

Personality and Obese Body Mass Index

Michael Pickren Valenti

Hawaii School of Professional Psychology at Argosy University, Hawaii

Michael M Omizo

Hawaii School of Professional Psychology at Argosy University, Hawaii

Lewis Mehl-Madrona

Union Institute and University

This study investigated the relationship between obese range Body Mass Index (BMI) and personality variables as measured by the Minnesota Multiphasic Personality Inventory-2 (MMPI-2). The sample consisted of 129 obese participants referred for preoperative psychological evaluation. Each completed an MMPI-2 and clinical interview. Multilevel linear regression analysis was used to assess the contribution of personality variables to the prediction of variance in obese range BMI. Age, Scale 9 (Hypomania), and Scale 4 (Psychopathic Deviate) emerged as statistically significant predictors of BMI. Each predicted 7.8%, 6.4%, and 3.1% of the variance of participant BMI, respectively, with a combined prediction power of 17.3%. F-scores for the final, best fit model, with age on Level 1 and Scale 9 and Scale 4 on Level 2, were statistically significant ($p < .0009$). Results suggest severely obese bariatric surgery candidates may be more prone to impulsivity, irritability, and instability. However, limited predictive power of MMPI-2 scales indicates restricted clinical utility.

Keywords: Obesity, BMI, MMPI-2, Personality, Age

Obesity is a global issue of epidemic proportion. The World Health Organization [WHO] (2011) reports in 2008, 500 million adults were obese and by 2015 this number is anticipated to reach 700 million. Obesity is defined as a body mass index over 30 or “excessive fat accumulation” (WHO, 2011). Obesity reduces an individual’s life expectancy between 5 to 20 years (Olshansky et al., 2005) and is as deleterious as heavy smoking (Neovius, Sundström, & Rasmussen, 2009). Moreover, it significantly increases a person’s risk of developing coronary heart disease, stroke, type 2 diabetes mellitus, and cancer (Center for Disease Control, 2008). Obesity is attributable to over 110,000 deaths annually in the United States (Flegal, Graubard, Williamson, & Gail, 2005).

Intentional weight loss in obese individuals is associated with a 24% reduction in mortality (Gregg, Gerzoff, Thompson, & Williamson, 2003). Despite the benefits, effective weight loss strategies remain elusive. Lifestyle modification, pharmacological treatment, and surgical intervention all present advantages and disadvantages (Bond, Phelan, Leahey, Hill, & Wing, 2009; Davis, Shish, Chao, & Cabana, 2006; Latner et al., 2000; Maggard et al., 2005; Padwal, Li, & Lau, 2003; Saris, 2001). However, treatment efficacy is related to more than modality alone. A patient’s expectations and perceived stress significantly affect outcome (Finch, Linde, Jeffery, Rothman, & King 2005; Hartigan et al., 1982; Kim, Bursac, DiLillo, White, & West, 2009). Furthermore, belief in one’s ability to lose weight is a powerful predictor of treatment success (Hartigan, Baker-Strauch, & Morris, 1982). This mind-body relationship appears bilateral and dynamic. A longitudinal study found multiple post-intervention personality changes proportionate to weight loss, with the largest improvements on measures of anxiety (Ryden et al., 2004). Initial weight loss may be reversed by certain psychological characteristics. Patients who relapse tend to exhibit more binary thinking, dissatisfaction, limited vigilance, and use of food in mood regulation (Byrne, Cooper, & Fairburn, 2003).

Obesity and Personality

Research on personality and obesity reveals a complex relationship. Obese individuals tend to be more impulsive, addictive, anxious, and novelty seeking than healthy weight counterparts even after controlling for treatment seeking behavior and binge eating disorder (Davis et al., 2008; Sullivan, Cloninger, Przybeck, & Klein, 2007). Treatment seeking behavior is associated with increased cooperativeness and reward dependence, while non-treatment seeking individuals tend to score lower on measures of persistence and self-directedness (Sullivan et al., 2007). Novelty seeking is key in intervention outcome and is negatively associated with successful weight loss after 22 weeks of treatment (Sullivan et al., 2007). A period of two years of successful weight loss is associated with changes in personality traits with significant reductions in measures of anxiety (Ryden et al., 2004). Although numerous statistically significant personality differences have been identified between obese and non-obese populations, effects sizes are small to moderate and do not suggest an obese personality profile (Ryden et al., 2003). Rather, individual personality traits are related to a dynamic combination of weight status, treatment seeking behavior, comorbidities, and intervention success (Ryden et al., 2003; Ryden, et al., 2004).

MMPI-2 and Obese Gastric Bypass Surgery Candidates

Pre-operative psychological evaluation is imperative for successful outcome of gastric bypass surgery (Breznikar & Dinevski, 2009). Minnesota Multiphasic Personality Inventory-2 (MMPI-2) has been used for decades in research and clinical assessment of pre-operative psychological screenings and obese populations (Crompton, Wine, & Groot, 1966; Johnson, Swenson, & Gastineau, 1976; Tsushima, Bridenstine, & Balfour, 2004). Obese bariatric surgery candidates tend to produce profiles more highly elevated than the general population (Kinder, Walfish, Young, & Fairweather, 2008) despite markedly defensive responding (Ruchinskas, Combs, Riley, & Broshek, 2006). Research results are mixed and do not support a typical profile

for obese populations. Elevations tend to be moderate and overlap most commonly on scales 1, 2, 3, which suggests depressive, anxious, and psychosomatic attributes (Kinder, Walfish, Young, & Fairweather, 2008; Maddi, Khoshiba, Persico, Bleeker, & VanArsdall, 1997; Tsushima et al., 2004). However, research has also indicated increased elevations on scales 4, 6, 7, 9, 0 (Johnson et al., 1976; Prather & Williamson, 1988; Tsushima, Bridenstine, & Balfour, 2004). Elevations on the MMPI-2 clinical scales 1, 2, and 3 were cross validated by research demonstrating similar elevations on the MMPI-2 Restructured Clinical Scales (Wygant, Boutacoff, Arbisi, Ben-Porath, Kelly, & Rupp, 2007). The connection between weight status and personality traits is further illustrated by studies that demonstrated successful weight loss decreases maladaptive personality traits (Maddi et al., 2001) and comorbid psychiatric disorder while improving social relations (Herpertz et al., 2003).

Current Investigation

The purpose of this study is to investigate the relationship between MMPI-2 personality profiles and degree of obesity among a diverse sample of gastric bypass surgery candidates. This study aims to augment current knowledge by investigating within group personality variance among an obese sample. A literature review revealed a focus on comparing obese samples to healthy weight individuals (Kinder et al., 2008; Maddi et al., 1997; Strine et al., 2008). Research suggests no specific personality profile among obese populations (Johnson et al., 1976; Ryden, 2003), however commonalities in MMPI-2 scale elevations exist (Kinder et al., 2008; Tsushima et al., 2004). Comparison neglects the diversity and complexity of obese populations while limiting depth of exploration. We hypothesize that the previously mentioned personality commonalities may also be related to degree of obesity. Our study will focus on personality divergence as related to weight status within the obese range.

Methods

Participants

The sample is composed of gastric bypass candidates referred for preoperative psychological assessment in Hawaii. As part of the battery participants completed a clinical interview, MMPI-2, and Eating Disorder Inventory-2. A psychologist supervised all assessments. For the purpose of our investigation only MMPI-2 and demographics data (age, race, gender) were collected. Participants are a diverse group of 129 (74% female) obese individuals. Participant age ranged from 18 to 67 years old ($m=44$, $SD=11.87$). Participant BMI ranged from 32.3 to 79.4 ($m=50.37$, $SD=8.99$). The sample is composed of 33% Caucasian, 30% mixed race, 16% Asian, 12% Pacific Islander, 5% African-American, and 2% Hispanic participants.

Measures

Body Mass Index. BMI is an inferential measure of body fat based on a calculation of height and weight (U.S. Department of Health and Human Services, n.d.). Height and weight measurements were derived from medical provider notes. This data was used to calculate BMI for each participant.

MMPI-2. The Minnesota Multiphasic Personality Inventory (MMPI) and newer version Minnesota Multiphasic Personality Inventory-2 (MMPI-2) have been utilized for over half a century in clinical assessment and research (Nichols, 2001). The original purpose of the MMPI was to assist in diagnosis, however it has also been found to be effective in personality and behavioral description (Graham, 2006). The MMPI-2 consists of 567 true or false questions. Sample items include "I have never seen a vision", "I feel anxiety about something or someone almost all the time", and "I believe I am being followed". The MMPI-2 is composed of several validity scales, which measure test taking approaches, and clinical scales, which assess personality, psychopathology, and interpersonal style (Butcher & Williams, 2000). Each scale is composed of multiple questions that equate to a raw score. Raw scores are converted to T-scores ($m=50$, $SD=10$) and clinical significance is signified by a variance of 1.5 standard deviations (Butcher & Williams, 2000).

Validity scales evaluate answer omission, favorable self-portrayal, deviant responding, defensiveness, and test taking consistency (Graham, 2006). Clinical scales are designated by number and corresponding description. The following descriptions are abbreviated and do not completely encompass function. Scale 1 (Hypochondriasis) measures one's preoccupation with health and psychosomatic propensity. Scale 2 (Depression) evaluates one's cognitive, behavioral, emotional, and physical symptoms of depression. Scale 3 (Hysteria) assesses propensity to develop physical symptoms in reaction to stress. Scale 4 (Psychopathic Deviate) measures one's tendency towards interpersonal conflict, rebellion, disregard of social virtues, and exploitation of others. Scale 5 (Masculinity-Femininity) appraises a person's adherence to gender stereotypes. Scale 6 (Paranoia) measures one's propensity to feel misunderstood, interpret other's actions as persecutory, and social sensitivity. Scale 7 (Psychasthenia) assesses proneness to anxiety, obsession, worry, rumination, and fearfulness in response to stress. Scale 8 (Schizophrenia) measures reality testing, detachment, and impassivity. Scale 9 (Hypomania) appraises hyperactivity, arousal, impulsivity, and grandiosity. Scale 10 (Social Introversion) evaluates social style including introversion/extroversion, desire for interaction, and interpersonal skills (Nichols, 2001).

The use of code types in interpretation is well researched and common clinical practice (Graham, 2006). Code types utilize combinations of elevations, rather than interpreting one scale at a time. (Graham, 2006). A two-point code type lists the highest elevation first and the second highest elevation second (e.g. 2-4). Three-point code types exist in profiles with three clinically elevated scales. This code type would be listed in a similar manner with the third highest elevation at the end (e.g. 2-4-8) (Graham, 2006).

Statistical Analysis

Data was analyzed using SPSS 17.0. The preliminary analysis obtained descriptive statistics. Next, graphing methods of exploratory data analysis were used to determine if the data were linear (Tukey, 1977). The data conformed to assumptions of linearity. Then stepwise linear multilevel regression analysis was used with demographic variables in level 1 and MMPI variables in level 2. Multilevel analysis was used due to the categorical

PERSONALITY AND OBESE BODY MASS INDEX

difference of demographic variables from personality variables and the potential correlation of personality and demographics (i.e. gender and personality). All variables were available as potential candidates for entry into the regression equation and those that contributed significantly to the prediction of the variance were reported.

Results

Regression Diagnostics

Standard regression diagnostics were applied. The histogram of residuals presented a normal distribution and P-P plotted residuals followed a 45-degree line. Variance of the errors and predicted BMI were not positively correlated. The scatterplot of Cook's distances versus leverage showed two outliers identified as cases 116 and 125. The final analysis included the outliers as their presence did not significantly alter the results.

Regression Analysis

Stepwise linear multilevel regression with demographic variables in level 1 and MMPI variables in level 2 resulted in the inclusion of age in level 1, and Scale 9 (Hypomania) ($m = 53.43$, $SD = 10.19$) followed by Scale 4 (Psychopathic Deviate) ($m = 59.73$, $SD = 10.62$) in level 2 with BMI as the dependent variable. Model 1 included age and predicted 7.8% of variance in BMI, $R^2 = .078$, $F(1,128) = 10.7$; $p = .001$, 95% CI [53.86, 65.57]. Model 2 included age + Scale 9 and predicted 14.2% of variance in BMI, $R^2 = .142$, $F(2, 128) = 10.46$; $p < .0009$, 95% CI [37.33, 57.02]. Model 3 included age + Scale 9 + Scale 4 and predicted 17.3% of variance in BMI, $R^2 = .173$, $F(3,128) = 8.69$; $p < .0009$, 95% CI [43.69, 70.35]. Variables in Model 3 exhibited a positive relationship ($R^2_{adj} = .153$). Standardized regression coefficient values for age, Scale 4, and Scale 9 were $-.306$ ($t = -3.648$; $p < .0009$), $-.180$ ($t = -2.135$; $p = .035$), and $.270$ ($t = 3.296$; $p = .001$), respectively. Clinically interpretable elevations ($t > 65$) were exhibited by 28% of participants on Scale 4 and 16% of participants on Scale 9.

Discussion

The central objective of this study was to investigate personality variance within an obese sample to better understand the influence of degree of obesity. Results indicate that scales 9 and 4 were statistically significant predictors of increased BMI within the obese range, detecting 6.4% and 3.1% of variance, respectively. Despite statistical significance, low predictive power suggests these scales are not clinically meaningful predictors of BMIs in the obese range. Previous research has also found increased elevations on scales 4 and 9 among obese populations (Johnson et al., 1976; Prather & Williamson, 1988; Tsushima et al., 2004). However, methodologies contrasted healthy weight and obese samples, making comparison difficult. Contrary to previous research, our study did not find an association between weight and scales 1, 2, and 3 (Kinder et al., 2008; Maddi et al., 1997; Tsushima et al., 2004) suggesting that once in the obese range, personality variables and symptoms related to these scales do not increase. Similar to previous research, our study demonstrates that there is significant personality heterogeneity among obese individuals (Ryden et al., 2003).

Combining scales 9 and 4 creates a common code type (Nichols, 2001). Individuals endorsing a 9-4 code type may be described as stimulation seeking, impulsive, irritable, reckless, irresponsible, and unstable (Nichols, 2001). Our findings are corroborated by research utilizing non-MMPI-2 measures of personality that found obese populations more impulsive, addictive, anxious, and novelty seeking than healthy weight controls (Davis et al., 2008; Sullivan et al., 2007). Such personality characteristic may lead to the binge and chronic over eating common in obese populations (Kolotkin, Revis, Kirkley, & Janick, 1987). The limited predictive power of scales 9 and 4 suggests this association becomes less substantial within the obese range.

In our study over 90% of BMI variance was not predicted by the MMPI-2, suggesting that it is not particularly sensitive to personality variance and degree of obesity. Research suggests that individuals' casual attributions and treatment outcome expectations contribute to the onset and maintenance of obesity (Finch et al., 2005; Hartigan et al., 1982). Accordingly, it is hypothesized that the MMPI-2's inability to assess the aforementioned beliefs may have decreased predictability as such beliefs could be positively correlated with degree of obesity.

A significant portion of research indicates obese individuals exhibit increased elevations on multiple clinical scales (Kinder et al., 2008; Maddi et al., 1997; Tsushima et al., 2004). However, our findings indicated a relationship only between scales 9 and 4, and BMI. This may be the result of using a sample of only obese participants. Including healthy weight participants may have significantly increased prediction power of the MMPI-2 because it provides a greater contrast. Combining previous research with this study suggests that obese BMI significantly increases the likelihood of MMPI-2 clinical scale elevations (Kolotkin et al., 1987; Prather & Williamson, 1988), however once in the obese range less variation exists.

Age of participant was the best predictor, accounting for nearly 8% of variance and almost half of the model's predictive power. This finding appears related to the gradual weight gain humans experience with age due to a combination of muscle loss, hormonal changes, and increased sedentary lifestyle (Vardi & Pinhas-Hamiel, 2000).

Limitations and Future Research

This study contains several limitations that influence interpretation and application. Our sample consisted of primarily female gastric bypass candidates from Hawaii. The demographic makeup of our sample is not reflective of the general US population, which limits generalizability of the results. Furthermore, all participants in this study were treatment seeking. Research suggests significant differences between treatment seeking and non-treatment seeking obese populations (Sullivan et al., 2007). Thus, results may not be generalizable to the entire obese population nor is it likely to be most representative of obese gastric bypass candidates.

Another limitation is that the MMPI-2 does not assess beliefs related to treatment outcome expectation or casual attribution of obesity. Employing an additional instrument to measure beliefs may yield more illuminating results as beliefs have been found related to weight status (Finch et al., 2005; Hartigan et al., 1982).

Furthermore, we restricted our analysis to the validity and clinical scales to focus on the most fundamental aspects of the MMPI-2. Including content and supplementary scales may have expanded or clarified findings. Additionally, BMI is not a direct measure of body fat, rather an inferential measure based on an individual's height and weight (U.S. Department of Health and Human Services, n.d.). Lean individuals with large muscle mass could be labeled obese according to BMI. A direct measure of adiposity would yield results most specific to obesity.

The limitations of our study provide an array of future research opportunities. Employing a direct measure of body fat would yield more exact information on the relationship between obesity and personality. Measuring treatment outcome expectation and casual attribution of obesity would offer breadth and increase our understanding of their possible moderating effects.

Conclusions

Our study suggests a positive relationship between MMPI-2 scales 4 and 9, and BMI among individuals seeking bariatric surgery in Hawaii. Among MMPI-2 profiles, the 9-4 is a common code type related to personality variables of recklessness, impulsivity, and stimulation seeking. Age was our most robust predictor of increased BMI. This appears related to the natural progression of bodily changes that increase body fat as people age. Future studies are needed to examine the clinical implications of the personality variables. Understanding their clinical presence and effect may influence pre-operative counseling and post-operative follow up.

References

- Bond, D. S., Phelan, S., Leahey, T.M., Hill, J. O., & Wing, R. R. (2009). Weight-loss maintenance in successful weight losers: surgical vs non-surgical methods. *International Journal of Obesity*, 33, 173-180.
- Breznikar, B., & Dinevski, D. (2009). Bariatric surgery for morbid obesity: Pre-operative assessment, surgical techniques and post-operating monitoring. *The Journal of International Medical Research*, 37(5), 1632-1645.
- Butcher, J. N., & Williams, C. L. (2000). *Essentials of MMPI-2 and MMPI-a interpretation* (2nd ed.). Minneapolis: University of Minnesota Press.
- Byrne, S., Cooper, Z., & Fairburn, C. (2003) Weight maintenance and relapse in obesity: A qualitative study. *International Journal of Obesity*, 27, 955-962.
- Center for Disease Control and Prevention. (2008). Obesity and overweight: Introduction. Retrieved from <http://www.cdc.gov/NCCDPHP/dnpa/obesity/>
- Crumpton, E., Wine, D. B., & Groot, H. (1966). MMPI profiles of obese men and six other diagnostic categories. *Psychological Reports*, 19(3), 1110.
- Davis, C., Levitan, R. D., Carter, J., Kaplan, A. S., Reid, C., Curtis, C., Patte, K., & Kennedy, J.L. (2008). Personality and eating behaviors: A case-control study of binge eating disorder. *International Journal of Eating Disorders*, 41, 243-250.
- Davis, M. M., Slish, K., Chao, C., & Cabana, M. D. (2006) National trends in bariatric surgery, 1996-2002. *Archives of Surgery*, 141, 71-74.
- Finch, E. A., Linde, J. A., Jeffery, R. W., Rothman, A. J., & King, C. M. (2005). The effects of outcome expectations and satisfaction on weight loss and maintenance: Correlational and experimental analyses - A randomized trial. *Health Psychology*, 24(6), 608-616.
- Flegal, K. M., Graubard, B. I., Williamson, D. F., & Gail, M. H. (2005). Excess deaths associated with underweight, overweight, and obesity. *Journal of the American Medical Association*, 293(15), 1861-1867.
- Graham, J. R. (2006) *MMPI-2: Assessing personality and psychopathology* (4th ed.). New York: Oxford University Press.
- Gregg, E. W., Gerzoff, R. B., Thompson, T. J., & Williamson, D. F. (2003) Intentional weight loss and death in overweight and obese U.S. adults 35 years of age and older. *Annals of Internal Medicine*, 138(5), 383-389.
- Hartigan, K. J., Baker-Strauch, D., & Morris, G. W. (1982). Perceptions of the causes of obesity and responsiveness to treatment. *Journal of Counseling Psychology*, 29(5), 478-485.
- Herpertz, S., Kielmann, R., Wolf, A. M., Langkafel, M., Senf, W., & Heberbrand, J. (2003). Does obesity surgery improve psychosocial functioning? A systematic review. *International Journal of Obesity*, 27, 1300-1314.
- Johnson, S. F., Swenson, W. M., & Gastineau, C. F. (1976). Personality characteristics in obesity: Relation of MMPI profile and age of onset of obesity to success in weight reduction. *The American Journal of Clinical Nutrition*, 29, 626-632.
- Kim, K. H., Bursac, Z., DiLillo, V., White, D. B., & West, D. S. (2009). Stress, race, body weight. *Health Psychology*, 28(1), 131-135.
- Kinder, B. N., Walfish, S., Young, M. S., & Fairweather, A. (2008). MMPI-2 profiles of bariatric surgery patients: A replication and extension. *Obesity Surgery*, 18, 1170-1179.
- Kolotkin, R. L., Revis, E. S., Kirkley, B. G., & Janick, L. (1987). Binge eating in obesity: associated MMPI characteristics. *Journal of Consulting and Clinical Psychology*, 55(6), 872-876.
- Latner, J. D., Stunkard, A. J., Wilson, G. T., Jackson, M. L., Zelitch, D. S., & Labouvie, E. (2000). Effective long-term treatment of obesity: a continuing care model. *International Journal of Obesity*, 24(7), 893-898.
- Maddi, S. R., Fox, S. R., Khoshaba, D. M., Harvey, R. H., Lu, J. L., & Persico, M. (2001). Reduction in psychopathology following bariatric surgery for morbid obesity. *Obesity Surgery*, 11(6), 680-685.
- Maddi, S. R., Khoshaba, D. M., Persico, M., Bleecker, F., & VanArsdall, G. (1997). Psychosocial correlates of psychopathology in a national sample of morbidly obese. *Obesity Surgery*, 7, 397-404.
- Maggard, M. A., Shugarman, L. R., Suttrop, M., Maglione, M., Sugerman, H. J., Livingston, E. H., Nguyen, N. T., Li, Z., Mojica, W. A., Hilton, L., Rhodes, S., Morton, S. C., & Shekelle, P. G. (2005). Meta-analysis: surgical treatment of obesity. *Annals of Internal Medicine*, 142(7), 547-559.
- Neovius, M., Sundstron, J., & Rasmussen, F. (2009). Combined effects of overweight and smoking in late adolescence on subsequent mortality: nationwide cohort study. *British*

PERSONALITY AND OBESE BODY MASS INDEX

- Medical Journal*, 338:b496.
- Nichols, D. S. (2001). *Essentials of MMPI-2 assessment*. New York, NY: John Wiley and Sons, Inc.
- Olshansky, S. J., Passaro, D. J., Hershow, R. C., Layden, J., Carnes, B. A., Brody, J., Hayflick, L., Butler, R. N., Allison, D. B., & Ludwig, D. S. (2005). A potential decline in life expectancy in the United States in the 21st century. *New England Journal of Medicine*, 352(11), 1138-1145.
- Padwal, R. S., Li, S. K., & Lau, D. C. (2003). Long-term pharmacotherapy for overweight and obesity: A systematic review and meta-analysis of randomized controlled trials. *Internal Journal of Obesity and Related Metabolic Disorders*, 27(12), 1437-1446.
- Prather, R. C., & Williamson, D. A. (1988). Psychopathology associated with bulimia, binge eating, and obesity. *International Journal of Eating Disorders*, 7(2), 177-184.
- Ruchinskas, R. A., Combs, C. J., Riley, K. C., & Broshek, D. K. (2006). Defensive responding on the MMPI-2 in pre-surgical candidates. *Journal of Clinical Psychology in Medical Settings*, 13, 441-445.
- Ryden, A., Sullivan, M., Torgerson, J. S., Karlsson, J., Lindroos, A. K., & Taft, C. (2003). Severe obesity and personality: a comparative controlled study of personality traits. *International Journal of Obesity*, 27, 1534-1540.
- Ryden, A., Sullivan, M., Torgerson, J. S., Karlsson, J., Lindroos, A-K., & Taft, C. (2004). A comparative study of personality in severe obesity: A 2 year follow-up after intervention. *International Journal of Obesity*, 28, 1485-1493.
- Saris, W. H. M. (2001). Very-low-calorie diets and sustained weight loss. *Obesity Research*, 9, 295-301.
- Strine, T. W., Mokdad, A. H., Dube, S. R., Balluz, L. S., Gonzalez, O., Berry, J. T., Manderscheid, R., & Kroenke, K. (2008). The association of depression and anxiety with obesity and unhealthy behaviors among community-dwelling US adults. *General Hospital Psychiatry*, 30(2), 127-137.
- Sullivan, S., Cloninger, C. R., Przybeck, T. R., & Klein, S. (2007). Personality characteristics in obesity and relationship with successful weight loss. *International Journal of Obesity*, 31, 669-674.
- Tukey, J. W. (1977). *Exploratory data analysis*. New York: Addison-Wesley.
- Tsushima, W. T., Bridenstine, M.P., & Balfour, J.F. (2004). MMPI-2 scores in the outcome prediction of gastric bypass surgery. *Obesity Surgery*, 14, 528-532.
- U.S. Department of Health and Human Services. (n.d.). Calculate your bmi. Retrieved from <http://www.nhlbisupport.com/bmi/>
- Vardi, P. & Pinhas-Hamiel, O. (2000). The young hunter hypothesis: Age-related weight gain - A tribute to the thrifty theories. *Medical Hypotheses*, 55(6), 521-523.
- World Health Organization. (2011). Obesity and overweight. Retrieved from <http://www.who.int/dietphysicalactivity/publications/facts/obesity/en/>
- Wygant, D. B., Boutacoff, L. I., Arbisi, P. A., Ben-Porath, Y. S., Kelly, P. H., & Rupp, W. M. (2007). Examination of the MMPI-2 restructured clinic (rc) scales in a sample of bariatric surgery candidates. *Journal of Clinical Psychology in Medical Settings*, 14, 197-205.