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## A comparison of borderline personality disorder with and without eating disorders

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## ABSTRACT

This study examines the degree to which an eating disorder (ED) is associated with the recurrence and severity of suicide attempts, non-suicidal self-injury, rates of co-occurring Axis I and II disorders, and psychosocial functioning among Borderline Personality Disorder (BPD) outpatients. A group of 135 treatment-seeking women with BPD were assessed using structured clinical interviews. BPD was assessed using the International Personality Disorders Examination, confirmed by the Structured Clinical Interview for DSM-IV (SCID)-II, and Axis I disorders were assessed with the SCID I. A total of 17.8% of the sample met criteria for a current ED, with 6.7% meeting criteria for Anorexia Nervosa (AN), 5.9% for Bulimia Nervosa (BN), and 5.2% for Binge-Eating Disorder (BED). In this BPD sample, in the last year, current BN was associated with a significantly greater risk of recurrent suicide attempts while current AN was associated with increased risk of recurrent non-suicidal self-injury. BPD with current AN or BED was associated with a greater number of non-ED current Axis I disorders. Further replication of these results is needed. Women with BPD must be assessed for AN and BN as these diagnoses may confer greater risk for suicidal and self-injurious behavior and may have to be prioritized in treatment.

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## 1. Introduction

Borderline Personality Disorder (BPD) is a serious chronic mental illness marked by recurrent suicide attempt or non-suicidal self-injury (deliberate behavior causing physical damage but without intent to die) with up to 10% committing suicide (Lieb et al., 2004). BPD is also typified by multiple Axis I and II disorders and poor psychosocial functioning (Lieb et al., 2004).

Multiple studies examine rates of BPD in eating disorder (ED) samples (see Cassin and von Ranson, 2005; Levitt et al., 2004), although few examine the rates of EDs in BPD samples. About half of treatment-seeking BPD women report a lifetime ED diagnosis ('lifetime' referring in this and following studies to past and current unless otherwise indicated) (Zimmerman and Mattia, 1999). Of 298 female inpatients with BPD, 25% reported lifetime Anorexia Nervosa (AN) (Zanarini et al., 1998) and 27% reported lifetime Bulimia Nervosa (BN) (Marino and Zanarini, 2001). Up to 33% of a treatment-seeking BPD sample reported lifetime EDs not otherwise specified, with 37% having Binge-Eating Disorder (BED) (Marino and Zanarini, 2001; Grilo et al., 2003).

Little has been published comparing BPD groups with and without EDs on variables such as suicidal behavior and non-suicidal self-injury, number of Axis I and II disorders, and psychosocial functioning. These studies are needed to establish what behaviors to prioritize in treatment. A study by Dulit et al. (1994) is one of the few that has examined the association of EDs with non-suicidal self-injury in BPD. Using a sample of 124 inpatients with BPD, this study found that BPD individuals with BN were 4 times as likely to engage in frequent self-injury ( $\geq 5$  lifetime acts of non-suicidal self-injury) compared with no self-injury. Frequent self-injurers were more likely to have current AN, but this finding failed to reach significance. Additionally, Zanarini et al. (2004) found that absence of an ED improves the odds of BPD remission.

The relationships between EDs and suicidal behavior and non-suicidal self-injury have been examined primarily in ED samples. Some studies suggest that suicide attempts and non-suicidal self-injury are found in more than half of BN samples (Franko and Keel, 2006; Svirko and Hawton, 2007). These rates appear higher in BN than in AN, although there are suggestions of similar rates of this behavior in the AN binge-eating/purging subtype as in BN (Favaro and Santonastaso, 2000; Nagata et al., 2000). In BED, suicidal behavior appears higher than that for obese non-BED controls (Grucza et al., 2007). Finally, the medical lethality of suicide attempts does not appear to differ between ED groups (Bulik et al., 1999).

The co-occurrence of Axis I and II disorders has been examined in ED samples but has not been examined in BPD samples with EDs. AN and BN

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groups with suicidal behavior or non-suicidal self-injury report greater numbers of Axis I and II disorders such as drug or alcohol abuse, anxiety disorders and depression (Fedorowicz et al., 2007; Franko et al., 2004). Other studies with ED samples have found that AN and BN are associated with major depression (Berkman et al., 2007). Restricting subtype AN is found to be associated with obsessive-compulsive disorder (O'Brien and Vincent, 2003). Finally, the AN binge-eating/purging subtype and BN are associated with alcohol use disorders (Bulik et al., 2004).

It is unclear as to whether BPD with EDs is associated with poorer psychosocial functioning than BPD alone. 'Multi-impulsive BN' (BN with other impulse-control Axis I disorders) compared with BN alone is associated with lower psychosocial functioning (Fichter et al., 1994). Lower psychosocial functioning is also found in a group with personality disorders (PDs) and EDs compared with BN alone (Skodol et al., 1993). However, Dulit et al. (1994) found no difference in psychosocial functioning between frequent, infrequent and non-self-injurers with BPD, where frequent self-injury was more associated with EDs.

In this BPD sample, it is hypothesized that there will be an increased likelihood of recurrent suicide attempts and non-suicidal self-injury in individuals with EDs, particularly BN. It is unclear, however, whether the severity of suicide attempts/non-suicidal self-injury, number of co-occurring Axis I and Axis II disorders, and psychosocial functioning will differ between individuals with and without EDs in this BPD sample.

## 2. Method

### 2.1. Participants

The sample consisted of 146 women from randomized controlled trials selecting for suicidal BPD ( $n = 101$ , Linehan et al., 2006b) or substance-dependent BPD ( $n = 45$ , Linehan et al., 1999; Linehan et al., 2002). Suicidal BPD participants were required to have recurrent suicide attempts and/or non-suicidal self-injury (at least two episodes in the last 5 years, with one in the last 8 weeks). Substance-dependent BPD participants were required to have co-occurring Substance Use Disorder for opiates, cocaine, amphetamines, sedatives, hypnotics, anxiolytics, or Polysubstance Use Disorder (Linehan et al., 1999) or co-occurring opiate dependence (Linehan et al., 2002). All studies included BPD women aged 18–45 years old and excluded those with the following characteristics: a lifetime diagnosis of schizophrenia, schizoaffective disorder, bipolar disorder, psychotic disorder not otherwise specified; mental retardation; seizure disorder; mandated treatment; another condition requiring primary treatment. Additionally, women in the opiate-dependence BPD trial were excluded if they had a medical condition contraindicating the use of opiate-replacement medication.

The all-women sample had a mean age of 30 years ( $S.D. = 7.6$ ), and 72% were Caucasian, 6.5% Black, 0.6% Mexican American/Mexican/Chicano, 1.8% Asian, 0.6% other Hispanic/Latino, and 0.6% Native American/Alaskan. The majority (53%) were single and never married, the modal education level (44%) was reported to be 'some college', and the modal income for the last year (42%) was reported to be <\$5000 per annum. The substance-dependent BPD group was similar to the suicidal BPD groups on race, marital status, education level, and income ( $P < 0.05$ ), although it was significantly older than the suicidal BPD group ( $t(133) = 2.90$ ,  $P = 0.005$ ).

### 2.2. Measures

Written informed consent was obtained from all subjects. The Demographic Data Schedule (Linehan, 1982) interview obtaining demographic data was administered as were the following. The inter-rater reliability of the interview measures described ranged from 0.74 to 1.00 (from Linehan et al., 2006b).

1. The Structured Clinical Interview for DSM-IV, Axis I (SCID-I) (First and Gibbon, 2004) and Axis II (SCID-II) (First et al., 1997), reliably evaluates the presence and severity of current Axis I and II diagnoses including DSM-IV AN, BN and BED. For the SCID-II, only the BPD module was utilized.
2. International Personality Disorders Examination (IPDE, (Loranger, 1995)) obtains Axis II personality disorder diagnoses.
3. The Suicide Attempt Self-Injury Interview (SASII) (Linehan et al., 2006a) was used to count the number of suicide attempts and non-suicidal self-injuries in the last year. A medical risk score was calculated for these acts from three questions assessing: 1) physical condition post-act, 2) lethality of method used, and 3) highest level of medical treatment received. Scores ranged from 0 to 23, with higher scores greater risk. Inter-rater reliability was 0.88 for medical risk (Linehan et al., 2006a).
4. The Medical Health History Interview (MHH) (M.M. Linehan, personal communication, 1997) documented measured current weight and height, used to compute body mass index.

5. The Social History Interview (SHI) (M.M. Linehan and H.L. Heard, personal communication, 1994) yielded a global adjustment score (GAS) for the past month ranging from 0 to 100 (with higher scores indicating better functioning in 10 areas including employment, household, school, financial, legal, and interpersonal relations). This interview was adapted from the Social Adjustment Scale–Self Report (Weissman and Bothwell, 1976) and the Longitudinal Interview Follow-up Evaluation Base Schedule (Keller et al., 1987).

### 2.3. Data analysis

To avoid BN or BED being counted twice; i.e., both as an ED diagnosis and also towards the BPD impulsivity criterion, participants were required to meet six rather than the minimum five out of nine DSM-IV criteria for BPD. As a result, nine (5 with current BN and 4 with current BED) of the 146 participants were excluded from analysis (therefore  $N = 135$ ).

This study utilized pre-treatment data. Hierarchical logistic or multiple regression analyses were used to assess the degree to which ED diagnoses (independent variable) were separately associated with dependent variables: suicide attempts and non-suicidal self-injury, highest lethality of suicide attempt/non-suicidal self-injury, number of non-ED Axis I and non-BPD Axis II disorders, and psychosocial functioning. Age was controlled for in each regression analyses because the substance-dependent BPD group was older than the suicidal BPD group. In the two analyses examining suicidal behavior and non-suicidal self-injury, the type of current non-ED Axis I disorders was also controlled for as these may be associated with suicide attempts in BPD (Yen et al., 2003).

Suicide attempt and non-suicidal self-injury data were skewed, and transformations did not normalize these data. To assess the types of EDs that are associated with suicide attempts, binary hierarchical logistic regressions were conducted controlling for age in the first step and type of Axis I disorders in the second step (five binary covariates coded for the presence/absence of mood, anxiety, substance abuse or dependence, psychotic, and somatization disorders). As the majority of the sample was selected for recurrent suicidal behavior and BPD is a diagnosis distinguished by the criterion of recurrent suicidal behavior and non-suicidal self-injury, this variable was coded as a binary variable: recurrent/not recurrent suicide attempts or non-suicidal self-injury (0 or 1 acts vs. 2 or more acts). Ordinal logistic regression was not used because of violations of assumptions (there were empty cells and the proportional odds assumption required for ordinal regression was violated).

In order to examine highest lethality rating for suicide attempts and non-suicidal self-injury, number of non-ED Axis I and II disorders, and psychosocial functioning (GAS), a series of hierarchical linear regressions were conducted.  $P$ -values are for 2-sided tests given the exploratory nature of the study.

## 3. Results

### 3.1. Current ED with BPD groups

Of the 135 participants in the current ED analyses, 17.8% met criteria for a current ED, with 6.7% (9/135) meeting criteria for current AN, 5.9% (8/135) for BN, and 5.2% (7/135) for BED.

There were no significant demographic differences between BPD women with and without EDs with the exception that women with current BN were significantly younger than those without an ED ( $t(131) = -3.36$ ,  $P = 0.007$ ) and those with current AN reported a significantly lower body mass index (BMI) ( $t(120) = -3.31$ ,  $P = 0.007$ ) than women without an ED.

Descriptive data for each outcome are reported in Table 1.

### 3.2. Suicide attempts

To assess the predictive value of current AN, BN and BED on likelihood of recurrent suicide attempts in the past year, independent of age and other types of Axis I disorders, a hierarchical logistic regression was conducted (Table 2). While age did not significantly contribute to the model ( $\beta = 0.01$ ,  $P = 0.68$ ), current substance abuse or dependence was significantly negatively associated ( $\beta = -1.45$ ,  $P = 0.003$ ), and current somatization disorder was significantly positively associated with the likelihood of recurrent suicide attempts ( $\beta = 3.66$ ,  $P = 0.003$ ). Current BN significantly increased the likelihood of recurrent suicide attempts ( $\beta = 2.93$ ,  $P = 0.02$ ), although AN or BED did not (respectively,  $\beta = 1.11$ ,  $P = 0.20$  and  $\beta = -1.02$ ,  $P = 0.48$ ).

### 3.3. Non-suicidal self-injury

A hierarchical logistic regression was conducted to assess the predictive value of current AN, BN and BED on likelihood of recurrent non-suicidal self-injury in the past year independent of age and other

**Table 1**  
Suicide attempts, non-suicidal self-injury, types of non-eating disorder Axis I disorders, number of non-eating disorder Axis I and II disorders, and global adjustment score among Borderline Personality Disorder (BPD) women with current Anorexia Nervosa (AN), Bulimia Nervosa (BN), Binge-Eating Disorder (BED) or any current eating disorders (EDs) or without any EDs.

	BPD without current EDs		BPD with current EDs							
	N = 111		AN (N = 9)		BN (N = 8)		BED (N = 7)		Any ED (N = 24)	
	N	%	N	%	N	%	N	%	N	%
<i>Suicide attempts<sup>a</sup></i>										
0	49	44	3	33	0	0	3	42	6	25
1	28	25	1	11	1	13	2	29	4	17
2+	34	31	5	56	7	87	2	29	14	58
<i>Self-injury<sup>a</sup></i>										
0	37	33	1	11	2	25	2	29	5	21
1	9	8	0	0	0	0	2	29	2	8
2+	65	59	8	89	6	75	3	43	17	71
<i>Axis I disorders</i>										
Mood	72	65.5	8	88.9	6	75	6	85.6	20	83
Anxiety	76	68.5	7	77.8	8	100	6	85.7	21	88
SA and D <sup>b</sup>	49	46.2	7	77.8	3	37.5	4	57.1	14	58
Psychotic	18	16.2	4	44.4	0	0	1	14.3	5	21
Somatization	4	3.7	2	22.2	1	12.5	2	33.3	5	21
	M <sup>c</sup>	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
# Axis I disorders	2.6	1.5	5.2	2.2	3.1	1.5	4.3	2.1	4.3	2.1
# Axis II disorders	1.5	0.9	1.9	0.9	1.9	0.8	1.7	0.8	1.8	0.8
GAS <sup>d</sup>	41.3	9.6	39.0	7.1	38.9	7.7	36.0	15.3	38.1	9.0

<sup>a</sup> Over the last year.

<sup>b</sup> Substance abuse and dependence.

<sup>c</sup> M = mean.

<sup>d</sup> GAS = global adjustment score ranging from 0 to 100, with higher scores indicating better functioning.

types of Axis I disorders (Table 2). Older age ( $\beta = -0.13, P < 0.001$ ) and current substance abuse or dependence ( $\beta = -2.13, P < 0.001$ ) were significantly associated with a reduced likelihood of recurrent non-suicidal self-injury. Current AN ( $\beta = 2.73, P = 0.03$ ) was significantly more likely to report recurrent non-suicidal self-injury, whereas BN ( $\beta = -0.50, P = 0.61$ ) and BED ( $\beta = -1.36, P = 0.20$ ) were not.

### 3.4. Highest medical lethality rating for suicide attempt/non-suicidal self-injury

A hierarchical linear regression was used to assess the value of current AN, BN and BED as predictors of the highest medical lethality rating for suicide attempt/non-suicidal self-injury, controlling for age and other types of Axis I disorders. Current substance abuse and

**Table 2**  
Hierarchical regression results for recurrent suicide attempt, self-injury, and highest lethality of suicide attempt or self-injury with age, type of Axis I disorder and current AN, BN or BED as predictors.

Variable	Suicide attempt			Self-injury			Highest lethality of suicide attempt or self-injury	
	NR <sup>2a</sup>	OR <sup>b</sup>	95th CI <sup>c</sup>	NR <sup>2</sup>	OR	95th CI	$\Delta R^2$ <sup>d</sup>	$\beta$ <sup>e</sup>
Block 1	0.02			0.17			0.00	
Age		1.01	0.95–1.07		0.88***	0.83–0.94		-0.01
Block 2	0.24			0.38			0.20	
Mood disorders		0.72	0.26–2.01		2.81	0.99–7.99		-0.003
Anxiety disorders		1.17	0.43–3.18		1.44	0.52–3.96		-0.002
Substance abuse and dependence		0.23**	0.09–0.62		0.12***	0.04–0.33		-0.40***
Psychotic disorders		1.70	0.58–4.95		0.36	0.10–1.30		0.14
Somatization disorders		34.91**	3.35–452.70		1.21	0.19–7.56		0.21*
Block 3	0.33			0.45			0.22	
Anorexia Nervosa		3.04	0.56–26.47		15.35*	1.29–182.98		0.06
Bulimia Nervosa		18.66*	1.78–195.41		0.62	0.09–4.06		-0.13
Binge-Eating Disorder		0.36	0.02–6.08		0.26	0.03–2.06		-0.03

<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.

<sup>d</sup> R<sup>2</sup> = indicates the amount of variance accounted for by each additional step in the hierarchical linear regression.

<sup>e</sup>  $\beta$  = standardized beta estimates for the final hierarchical linear regression model generated are presented as an estimate of effect size.

\* P < 0.05.

\*\* P < 0.01.

\*\*\* P < 0.001.

dependence were negatively associated ( $P < 0.001$ ) and current somatization disorder ( $P = 0.03$ ) was positively associated with highest medical lethality rating. Current AN, BN or BED did not predict highest medical lethality rating (respectively,  $P = 0.55$ ,  $P = 0.17$ , and  $P = 0.74$ , Table 2).

### 3.5. Number of current non-ED Axis I disorders

In a hierarchical linear regression assessing the predictive value of current AN, BN and BED where age was controlled for, only current AN ( $P < 0.001$ ) and BED ( $P = 0.006$ ) but not BN ( $P = 0.34$ ) were positively associated with number of non-ED Axis I disorders (Table 3).

### 3.6. Number of Axis II disorders

In a hierarchical linear regression assessing the predictive value of current AN, BN and BED on number of Axis II disorders, age ( $P = 0.09$ ), current AN ( $P = 0.10$ ), BN ( $P = 0.11$ ) and BED ( $P = 0.41$ ) did not significantly predict number of Axis II disorders (Table 3).

### 3.7. Psychosocial functioning (GAS)

In a hierarchical linear regression assessing the predictive value of current AN, BN and BED on psychosocial functioning, age ( $P = 0.18$ ), current AN ( $P = 0.40$ ), BN ( $P = 0.37$ ) and BED ( $P = 0.19$ ) did not significantly predict psychosocial functioning (Table 3).

## 4. Discussion

Although only one-fifth of this BPD sample reported an ED, this group is notable for its increased risk of life-threatening behavior. In this BPD sample, current BN was associated with greater risk of recurrent suicide attempts and current AN was associated with increased risk of recurrent non-suicidal self-injury. Current AN or BED was associated with a greater rate of co-occurring non-ED Axis I disorders in this sample. No relationships were found between EDs and highest medical lethality rating for suicide attempt/non-suicidal self-injury, number of Axis II disorders or psychosocial functioning.

The relationship between EDs and recurrent suicidal and self-injurious behavior and the lack of relationship between EDs and highest medical lethality in this study fit previous findings (Dulit et al., 1994; Bulik et al., 1999; Franko and Keel, 2006; Svirko and Hawton, 2007), but lead to more questions. Despite a relationship between AN and suicide (Franko and Keel, 2006), no specific relationship between recurrent suicide attempts and AN was found. Future studies need to

examine if the AN binge-eating/purging subtype rather than the AN restricting subtype is particularly associated with recurrent non-suicidal self-injury in BPD samples. Despite high rates of non-suicidal self-injury in BN samples, no relationship between BN and recurrent non-suicidal self-injury was found in this BPD sample. Replication of this study is needed.

The increased risk of recurrent suicide attempts and non-suicidal self-injury in, respectively, BN and AN in this BPD sample extends beyond the effects of non-ED Axis I disorders and appear to be due to unique characteristics of EDs. However, the study does not explore the underlying mechanisms of these relationships. Potential mediators and moderators of recurrent suicide attempts/non-suicidal self-injury in EDs and BPD may include poor problem-solving, emotion dysregulation, impulsivity and compulsivity, dissociation, need for control, self-hatred, and childhood trauma (Franko and Keel, 2006). There may also be biological processes that occur in EDs and BPD that create an increased risk of non-suicidal self-injury/suicidal behavior such as reduced central serotonergic neurotransmission and/or dysfunction in the biosynthesis of cholesterol or in the endocrine response to stress in the hypothalamic-pituitary-adrenal axis.

The finding that current AN and BED are associated with a significantly greater number of non-ED Axis I disorders in BPD mirror ED findings (Berkman et al., 2007; Grucza et al., 2007). However, it was surprising that there was no such relationship for BN with BPD (Bulik et al., 2004). Future studies will need to examine which non-ED Axis I disorders are associated with AN or BED among BPD individuals and if the relationship between AN and non-ED Axis I disorders are associated with a specific AN subtype. Finally, there were no differences between the BPD women with and without EDs on psychosocial functioning, replicating previous findings (Dulit et al., 1994; Fichter et al., 1994). This may have resulted from a floor effect as psychosocial functioning was poor in both ED and non-ED groups in this BPD sample.

The main limitation in this study was that the sample represented the merging of highly selected samples (suicidal BPD or substance-dependent BPD) from studies that differed in aims and size. This sample's nature may have accounted for some of the results. Future studies need to enroll BPD individuals not selected for suicidal behavior or substance dependence. Other limitations included the cross-sectional nature of the data, the small sizes of ED groups, and the multiple comparisons conducted. Results need to be replicated longitudinally and in a larger sample. This would allow for analyses examining whether a history of AN is associated with later suicide attempts/non-suicidal self-injury and for analyzing the effects of transitions between ED diagnoses such as BED and BN. Utilizing ED-specific measures such as the Eating Disorders Examination would have strengthened the diagnostic battery. This would have allowed for delineation of different ED Not Otherwise Specified types, rather than grouping individuals into AN, BN or BED categories as in this study, which may have led to an underestimation of EDs. Use of an ED-specific measure would have also allowed for analyses of the relationship between AN subtypes and suicidal/self-injurious behavior or between impulsive binge-eating and impulsive suicidal behavior. Future studies are needed with community samples rather than a treatment-seeking group, this sample being particularly disabled and low-income. Finally future studies could include control groups with EDs but without BPD or without EDs or BPD (e.g., with major depression).

Clients with BPD must be assessed for Axis I disorders such as AN and BN as these diagnoses may confer greater risk for suicidal and self-injurious behavior. In BPD treatment, where life-threatening behaviors are the highest treatment targets, AN and BN, if present, may have to be prioritized because of their association with suicidal behavior. Aside from replication of these results, future research is needed to understand the causal pathways between EDs and suicidal and non-suicidal self-injury in BPD.

**Table 3**  
Hierarchical linear regression results for number of current non-eating disorder Axis I disorders, number of non-Borderline Personality Disorder Axis II disorders and Global Adjustment Scores with age and current Anorexia Nervosa, Bulimia Nervosa or Binge-Eating Disorder as predictors.

Variable	Number of Axis I disorders		Number of Axis II disorders		Global adjustment scores	
	$\Delta R^2$ <sup>a</sup>	$\beta$ <sup>b</sup>	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Block 1	0.003		0.011		0.009	
Age		0.01		0.15		-0.12
Block 2	0.188		0.049		0.032	
Current Anorexia Nervosa		0.39***		0.14		-0.07
Current Bulimia Nervosa		0.08		0.14		-0.08
Current Binge-Eating Disorder		0.22**		0.07		-0.12

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

<sup>a</sup>  $R^2$  = indicates the amount of variance accounted for by each additional step in the hierarchical linear regression.

<sup>b</sup>  $\beta$  = standardized beta estimates for the final hierarchical linear regression model generated are presented as an estimate of effect size.

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