ASSESSING PSYCHOSOCIAL FUNCTIONING OF BARIATRIC SURGERY CANDIDATES WITH THE MINNESOTA MULTIPHASIC PERSONALITY INVENTORY – 2 RESTRUCTURED FORM

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by

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Introduction

Obesity has reached epidemic proportions in the United States (Mechanick et al., 2009). Approximately 65% (130 million) of adult residents are currently overweight or obese [Body Mass Index (BMI) $\geq$30 kg/m^2] (Mechanick et al., 2009). Bariatric surgery for patients with morbid obesity (BMI $\geq$ 40) is the most effective treatment tool for weight loss (Mechanick et al., 2009), as patients typically lose around 61.2% of their excess weight and co-morbid medical conditions typically resolve or reduce in severity (Buchwald et al., 2004). In addition to medical co-morbidities (e.g., Type 2 Diabetes, Sleep Apnea, Hypertension, etc.), psychiatric disorders are also common among bariatric surgery candidates, with studies reporting up to 68.6% of individuals meeting criteria for at least one lifetime Axis I disorder (Mitchell et al., 2012) and 29% meeting criteria for at least one Axis II personality disorder (Kalarchian et al., 2007). The most common disorders include mood, eating, anxiety, and substance abuse and many patients report impaired quality of life (Kalarchian et al., 2007; Mechanick et al., 2009). The prevalence of past suicide attempts within this population is approximately 11.2% (Windover, Merrell, Ashton, & Heinberg, 2010). Other psychosocial co-morbidities associated with obesity include: compulsivity, somatization, cognitive distortions, poor self-esteem, family discord, and other interpersonal problems (Abiles et al., 2010; Glinski, Wetzler, & Goodman, 2001; Kinzl et al., 2006; van Hout, Verschure, & van Heck, 2005).

The previously described psychological comorbidities and associated behavioral factors can lead to significant post-surgical challenges for bariatric surgery patients, including poor adherence, increased risk of post-surgical complications (e.g., vomiting, dumping, decreased weight loss, or weight regain; Hsu et al., 1998; Kalarchian et al., 2002; Sarwer, Wadden, & Fabricatore, 2005). Severe depression has been considered a contraindication for bariatric surgery (Kalarchian et al., 2008; Mechanick et al., 2009; Semanscin-Doerr, Windover, Ashton, & Heinberg, 2010). Semanscin-Doerr et al. (2010) reported the percent of excess weight loss (%EWL) for 104 patients who underwent a laparoscopic sleeve gastrectomy (LSG). Patients with current mood disorders had lower %EWL than those with no current mood disorder one year post-operatively. Kalarchian et al. (2008) presented six-month follow-up data on 207 patients who underwent a Roux-en-Y gastric bypass. A lifetime diagnosis of depression and anxiety was associated with smaller decreases in BMI, though current depression and anxiety disorders were unrelated to weight loss. However, the literature is mixed, with some studies suggesting preoperative psychiatric diagnosis or distress having no association with weight loss outcomes (Powers, Rosemurgy, Boyd, & Perez, 1997).

Psychosocial Assessment of Bariatric Surgery Candidates

Psychologists can aid in the identification of patients who need further mental health evaluation or treatment prior to surgery (Fabricatore, Crerand, Wadden, Sarwer, & Krasucki, 2006). Psychological screening for preoperative, psychological functioning in bariatric surgery candidates usually includes some form of psychometric testing along

with a comprehensive clinical interview (Peterson, Berg, & Mitchell, 2012). Taken from bariatric surgery survey data, 63.4% of clinics adapted to a version of an objective psychopathology/personality self-report measure along with a clinical interview (Bauchowitz et al., 2005). It is recommended that self-report measures be used alongside an unstructured clinical interview in order to improve the validity of the self-reported data as well as improve communication and treatment planning (Peterson et al., 2012).

Although self-report inventories are used widely in bariatric surgery settings, specific measures and criteria used have been inconsistent. In addition, concerns have been voiced regarding some measures. For example, some of original Clinical Scales of the Minnesota Multiphasic Personality Inventory – 2 (MMPI – 2: Butcher, Dahlstrom, Graham, Tellegen, & Kreammer, 1989) were not internally consistent within this population (Wygant et al., 2007). Similarly low internal consistency was reported for the Million Behavioral Medicine Diagnostic (MBMD) (Walfish, Wise, & Streiner, 2008). Additionally, whereas the Beck Depression Inventory (BDI) and the Symptom Checklist–90–Revised (SCL-90-R) demonstrate strong internal consistency coefficients within this population (Krukowski, Friedman, & Applegate, 2010; Ransom, Ashton, Windover, & Heinberg, 2010), the BDI has a narrow focus (depression) and is not intended to capture all of the potential areas of dysfunction noted earlier. The SCL-90-R has been criticized as being a global measure of distress or dysphoria, with limited discriminant validity (Ronan, Dreer, & Dollard, 2000). Therefore, even though there is a widespread use of self-report inventories in bariatric surgery settings, measures and criteria have typically been inconsistent. Whereas many of these instruments have demonstrated excellent

reliability coefficients (Krukowski et al., 2010; Ransom et al., 2010), many other instruments have been limited in either improperly identifying psychopathology due to poor reliability, a lack of discriminant validity (Ronan et al., 2000; Walfish et al., 2008; Wygant et al., 2007), or are too narrowly focused (e.g., Beck Depression Inventory) to capture broader domains of psychopathology.

Assessing Bariatric Surgery Candidates with the MMPI-2-RF

There is limited research examining the utility of the newest version of the Minnesota Multiphasic Personality Inventory (MMPI), the MMPI-2 Restructured Form (MMPI-2-RF: Ben-Porath & Tellegen, 2008/2011; Tellegen & Ben-Porath, 2008/2011), in a bariatric surgery candidate population. The MMPI-2(Butcher, Dahlstrom, Graham, Tellegen, & Kreammer, 1989) (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) was restructured to improve measurement of psychological constructs assessed by its item pool while addressing, to the extent possible, the psychometric limitations of the instrument (Ben-Porath, 2012). The first step in developing the MMPI-2-RF involved restructuring the original Clinical Scales by removing the general factor variance associated with scores on these scales, labeled Demoralization. This factor artificially increased inter-correlations among the Clinical Scales. Following removal of demoralization from the Clinical Scales, a major distinctive core component of each of the original scales was identified as the target for further scale development. The resulting Restructured Clinical (RC) scales have stronger internal consistency than some of the original Clinical Scales of the MMPI-2 because they are more homogeneous (Ben-

Porath, 2012). The RC Scales also show evidence of similar to improved convergent validity and substantially improved discriminant validity when compared with their Clinical Scale counterparts (Tellegen & Ben-Porath, 2008/2011). A similar process led to the development of 23 Specific Problems Scales for the MMPI-2-RF. The test also includes Interest Scales and PSY-5 Scales as well as nine validity scales, for a total of 51 MMPI-2-RF scales scored from 338 items.

In sum, the MMPI-2-RF is psychometrically improved over its predecessor and has conceptually grounded scales. The test follows a broadband, hierarchical structure that is linked to contemporary models of psychopathology (Markon, Krueger, & Watson, 2005; Sellbom, Ben-Porath, & Bagby, 2008). This model encompasses three higher-order domains: Emotional/Internalizing Dysfunction (EID), Thought Dysfunction (THD), and Behavioral/Externalizing Dysfunction (BXD). The MMPI-2-RF enables clinicians to assess both protocol validity (i.e., the extent is the candidate over- or under-reports somatic and psychological symptoms) as well as capture broad and narrow aspects of symptomatology, including somatic complaints, emotions, cognitions, behavioral disconstraint, and interpersonal problems (Ben-Porath & Tellegen, 2008/2011).

The MMPI-2-RF Technical Manual (Tellegen & Ben-Porath, 2008/2011) includes descriptive data (means and standard deviations) on the 51 scales of the test for a sample of 435 female and 228 male bariatric surgery candidates. These data demonstrate that as a group, bariatric surgery candidates show evidence of concern over their physical health, low energy, fatigue, sleep disturbance, and possible sexual dysfunction. Only one study published to date has examined correlates of MMPI-2-RF scores in a bariatric surgery

sample (Wygant et al., 2007). Wygant et al. (2007) found that the RC Scales yielded significantly better convergent and discriminant validity than the original Clinical Scales in a sample of 1091 bariatric surgery candidates. The RC scale scores were associated with indications of psychological dysfunction, as well as behavioral and developmental problems in this sample. Specifically, RC scales that comprise the EID domain (RCd [Demoralization], RC2 [Low Positive Emotions], & RC7[Dysfunctional Negative Emotions]), can be used to asses a patient's emotional stability and help further differentiate between anxiety and depression (Sellbom et al., 2008; Wygant et al., 2007). Scales that comprise the BXD domain (RC4 [Antisocial Behavior] & RC9 [Hypomanic Activation]) can better detect possible behavioral concerns that may negatively impact post-surgical results than do comparable scores on the Clinical Scales (Wygant et al., 2007). RC6 (Ideas of Persecution) scores were associated with patients' perception of weight-related prejudice (Wygant et al., 2007).

The Current Study

The Restructured Clinical (RC) scales of the MMPI-2-RF, which comprise 9 of the 42 psychological functioning measures available on this test, demonstrated good convergent and discriminant validity with bariatric surgery criteria (Wygant et al., 2007). The phrase "bariatric surgery criteria" will be used throughout the remainder of this study to collectively mean patient characteristics/variables that have been deemed appropriate for clinicians to assess for prior to clearance for bariatric surgery. The current study seeks to replicate descriptive findings of the bariatric surgery candidate comparison group

reported in the MMPI-2-RF Technical Manual (Tellegen & Ben-Porath, 2008/2011), and identify psychosocial correlates of the full MMPI-2-RF in a bariatric surgery population. This information will enhance use of the test as a measure of psychosocial functioning in bariatric surgery candidates. It is hypothesized that the descriptive findings with the MMPI-2-RF in this broader sample will not significantly differ from those reported previously in the Wygant et al. (2007) study. It is further hypothesized that the substantive scales of the full MMPI-2-RF will correlate well with bariatric surgery criteria assessed during a pre-surgical, psychological interview (see Material and Methods for criteria assessed), because the test has demonstrated strong construct validity in a variety of settings (Ben-Porath, 2012).

Method

Participants

The initial sample consisted of 1025 consecutive patients seeking bariatric surgery at the Cleveland Clinic. All patients were administered the MMPI-2-RF, the Binge Eating Scale (BES: Gormally, Black, Daston, & Rardin, 1982), and completed a semi-structured psychiatric interview as part of a pre-surgical evaluation. Of the total sample, 43 patients were excluded due to having an invalid MMPI-2-RF protocol according to criteria recommended in the MMPI-2-RF Technical Manual (Cannot Say [CNS] > 18, Variable Response Inconsistency [VRIN-r] > 80, True Response Inconsistency [TRIN-r] > 80, Infrequent Responses [F-r] > 120, & Infrequent Psychopathology Responses [Fp-r] > 100) [28]. Of the included sample (n = 982), 67.00% were women and 33.00% were men. A majority of the sample were Caucasian (63.80%), 24.20% African American, and 12.00% indicated "other" ethnicity. The mean age of sample was 46.04 years (Standard Deviation (SD) = 11.63 years) with an average of 14.12 (SD= 2.64) years of education. The mean BMI at the time of their initial evaluation was 49.17 + 11.27 kg/m^2 (Range: 30.3 kg/m^2 – 108.70kg/m^2).

Measures

The **Minnesota Multiphasic Personality Inventory – 2 Restructured Form** (MMPI-2-RF: Ben-Porath & Tellegen, 2008/2011; Tellegen & Ben-Porath, 2008/2011) is

a 338-item version of the MMPI-2 (Butcher et al., 1989) that consists of 9 validity scales and 42 substantive scales that measure broadband, psychological constructs relevant to the assessment of personality and psychopathology. As mentioned earlier, the test is organized in a hierarchical manner similar to current models of psychopathology (Markon et al., 2005; Sellbom, Ben-Porath, & Bagby, 2008). Of the substantive measures, the test consists of 3 Higher-Order Scales, 9 Restructured Clinical Scales, 5 Somatic/Cognitive Complaint Scales, 9 Internalizing Scales, 4 Externalizing Scales, 5 Interpersonal Scales, 2 Interest Scales, and the Personality Psychopathology – Five scales. Detailed psychometric findings, including reliability estimates and corresponding standard errors of measurement in clinical and non-clinical settings along with validation data for mental health, medical, and other settings are provided in the MMPI-2-RF Technical Manual (Tellegen & Ben-Porath, 2008/2011).

The **Binge Eating Scale** (BES: Gormally et al., 1982) is a 16-item self-report measure used to assess binge eating, including behavioral manifestations and emotions/cognitions associated with binge eating in bariatric surgery candidates (Hood, Grupski, Hall, Ivan, & Corsica, in press). Scores range from 0-46, with higher scores indicating more severe binge eating symptomatology.

Retrospective Chart Review

Data were coded through a retrospective chart review by trained research assistants. A graduate-level student as well as a trained undergraduate student coded information from the patient's pre-operative, semi-structured psychiatric interview.

Coded data included information and diagnoses that were gathered by a doctoral level clinical psychologist at the time of the intake. The clinical psychologists review information with each patient in a structured manner as mandated by the Cleveland Clinic. Thus, every patient reviews the following criteria with the clinical psychologist: past mental health history/treatment, current mental health diagnoses, substance use (current and past), physical and sexual abuse history, pre-surgical BMI, sleep apnea diagnosis and adherence to Continuous Positive Airway Pressure (CPAP). Measures of maladaptive eating were also collected, including the presence of a diagnosis of EDNOS, specifically Binge Eating Disorder, number of patient-reported subjective binge episodes per week, scores on the BES, presence of Night Eating Syndrome, a history of laxative/diuretic abuse, and history of vomiting to lose weight. All diagnoses were given by clinical psychologists based on information gathered from the intake session. Data were then double entered to maintain consistency and reduce typographical error. Inter-rater reliability (Kappa and Intra-Class Correlation Coefficients) between coders was .96 (n = 50; Range = .81 - 1.00). The retrospective chart review and use of the patients' MMPI-2-RF scores for research purposes were approved by the hospital's Institutional Review Board.

Procedure

Means and standard deviations were computed for each of the 51 MMPI-2-RF scales within this sample. These scores were compared to those reported in the bariatric surgery comparison group reported in the MMPI-2-RF Technical Manual (Tellegen &

Ben-Porath, 2008/2011). Zero-Order Pearson Product-Moment correlations were computed between the MMPI-2-RF substantive scale scores and medical chart information. Due to the amount of comparisons, a family-wise Bonferroni corrected alpha was computed (.05/42 = .0012). Thus, only correlation coefficients $\geq$ .20 and p-values $\leq$ .0012 were interpreted. Additionally, rates of the criteria endorsed in this sample are also reported.

Results

MMPI-2-RF Descriptive Analyses

Displayed in Table 1 are means and standard deviations on the 51 MMPI-2-RF scales for male and female bariatric surgery candidates in this sample along with comparable data for the bariatric surgery candidate comparison group reported in the MMPI-2-RF Technical Manual (Tellegen & Ben-Porath, 2008/2011). Mean group differences of at least 5 T score points (corresponding to half a standard deviation in the general population) are considered clinically meaningful. Significant gender differences were found on Behavioral Externalizing Dysfunction (BXD), a broad measure of under-controlled behavior, and Juvenile Conduct Problems (JCP), a measure suggesting a history of problematic behavior; with men scoring 5 to 6 T score points higher than women. Next, women in this sample scored 6 T score points higher on the Uncommon Virtues (L-r) scale, a measure of under-reporting, as compared to women in the comparison group, whereas men scored significantly higher on the Mechanical Interests (MEC) scale in this sample than men included in the comparison group. Further, both samples and genders produced elevated scores on Malaise (MLS), a measure that assesses preoccupation with poor health and low energy. Overall, there was remarkable similarity in the descriptive findings across genders and samples.

Table 1

Means and Standard Deviations for MMPI-2-RF Scales: Bariatric Surgery Candidates.

MMPI-RF Validity & Substantive Scales	Current Sample				Comparison Group			
	Men (n = 324)		Women (n = 658)		Men (n = 228)		Women (n = 435)	
	M	SD	M	SD	M	SD	M	SD
Validity Scales								
Variable Response Inconsistency (VRIN-r)	48	9	48	9	46	9	48	9
True Response Inconsistency (TRIN-r)	52 F	9	52 F	9	52 F	8	52 F	8
Infrequent Responses (F-r)	54	12	53	12	52	12	51	10
Infrequent Psychopathology Responses (Fp-r)	49	8	48	8	48	9	48	8
Infrequent Somatic Responses (Fs)	52	11	52	12	51	10	51	11
Symptom Validity (FBS-r)	56	10	59	11	52	10	58	11
Response Bias Scale (RBS)	53	10	55	12	52	10	50	11
Uncommon Virtues (L-r)	56	12	57	11	53	11	51	9
Adjustment Validity (K-r)	53	10	54	10	53	11	52	10
Higher-Order Scales								
Emotional/Internalizing Dysfunction (EID)	50	11	51	12	49	11	51	11
Thought Dysfunction (THD)	48	9	48	9	47	8	47	8
Behavioral/Externalizing Dysfunction (BXD)	49	9	44	8	51	10	47	8
Restructured Clinical (RC) Scales								
Demoralization (RCd)	51	10	52	11	49	10	52	10
Somatic Complaints (RC1)	57	11	58	12	53	10	57	11
Low Positive Emotions (RC2)	52	11	52	11	52	10	53	10
Cynicism (RC3)	49	10	48	11	48	10	46	9
Antisocial Behaviors (RC4)	49	10	45	8	50	10	49	9
Ideas of Persecution (RC6)	52	10	51	10	50	9	50	9

Table 1 (Continued)

Means and Standard Deviations for MMPI-2-RF Scales: Bariatric Surgery Candidates.

	Current Sample				Comparison Group			
MMPI-RF Validity & Substantive Scales	Men (n = 324)		Women (n = 658)		Men (n = 228)		Women (n = 435)	
	M	SD	M	SD	M	SD	M	SD
Dysfunctional Negative Emotions (RC7)	45	9	47	10	46	10	49	9
Aberrant Experiences (RC8)	48	9	47	9	47	9	47	8
Hypomanic Activation (RC9)	46	9	42	8	46	9	45	8
Somatic Complaints Specific Problems Scales								
Malaise (MLS)	65	12	64	12	64	10	65	10
Gastrointestinal Complaints (GIC)	51	11	53	13	50	9	53	12
Head Pain Complaints (HPC)	54	9	56	11	52	9	58	11
Neurological Complaints (NUC)	58	13	57	13	54	11	53	11
Cognitive Complaints (COG)	51	11	51	12	51	11	48	10
Internalizing Specific Problems Scales								
Suicidal/Death Ideation (SUI)	50	10	48	9	47	7	47	7
Helplessness/Hopelessness (HLP)	48	9	47	9	46	9	45	7
Self-Doubt (SFD)	50	11	52	11	50	11	53	11
Inefficacy (NFC)	47	10	49	10	47	10	49	10
Stress/Worry (STW)	51	11	51	10	48	9	49	10
Anxiety (AXY)	49	9	50	11	48	9	49	9
Anger Proneness (ANP)	48	9	47	9	49	10	48	10
Behavior-Restricting Fears (BRF)	48	8	49	10	48	7	48	8
Multiple Specific Fears (MSF_	47	8	51	9	47	7	51	8
Externalizing Specific Problems Scales								
Juvenile Conduct Problems (JCP)	52	12	47	9	54	12	51	11

Table 1 (Continued)

Means and Standard Deviations for MMPI-2-RF Scales: Bariatric Surgery Candidates.

	Current Sample				Comparison Group			
MMPI-RF Validity & Substantive Scales	Men (n = 324)		Women (n = 658)		Men (n = 228)		Women (n = 435)	
	M	SD	M	SD	M	SD	M	SD
Substance Abuse (SUB)	45	6	44	5	47	7	46	7
Aggression (AGG)	47	9	44	8	47	9	45	8
Activation (ACT)	45	10	44	9	44	8	47	10
Interpersonal Specific Problems Scales								
Family Problems (FML)	48	10	48	10	46	9	49	10
Interpersonal Passivity (IPP)	46	8	50	10	47	8	50	10
Social Avoidance (SAV)	51	10	52	11	54	11	52	12
Shyness (SHY)	46	9	47	9	47	10	49	10
Disaffiliativeness (DSF)	50	10	50	10	50	10	48	8
Interest Scales								
Aesthetic-Literary Interests (AES)	44	9	47	10	42	8	49	10
Mechanical-Physical Interests (MEC)	53	10	43	6	59	9	44	6
Personality Psychopathology Five (PSY-5) Scales								
Aggressiveness – Revised (AGGR-r)	53	9	49	9	52	9	48	8
Psychoticism – Revised (PSYC-r)	48	9	47	9	47	9	47	8
Disconstraint – Revised (DISC-r)	50	9	42	6	53	9	46	8
Negative Emotionality/Neuroticism – Revised (NEGE-r)	48	10	49	10	47	10	49	10
Introversion/Low Positive Emotionality – Revised (INTR-r)	53	11	53	11	54	11	52	11

Rates of Endorsement

Table 2 displays the rates of psychological comorbidity present in this sample. The sample had significant psychiatric comorbidity; 50.1% had a lifetime history of outpatient mental health treatment, 41.8% were currently taking at least one psychotropic medication, and 11.3% met criteria for Major Depression. Furthermore, 22.1% of the sample met criteria for EDNOS (Binge Eating Disorder). Additionally, 11.3% reported a lifetime history of a psychiatric inpatient hospitalization and 10.6% had reported a previous suicide attempt(s). In terms of alcohol and substance abuse, 12.9% of patients reported a history of alcohol abuse and/or dependence and 13.7% reported a history of substance abuse and/or dependence.

Empirical Correlates of MMPI-2-RF Scores

Because men and women yielded similar patterns of MMPI-2-RF scores, the analyses are reported based on a combined gender sample. Zero-Order Pearson Product-Moment correlations were calculated between scores on the MMPI-2-RF substantive scales and preoperative variables collected via retrospective chart review using pairwise deletion of missing criteria. Table 2 also displays the empirical correlates of these variables. Due to the large sample size (n = 982), even small, potentially meaningless correlations can be statistically significant. The correlation coefficients reported in Table 2 were interpreted both in terms of statistical significance and their strength of association. Specifically, only comparisons at a p-value of $< .0012$ and $r \geq .20$ were interpreted to prevent the risk of a Type I Error.

In the Emotional/Internalizing domain, history of mental health problems requiring treatment (including past suicide attempts), maladaptive eating variables, and a history of Major

Depressive Disorder were all meaningfully correlated with Emotional/Internalizing Dysfunction (EID), Demoralization (RCd), Low Positive Emotions (RC2), Dysfunctional Negative Emotions (RC7), the Internalizing Specific Problem scales, as well as Negative Emotionality/Neuroticism Revised (NEGE-r) and Introversion/Low Positive Emotionality (INTR-r). No meaningful correlations were found with the thought dysfunction domain. When examining measures within the Behavior/Externalizing Dysfunction (BXD) domain, Antisocial Behaviors (RC4), Externalizing Specific Problems scales, and Disconstraint (DISC-r) were associated with current substance use diagnoses and physical abuse history. Somatic scales on the MMPI-2-RF, including Somatic Complaints (RC1) and the associated specific problems scales, were associated with a history of mental health problems and treatment, current mood diagnoses, maladaptive eating behaviors, physical/sexual abuse history, sleep apnea diagnosis, and higher BMI's both at intake and time of surgery. The Family Problems (FML) specific problem scale was also associated with both a history of physical and sexual abuse as well as higher scores on the BES.

Table 2

Correlations between the MMPI-2-RF Higher Order and Restructured Clinical Scales with External Criteria

			Higher-Order Scales			Restructured Clinical Scales								
Criteria	n	% Present	EID	THD	BXD	RCd	RC1	RC2	RC3	RC4	RC6	RC7	RC8	RC9
Mental Health History/Treatment														
Psychiatric Hospitalization	939	11.3%	.22**	.12**	.08*	.21**	.15**	.14**	.02	.17**	.12**	.20**	.10*	.04
Past suicide attempt(s)	940	10.6%	.23**	.17**	.11**	.21**	.21**	.15**	.11*	.16**	.16**	.22**	.14**	.09*
Past Psychotropic Medication Use	911	56.3%	.29**	.04	.02	.26**	.25**	.24**	.06	.08*	.05	.23**	.05	-.03
Current Psychotropic Medication Use	947	41.8%	.23**	.01	-.01	.20**	.22**	.20**	.02	.03	.00	.16**	.02	-.05
History of Outpatient Therapy	895	50.1%	.25**	.07*	.05	.25**	.17**	.17**	.03	.11**	.10*	.20**	.08*	.04
History of Eating Disorder Treatment	888	1.9%	.10*	.04	.00	.12**	.02	.07*	-.01	.05	.02	.08*	.04	-.02
Mental Health Diagnoses (Depression)														
Major Depression	906	11.3%	.33**	.07*	-.02	.32**	.14**	.27**	.06	.05	.08*	.23**	.06	-.02
Dysthymia	906	1.1%	.09*	.05	.04	.08*	.01	.09*	.03	.04	.04	.07*	.04	.01
Depression NOS	903	18.5%	.13**	-.02	.01	.12**	.09*	.14**	.02	.05	-.02	.07*	-.03	-.06
Mental Health Diagnoses (Anxiety)														
Generalized Anxiety Disorder	892	1.8%	.14**	.03	.00	.12**	.04	.06	.04	.01	.04	.14**	.05	.05

Panic Disorder	896	2.6%	.08*	.00	.03	.06	.09*	.06	.02	.04	.00	.08*	.02	.00
Post-Traumatic Stress Disorder	891	1.7%	.08*	.10*	.06	.09*	.10*	.05	.00	.07*	.11**	.10*	.09*	.05
Obsessive-Compulsive Disorder	891	.8%	.12**	.08*	.02	.13**	.00	.06	.00	.05	.07*	.14**	.07*	.07*
Anxiety NOS	873	8.2%	.10*	-.03	-.02	.09*	.08*	.12**	-.01	.03	.01	.08*	-.04	-.03
Other Mental Health Diagnoses														
Bipolar Disorder	904	4.4%	.13**	.09*	.08*	.12**	.15**	.10*	.02	.11**	.08*	.14**	.09*	.02
Psychotic Disorders	904	.9%	.06	.11*	.09*	.07*	.04	.01	.05	.13**	.09*	.11**	.11*	.06
Personality Disorders	904	1.3%	.07*	.03	.08*	.06	.11**	.05	.02	.08*	.09*	.07*	.00	.03
Learning/Developmental Disability	904	.7%	.02	.06	.06	.04	.04	.00	.03	.05	.08*	.02	.04	.06
Attention Deficit Hyperactivity Disorder	903	1.1%	.02	-.02	.02	.06	-.04	.02	.03	.04	-.02	-.01	-.02	.00
Substance Use														
Current or Past Substance Abuse	904	10.3%	.12**	.13**	.26**	.13**	.12**	.07*	.12**	.29**	.09*	.15**	.17**	.13**
Current Substance Use	934	2.7%	.10*	.07*	.17**	.09*	.07*	.02	.09*	.17**	.11*	.12**	.08*	.13**
Current Alcohol Abuse/Dependence	891	1.1%	.09*	.04	.05	.10*	.02	.03	.04	.09*	.09*	.08*	.02	.07*
Current Substance Abuse/Dependence	891	.8%	.01	-.01	.09*	-.01	.04	.05	.08*	.14**	.00	-.02	-.02	.00
Current Smoking	936	11.1%	.09*	.04	.13**	.07*	.09*	.05	.11**	.12**	.04	.06*	.06	.09*
History of Substance Use	934	13.7%	.09*	.14**	.31**	.10*	.13**	.07*	.12**	.35**	.14**	.10*	.15**	.16**
History of Alcohol Abuse/Dependence	891	12.9%	.07*	.10*	.23**	.08*	.12**	.02	.14**	.21**	.09*	.12**	.13**	.16**
History of Substance Abuse/Dependence	891	15.9%	.11**	.09*	.25**	.14**	.11**	.04	.09*	.24**	.11*	.14**	.13**	.17**
History of Smoking	936	35.0%	.01	.03	.14**	-.01	.00	.01	.03	.17**	.00	.03	.04	.04
Eating Disorders & Maladaptive Eating														

EDNOS (Binge Eating Disorder)	903	22.1%	.20**	.11**	.07*	.21**	.06	.16**	.05	.13**	.13**	.20**	.12**	.03
Number of Subjective Binges Per Week	982		.25**	.08*	.09*	.25**	.08*	.19**	.09*	.14**	.14**	.23**	.08*	.05
Binge Eating Scale Score	864		.33**	.11**	.11**	.34**	.11**	.26**	.13**	.16**	.14**	.32**	.10**	.08*
Night Eating Syndrome	888	3.4%	.05	.09*	.03	.06	.07*	.05	.06	.06	.06	.06	.08*	.04
History of Laxative/Diuretic Use	888	6.3%	.06	.09*	.10*	.08*	.10*	.04	.07	.13**	.07*	.07*	.09*	.05
History of Vomiting to Lose Weight	888	4.4%	.09*	.07*	.05	.10*	.07*	.04	.07*	.06	.07	.12**	.08*	.05
Abuse History														
Sexual Abuse	914	15.3%	.16**	.11*	.06	.16**	.17**	.09*	.04	.10*	.11*	.18**	.12**	.06
Physical Abuse	912	16.7%	.14**	.14**	.11**	.14**	.18**	.11*	.11**	.22**	.14**	.15**	.14**	.07*
Exercise														
No Current Exercise Program	858	55.4%	.14**	.00	-.04	.13**	.10*	.19**	.07*	-.01	.00	.04	-.02	-.05
BMI														
At intake	921		.09*	.03	.07*	.08*	.06	.12**	.04	.06	.08*	.09*	.03	.05
At surgery	524		.10*	.07	.02	.10*	.05	.08	.06	.01	.13*	.11*	.04	.04
Sleep Apnea/Adherence														
Diagnosed with OSA	925	44.4%	.07*	.07*	.03	.05	.10*	.08*	.02	.03	.05	.02	.06	.06*
Adherent to CPAP	850	6.1%	.02	.09*	.01	.00	.06	.03	.06	-.01	.06	-.01	.08*	.06

Note. * $p < .05$, ** $p < .001$, $r \geq .20$ (underlined), MMPI-2-RF (Minnesota Multiphasic Personality Inventory – 2 Restructured Form); NOS (Not Otherwise Specified); BMI (Body Mass Index); OSA (Obstructive Sleep Apnea); CPAP (Continuous Positive Airway Pressure); EID (Emotional/Internalizing Dysfunction); THD (Thought Dysfunction); BXD (Behavioral/Externalizing Dysfunction); RCd (Demoralization); RC1 (Somatic Complaints); RC2 (Low Positive Emotions); RC3 (Cynicism); RC4 (Antisocial Behavior); RC6 (Ideas of Persecution); RC7 (Dysfunctional Negative Emotions); RC8 (Aberrant Experiences); RC9 (Hypomanic Activation).

Table 3

Correlations between the MMPI-2-RF Somatic/Cognitive Specific Problem Scales with External Criteria

			Somatic Complaints Scales				
Criteria	n	% present	MLS	GIC	HPC	NUC	COG
Mental Health History/Treatment							
Psychiatric Hospitalization	939	11.3%	.14**	.07*	.13**	.14**	.18**
Past suicide attempt(s)	940	10.6%	.15**	.12**	.21**	.18**	.17**
Past Psychotropic Medication Use	911	56.3%	.28**	.16**	.25**	.17**	.22**
Current Psychotropic Medication Use	947	41.8%	.29**	.13**	.20**	.17**	.18**
History of Outpatient Therapy	895	50.1%	.19**	.13**	.18**	.12**	.18**
History of Eating Disorder Treatment	888	1.9%	.06	.10*	.01	.00	.09*
Mental Health Diagnoses (Depression)							
Major Depression	906	11.3%	.21**	.13**	.11**	.11*	.18**
Dysthymia	906	1.1%	.03	.00	.03	.02	.05
Depression NOS	903	18.5%	.17**	.04	.11**	.05	.08*
Mental Health Diagnoses (Anxiety)							
Generalized Anxiety Disorder	892	1.8%	.04	-.01	.05	.04	.08*
Panic Disorder	896	2.6%	.12**	.03	.08*	.07*	.07*
Post-Traumatic Stress Disorder	891	1.7%	.07*	.00	.05	.14**	.12**
Obsessive-Compulsive Disorder	891	.8%	.06	.04	-.03	-.01	.05

			Somatic Complaints Scales				
Criteria	n	% present	MLS	GIC	HPC	NUC	COG
Anxiety NOS	873	8.2%	.13**	.09*	.07*	.06	.04
Other Mental Health Diagnoses							
Bipolar Disorder	904	4.4%	.10*	.07*	.14**	.15**	.14**
Psychotic Disorders	904	.9%	.02	-.01	.02	.02	.05
Personality Disorders	904	1.3%	.08*	.06	.10*	.09*	.03
Learning/Developmental Disability	904	.7%	.03	.05	-.01	.01	.00
Attention Deficit Hyperactivity Disorder	903	1.1%	-.01	-.04	.00	-.05	.03
Substance Use							
Current or Past Substance Abuse	904	10.3%	.08*	.10*	.09*	.11*	.14**
Current Substance Use	934	2.7%	.09*	.06	.05	.06	.05
Current Alcohol Abuse/Dependence	891	1.1%	.07*	.06	.00	.01	.03
Current Substance Abuse/Dependence	891	.8%	.04	-.01	.05	.03	-.02
Current Smoking	936	11.1%	.08*	.09*	.06	.09*	.07*
History of Substance Use	934	13.7%	.09*	.06	.06	.16**	.12**
History of Alcohol Abuse/Dependence	891	12.9%	.07*	.11**	.09*	.11**	.10*
History of Substance Abuse/Dependence	891	15.9%	.09*	.11*	.05	.11*	.13**
History of Smoking	936	35.0%	.02	-.04	.00	.02	.04

			Somatic Complaints Scales				
Criteria	n	% present	MLS	GIC	HPC	NUC	COG
Eating Disorders & Maladaptive Eating							
EDNOS (Binge Eating Disorder)	903	22.1%	.09*	.02	.06	.05	.17**
Number of Subjective Binges Per Week	982		.12**	.06	.08*	.04	.19**
Binge Eating Scale Score	864		.21**	.03	.11**	.06	.17**
Night Eating Syndrome	888	3.4%	.06	.03	.03	.05	.03
History of Laxative/Diuretic Use	888	6.3%	.03	.08*	.04	.07*	.12**
History of Vomiting to Lose Weight	888	4.4%	.03	.04	.08*	.06	.13**
Abuse History							
Sexual Abuse	914	15.3%	.11**	.18**	.15**	.11**	.14**
Physical Abuse	912	16.7%	.13**	.16**	.15**	.15**	.14**
Exercise							
No Current Exercise Program	858	55.4%	.22**	.04	.07*	.08*	.06
BMI							
At intake	921		.20**	-.03	.04	.07*	-.03
At surgery	524		.16**	-.10*	.06	.07	-.02
Sleep Apnea/Adherence							
Diagnosed with OSA	925	44.4%	.18**	-.02	.05	.11**	.06
Adherent to CPAP	850	6.1%	.11*	-.02	.01	.05	.06

Note. * $p < .05$, ** $p < .001$, $r \geq .20$ (underlined), MMPI-2-RF (Minnesota Multiphasic Personality Inventory – 2 Restructured Form); NOS (Not Otherwise Specified); BMI (Body Mass Index); OSA (Obstructive Sleep Apnea); CPAP (Continuous Positive Airway Pressure); MLS (Malaise); GIC (Gastrointestinal Complaints); HPC (Head Pain Complaints); NUC (Neurological Complaints); COG (Cognitive Complaints).

Table 4

Correlations between the MMPI-2-RF Internalizing Specific Problem Scales with External Criteria

			Internalizing Specific Problem Scales								
Criteria	n	% Present	SUI	HLP	SFD	NFC	STW	AXY	ANP	BRF	MSF
Mental Health History/Treatment											
Psychiatric Hospitalization	939	11.3%	.09*	.11**	.19**	.18**	.14**	.17**	.13**	.15**	.07*
Past suicide attempt(s)	940	10.6%	.21**	.15**	.20**	.19**	.14**	.15**	.16**	.19**	.06
Past Psychotropic Medication Use	911	56.3%	.09*	.10*	.24**	.21**	.20**	.16**	.13**	.16**	.12**
Current Psychotropic Medication Use	947	41.8%	.08*	.08*	.16**	.14**	.17**	.15**	.10*	.10*	.09*
History of Outpatient Therapy	895	50.1%	.11**	.14**	.23**	.15**	.17**	.17**	.10*	.12**	.07*
History of Eating Disorder Treatment	888	1.9%	.01	.03	.12**	.09*	.06	.10*	-.01	.04	.03
Mental Health Diagnoses (Depression)											
Major Depression	906	11.3%	.22**	.20**	.28**	.25**	.14**	.16**	.12**	.09*	.08*
Dysthymia	906	1.1%	.00	.07*	.07*	.03	.07*	.08*	.02	.04	.02
Depression NOS	903	18.5%	.08*	.05	.08*	.07*	.10*	.03	.01	.00	.01
Mental Health Diagnoses (Anxiety)											

			Internalizing Specific Problem Scales								
Criteria	n	% Present	SUI	HLP	SFD	NFC	STW	AXY	ANP	BRF	MSF
Generalized Anxiety Disorder	892	1.8%	.00	.08*	.13**	.10*	.10*	.10*	.07*	.07*	.01
Panic Disorder	896	2.6%	.02	.07*	.08*	.07*	.05	.09*	.04	.14**	.04
Post-Traumatic Stress Disorder	891	1.7%	.04	.04	.06	.10*	.06	.15**	.07*	.12**	.04
Obsessive-Compulsive Disorder	891	.8%	.02	.08*	.11**	.09*	.07*	.16**	.11**	.08*	-.01
Anxiety NOS	873	8.2%	.04	.02	.10*	.03	.07	.06	.07	.10*	.04
Other Mental Health Diagnoses											
Bipolar Disorder	904	4.4%	.05	.02	.12**	.09*	.06	.12**	.11**	.12**	.06
Psychotic Disorders	904	.9%	.03	-.01	.06	.06	.04	.17**	.08*	.01	.10*
Personality Disorders	904	1.3%	.00	.09*	.06	.08*	.03	.04	.08*	.08*	.01
Learning/Developmental Disability	904	.7%	-.03	.05	.01	.08*	-.02	.01	.05	.00	-.02
Attention Deficit Hyperactivity Disorder	903	1.1%	-.04	.00	.09*	.05	.00	-.03	.01	.00	-.05
Substance Use											
Current or Past Substance Abuse	904	10.3%	.05	.08*	.13**	.12**	.11*	.14**	.14**	.10*	.04
Current Substance Use	934	2.7%	.08*	.05	.08*	.10*	.09*	.11**	.13**	.00	.09*
Current Alcohol Abuse/Dependence	891	1.1%	.12**	.06	.07*	.03	.06	.07	.06	.02	.04
Current Substance Abuse/Dependence	891	.8%	.02	.00	-.04	.03	.02	.02	.01	-.05	-.03

			Internalizing Specific Problem Scales								
Criteria	n	% Present	SUI	HLP	SFD	NFC	STW	AXY	ANP	BRF	MSF
Current Smoking	936	11.1%	-.01	.00	.06	.07*	.13**	.06	.10*	.03	.05
History of Substance Use	934	13.7%	.05	.06	.11*	.07*	.05	.08*	.15**	.08*	-.03
History of Alcohol Abuse/Dependence	891	12.9%	.02	.06	.09*	.07*	.05	.09*	.10*	.06	-.01
History of Substance Abuse/Dependence	891	15.9%	.09*	.05	.15**	.08*	.06	.11*	.18**	.09*	.01
History of Smoking	936	35.0%	.03	.05	.00	.01	-.02	.00	.08*	.00	.01
Eating Disorders & Maladaptive Eating											
EDNOS (Binge Eating Disorder)	903	22.1%	.09*	.13**	.15**	.16**	.13**	.19**	.13**	.10*	-.01
Number of Subjective Binges Per Week	982		.06*	.14**	.21**	.19**	.18**	.19**	.16**	.12**	.01
Binge Eating Scale Score	864		.15**	.20**	.33**	.27**	.23**	.17**	.21**	.15**	.05
Night Eating Syndrome	888	3.4%	.03	.03	.05	.05	.04	.08*	.04	.02	.04
History of Laxative/Diuretic Use	888	6.3%	.02	.05	.07*	.10*	.02	.08*	-.01	.07*	.08*
History of Vomiting to Lose Weight	888	4.4%	.06	.01	.11*	.07*	.07*	.10*	.06	.09*	.01
Abuse History											
Sexual Abuse	914	15.3%	.09*	.07*	.16**	.14**	.11**	.13**	.14**	.14**	.11*
Physical Abuse	912	16.7%	.07*	.03	.12**	.08*	.08*	.09*	.11*	.11**	.07*

			Internalizing Specific Problem Scales								
Criteria	n	% Present	SUI	HLP	SFD	NFC	STW	AXY	ANP	BRF	MSF
Exercise											
No Current Exercise Program	858	55.4%	.08*	.14**	.09*	.09*	.08*	.06	.05	.06	.04
BMI											
At intake	921		-.01	.03	.10*	.08*	.03	.01	.04	.06	.01
At surgery	524		.00	.04	.10*	.08	.02	.04	.06	.04	-.02
Sleep Apnea/Adherence											
Diagnosed with OSA	925	44.4%	.05	.08*	.02	.01	.04	-.01	.05	.05	-.03
Adherent to CPAP	850	6.1%	.00	.04	-.03	-.01	.02	-.02	.07	.04	-.02

Note. * $p < .05$, ** $p < .001$, $r \geq .20$ (underlined), MMPI-2-RF (Minnesota Multiphasic Personality Inventory – 2 Restructured Form); NOS (Not Otherwise Specified); BMI (Body Mass Index); OSA (Obstructive Sleep Apnea); CPAP (Continuous Positive Airway Pressure); SUI (Suicidal/Death Ideation);HLP (Helplessness/Hopelessness); SFD (Self-Doubt); NFC (Inefficacy); STW (Stress/Worry); ANX (Anxiety); ANP (Anger Proneness); BRF (Behavior-Restricting Fears); MSF (Multiple Specific Fears).

Table 5

Correlations between the MMPI-2-RF Externalizing Specific Problem Scales with External Criteria

			Externalizing Specific Problem Scales			
Criteria	n	% present	JCP	SUB	AGG	ACT
Mental Health History/Treatment						
Psychiatric Hospitalization	939	11.3%	.11**	.04	.06	.10*
Past suicide attempt(s)	940	10.6%	.11**	.05	.12**	.12**
Past Psychotropic Medication Use	911	56.3%	.05	.03	.08*	.02
Current Psychotropic Medication Use	947	41.8%	.00	-.01	.04	-.01
History of Outpatient Therapy	895	50.1%	.04	.06	.11*	.05
History of Eating Disorder Treatment	888	1.9%	.00	.06	-.01	.04
Mental Health Diagnoses (Depression)						
Major Depression	906	11.3%	-.02	.02	.04	.02
Dysthymia	906	1.1%	.00	.01	.04	-.03
Depression NOS	903	18.5%	.06	.05	.01	-.07*
Mental Health Diagnoses (Anxiety)						
Generalized Anxiety Disorder	892	1.8%	-.02	.01	.05	.07*
Panic Disorder	896	2.6%	.02	.02	.06	-.02
Post-Traumatic Stress Disorder	891	1.7%	.05	-.02	.05	.07*
Obsessive-Compulsive Disorder	891	.8%	.00	.07*	.08*	.06
Anxiety NOS	873	8.2%	.00	.01	.04	-.04

Other Mental Health Diagnoses						
Bipolar Disorder	904	4.4%	.09*	.04	.09*	.08*
Psychotic Disorders	904	.9%	.08*	.09*	.10*	.06
Personality Disorders	904	1.3%	.02	.07*	.06	.01
Learning/Developmental Disability	904	.7%	.06	.04	.01	.05
Attention Deficit Hyperactivity Disorder	903	1.1%	.03	-.02	.00	-.02
Substance Use						
Current or Past Substance Abuse	904	10.3%	.23**	.30**	.18**	.07*
Current Substance Use	934	2.7%	.12**	.24**	.09*	.08*
Current Alcohol Abuse/Dependence	891	1.1%	.02	.21**	.08*	.03
Current Substance Abuse/Dependence	891	.8%	.13**	.10*	.02	-.02
Current Smoking	936	11.1%	.14**	.03	.07*	.03
History of Substance Use	934	13.7%	.30**	.30**	.20**	.08*
History of Alcohol Abuse/Dependence	891	12.9%	.17**	.20**	.16**	.10*
History of Substance Abuse/Dependence	891	15.9%	.21**	.22**	.16**	.11**
History of Smoking	936	35.0%	.17**	.16**	.06	.04
Eating Disorders & Maladaptive Eating						
EDNOS (Binge Eating Disorder)	903	22.1%	.12**	.10*	.12**	.08*
Number of Subjective Binges Per Week	982	51.4%	.10**	.06	.12**	.04
Binge Eating Scale Scores	864		.10**	.10**	.13**	.08*
Night Eating Syndrome	888	3.4%	.05	-.02	.02	.05
History of Laxative/Diuretic Use	888	6.3%	.11**	.11*	.03	.10*
History of Vomiting to Lose Weight	888	4.4%	.04	.08*	.06	.05
Abuse History						
Sexual Abuse	914	15.3%	.04	.02	.06	.12**
Physical Abuse	912	16.7%	.14**	.04	.11*	.09*

Exercise						
No Current Exercise Program	858	55.4%	-.04	.02	.00	-.07*
BMI						
At intake	921		.07*	-.01	.03	.04
At surgery	524		.00	.00	.07	.04
Sleep Apnea/Adherence						
Diagnosed with OSA	925	44.4%	.02	-.02	.04	.01
Adherent to CPAP	850	6.1%	.00	-.02	.03	.02

Note. * $p < .05$, ** $p < .001$, $r \geq .20$ (underlined), MMPI-2-RF (Minnesota Multiphasic Personality Inventory – 2 Restructured Form); NOS (Not Otherwise Specified); BMI (Body Mass Index); OSA (Obstructive Sleep Apnea); CPAP (Continuous Positive Airway Pressure); JCP (Juvenile Conduct Problems); SUB (Substance Abuse); AGG (Aggression); ACT (Activation);

Table 6

Correlations between the MMPI-2-RF Interpersonal Problems Specific Problem Scales and Interest Scales

			Interpersonal Specific Problem Scales					Interest Scales	
Criteria	n	% present	FML	IPP	SAV	SHY	DSF	AES	MEC
Mental Health History/Treatment									
Psychiatric Hospitalization	939	11.3%	.18**	.05	.14**	.12**	.10*	.08*	-.03
Past suicide attempt(s)	940	10.6%	.23**	.02	.15**	.13**	.09*	.04	-.05
Past Psychotropic Medication Use	911	56.3%	.14**	.11**	.16**	.17**	.06	.04	-.11**
Current Psychotropic Medication Use	947	41.8%	.08*	.10*	.15**	.14**	.08*	.08*	-.07*
History of Outpatient Therapy	895	50.1%	.19**	.07*	.09*	.10*	.06	.09*	-.06
History of Eating Disorder Treatment	888	1.9%	.09*	.10*	.04	.07*	.05	.02	-.02
Mental Health Diagnoses (Depression)									
Major Depression	906	11.3%	.14**	.18**	.21**	.26**	.13**	.05	-.08*
Dysthymia	906	1.1%	.11**	.02	.09*	.12**	.04	-.02	.01
Depression NOS	903	18.5%	.03	.08*	.07*	.05	.03	.01	-.06
Mental Health Diagnoses (Anxiety)									

			Interpersonal Specific Problem Scales					Interest Scales	
Criteria	n	% present	FML	IPP	SAV	SHY	DSF	AES	MEC
Generalized Anxiety Disorder	892	1.8%	.10*	.00	.07*	.14**	.04	.03	-.02
Panic Disorder	896	2.6%	.05	.03	.07*	.09*	.03	.03	-.07*
Post-Traumatic Stress Disorder	891	1.7%	.16**	.02	.06	.02	-.01	.02	.02
Obsessive-Compulsive Disorder	891	.8%	.09*	-.01	.00	.05	-.03	.07*	-.03
Anxiety NOS	873	8.2%	.04	.05	.01	.06	.02	-.01	-.07*
Other Mental Health Diagnoses									
Bipolar Disorder	904	4.4%	.08*	.04	.13**	.09*	.06	.00	-.03
Psychotic Disorders	904	.9%	.07*	-.02	.08*	.05	.10*	.01	-.02
Personality Disorders	904	1.3%	.08*	-.02	.02	.05	-.03	-.01	-.03
Learning/Developmental Disability	904	.7%	.06	-.02	-.06	.02	.02	.01	.08*
Attention Deficit Hyperactivity Disorder	903	1.1%	.07*	.02	-.02	.01	-.02	.04	.00
Substance Use									
Current or Past Substance Abuse	904	10.3%	.14**	-.05	.03	.09*	.06	.02	.06
Current Substance Use	934	2.7%	.10*	-.03	.02	.04	.11**	.02	-.03
Current Alcohol Abuse/Dependence	891	1.1%	.06	-.02	.00	.03	.03	-.02	.01
Current Substance Abuse/Dependence	891	.8%	.04	-.03	.06	-.01	.04	-.02	.02

			Interpersonal Specific Problem Scales					Interest Scales	
Criteria	n	% present	FML	IPP	SAV	SHY	DSF	AES	MEC
Current Smoking	936	11.1%	.08*	-.06	.04	.07*	.04	-.06	.02
History of Substance Use	934	13.7%	.14**	-.09*	.07*	.03	.06	-.02	.12**
History of Alcohol Abuse/Dependence	891	12.9%	.09*	-.09*	.02	.00	.06	-.05	.10*
History of Substance Abuse/Dependence	891	15.9%	.10*	-.08*	.04	.01	.03	.02	.00
History of Smoking	936	35.0%	.00	-.02	.03	.05	.00	-.03	.05
Eating Disorders & Maladaptive Eating									
EDNOS (Binge Eating Disorder)	903	22.1%	.15**	.06	.15**	.15**	.09*	.04	-.03
Number of Subjective Binges Per Week	982	51.4%	.17**	.05	.13**	.16**	.11**	.03	-.06*
Binge Eating Scale Scores	864		.20**	.07*	.17**	.23**	.15**	.01	-.02
Night Eating Syndrome	888	3.4%	.05	-.04	-.01	.00	.01	.00	-.04
History of Laxative/Diuretic Use	888	6.3%	.08*	.02	.01	.03	.06	.08*	-.05
History of Vomiting to Lose Weight	888	4.4%	.09*	.02	.00	.02	.07*	.06	-.06
Abuse History									
Sexual Abuse	914	15.3%	.19**	.04	.11**	.12**	.05	.10*	-.12**
Physical Abuse	912	16.7%	.27**	.01	.13**	.10*	.07*	.07*	-.07*

			Interpersonal Specific Problem Scales					Interest Scales	
Criteria	n	% present	FML	IPP	SAV	SHY	DSF	AES	MEC
Exercise									
No Current Exercise Program	858	55.4%	.04	.06	.14**	.09*	.05	-.06	.00
BMI									
At intake	921		.05	-.02	.07*	.09*	.06	-.02	.05
At surgery	524		.06	-.01	.06	.09*	.10*	-.01	-.03
Sleep Apnea/Adherence									
Diagnosed with OSA	925	44.4%	.03	-.03	.08*	.09*	.04	-.06	.15**
Adherent to CPAP	850	6.1%	.01	-.07*	.07*	.03	.04	-.06	.12**

Note. * $p < .05$, ** $p < .001$, $r \geq .20$ (underlined), MMPI-2-RF (Minnesota Multiphasic Personality Inventory – 2 Restructured Form); NOS (Not Otherwise Specified); BMI (Body Mass Index); OSA (Obstructive Sleep Apnea); CPAP (Continuous Positive Airway Pressure); FML (Family Problems); IPP (Interpersonal Passivity); SAV (Social Avoidance); SHY (Shyness); DSF (Disaffiliativeness); AES (Aesthetic Interest Scale); Mechanical Interest Scale (MEC);

Table 7

Correlations between the MMPI-2-RF Personality Psychopathology—5 (PSY-5) Scales with External Criteria

Criteria	n	% Present	PSY-5 Scales				
			AGGR-r	PSYC-r	DISC-r	NEGE-r	INTR-r
Mental Health History/Treatment							
Psychiatric Hospitalization	939	11.3%	-.06	.13**	.03	.19**	.12**
Past suicide attempt(s)	940	10.6%	.01	.15**	.03	.21**	.14**
Past Psychotropic Medication Use	911	56.3%	-.11**	.04	-.05	.24**	.19**
Current Psychotropic Medication Use	947	41.8%	-.09*	.01	-.06	.18**	.18**
History of Outpatient Therapy	895	50.1%	-.07*	.06	.01	.22**	.12**
History of Eating Disorder Treatment	888	1.9%	-.11*	.05	-.02	.05	.06
Mental Health Diagnoses (Depression)							
Major Depression	906	11.3%	-.17**	.06	-.05	.20**	.23**
Dysthymia	906	1.1%	-.02	.02	.02	.05	.09*
Depression NOS	903	18.5%	-.09*	-.02	.01	.07*	.11*
Mental Health Diagnoses (Anxiety)							
Generalized Anxiety Disorder	892	1.8%	.00	.03	-.01	.13**	.06
Panic Disorder	896	2.6%	-.01	.00	.00	.08*	.06
Post-Traumatic Stress Disorder	891	1.7%	.00	.11*	.04	.10*	.03
Obsessive-Compulsive Disorder	891	.8%	-.01	.09*	-.02	.11*	.00
Anxiety NOS	873	8.2%	-.04	-.02	-.04	.09*	.06

Criteria	n	% Present	PSY-5 Scales				
			AGGR-r	PSYC-r	DISC-r	NEGE-r	INTR-r
Other Mental Health Diagnoses							
Bipolar Disorder	904	4.4%	-.03	.07*	.00	.10*	.10*
Psychotic Disorders	904	.9%	.04	.09*	.04	.09*	.05
Personality Disorders	904	1.3%	.02	.03	.05	.06	.01
Learning/Developmental Disability	904	.7%	.02	.06	.09*	.01	-.05
Attention Deficit Hyperactivity Disorder	903	1.1%	-.03	-.03	.03	.00	.00
Substance Use							
Current or Past Substance Abuse	904	10.3%	.08*	.14**	.21**	.14**	.03
Current Substance Use	934	2.7%	.06	.08*	.13**	.09*	.00
Current Alcohol Abuse/Dependence	891	1.1%	.03	.04	.04	.08*	-.01
Current Substance Abuse/Dependence	891	.8%	.02	-.02	.10*	-.01	.07*
Current Smoking	936	11.1%	.07*	.05	.13**	.11**	.03
History of Substance Use	934	13.7%	.13**	.14**	.28**	.12**	.05
History of Alcohol Abuse/Dependence	891	12.9%	.12**	.12**	.19**	.08*	-.01
History of Substance Abuse/Dependence	891	15.9%	.10*	.09*	.18**	.13**	.02
History of Smoking	936	35.0%	.03	.03	.12**	.02	.01
Eating Disorders & Maladaptive Eating							
EDNOS (Binge Eating Disorder)	903	22.1%	-.06	.12**	.04	.18**	.14**
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Criteria	n	% Present	PSY-5 Scales				
			AGGR-r	PSYC-r	DISC-r	NEGE-r	INTR-r
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Sexual Abuse	914	15.3%	-.03	.10*	-.01	.16**	.06
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No Current Exercise Program	858	55.4%	-.04	.02	-.05	.09*	.18**
BMI							
At intake	921		.00	.05	.07*	.06	.04
At surgery	524		.02	.07	-.01	.08	-.01
Sleep Apnea/Adherence							
Diagnosed with OSA	925	44.4%	.07*	.06	.07*	.04	.06
Adherent to CPAP	850	6.1%	.11*	.07*	.05	.02	.04

Note. * $p < .05$, ** $p < .001$, $r \geq .20$ (underlined), MMPI-2-RF (Minnesota Multiphasic Personality Inventory – 2 Restructured Form); NOS (Not Otherwise Specified); BMI (Body Mass Index); OSA (Obstructive Sleep Apnea); CPAP (Continuous Positive Airway Pressure); AGGR-r (Aggressiveness-Revised), PSYC-r (Psychoticism-Revised), DISC-r (Disconstraint-Revised), NEGE-r (Negative Emotionality/Neuroticism-Revised), INTR-r (Introversion/Low Positive Emotionality-Revised).

Discussion

The MMPI-2-RF descriptive statistics (Table 1) demonstrated mean profile scores in this sample that are nearly interchangeable with the smaller bariatric surgery candidate comparison group reported in the MMPI-2-RF Technical Manual (Tellegen & Ben-Porath, 2008/2011). This suggests that across different sites, bariatric surgery candidates present in a similar manner, adding to the clinical utility of the published norms. Further, bariatric surgery candidates of both genders produced comparable MMPI-2-RF profiles. Bariatric surgery candidates produce mean MMPI-2-RF validity and substantive scale scores that are, on average, within normal limits, with the exception of above average scores on Malaise (MLS). The higher mean scores found on MLS indicate that bariatric surgery patients are likely to present as being preoccupied with poor health as well as having low energy or sleep disturbance (Ben-Porath & Tellegen, 2008/2011). This finding likely stems from the high rate of weight-related medical co-morbidities found among bariatric surgery candidates (Mechanick et al., 2009). However, the reported standard deviations indicate that a substantial number of bariatric surgery candidates do produce clinically elevated MMPI-2-RF scores.

Rates of psychiatric comorbidity in this sample are relatively consistent with those found in other clinical samples (Kalarchian et al., 2007; Mitchell et al., 2012). Broadly speaking, the domains associated with the MMPI-2-RF scales converged well

with the factors assessed from the psychological interview pointing to the validity and utility of the MMPI-2-RF. Higher scores in the internalizing domain were positively associated with mental health history, treatment, maladaptive eating behaviors/diagnoses, as well as active Major Depression. A Major Depression diagnosis was also associated with somatic scales on the MMPI-2-RF, lending to the possibility that internalizing problems may be a facet of somatization. However, the direction of this relationship is unknown and future research is warranted. Scores on scales in the externalizing domain were positively associated with current and past substance use, as well as previous physical abuse. History of physical abuse was also associated with reported family problems reported on the MMPI-2-RF. These findings demonstrate that the substantive scales on the MMPI-2-RF are able to assess multiple factors that clinicians should further assess for during a psychological interview. This indicates that the test can be used by the clinician to identify possible current or past problems that may be risk factors for diminished outcome. These findings add to a robust and growing literature that supports the validity of MMPI-2-RF scales as a measure of clinically-relevant psychological constructs.

Correlates of the Restructured Clinical (RC) scales with bariatric surgery criteria outlined in Table 2 were also consistent with previously reported findings (Wygant et al., 2007). Of interest are the similar correlations for Antisocial Behaviors (RC4). Constructs assessed on RC4 have been related to past criminal behavior and social deviance (Ben-Porath, 2012; Ben-Porath & Tellegen, 2008/2011; Sellbom, Ben-Porath,

Lilienfeld, Patrick, & Graham, 2005). However, in bariatric surgery populations, elevations on RC4 are more broadly associated with under-controlled behavioral, substance abuse, and negative childhood experiences (e.g., history of physical abuse) (Wygant et al., 2007). Additionally, RC4 in this study yielded small to moderate associations with maladaptive eating variables, though internalizing scales were more strongly associated. Consistent with our findings, negative affect has also been linked to binge eating in obese individuals (Haedt-Matt & Keel, 2011), but future studies should also measure the degree to which under-controlled behavior with increased negative affect contributes to a higher likelihood of binge eating.

The primary limitation of this study is that it focused only on pre-surgical variables. Although these variables are ones that have been found previously to predict post-surgical outcomes (Kalarchian et al., 2008; Semanscin-Doerr et al., 2010), future research should directly examine the ability of the MMPI-2-RF to predict post-surgical diminished outcomes, such as excess body weight loss, improvements in quality of life, or ongoing psychological and maladaptive eating behaviors. Specifically, it is plausible that there are associations with scores in the Behavioral/Externalizing Domain (BXD) domain and behavioral non-adherence after surgery (e.g., drinking caffeinated beverages, lack of exercise, insufficient hydration, etc.) or scores in the Emotional/Internalizing Domain (EID) domain and continued signs or symptoms of depression, anxiety, and maladaptive eating behaviors following bariatric surgery.

Further research in this area should explore the impact of pre-surgical scores on the MMPI-2-RF and its contribution to predicting diminished outcomes. Higher scores on the somatic may be able to predict whether or not some patients will face more medical complications following surgery – such as dumping, vomiting, or excess pain. Scores on the internalizing scales may predict which patients are more at risk for experiencing psychological distress or a recurrence of a psychiatric disorder (e.g., Major Depression Disorder) that have been supported to reduce surgical impact (Kalarchian et al., 2008; Mechanick et al., 2009; Semanscin-Doerr, Windover, Ashton, & Heinberg, 2010). Further, the combination of internalizing scales, reports of cognitive complaints, and scores on the externalizing scales may be predictive of post-surgical maladaptive eating patterns. One additional area to explore would be the impact of under-reporting in this population. Within the current sample, approximately thirty percent of individuals produce an elevation on Uncommon Virtues (L-r) or Adjustment Validity (K-r). Further, approximately one-third of those score above the cutoff for the protocol to be considered invalid. Future research should address this concern and explore its implications for post-surgical outcome.

Overall, the MMPI-2-RF can assist in identifying a broad range of psychopathology typically found in pre-surgical bariatric populations and adds to growing literature of using the MMPI-2-RF as part of a presurgical psychological screening (Block. Ben-Porath, & Marek, 2013). The use of this instrument, in conjunction with a pre-surgical psychological interview, can aid in the assessment of

psychological factors relevant to pre-surgical psychological assessment of bariatric surgery candidates. A smaller version of this study was accepted for publication and printed in the journal *Obesity Surgery* in November, 2013 (Marek, Ben-Porath, Windover, et al., 2013). The final publication is available at link.springer.com (http://link.springer.com/article/10.1007%2Fs11695-013-1024-x).

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