{a,c}
Cluster C PD	0%	0%	41.7% ^a	26.8% ^{a,c}
Associated variables				
Aggression (BPAQ)	56.30 (17.01)	69.57 (17.62) ^a	69.41 (17.56) ^a	92.28 (23.36) ^{a,b,c}
Impulsivity (BIS)	57.17 (9.13)	62.98 (9.84) ^a	64.45 (10.01) ^a	69.13 (11.09) ^{a,b,c}
Affect Liability (ALS)	73.32 (21.11)	86.43 (27.85) ^{a,c}	101.97 (29.10) ^{a,b}	121.18 (30.94) ^{a,b,c}

Note. IED = intermittent explosive disorder; PD = personality disorder; IED + PD = comorbid intermittent explosive disorder and personality disorder; BPAQ = Buss Perry Aggression Questionnaire, BIS = Barratt Impulsivity Scale, ALS = Affect Liability Scale.

^a Significantly different from Controls.

^b Significantly different from the IED group.

^c Significantly different from PD group; all p -values $< .05$.

Table 3

Demographic and study variables as a function of NSSI and suicide attempt history.

	No NSSI	NSSI	No suicide attempt	Suicide attempt
% Female	52.9%	57.1%	52.6%	60.0%
Race				
% Caucasian	60.0%	55.6%	61.8%	43.4%***
% African-American	26.1%	22.7%	24.2%	33.1%***
% Other	13.9%	21.7%*	13.9%	23.4%***
Level of education				
% No college	13.6%	16.8%	12.1%	27.8%***
Mean age (SD)	35.52 (10.50)	34.43 (9.32)	35.11 (10.36)	35.32 (9.81)
Psychopathology				
Major Depressive Disorder	26.4%	63.6%***	27.9%	69.7%***
Any other Mood Disorder	7.7%	14.1%**	7.2%	20.0%***
Any Anxiety Disorder	24.3%	46.5%***	23.7%	60.7%***
Any Substance Use Disorder	29.0%	50.5%***	29.3%	57.2%***
Any Eating Disorder	4.5%	18.2%***	5.6%	17.2%***
Cluster A PD	7.1%	13.1%**	6.4%	20.0%***
Borderline PD	11.5%	40.9%***	11.4%	53.8%***
Any other Cluster B PD	13.6%	27.8%***	13.5%	33.1%***
Cluster C PD	15.7%	32.8%***	16.3%	35.2%***
Associated variables				
Aggression (BPAQ)	68.67 (23.95)	89.80 (22.60)***	70.34 (24.45)	89.28 (23.62)***
Impulsivity (BIS)	61.71 (10.82)	69.95 (11.07)***	62.11 (10.91)	71.35 (10.94)***
Affect Liability (ALS)	91.46 (31.68)	119.94 (34.98)***	92.85 (32.76)	125.16 (30.26)***

Note. NSSI = non-suicidal self-injury; * $p < .05$; ** $p < .01$; *** $p < .001$. BPAQ = Buss Perry Aggression Questionnaire, BIS = Barratt Impulsivity Scale, ALS = Affect Liability Scale.

anxiety disorder and an eating disorder. The PD group had a higher prevalence of any anxiety disorder and any eating disorder than the IED group. The IED + PD group also endorsed higher rates of all PDs assessed than those in the PD group [$\chi^2(1) = 15.01$ – 40.54 , all $p < .001$].

There was also a significant effect of diagnostic group on measures of aggression [BPAQ total $F(3,696) = 147.30$, $p < .001$], impulsivity [BIS total $F(3,720) = 63.73$, $p < .001$], and affect liability [ALS total $F(3,743) = 150.60$, $p < .001$]. As Table 2 shows, for both impulsivity and aggression, Control participants had the lowest scores, the IED and PD group did not differ from each other, and the IED + PD participants showed the highest levels of aggression and impulsivity. For affect liability there was a monotonic trend with the IED + PD group showing the greatest level of affect liability, followed by the PD group, then the IED group, and finally the Control group with the lowest affect liability score.

Another series of χ^2 tests revealed that several demographic and other study variables were associated with NSSI and suicide attempts (see Table 3). First, race was significantly associated with both NSSI [$\chi^2(2) = 7.63$, $p = .02$] and suicide attempts [$\chi^2(2) = 33.14$, $p < .001$]. Individuals of "Other" races endorsed higher rates of NSSI and suicide than expected, African Americans endorsed higher rates of suicide than expected, and Caucasians endorsed lower rates of suicide than expected. Level of education was also significantly associated with suicide attempts [$\chi^2(1) = 21.68$, $p < .001$] but not NSSI, with individuals who did not attend college reporting greater incidence of suicide attempts. Neither age nor sex was significantly associated with NSSI or suicide attempts (all $p > .34$). NSSI and suicide attempts were also significantly associated with all forms of comorbid psychopathology assessed [$\chi^2 = 7.66$ – 159.39 , all $p \leq .006$].

With respect to potential intervening variables, NSSI + participants reported greater levels of aggression [BPAQ $t(695) = 9.14$, $p < .001$], impulsivity [BIS $t(719) = 7.88$, $p < .001$], and affect liability [ALS $t(742) = 9.24$, $p < .001$] than individuals with no history of NSSI. Likewise, individuals with a history of suicide attempts reported greater levels of aggression [BPAQ $t(695) = 6.58$, $p < .001$], impulsivity [BIS $t(719) = 9.23$, $p < .001$], and affect liability [ALS $t(742) = 8.72$, $p < .001$] relative to those with no suicide attempt history.

3.2. Prevalence of self-harm

Prevalence rates among the total sample were 18% ($n = 194$) for NSSI and 13.2% ($n = 142$) for suicide attempts. In addition, 41% of the sample who reported a history of NSSI also endorsed a past suicide attempt. Within the Control group, 3.7% ($n = 13$) endorsed any type of self-harm, 3.5% ($n = 12$) endorsed NSSI, and .3% ($n = 1$) endorsed a suicide attempt. In the IED group, 17.6% ($n = 12$) endorsed any type of self-harm, 12.3% ($n = 9$) endorsed NSSI, and 8.1% ($n = 6$) endorsed a suicide attempt. In the PD group, 21.8% ($n = 47$) endorsed any self-harm, 20.1% ($n = 42$) endorsed NSSI, and 11.1% ($n = 24$) endorsed a suicide attempt. Finally, in the IED + PD group, 41.8% ($n = 189$) endorsed any type of self-harm, 30.7% ($n = 135$) endorsed NSSI, and 25.4% ($n = 114$) endorsed a suicide attempt.

3.3. Association between diagnosis and self-harm

Omnibus Pearson χ^2 analyses revealed that diagnostic status was significantly associated with history of NSSI and suicide attempt [$\chi^2(3) = 96.90$ – 109.29 , both $p < .001$]. Single degree of freedom Pearson χ^2 analyses revealed that individuals with IED, PDs, and comorbid IED + PD were significantly more likely than Controls to have engaged in NSSI and attempted suicide. Furthermore, those with comorbid IED + PD were significantly more likely than those with PD or IED alone to endorse a history of NSSI or suicide attempt. Individuals with IED or PD alone were not significantly different from one another in regard to either NSSI or suicide attempts (see Table 4).

Table 4Pearson χ^2 tests examining the likelihood of engaging in self-harm by diagnostic group.

	NSSI	Suicide Attempt
IED versus Controls	9.89**	22.74***
PD versus Controls	40.85***	37.96***
IED + PD versus Controls	94.03***	99.76***
IED versus PD	2.20	.66
IED + PD versus IED	10.45**	10.78***
IED + PD versus PD	8.01**	16.75***

Note. NSSI = non-suicidal self-injury; ** $p < .05$; *** $p < .001$.

Hierarchical logistic regressions indicated that diagnostic status significantly predicted NSSI, after controlling for relevant diagnostic and demographic correlates. Diagnostic and demographic correlates were controlled for if they significantly predicted both study diagnostic group as well as NSSI or suicide attempt. First, compared to Controls, a diagnosis of IED significantly predicted a history of suicide attempt [$OR = 17.72 (1.56–201.29)$, $p = .02$], but not NSSI (controlling for major depression, any other mood disorder, any substance use disorder, and any anxiety disorder). Similarly, having a PD significantly predicted a history of suicide attempt [$OR = 10.09 (1.07–93.43)$, $p = .04$], but not NSSI (controlling for major depression, any other mood disorder, any substance use disorder, any anxiety disorder, and any eating disorder). Next, a diagnosis of IED + PD significantly predicted a history of NSSI [$OR = 7.06 (3.39–14.72)$, $p < .001$] and suicide attempt [$OR = 37.51 (4.89–287.51)$, $p < .001$] (controlling for major depression, any other mood disorder, any substance use disorder, any anxiety disorder, and any eating disorder in both analyses). Compared to individuals with IED alone, a diagnosis of IED + PD significantly predicted a history of NSSI [$OR = 2.45 (1.15–5.20)$, $p = .02$] and suicide attempts [$OR = 2.46 (1.01–6.00)$, $p = .048$] (controlling for major depression, any other mood disorder, any substance use disorder, any anxiety disorder, and any eating disorder in both analyses). Similarly, compared to individuals with PD alone, a diagnosis of IED + PD significantly predicted a history of NSSI [$OR = 1.56 (1.03–2.35)$, $p = .04$] and suicide attempts [$OR = 2.20 (1.34–3.61)$, $p = .002$] (controlling for major depression, any other mood disorder, and any substance use disorder in both analyses).

3.4. Intervening variables

For each mediation result, the coefficient of the indirect effect (bootstrap standard error), Normal theory p -value (which should be interpreted with caution as it based on assumptions of normality), and bootstrap 95% confidence interval is reported. The indirect effect is considered significant at $p < .05$ if the 95% confidence interval does not contain zero. In each analysis, relevant diagnostic correlates were included (see above).

3.4.1. Aggression

Scores on the BPAQ had a significant indirect effect on the relationship between PD and NSSI [effect = .35(.15), $p = .002$, $CI = .12–.68$], and IED + PD and NSSI [effect = .50(.19) $p = .006$, $CI = .15–.88$]. Scores on this scale did not significantly affect the relationship between IED and NSSI, IED and suicide attempts, PD and suicide attempts, or IED + PD and suicide attempts.

3.4.2. Impulsivity

Scores on the BIS had a significant indirect effect on the relationship between IED + PD and NSSI [effect = .18(.10) $p = .02$, $CI = .04–.41$], and IED + PD and suicide attempts [effect = .19(.11) $p = .04$, $CI = .004–.46$]. Scores on this measure did not significantly affect the relationship between IED and NSSI or suicide attempts, nor PD and NSSI or suicide attempts.

3.4.3. Affect lability

Scores on the ALS had a significant indirect effect on the relationship between IED + PD and NSSI [effect = .36(.15) $p = .006$, $CI = .09–.68$]. Scores did not significantly affect the relationship between any other diagnosis and NSSI or suicide attempt.

4. Discussion

This is one of the largest examinations of the prevalence of self-harming behaviors among individuals with IED. The current study

revealed high rates of NSSI and suicide attempt among individuals with IED, PDs, and comorbid IED + PD, with particularly high risk for self-harm among the IED + PD group. Furthermore, even after controlling for relevant diagnostic correlates, a comorbid diagnosis of IED + PD predicted history of NSSI and all diagnostic categories (IED, PD, and IED + PD) predicted history of suicide attempt. Finally, affect lability, trait aggression, and impulsivity all emerged as significant intervening variables in the relationship between study diagnostic status and self-harm behavior.

The first goal, of the current study was to examine rates of self-harm among individuals with IED, PDs, and comorbid IED + PD. Among the total sample, 18% endorsed a history of NSSI and 13% endorsed at least one suicide attempt. In addition, 41% of the individuals who reported a history of NSSI also reported a past suicide attempt. Although these outcomes overlap substantially, they are largely distinct. Among individuals with IED, 12.3% endorsed NSSI and 8.1% endorsed a suicide attempt. Rates were higher among individuals with PDs, with 20.1% reporting NSSI and 11.5% reporting a suicide attempt. The IED and PD groups, however, were not significantly different from one another. Finally, individuals with comorbid IED and PD endorsed the highest rates of self-harm, with 30.7% endorsing NSSI and 25.4% endorsing a suicide attempt, suggesting that this group is at highest risk for engaging in self-harm behavior. These individuals may be particularly prone to self-harm because this comorbidity reflects a combination of several psychological characteristics associated with NSSI and suicidal behavior. First, the aggressive response styles characteristic of IED are also associated with increased risk for self-harm (McCloskey et al., 2009; Ribiero and Joiner, 2009; Selby et al., 2011). Additionally, the general emotional dysregulation associated with many PDs has also been robustly linked to self-harm behaviors (Brown et al., 2002; Gratz and Chapman, 2007).

The current study revealed several significant correlates of study diagnostic status and self-harm. These included major depressive disorder, other mood, anxiety, substance use, and eating disorders. Surprisingly, sex was not significantly associated with self-harm behavior in the current study. This is somewhat surprising, particularly in regards to suicide attempts, as previous research suggests that women attempt suicide two to three times as often as men (CDC, 2007; Lewinsohn et al., 2001). As IED is more prevalent among men than women, however (Seedat et al., 2009), typical sex differences in suicide attempts may have been masked in the current study.

Even when significant correlates were taken into account, study diagnostic status still predicted NSSI and suicide attempt. Specifically, when compared to Controls, comorbid IED + PD predicted a history of NSSI. Furthermore, all three diagnoses (IED, PD, and IED + PD) predicted a history of suicide attempt. Thus, the presence of IED, PD, and particularly the combination of the two, are robustly associated with self-harm, even after taking into account other disorders that are commonly associated with self-harm behaviors. In addition, when compared to individuals with IED or PD alone, those with comorbid IED + PD were at significantly greater risk for NSSI and suicide attempts. Again, these results suggest that the general emotion dysregulation associated with PD, combined with the aggressive and impulsive traits commonly seen among individuals with IED may place those with comorbid disorders at particular risk for engagement in self-harm behaviors.

The second goal of the current study was to examine variables that may have indirect effects on the relationship between IED and NSSI/suicide attempts. As expected, several variables had significant indirect effects on the relationships between diagnostic status and self-harm behaviors, after controlling for diagnostic correlates. Specifically, scores on aggression had a significant indirect effect on the relationship between PDs and NSSI. Scores on aggression,

impulsivity, and affect lability had a significant indirect effect on the relationship between IED + PD and NSSI. Finally, scores on impulsivity had a significant indirect effect on the relationships between IED + PD and suicide attempts. These results suggest that these psychological variables, rather than the diagnoses themselves, are essential to assess among individuals with a history of self-harm.

Interestingly, none of the intervening variables examined in this study significantly accounted for the relationships between IED and NSSI or suicide attempts. As individuals with IED did not report significantly different histories of NSSI and suicide attempt than individuals with PD, these results are surprising. We offer two possible explanations for these results. First, as IED and personality disorders are frequently comorbid (Lenzenweger, Lane, Loranger, Kessler, 2007), relatively little is known about individuals with “pure” IED and how they may be qualitatively different from individuals with comorbid PDs. For example, of the 526 individuals in the present study meeting criteria for IED, 452 (86%) also met criteria for a PD (including PD-NOS). Therefore, although aggression, impulsivity, and affect lability were all significantly positively correlated with a diagnosis of IED, they do not account for the relationship between it and self-harm as do the other diagnoses examined in this study. Secondly, we hypothesize that aggression, impulsivity, and affect lability may play a lesser role in IED than the other diagnoses, because the symptoms of IED (particularly IED that is not comorbid with PD) are generally more context-dependent than symptoms of PDs, which tend to be more context-invariant. For example, individuals with “pure” IED may only display symptoms in specific situations, such as in traffic or with certain people. On the other hand, symptoms of PDs tend to be more pervasive, occurring across a wide variety of situations. As such, aggression, impulsivity, and affect lability may be less globally relevant among individuals with pure IED as compared to individuals with PDs or comorbid IED and PD. Future research should address this issue by examining both context variant and invariant constructs in relation to IED.

Several limitations of this study should be acknowledged and taken into consideration when interpreting the results. First, due to methodological variability across studies, outcome variables were limited to dichotomous indices of NSSI and suicide attempt history. Therefore, results may not speak to how IED or PDs may impact frequency or severity of self-harm or whether aggression, impulsivity, and affect lability might indirectly affect these relationships. Second, all intervening variables were assessed with self-report measures, which are prone to the limitations associated with such data (Nisbett and Wilson, 1977). Next, although the authors attempted to assess several domains that have been implicated in IED, PD, and self-harm in the examination of potential intervening variables, only a handful of the many possible variables that might account for the relationships between diagnostic status and self-harm were examined. Notably, broad-based measures of emotion dysregulation could not be included in the current study due to variability in measures across studies. Although emotional lability, impulsivity, and trait anger/aggression may all fall into the realm of emotion dysregulation, future studies should include more global measures of this construct to determine whether general emotion dysregulation (versus its various specific components) might play a role in the relationship between IED, PDs, and self-harm behavior. Furthermore, future studies should examine how these constructs might fit with the interpersonal-psychological theory of suicide, which posits that suicidal behavior requires both the capacity and capability for suicide (Van Orden et al., 2005). For example, individuals with high levels of trait aggression, impulsivity, and affect lability may more often find themselves in painful or provocative situations, therefore increasing their capability and capacity for

suicide. Research is needed to determine whether this may be the case. Finally, this study was cross-sectional and the outcomes of NSSI and suicide attempt were assessed via life history. Thus, although we can draw associations between diagnosis and self-harm history, we cannot draw conclusions about risk for future self-harm. Furthermore, it is possible that the outcome variables of NSSI and suicide attempt may have preceded the onset of IED or PDs. However, the onset of NSSI typically occurs in mid-adolescence and suicide attempts generally occur even later. As the traits associated with IED and PDs have typically emerged by early to mid-adolescence, we would assert that these traits would generally be present prior to the onset of self-harm behaviors.

In sum, the current study reveals that individuals with PDs, IED, and particularly those with comorbid IED and PD, are at increased risk for engagement in self-harm behaviors. Mental health practitioners who work with individuals with IED or PDs should be aware of the increased risk among individuals with comorbid IED and PD. Furthermore, measurable traits of aggression, impulsivity, and affect lability significantly accounted for the relationship between diagnostic status and self-harm, particularly in regards to NSSI. Assessing these traits may provide important information above and beyond diagnostic assessments and may help clinicians to more accurately determine who may be at increased risk for self-harm. In terms of treatment, reducing aggression, affect lability, and impulsivity may play an important role in reducing self-harm behaviors. One such treatment that may be effective is Dialectical Behavior Therapy (DBT). DBT is a well-established treatment designed to treat Borderline Personality Disorder that has been shown to reduce several problems including self-injurious behavior, suicidal ideation and attempts, and risky behavior (Linehan, 1993; Robins and Chapman, 2004). Recently, researchers have also demonstrated the effectiveness of a cognitive-behavioral treatment for IED, Cognitive Restructuring, Relaxation, and Coping Skills Training (CRCST; Deffenbacher and McKay, 2000). Research suggests that CRCST reduces aggression and anger, and increases emotional control (McCloskey et al., 2008a, 2008b). Incorporating CRCST techniques into a DBT framework may prove useful for treating individuals with comorbid IED and PD, particularly for individuals who engage in suicidal or self-injurious behaviors.

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Contributors

Michael McCloskey, Emil Coccato, and Mitchell Berman designed the study and wrote the protocol. Abigail Jenkins and Michael McCloskey conducted literature searches and statistical analyses. Abigail Jenkins wrote the first draft of the manuscript. Daniel Kulper and Michael McCloskey made significant editorial contributions. All authors contributed to and have approved the final manuscript.

Conflict of interest statement

All authors declare that they have no conflicts of interest.

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