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## Prevalence and Correlates of Binge Eating Disorder in a Community Sample

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### Abstract

**Objective**— Diagnostic criteria for Binge-Eating Disorder (BED) appear in DSM-IV as “Criteria for Further Study.” Few epidemiological studies of BED have been conducted. Our aim was to describe the prevalence and correlates of BED as assessed by the Patient Health Questionnaire (PHQ) in a community sample.

**Method**— Descriptive epidemiology from a survey of 910 randomly ascertained participants residing in the greater metropolitan area of St. Louis, Missouri.

**Results**— Sixty individuals (6.6%) screened positive for current BED as assessed by the PHQ (BED+). Men were as likely to screen positive as women. BED+ subjects were at substantially elevated odds for depression, generalized anxiety disorder, panic attacks, and past suicide attempts; individuals with obesity who screened negative for BED (BED−) were not at elevated odds for these syndromes. BED+ subjects, but not other obese individuals, exhibited substantially lower scores on measures of mental health-related quality of life. Personality traits associated with BED symptomatology included high Novelty Seeking, high Harm Avoidance and low Self-Directedness. Personality and psychiatric profiles in obese, BED− individuals were closer to those for normal weight, BED− individuals, suggesting that BED is distinct from typical obesity. BED+ subjects reported mean BMI of 34.1, more than six units above BED− subjects.

**Conclusion**— PHQ-BED criteria are associated with substantial impairment, psychiatric comorbidity, and obesity, and effectively discriminate obese individuals with psychological problems from obese subjects without similar problems. BED may be considerably more prevalent than other eating disorders and equally prevalent among men and women.

### Keywords

Binge Eating Disorder; Epidemiology; Personality; Comorbidity; Quality of Life

### Introduction

Binge eating disorder (BED) resembles *bulimia nervosa*, but is characterized by the absence of purging and other behavior compensatory to binge eating. Diagnostic criteria for BED were introduced in DSM-IV under “Criteria for Further Study.” Early field trials found a high prevalence (30%) among individuals seeking treatment for obesity (1,2). Given the emergence of obesity as a growing public health problem (3), such observations suggest that BED may be a significant, modifiable cause of morbidity and mortality. Additionally, BED is accompanied by significant psychiatric comorbidity (4,5). Only a handful of BED prevalence studies have been conducted in community samples. Studies in the U.S have found point prevalences of only 1–3% in the general population (reviewed in *refs.* 6,7). However, not all

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of these studies utilized population-based sampling strategies. Consequently, the precise contribution of binge eating disorder to obesity remains an open question. In spite of this uncertainty, available evidence suggests that BED may be the most common eating disorder and that it is accompanied by substantial distress, impairment, and comorbidity (8).

The goal of the present study is to describe the prevalence and correlates of binge eating disorder in a community based, epidemiological sample. Specifically, we examined the prevalence of BED symptomatology as assessed by the Patient Health Questionnaire (PHQ), a validated self-administered instrument with good predictive validity for BED diagnosis (9). Our aim was to describe the associations with common psychiatric outcomes, clinically relevant personality characteristics, health-related quality of life, and obesity. In addition to establishing the association of BED symptomatology with other adverse conditions, we sought to contrast BED as assessed by the PHQ with obesity in the absence BED symptomatology. Though obesity without BED may arise from a variety of causes, it is logical comparison category for determining whether BED symptomatology is distinct from non-psychopathological overeating. In short, the purpose of this work is to examine the criterion validity and discriminant validity of the BED diagnostic construct as operationalized by the PHQ.

## Methods

### Survey Description

The St. Louis Personality Health and Lifestyle Survey (SLPHL) was administered by mail between November of 2001 and February of 2002 to a stratified random sample of adults, ages 18 years and older. Recruitment was through random digit dialing targeting St. Louis City, St. Louis County, and the five immediately surrounding counties in Missouri and Illinois. Quotas for sampling strata were set based on county (or city), sex, age, and race using 2000 U.S. census data for the equivalent geographic sampling universe. Subjects were excluded if they were under 18 years of age, were cognitively impaired, or belonged to a sampling stratum for which the recruitment quota had already been met. Among completed telephone screening interviews, 3,292 eligible subjects were identified. Of these, 34.8% agreed to participate, gave verbal informed consent, and were mailed a survey booklet; 79.9% returned completed surveys for a final N=917 and a net response rate of 28%, which is comparable to response rates for other community health surveys using similar methods (10). Procedures were approved by the Washington University School of Medicine Institutional Review Board (IRB). All subjects provided informed consent prior to completing the study. Additional methodological details are provided in *refs.* (11,12).

### Binge Eating Disorder and BMI

The Patient Health Questionnaire (PHQ) version of the Primary Care Evaluation of Mental Disorders (PRIME-MD) family of assessments was used to assess current psychiatric symptoms, including symptoms of Binge Eating Disorder (BED, 9). The BED section contained two questions about eating binges: "Do you often feel that you can't control what or how much you eat?" and "Do you often eat, within any 2-hour period, what most people would regard as an unusually large amount of food?" If responses to both questions are positive, the respondent was asked, "Has this been as often, on average, as twice a week for the last 3 months?" An affirmative response to all three questions is required to screen positive for BED (BED+). Individuals reporting any recent behaviors related to *bulimia nervosa* (vomiting, laxative use, fasting, or excessive exercise) were counted as indeterminate with respect to PHQ-BED diagnosis (n=7).

Body-mass index was obtained by self-report of weight and height. In order to establish whether BED overeating patterns were distinct from typical overeating patterns that might lead to obesity, BED+ individuals were contrasted with obese individuals who screened negative for BED (Obesity+/BED-) in several analyses. Obesity was defined as having a BMI of 30 or higher. Though not all BED+ individuals met criteria for obesity, this definition was sufficient to determine whether BED symptoms exhibited distinct correlates using a logical comparison group. Due to insufficient statistical power, comparisons between the obese BED+ (n=41) and non-obese BED+ groups (n=18) were not made.

### Other Psychiatric Outcomes

The PHQ assesses full diagnostic criteria for past two-week major depression and past six-month generalized anxiety disorder; it also includes a four-item alcohol abuse and dependence screening section. Although full diagnostic criteria for panic disorder are assessed by the PHQ, we used the presence of any panic attacks in the past four weeks as an outcome variable. A positive score required that the respondent reported an attack and that the attack involved "(having) symptoms like shortness of breath, sweating...heart racing or pounding, dizziness or faintness, tingling or numbness, or nausea or upset stomach." The SLPHL also included a section on cigarette smoking that assessed symptoms of DSM-IV nicotine dependence. Life history of one or more suicide attempts was assessed with a single question as part of a brief mental health history section.

### Health-Related Quality of Life (SF-12)

The SF-12 (version 2), a short version of the Medical Outcomes Survey (MOS) SF-36, was incorporated into the SLPHL. It assesses health-related quality of life and functioning on eight short-scales and two aggregate summary scales (13). The psychometric characteristics of the MOS-SF family of instruments have been thoroughly studied and the assessments have been used for a wide variety of applications. The full SF-12 was incorporated into the SLHPL. Norm-based t-scores were calculated based on U.S. norms for the SF-12 that were collected in 1998 from a large, general population sample (14). These scores were standard normalized (Z-scored) prior to analysis.

### Personality

Personality was assessed using the revised version of the Temperament and Character Inventory (TCI-R), a 240-item measure of seven separate personality scales. This version of the instrument contains similar item content as the original TCI, but incorporates a number of changes that result in improved psychometric properties. The original TCI was validated in both inpatient and general population samples (15). A report on the factor structure and other internal consistency data for the revised instrument is in preparation (T.R. Przybeck, R.A. Grucza and C.R. Cloninger). The TCI-R is scored on four temperament scales, labeled Novelty-Seeking (NS), Harm-Avoidance (HA), Reward-Dependence (RD), and Persistence (PS); and three character scales labeled Self-directedness (SD), Cooperativeness (CO), and Self-transcendence (ST). Detailed descriptions of these scales are available elsewhere (16,17).

### Data Analysis

All analyses were conducted using SAS version 8.01 (18). Chi-square tests were used to test associations between BED and class variables. Effect sizes for continuous variables were calculated using standard linear models (ANCOVA). Reported effect sizes ( $\beta$ ) indicate standardized regression coefficients. Logistic regression was used to test the association between psychiatric disorders and BED or obesity without BED. Sociodemographic covariates included in regression analyses included gender, race/ethnicity, age, marital status, and

education. Covariates were grouped as shown in Table 1 (see below), with the exception of age, which was treated as a continuous variable.

## Results

### Prevalence and Demographics

A total of 67 of 917 individuals (7.2% of the total sample) screened positive for Binge Eating Disorder, as assessed by the PHQ, but 7 of those subjects reported symptoms of bulimia and were excluded from the analyses. This results in a final sample size of 910 and a sample prevalence of 6.6% for positive screens on the BED section of the PHQ. Demographic make-up of the sample was: 55% female and 45% male; 15% African-American/Black, 82% Caucasian/White and 3% other race/ethnicity; mean age was 44 years (SD=14, median 46). Due to differential response rates among demographic groups, our sample is slightly under-representative of males (48 % targeted vs. 45% recruited), African-Americans (20% targeted vs. 15% recruited), and persons aged 18–34 (29% targeted vs. 24% recruited). The demographic distribution of BED is presented in Table 1. There were no significant differences between BED+ and BED– groups; males and females report BED symptoms in nearly equal proportions.

### Association with BMI

Table 2 presents the prevalence of BED in four BMI categories, using standard cutoffs (25 and below for normal/underweight, 30 for obesity, 40 for morbid obesity). There is a strong association between weight category and BED ( $\chi^2=47.7$ ,  $df=3$ ,  $p<0.001$ ). Nearly 70% of BED+ subjects report BMI of 30 and above, whereas slightly fewer than 30% of BED– participants reported comparable BMIs. The mean BMI for BED+ individuals was 34.1, contrasted with a mean BMI of 27.8 for BED– subjects. After adjusting for sociodemographic variables, the between-class BMI difference was 6.3 units ( $F=61.4$ ,  $p<0.001$ ).

### Association with Psychiatric Outcomes

The association of BED with other common psychiatric syndromes is presented in Table 3. Highly significant associations were seen with major depression, generalized anxiety disorder, panic attacks, and a history of one or more suicide attempts. A marginal association was seen with nicotine dependence and a trend was observed with probable alcohol use disorder. Obesity without BED (Obesity+/BED–) exhibited no significant association with these outcomes. For depression, generalized anxiety disorder, panic attacks, and probable alcohol use disorder, the association with BED was significantly stronger than that for obesity only. Interestingly, there was a significant difference between the BED+ group and the Obesity+/BED– group in the odds for probable alcohol use disorder, although neither effect was significant relative to the comparison group. The Obesity+/BED–group exhibited a trend toward lower odds for probable alcohol use disorder; apparently this trend is countered by BED such that BED+ individuals had significantly higher odds for probable alcohol use disorder than obese individuals without BED symptomatology.

### Health-Related Quality of Life

Mean values for health-related quality of life scores, as measured by the SF-12 questionnaire, are presented in Table 4. Scores for Obesity–/BED–participants were compared to those for the Obesity+/BED– and the BED+ group. BED+ individuals scored substantially lower on the Mental Health Summary scale (MHS) than did the Obesity–/BED– group or the Obesity+/BED– group. The effect was significant after adjusting for sociodemographic factors ( $\beta=-0.73$ ,  $F=32.8$ ,  $p<0.001$ ). Moreover, the effect remained significant after adjusting for all psychiatric syndromes listed in Table 3 in addition to sociodemographic variables ( $\beta=-0.38$ ,  $F=8.5$ ,

$p=0.004$ ). Notably, obesity without BED exhibited no effect on MHS score. On the Physical Health Summary scale (PHS), both Obesity+/BED- subjects and BED+ subjects scored lower than the Obesity-/BED- group ( $\beta=-0.48$ ,  $F=50.0$ ,  $p<0.001$  for obesity only,  $\beta=-0.65$ ,  $F=28.6$ ,  $p<0.001$  for BED, adjusting for sociodemographic variables). But Obesity+/BED- and BED+ groups did not differ from each other ( $F=1.6$ ,  $p=0.20$ ), suggesting that decreased PHS scores are likely to be attributable to obesity, rather than BED symptoms. After adjusting for psychiatric syndromes, neither PHS effect remained significant.

### Personality Correlates

Mean personality scores for each of the three groups (BED+, Obesity+/BED- and Obesity-/BED-) are presented in Table 5. Statistical tests (ANCOVA) included sociodemographic variables as covariates. The BED+ group scored significantly higher on Novelty Seeking than either of the other two groups. Likewise, low Self-Directedness and low Cooperativeness were associated with BED, but not with obesity alone. Harm Avoidance scores were elevated for both Obesity+/BED- individuals and for the BED+ group, but the former effect was small and the BED+ group scored significantly higher than the obesity only group. Both the obesity-only group and the BED+ group scored slightly lower in Persistence compared to the Obesity-/BED- group.

## Discussion

### Overview

Using the Patient Health Questionnaire binge eating disorder module, 67 of 917 participants (7.2%) in the SLPHL survey screened positive for current BED. Seven cases were classified as indeterminate because symptoms of *bulimia nervosa* were also reported, resulting in a final sample prevalence of 6.6% for BED ( $n=60$ ). There were no significant associations with gender, age, education, marital status, or race/ethnicity. Notably, roughly the same percentage of males screened positive for BED as females (6.8% compared with 6.4%, respectively). Nearly 70% of those screening positive for BED reported BMI over 30 and almost 20% reported having BMI over 40; there was an overall mean BMI difference of 6.3 between the BED+ group and the BED- group. Statistically and clinically significant associations were seen with current major depressive disorder, generalized anxiety disorder, panic attacks, and a life history of suicide attempts. There was also a marginal association with nicotine dependence and a trend toward association with probable alcohol use disorder. Screening positive for BED predicted lower scores on the Mental Health Summary scale for health-related quality of life as measured by the SF-12. The effect remained significant when other psychiatric syndromes were included as covariates, indicating that BED as assessed by the PHQ is independently associated with lower mental health-related quality of life. Screening positive for BED predicted high Harm Avoidance, high Novelty Seeking, low Self-Directedness and low Cooperativeness; the association with Self-Directedness had the largest effect size. Notably, obese individuals who screened negative for BED exhibited normal profiles with regard to psychiatric comorbidity, mental health-related quality of life, and personality, with the exception of small effects for Persistence and Harm Avoidance.

### Prevalence

Generally, community studies of BED using interview-based assessments have found substantially lower prevalences than the estimates reported here. For example, Smith *et al* found an overall prevalence of 1.5% in an epidemiological sample participating in a longitudinal study of cardiovascular risk factors (19). However, our overall prevalence is comparable to those measured in several studies of primary-care populations that have utilized the PHQ (9,20–22). It is generally believed that the use of self-administered questionnaires to assess eating disorders results in a large number of false-positives (23). On the other hand, self-



administered instruments also tend to reduce reporting bias, increasing the likelihood that respondents will faithfully disclose socially undesirable behaviors (24–26). Moreover, the PHQ-BED module exhibited few false positives in validation studies (9). The strong association between PHQ-BED and adverse outcomes lends credibility to the prevalence estimate. Though the estimated high prevalence should be interpreted cautiously, it should not be immediately dismissed as being the result of false-positives.

The high prevalence of BED in this sample may also be related to the high prevalence of obesity. The overall prevalence of obesity in our sample was 32.2%. The prevalence of self-report based obesity among U.S. adults from the Behavioral Risk Factor Surveillance System (BRFSS) was 21.7% in 2001 (27). In addition, our catchment area may have a higher prevalence of obesity than the national average (e.g., Missouri prevalence was 23.8% by BRFSS estimates). Thus, because of the sampling region or other sampling issues, the current sample may contain a disproportionately high number of obese individuals. Accordingly, the correlation between obesity and BED could lead to a BED prevalence estimate that is higher than the true national or regional prevalence. On the other hand, the estimate from the current survey compares favorably with national prevalence of observer-measured obesity, estimated to be 30.5% among U.S. adults in 1999–2000 (28).

It is also noteworthy that the prevalence of positive BED screens is similar in males and females. Eating disorders are generally much more prevalent among women than among men. Although less information is available about BED, the gender discrepancy does not appear to be as large as that for other eating disorders (6,8). Our results suggest that there may be no gender discrepancy in BED prevalence; however, we lack the statistical power to conclude this with certainty. Nonetheless, our results confirm that BED is not as rare among men as other eating disorders.

### Clinical Significance

Health-related quality of life, as measured by the SF-12, was substantially impacted by PHQ-BED diagnosis. Those who screened positive for BED scored nearly three-quarters of a standard deviation lower on the Mental Health Summary scale and one-half standard deviation lower on the Physical Health Summary scale. Individuals who screened positive for PHQ-BED were at six-fold higher odds of meeting criteria for major depression, nearly five-fold higher odds for meeting criteria for generalized anxiety disorder, nearly four-fold higher odds for a history of one or more suicide attempts, and were at elevated risk for nicotine dependence and panic attacks. Maladaptive personality characteristics were also associated with PHQ-BED; the largest association was with low Self-Directedness, which is known to be a correlate of many Axis-I and Axis-II disorders (15,29–31). With the exception of a small elevation in Harm Avoidance and a small decrement in Persistence, obesity without PHQ-BED exhibited no associations with personality scores or psychiatric syndromes.

### Specific Associations with Personality and Psychiatric Syndromes

Elevated Harm Avoidance scores are typically seen in mood and anxiety disorders, cluster A personality disorders, and are also characteristic of canonical eating disorders (32–34). Elevated Novelty Seeking is characteristic of substance use disorders, pathological gambling, ADHD, antisocial and other cluster B personality disorders, and *bulimia nervosa* (12,35–38). These associations parallel the observations that PHQ-BED exhibits significant associations with major depression and generalized anxiety disorder but also with nicotine dependence and possibly alcohol use disorder (after adjusting for obesity). Similar observations in individuals with alcoholism led to the proposal that these personality traits distinguish different types of alcoholics (39). It is tempting to speculate that a similar heterogeneity exists among individuals with BED; for example, it may be an impulsive “novelty seeking” behavior for some while for

others it may be related to underlying mood dysregulation (i.e., “comfort eating”), which is correlated with harm avoidance. In a study of personality and attitudes toward food, van den Bree and colleague showed that Harm Avoidance predicted greater likelihood to continue eating when satiated, whereas Novelty Seeking predicted lack of dietary control (40). Evaluating potential heterogeneity would require a large sample of individuals with BED, and so such interpretations are highly speculative at this point, but such issues could be readily addressed in appropriately characterized clinical samples with carefully matched controls.

The personality scale that was most strongly associated with PHQ-BED was Self-Directedness, which exhibited a negative correlation. Low Self-Directedness is associated with all personality disorders and has also been reported in other eating disorders (15,41). Notably, Self-Directedness has been found to improve in response to cognitive-behavior Therapy in patients with *bulimia nervosa* (42). Hence, Self-Directedness represents a logical psychotherapeutic target for BED treatment.

### Attributable Fraction of Obesity

Nearly 70% of PHQ-BED cases reported obesity, compared with slightly less than 30% of PHQ-BED negative individuals. About 16% of individuals with obesity in our sample also screen positive for BED. This suggests that a substantial number of individuals with obesity could benefit from BED treatment. Hence, a considerable public health benefit might be realized by the development of effective BED therapies.

### Strengths and Limitations

The diverse, population-based sample and availability of data on a number of relevant correlates constitute substantial strengths of this investigation. To our knowledge, this is the first population-based study of BED that provides both prevalence estimates and examines association with a wide variety of correlates. The response rate for this survey was comparable to that for other community surveys that have recruited participants through random digit dialing (10). While it is low compared to response rates for major, national psychiatric epidemiological surveys, such surveys unfortunately have not examined eating disorders. Hence, our results are likely to be more generalizable than those from clinic-based or convenience sample studies, but may contain sampling bias not found in major national surveys. An additional limitation is with the use of self-administered questionnaires rather than interview-based methods to gather information about BED criteria. In their review of epidemiological studies of BED, Striegel-Moore and Franko argued that the use of self-administered instruments leads to over-reporting of binge eating due to inadequate lay understanding of what constitutes an eating binge (6). However, the same review acknowledged the PHQ as a validated measure with acceptable overall accuracy (94–98%; see *ref.* (9)).

### BED as a Psychiatric Disorder

There is debate about whether BED should be understood as a discrete psychiatric disorder, an important marker of psychological problems, or a sub-type of overeating (43–45). Addressing such questions is beyond the scope of the present study. Yet, we have shown that individuals with weight problems who do not exhibit BED symptoms do not, on average, exhibit signs of psychological maladjustment. Hence, those who report BED symptoms differ substantially from other individuals with weight problems. It is clear from our results that BED as operationalized by the PHQ is a clinically significant condition that is distinct from typical obesity.

## Conclusion

In one of the few population-based studies of BED to date, we report a 6.6% prevalence of current binge eating disorder as operationalized by the Patient Health Questionnaire, with men and women reporting BED in equal proportions. Association with a variety of other adverse outcomes was not a result of confounding with obesity, affirming that the syndrome is clinically significant. Limitations notwithstanding, our data suggest that BED may be more common than other eating disorders. The strong link between BED and obesity suggests that a better understanding of this syndrome could yield significant benefits for public health.

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**Table 1**  
Prevalence of Probable BED among Demographic Groups

	Row Total	Prevalence PHQ-BED		$\chi^2$ -Test	
	N	n	%	$\chi^2$	p
<b>Gender</b>				<b>0.1</b>	0.80
Male	411	28	6.8		
Female	499	32	6.4		
<b>Race/Ethnicity</b>				<b>1.1</b>	0.59
Caucasian/White	739	51	6.9		
African-American/Black	133	2	4.5		
Other non-Caucasian	29	6	6.9		
<b>Mean Age*</b>				<b>0.7</b>	0.42
45 and Under	469	34	7.3		
Over 45	440	26	5.9		
<b>Marital Status</b>				<b>0.6</b>	0.45
Currently Married	658	41	6.2		
Not Currently Married	249	19	7.6		
<b>Education</b>				<b>1.9</b>	0.17
College Degree	591	44	7.5		
No College Degree	316	16	5.1		
<b>Total:</b>	<b>910</b>	<b>60</b>	<b>6.6</b>		

\* As a continuous variable, age is significantly associated with BED ( $F=4.3$ ,  $p=0.04$ )

**Table 2**  
 BMI Categories for PHQ-BED+ versus PHQ-BED- Subjects

	BED- (N=844)		BED+ (N=59) <sup>a</sup>	
	n	% of Column	n	% of Column
<=25	309	36.6	6	10.2
25-30	286	33.9	12	20.3
30-40	210	24.9	30	50.9
>40	39	4.6	11	18.6
Total	844	100.0	59	100.0
Mean BMI (SD)	27.8	(6.0)	33.6	(7.3)

Note: For BMI categories vs. PHQ-BED results,  $\chi^2=47.7$ ,  $df=3$ ,  $p<0.001$ .

<sup>a</sup> BMI data was missing for one subject.

**Table 3**  
Odds-ratios for the Prediction of Psychiatric Problems from PHQ-BED, or Obesity.

	Odds Ratios				
	Sample Prevalence %	BED-/Obesity+ OR (95% CI)	P	BED+ (with or w/o Obesity) OR (95% CI)	P
Major Depression	4.3	0.8 (0.3-1.9)	0.63	5.4 (2.3-12.9) <sup>†</sup>	<0.001
Generalized Anxiety Disorder	4.6	1.4 (0.7-3.1)	0.33	5.3 (2.3-12.7) <sup>†</sup>	<0.001
Panic Attacks	7.4	1.5 (0.8-2.8)	0.18	4.9 (2.3-10.4) <sup>†</sup>	<0.001
Nicotine Dependence	19.3	1.2 (0.8-1.7)	0.42	1.9 (1.0-3.5)	0.04
Probable Alcohol Use Disorder	19.2	0.7 (0.4-1.1)	0.11	1.8 (1.0-3.3) <sup>†</sup>	0.07
Suicide Attempts	5.9	1.6 (0.8-3.0)	0.07	3.7 (1.6-8.5)	0.003

Note: Comparison group is non-obese, BED- subjects. Symbols denote comparison between BED-/Obesity+ and PHQ-BED+ groups:

<sup>‡</sup> p<0.01,

<sup>†</sup> p<0.001



**Table 4**  
 Mean SF-12 Scores for PHQ-BED+ Versus PHQ-BED- Subjects, With and Without Obesity

	BED-/Obesity- (N=595)		BED-/Obesity+ (N=249)		BED+ (with or w/o Obesity) (N=60)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)
SF-12 Mental	0.02	(0.98)	0.03	(0.98)	-0.79 <sup>***!</sup>	(1.19)
SF-12 Physical	0.15	(0.90)	-0.48 <sup>***</sup>	(1.18)	-0.55 <sup>***</sup>	(1.18)

Note: SF-12 scores are reported on Z-scores derived from a U.S. normative sample (see Methods). Asterisks denote comparison with BED-/Obesity- group:

\*\*\*  
 p<0.001.

Other symbols denote comparisons between BED-/Obesity+ and PHQ-BED+ groups:

!  
 p<0.001

**Table 5**  
 TCI Personality Scale Scores for PHQ-BED+ Versus PHQ-BED- Subjects, With and Without Obesity

	BED-/Obesity- (N=595)		BED-/Obesity+ (N=249)		BED+ (with or w/o Obesity) (N=60)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)
Novelty Seeking	-0.04	(1.00)	0.00	(0.92)	0.42 <sup>***†</sup>	(1.21)
Harm Avoidance	-0.12	(0.95)	0.15 <sup>***</sup>	(1.03)	0.55 <sup>***†</sup>	(1.14)
Reward Dependence	0.00	(0.99)	0.02	(1.03)	-0.09	(0.98)
Persistence	0.07	(0.98)	-0.10 <sup>*</sup>	(1.03)	-0.28 <sup>*</sup>	(1.01)
Self-Directedness	0.10	(0.98)	-0.03	(0.98)	-0.79 <sup>***†</sup>	(0.95)
Cooperativeness	0.05	(0.96)	-0.03	(1.07)	-0.43 <sup>***†</sup>	(1.00)
Self-Transcendence	-0.03	(0.98)	0.04	(1.00)	0.05	(1.19)

Note: Personality scores are reported on a standard normal scale. Asterisks denote comparison with BED-/Obesity- group:

\* p<0.05,

\*\* p<0.01,

\*\*\* p<0.001.

Other symbols denote comparisons between BED-/Obesity+ and PHQ-BED+ groups:

† p<0.05,

‡ p<0.01,

§ p<0.001