



## Characterizing eating disorders in a personality disorders sample

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### ABSTRACT

The presence of a comorbid eating disorder (ED) and personality disorder (PD) is associated with greater problems and poorer functioning than having an ED alone or PD alone. This pattern is also found for non-ED axis I disorders and PDs. This study aims to examine if an ED, compared to other non-ED axis I disorders, in a PD sample confers greater risks for: number and type of non-ED axis I and axis II disorders, suicide attempts and non-suicidal self-injury, and poorer psychosocial functioning. Standardized interviews were conducted on 166 females and 166 males with PDs. In females with PDs, EDs, as compared to other axis I disorders, were associated with more non-ED axis I and II disorders (particularly borderline and avoidant PD) and poorer global functioning, but not with suicide attempts or non-suicidal self-injury. In males with PDs, EDs were associated with more axis II disorders, particularly borderline PD. Given the small group of males with EDs, these results require replication. Males and females with PDs and EDs may have multiple comorbid disorders, particularly borderline PD and for females, avoidant PD that may warrant targeting in treatment.

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### 1. Introduction

Although there are important findings about the longitudinal course of eating disorders (EDs) among individuals with personality disorders (PDs) (Grilo et al., 2003; Zanarini et al., 2010), we understand little about what features characterize individuals with both EDs and PDs. For instance, it is unknown whether individuals with EDs and PDs differ from individuals with PDs without EDs with regards to rates of non-suicidal self-injury or suicidal behavior, co-occurrence of axis I or II disorders, or their degree of psychosocial impairment. A study examining these variables in a group with both an ED and PD compared to a group with PDs and without EDs would improve understanding of these individuals, and inform the assessment and treatment of this comorbid group.

There is some evidence that the presence of an ED in the context of borderline PD compared to borderline PD without EDs confers greater risk for co-occurrence of other axis I and II disorders. In a treatment-seeking sample of 135 females with borderline PD, presence of an ED compared to absence of an ED was associated with a greater rate of co-occurring non-ED axis I disorders (Chen et al., 2009). Similarly, greater axis I disorder comorbidity was found in treatment-seeking females

with bulimia nervosa and borderline PD compared to other PD or no PD groups ( $N=134$ ; Rowe et al., 2008).

In addition, there are some empirical findings which suggest that an ED in the context of a PD may be particularly associated with suicidal behavior or non-suicidal self-injury. For instance, a study by Chen et al. (2009) found that anorexia nervosa in a sample of females with borderline PD conferred a significantly greater risk of recurrent suicide attempts while bulimia nervosa conferred a significantly greater risk of recurrent non-suicidal self-injury. These findings are similar to those reported by Dulit et al. (1994). This study found that individuals with bulimia nervosa were 4 times as likely to engage in frequent self-injury ( $\geq 5$  lifetime acts of non-suicidal self-injury) compared to no self-injury in a group of 124 male and female inpatients with borderline PD (21% male). Frequent self-injurers were also found to be more likely to have current anorexia nervosa, but this finding failed to reach statistical significance.

The findings are mixed with regards to global assessment of functioning among individuals with an ED and a PD as compared to those with a PD alone. In a study of 200 male (44% of the sample) and female inpatients and outpatients with PDs, Skodol et al. (1993) found that an ED was associated with poorer global assessment of functioning on axis V of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III-R; American Psychiatric Association, 1987), a finding replicated by Rowe et al. (2008). These findings were not replicated in the studies by Chen et al. (2009) or Dulit et al. (1994), although both of these studies utilized similar methodology (interviews or questionnaires).

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The finding that an axis I disorder, such as an ED, in the context of a PD, confers greater risk for problems does not appear to be specific to ED diagnoses. For instance, diagnoses of major depression and substance use disorder, rather than an ED in a PD sample, predicted suicide attempts (Yen et al., 2003). Meanwhile, Zlotnick et al. (1999) found that individuals with PDs and non-ED axis I disorders reported more suicidal behavior and non-suicidal self-injury as compared to general psychiatric patients. Individuals with PDs and comorbid axis I disorders other than EDs (mood disorders, disruptive behavior and substance use disorders) appear to have significantly poorer psychiatric prognosis long-term than individuals who only have axis I disorders alone or axis II disorders alone. For instance, individuals with co-occurring axes I and II disorders had a significantly increased risk for other axis I and axis II disorders (e.g., major depression, bipolar disorder, substance use disorder, psychosis and schizophrenia spectrum personality disorder) over 20 years compared to an axis I only group and axis II only group (an average 9-fold increased risk compared to a 2-fold increase and 1.7-fold increase, respectively) (Crawford et al., 2008). Finally, individuals with non-ED axis I disorders with PDs report poorer global assessment of functioning than individuals with PDs alone, for example in the study by Crawford et al. (2008) and in a group with substance use disorder and PDs (Skodol et al., 1999).

Given that EDs may be no different from other axis I disorders in conferring additional risks to meeting criteria for a PD alone, this study adds to the literature by asking: is there something especially different in individuals with both an ED and PD compared to individuals with other axis I disorders and PDs? The current study sought to answer this question with regards to the risk of co-occurrence of other axis I and II disorders, suicidal and non-suicidal self-injury, and global psychosocial functioning. Understanding individuals with PDs who also have EDs as compared to those with other non-ED axis I disorders has important treatment implications for understanding, for instance, what to assess for and to target in treatment. This may be important, as individuals with an ED and PD may have poorer treatment outcome than those with PDs alone. For instance, a study by Zanarini et al. (2004) in a borderline PD and other PD sample found that absence of an ED improves the odds of borderline PD remission. Harned et al. (2009) also found that although borderline PD can improve in treatment, co-occurring EDs in this sample may not. Additionally, as many studies examining individuals with EDs and PDs utilize female samples (Cassin and von Ranson, 2005) and there are gender differences in axis I disorder presentation in axis II samples (e.g., Johnson et al., 2003; Paris, 2004), we hope to add to the literature by including males in our analysis as well.

Based upon previous research (Chen et al., 2009; Dulit et al., 1994; Rowe et al., 2008), we hypothesized that presence of an ED compared to the presence of other non-ED axis I disorders in a PD sample, would confer additional risk for the co-occurrence of other axes I and II disorders. We also predicted that the presence of an ED in a PD sample would lead to a greater risk of suicide attempts and non-suicidal self-injury compared to presence of non-ED axis I disorders (Chen et al., 2009; Dulit et al., 1994). Additionally, we hypothesized that in a PD sample, a co-occurring ED would be associated with worse psychosocial functioning than other non-ED axis I disorders (Rowe et al., 2008; Skodol et al., 1993). Given the possible differences between females and males with regards to EDs and PDs and their correlates, the sample was analyzed separately for each gender.

## 2. Method

### 2.1. Participants

Participants consisted of 178 males and 174 females ( $N = 352$ ) aged 18–65 years ( $M = 35.90$ ;  $S.D. = 9.80$ ) with DSM-IV PDs who were recruited from advertisements as part of ongoing research studies on personality dysfunction and assessed consecutively from January 2001 to May 2006. The study sample has been used in previous studies

(Coccaro et al., 2007),  $n = 31$ ; (Lee et al., 2009),  $n = 40$ ; (McCloskey et al., 2006) ( $n = 78$ ); (McCloskey et al., 2009),  $n = 205$ ). Participants were excluded if they had a lifetime diagnosis of psychosis or bipolar disorder, organic brain syndrome, mental retardation, a current diagnosis of substance dependence or current use of psychotropic medication. In our sample, participants were predominately Caucasian ( $n = 182$ , 52%) and African-American ( $n = 113$ , 32%). The majority reported some college education, ( $n = 283$ , 80%) and reported never being married ( $n = 189$ , 54%). The University of Chicago Institutional Review Board approved the protocol and all participants provided written informed consent prior to enrollment in the study.

Individuals with (1) PDs and EDs (35/352, 9.9%) were compared with individuals with (2) PDs and non-ED axis I disorders (297/352, 84.4%), excluding 16/352 (4.5%) individuals with PDs only (5/16 females and 11/16 males). This latter group was too small to allow for group comparisons. Of the 332 individuals examined, 10.5% (35/332) had a current or lifetime ED. Of the 166 females in the group, 29 (17.5%) had a current or lifetime ED and of the 166 males, 6 (3.6%) had a current or lifetime ED. Of the females with EDs, most met criteria for EDs otherwise not specified (16/166, 9.6%), followed by binge-eating disorder (8/166, 4.8%), anorexia nervosa (3/166, 1.8%) and bulimia nervosa (2/166, 1.2%). Of the males with EDs, most met criteria for binge-eating disorder (3/166, 1.8%), followed by anorexia nervosa (2/166, 1.2%) and EDs not otherwise specified (1/166, 0.6%). Although it would have been interesting to compare the different ED diagnostic categories in this PD sample, we had to collapse these diagnoses given the small size of the ED group.

### 2.2. Measures

#### 2.2.1. The Structured Clinical Interview for the DSM-IV

The Structured Clinical Interview for the DSM-IV (First et al., 1995) is a semi-structured clinical interview that is used to diagnose DSM-IV axis-I disorders including lifetime EDs. This interview has shown adequate inter-rater reliability with kappa's ranging between 0.70 and 1.00.

#### 2.2.2. The Structured Interview for DSM-IV Personality

The Structured Interview for DSM-IV Personality (Pfohl et al., 1995), which has adequate inter-rater reliability, was used to assess DSM IV axis II disorders.

#### 2.2.3. The Suicidal Behavior History Form

The Suicidal Behavior History Form (Endicott and Spitzer, 1978) is a semi-structured interview that was used to determine history of past suicide attempts. This interview is derived from the Schedule for Affective Disorders and Schizophrenia-Lifetime Version (Endicott and Spitzer, 1978), a commonly used structured interview with high inter-rater reliability (Coccaro et al., 1996).

#### 2.2.4. The Self-Injurious Behavior History Form

The Self-Injurious Behavior History Form (Coccaro et al., 1996) is a semi-structured interview that was used to assess the number of past non-suicidal self-injuries, which is defined as "a physically self-damaging act with the conscious intent to hurt one's self, but not to end one's life."

#### 2.2.5. Global Assessment of Functioning (DSM-IV)

Global Assessment of Functioning (DSM-IV); APA, 2000) is a 0–100 score assessing the extent to which social and occupational functioning is affected by psychological problems, with lower scores reflecting greater psychosocial impairment.

### 2.3. Procedure

Participants completed a clinical interview conducted by trained doctoral-level diagnosticians. Axis I and axis II disorders were assessed using DSM-IV criteria via the Structured Clinical Interview for the DSM-IV and Structured Interview for DSM Personality, respectively. History of suicidal and self-injurious behavior was assessed using the Suicidal Behavior History Form and the Self-Injurious Behavior History Form. Psychosocial impairment was estimated using a Global Assessment of Functioning score. Diagnoses, suicidal behavior and non-suicidal self-injury history, and level of psychosocial impairment were confirmed using a "best estimate procedure" in which the written diagnostic report and raw interview data were reviewed by a multidisciplinary committee of psychiatrists, psychologists, and diagnosticians who were blind to the study hypotheses (Klein et al., 1994).

### 2.4. Data analysis

Analyses were conducted on females and males separately to account for the gender differences seen in axes I and II disorders, which are also seen in PD samples (Johnson et al., 2003; Paris, 2004). *T*-tests and chi-square tests were conducted comparing individuals with PDs and EDs and those with other non-ED axis I disorders on demographics, number and type of non-ED axis I and axis II disorders, suicide attempts and non-suicidal self-injury, and global assessment of functioning. Where differences on these variables between the PD with ED or PD with non-ED axis I groups were found, hierarchical regressions were conducted. For females, in comparing the PD with ED group and PD with other axis I disorder group, minority race was less frequently found in the former group and this result had a trend to significance ( $p = 0.052$ ). Given this and the fact that there is some evidence that EDs in females may

be less frequently occurring in minority groups (Franko 2007; Hudson et al., 2007), this was entered into the regressions involving females. Univariate differences were found between individuals with PDs and EDs and individuals with PDs and non-ED axis I disorders. As we wanted to know which particular types of non-ED axis I or axis II disorders were associated with EDs and PDs, we entered these as predictors into a hierarchical logistic regression, controlling for race (for females only) and with group (EDs/other non-ED axis I disorders) as the dependent variable. We conducted this separately with females and then males. In this exploratory study, two-tailed hypotheses tests were conducted where findings were considered statistically significant when  $P < 0.05$ .

### 3. Results

#### 3.1. T-test and chi-squared test comparisons between individuals with PDs and EDs and individuals with PDs and other non-ED axis I disorders

Tables 1 and 2 report the means and standard deviations or proportions and percentages of demographic variables, number and type of non-ED axes I and II disorders, global assessment of functioning scores, and counts of suicide attempts and non-suicidal self-injury in each group for females and then males.

#### 3.2. Examining the association between EDs and demographic variables

For females and males, no differences were found between individuals with PDs and EDs and those with PDs and other non-ED axis I disorders on: marital status, current employment, age and education (Table 1). For females, there was a trend to significance for a greater number of minority females (black or other groups) who did not report an ED ( $P = 0.052$ ). This finding was not replicated in males.

#### 3.3. Examining the association between EDs and number and type of axes I and II disorders

For females, a greater number of non-ED axes I and II disorders was significantly associated with individuals with PDs and EDs compared to those with PDs and other non-ED axis I disorders (Table 1). Greater proportions of females with PD and EDs than females with PDs and other non-ED axis I disorders had mood disorders, borderline PD, and avoidant PD (Table 2) and were less likely to have PD not otherwise specified. Given this, a hierarchical logistic regression was conducted to assess which of these non-ED axes I and II disorders are more frequently occurring in EDs, controlling for race (Table 3). The final model found borderline PD ( $\beta = 1.01$ ,  $P = 0.04$ ) and avoidant PD ( $\beta = 1.25$ ,  $P = 0.01$ ) to be specifically associated with an ED in females in this PD sample.

For males in this PD sample, only a greater number of axis II disorders was significantly associated with EDs compared to non-ED axis I disorders although there was a trend for there being a greater number of non-ED axis I disorders ( $P = 0.060$ ) (Table 1). Given the univariate test findings, that antisocial, borderline and narcissistic PDs were significantly associated with EDs, in males, a hierarchical logistic regression was conducted to assess which of these disorders were more frequently occurring in males with EDs (Table 3). This found that borderline PD ( $\beta = 2.72$ ,  $P = 0.02$ ) in males was particularly associated with EDs and PDs.

#### 3.4. Examining the association between EDs and global psychosocial functioning

For females with PDs, the ED group compared to the group with other non-ED axis I disorders reported worse global psychosocial functioning (Table 1). For males, although the relationship was similar, it was not significant ( $P = 0.09$ ).

#### 3.5. In females, post-hoc exploration of the relationship between EDs, number of axes I and II disorders and global assessment of functioning

Univariate tests showed that in females with PDs, global assessment of functioning was worse and number of non-axes I and II disorders was greater in females with EDs compared to those with other non-ED axis I disorders. Therefore, we hypothesized that in females poorer global assessment of functioning was specifically related to an ED rather than the burden of multiple axes I and II diagnoses. We explored this by conducting a hierarchical linear regression with global assessment of functioning as a dependent variable, controlling for race and entering ED diagnosis versus no ED-diagnosis and number of non-ED axes I and II disorders. The final model revealed that a greater numbers of axis I ( $\beta = -0.25$ ,  $P = 0.001$ ) and axis II ( $\beta = -0.38$ ,  $P < 0.001$ ) disorders were significantly associated with poorer global psychosocial functioning while EDs were not ( $\beta = -0.09$ ,  $P = 0.22$ ).

#### 3.6. Examining the association between EDs and the risk of suicide attempts or non-suicidal self-injury

In this PD sample, for females, chi-squared tests revealed no differences in lifetime history of suicide attempt and non-suicidal self-injury in females with EDs compared to other non-ED axis I disorders, although for males, there was a trend for a higher proportion of those

**Table 1**

Comparisons between individuals with (1) personality disorders and eating disorders (EDs) and (2) personality disorders with non-eating disorder axis I disorders (non-ED) for females and males on demographics, number of non-ED axis I disorders and axis II disorders, global assessment of functioning, and lifetime suicide attempts and non-suicidal self-injury.

	Females			Males		
	EDs	Non-ED	T/X <sup>2</sup>	EDs	Non-ED	T/X <sup>2a</sup>
Marital status (never married #, %)	16/29 (55%)	49/133 (36.8%)	3.33	3/6 (50%)	74/160 (46.3%)	0.37
Current employment (employed #, %)	18/29 (62%)	95/131 (72.5%)	1.25	5/6 (83%)	122/158 (77%)	1.46
Race (black/other #, %)	12/29 (41.4%)	83/136 (61%)	3.78	1/6 (17%)	65/159 (41%)	0.41
Age—M (S.D.) <sup>b</sup>	37.7 (10.0)	34.2 (9.8)	−1.69	29.6 (11.1)	37.4 (9.6)	1.54
Education (high school grad #, %)	29/29 (100%)	124/136 (91%)	2.76	5/6 (83%)	151/159 (95%)	0.26
# Non-ED Axis I disorders—M (S.D.)	7.59 (3.05)	5.75 (2.50)	−3.03**	8.50 (3.15)	5.40 (2.36)	−2.39 <sup>c</sup>
# Axis II disorders—M (S.D.)	4.38 (1.54)	3.32 (1.89)	−3.21**	6.33 (2.34)	3.11 (1.77)	−3.34**
Global assessment of functioning—M (S.D.)	50.45 (9.83)	56.04 (8.97)	2.83**	47.5 (11.68)	57.71 (9.77)	2.11 <sup>c</sup>
Suicide attempts <sup>d</sup> —(Yes #, %)	9/29 (31.0%)	38/137 (27.7%)	0.128	3/6 (50%)	23/159 (14.5%)	5.50
Self-Injury <sup>d</sup> —(Yes #, %)	8/29 (27.6%)	26/137 (19%)	1.089	2/6 (33.3%)	17/159 (10.7%)	2.91

\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

<sup>a</sup> Utilized Fisher's exact test  $P$ -values where cells were 5/less and also reported the Pearson's Chi Square test result.

<sup>b</sup> M = Mean and S.D. = standard deviation.

<sup>c</sup> Equal variances not assumed for this  $t$ -test.

<sup>d</sup> Lifetime.

**Table 2**  
Comparisons between individuals with (1) personality disorders and eating disorders (EDs) and (2) personality disorders with non-eating disorder axis I disorders (non-ED) for females and males on types of axes I and II disorders.

	Females			Males		
	EDs	Non-ED	T/X <sup>2</sup>	EDs	Non-ED	T/X <sup>2a</sup>
Axis II disorders— <i>n</i> (%)						
Paranoid	6/29 (20.7%)	26/137 (19.0%)	0.05	2/6 (33.3%)	20/159 (12.6%)	2.16
Antisocial	3/29 (10.3%)	24/137 (17.5%)	0.90	4/6 (66.7%)	41/158 (25.9%)	4.81*
Borderline	22/29 (75.9%)	59/137 (43.1%)	10.30**	5/6 (83.3%)	34/158 (21.5%)	12.19**
Narcissistic	3/29 (10.3%)	19/137 (13.9%)	0.26	4/6 (66.7%)	36/159 (22.6%)	6.10*
Avoidant	11/28 (39.3%)	17/137 (12.4%)	11.92**	2/6 (33.3%)	18/159 (11.3%)	2.63
Obs-Com	7/29 (24.1%)	22/137 (16.1%)	1.08	2/6 (33.3%)	34/159 (21.4%)	0.48
PDNOS	2/29 (6.9%)	41/137 (29.9%)	6.61**	0/6 (0%)	51/160 (31.9%)	2.76
Axis I disorders— <i>n</i> (%)						
Mood	26/29 (89.7%)	99/137 (72.3%)	3.89*	5/6 (83.3%)	85/160 (53.1%)	2.13
Anxiety	21/29 (72.4%)	73/137 (53.3%)	3.57	6/6 (100%)	52/160 (32.5%)	11.59**
Alcohol Disorder	14/29 (48.3%)	51/137 (37.2%)	1.23	4/6 (66.7%)	81/160 (50.6%)	0.60
Drug Abuse	7/29 (24.1%)	15/137 (10.9%)	3.62	0/6 (0%)	21/160 (13.1%)	0.90
Drug Dependence	14/29 (48.3%)	51/137 (37.2%)	1.23	2/6 (33.3%)	41/160 (25.6%)	0.18

Note: Obs-Com = obsessive-compulsive personality disorder; PDNOS = personality disorder not otherwise specified.

\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

<sup>a</sup> Utilized Fisher's exact test  $P$ -values where cells were 5/less and also reported the Pearson's Chi Square test result.

with EDs and PDs to report a lifetime suicide attempt ( $P = 0.051$ ) (Table 1).

#### 4. Discussion

For females with PDs in this sample, having an ED increased the likelihood of having other non-ED axis I and II disorders, particularly borderline and avoidant PDs, more than having a non-ED axis I disorder. In females with PDs, EDs were associated with poorer global functioning than non-ED axis I disorders, as in previous studies (Rowe et al., 2008; Skodol et al., 1993). However, this appeared to be more associated with the burden of multiple axes I and II disorders, rather than the ED alone, when minority race was controlled for. This is consistent with previous studies that have shown that greater comorbidity is generally associated with poorer global functioning in PD samples (Lenzenweger et al., 2007; McDermut et al., 2001). Finally, EDs in females of this PD sample did not increase the lifetime risk of suicide attempts or non-suicidal self-injury as compared to non-ED axis I disorders.

For males, the rate of axis II disorders was elevated in those with EDs compared to other axis I disorders, with borderline PD being particularly associated with an ED. Furthermore, males with EDs, as compared to those with non-ED axis I disorders, had a higher rate of additional axis I disorders, poorer global assessment of functioning scores, and more suicide attempts, although these findings did not reach significance (perhaps due to the limited power in our relatively

small sample size of men with EDs). There were no differences between groups in non-suicidal self-injury.

The findings suggest that EDs, compared to other non-ED axis I disorders, in the context of PDs are particularly associated with higher rates of axis II disorders. This could be due to a sampling bias, such as Berkson's bias, where individuals with multiple disorders are more likely to be referred for treatment than those with single disorders. However, the sample utilized here was a non-treatment-seeking sample, so the chances of Berkson's bias occurring may have been minimized. An alternative explanation for these results is that increased comorbidity in individuals with EDs and PDs may be artifacts of overlapping diagnostic criteria (e.g., the binge-eating criterion for bulimia nervosa and binge-eating disorder and the impulsivity criterion for borderline personality disorder). One future strategy for examining these possibilities (Klein et al., 1993) would be to compare non-ED axes I and II prevalence rates in groups with EDs only, PDs only, and with both EDs and PDs (i.e., adding an ED only group to our current design). In addition, future studies could investigate the hypothesis about diagnostic overlap by controlling for the number of borderline PD symptoms met (e.g., Chen et al., 2009).

Future research may explore the possibility that our findings are due to etiological overlap between borderline PD and EDs. Specifically, both disorders are associated with poor problem-solving, childhood trauma, impulsivity and compulsivity, dissociation, self-hatred, emotion dysregulation (Franko and Keel, 2006; Svirko and Hawton, 2007), rejection sensitivity (Selby et al., 2010), and reduced central

**Table 3**  
Hierarchical logistic regressions examining the association between type of axes I and II disorders and eating disorders in a personality disorder sample for females and males.

Eating disorders—Females				Eating disorders—Males			
Variable	NR <sup>2a</sup>	OR <sup>b</sup>	95th CI <sup>c</sup>	Variable	NR <sup>2a</sup>	OR <sup>b</sup>	95th CI <sup>c</sup>
Block 1	0.05*			Block 1	0.33**		
Race		0.41	0.17–1.00	Antisocial		1.90	0.27–13.44
				Borderline		15.23*	1.57–147.85
				Narcissistic		5.54	0.83–37.10
Block 2	0.08	1.89	0.50–7.07				
Mood							
Block 3	0.20**						
Borderline		2.75*	1.03–7.32				
Avoidant		3.50*	1.31–9.34				

\* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ .

<sup>a</sup> NR<sup>2</sup> = Nagelkerke's  $R$  squared which estimates strength of association between predictors in each step for the hierarchical logistic regression.

<sup>b</sup> OR = Odds Ratio which is an estimate of effect size for each predictor from the final hierarchical logistic regression model generated.

<sup>c</sup> 95th CI = 95th Confidence Interval for each predictor from the final hierarchical logistic regression model generated.



serotonergic neurotransmission (Paris et al., 2004; Steiger et al., 2007). Understanding the common mechanisms of borderline PD and EDs are important, as this co-occurrence may compromise treatment of the borderline PD (Zanarini et al., 2004) or of the ED in a borderline PD sample (Harned et al., 2009).

Our findings also suggest that females with PDs and EDs may be more likely to meet avoidant PD criteria than those with non-ED axis I disorders. The particular relationship between avoidant PD and EDs may be due to common neurobiological pathways involving the serotonergic system (Bruce et al., 2004), which appears more extreme in individuals with both an ED and avoidant PD than those with an ED alone. Additionally, there may be a common pathway of stressful life events, with emotional abuse in childhood being found to be associated with avoidant PD in an ED sample (Grilo and Masheb, 2002). These factors, of course, overlap with borderline PD. EDs share features with avoidant PD, as both disorders involve behavioral avoidance (particularly in interpersonal situations), submissiveness, and behavioral inhibition in response to threat (Stein et al., 2004). Understanding the particular relationship between EDs and avoidant PD is important, as an avoidant-insecure personality subtype (which overlaps with avoidant PD) in an ED sample was found to be associated with the poorest functioning and ED outcome after 5 years, despite high utilization of treatment (Thompson-Brenner et al., 2008).

Rates of suicidal behavior and non-suicidal self-injury were not associated with EDs, as compared to non-ED axis I disorders, in this PD sample for either females or males, despite the relationship between EDs and borderline PD in the sample. Previous studies with borderline PD samples suggest that the rates of recurrent suicidal behavior and non-suicidal self-injury in an ED subgroup are greater than in those with borderline PD without EDs (Chen et al., 2009; Dulit et al., 1994). The discrepancy with previous findings may have occurred because the current study examined this question in a sample with a variety of PDs rather than focusing only on borderline PD. In addition, unlike previous studies, this study did not examine the recurrence of suicidal behavior and non-suicidal self-injury, but rather examined whether or not there was any lifetime history of these behaviors. Finally, this current sample was not treatment-seeking as in the previous studies. While further exploration of the relationship between suicidal behavior and non-suicidal self-injury in individuals with PDs and EDs is warranted, it may be that other axis I disorders like mood disorders and substance use disorders better predict suicide attempts in individuals with PDs as found by Yen et al. (2003).

Our findings should be considered in light of the study's limitations. The findings of this study are limited by use of a research-seeking sample rather than an epidemiological sample. As part of research criteria, individuals using psychotropics were excluded from the sample, which may account for the small sample size of individuals with EDs, particularly those with bulimia nervosa and binge-eating disorder. The small number of males in the sample with EDs led to low power to detect group differences in males. The sample was also limited by the less specified and heterogeneous nature of the control group, i.e. the non-ED axis I and PD group. Future studies with larger samples sizes would allow for more precise comparison of homogeneous diagnostic groups (e.g., comparing between ED diagnostic groups rather than forming one heterogeneous ED group). The diagnostic battery could have also been strengthened by the addition of ED-specific measures like the Eating Disorders Examination. As described, the addition of another control group, e.g., a group with PDs only would further clarify the particular characteristics of individuals with PDs and EDs. Future studies, improving upon these limitations, are needed to replicate these results.

Despite its limitations, the study adds to the literature by characterizing the features which distinguish individuals with PDs and comorbid EDs from individuals with non-ED axis I disorders and PDs. Our findings build upon the literature, and demonstrate that individuals with EDs and PDs may be more severe and have greater

problems than individuals with EDs alone or PDs alone. Comparison between a PD and EDs group and a PD and non-ED axis I disorder group provides a strong test of whether EDs in the context of PDs are associated with particular problems. Here, the presence of an ED compared to other non-ED axis I disorders with a PD, was associated with greater comorbidity, particularly with borderline PD for males and females, and avoidant PD for females.

Our findings may also inform clinical work. When treating an individual with an ED and PD, possible co-occurring disorders must be carefully assessed and addressed in treatment, particularly as the burden of these disorders can lead to poor global functioning. Borderline and avoidant PD may particularly co-occur in individuals with PD and EDs, more so than in individuals with other axis I disorders and a PD. Given that both avoidant PD and borderline PD are independently associated with poorer treatment outcome for individuals with EDs, it is important that treatment addresses the problems associated with these disorders, for instance recurrent suicidal behavior in borderline PD, and behavioral and interpersonal avoidance in avoidant PD. This would require a flexible treatment with the capacity to address the extremes of impulsive and overcontrolled behaviors (e.g., Dialectical Behavior Therapy for comorbid personality disorders; Lynch et al., 2008). These current findings are preliminary, but suggest that further investigation of the relationship between ED and avoidant or borderline PDs in PD samples may be warranted.

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