Prevalence and Correlates of Being Overweight or Obese in College

Brian L. Odlaug[a*]

Katherine Lust[b]

Cathrine L. Wimmelmann[a]

Samuel R. Chamberlain[c]

Erik L. Mortensen[a]

Katherine Derbyshire[d]

Gary Christenson[b]

Jon E. Grant[d]

[a]Department of Public Health, Faculty of Health and Medical Sciences, University of

Copenhagen, Copenhagen, Denmark

[b]Boynton Health Services, University of Minnesota, Minneapolis, MN USA

[c]Department of Psychiatry, University of Cambridge, UK

[d]Department of Psychiatry & Behavioral Neuroscience, University of Chicago, Chicago IL USA

*Corresponding Author:

Brian L. Odlaug

Department of Public Health, Faculty of Health & Medical Sciences

University of Copenhagen, Øster Farimagsgade 5, DK-1353 Copenhagen K, Denmark

Telephone Number: +45 3532 7212; Email: brod@sund.ku.dk; odlaug@gmail.com

Abstract

Recent statistics indicate that over one-third of college students are currently overweight or obese, however, the impact of weight in this population from academic and psychiatric perspectives are not fully understood. This study sought to examine the prevalence of overweight and obesity in college students and its association with stress, mental health disorders and academic achievement. A total of 1,765 students completed the College Student Computer User Survey (CSCUS) online at a large Midwestern United States University. Responders were classified by weight as normal, overweight or obese based on Body Mass Index. Data were stratified by sex, with cross-tabulation and t-tests, one-way analysis of variance, and logistic regression for analysis. A total of 492 (27.9%) students were overweight (20.2%; range 25.01-29.98) or obese (7.7%; range 30.04-71.26). Overweight and obesity were associated with significantly lower overall academic achievement, more depressive symptoms, and using diet pills for weight loss. Obese males had significantly higher rates of lifetime trichotillomania while overweight and obese females reported higher rates of panic disorder. Higher educational institutions should be aware of the significant burden associated with overweight and obesity in students, and of the differing demographic and clinical associations between overweight or obesity in men and women.

Keywords. academic; college; education; health; impulse; obesity; weight

1. Introduction

Obesity represents a leading public health concern, with the World Health Organization estimating that more than 1.4 billion individuals are obese worldwide (WHO, 2013). Although the rates of obesity have more than doubled in the general population since the 1980s, the greatest increase in rates of overweight individuals has continued to be young adults aged 18–29 year (Racette et al., 2005; Flegal et al., 2012). In fact, the American College Health Association (2011) reports that 34.1% of college students are currently overweight or obese.

Weight gain in college students is a particular concern given the large number of health problems associated with obesity, and young adults who are overweight will be exposed to greater cumulative risk over time (Finkelstein et al., 2008). The negative long-term consequences of being overweight include high blood pressure, heart disease, diabetes, arthritis-related disabilities, some cancers, and sleep apnea (Gortmaker et al., 1993; Poirier et al., 2006). The weight of college students, in particular women, is particularly important as the average age of first-time pregnancy is 25.8 years old in the US (Martin et al., 2013). Research has shown that women have a particular risk as overweight or obesity also increases the risk of pre-term delivery in females who are overweight or obese prior to pregnancy (Cnattingius et al., 2013) and is associated with reduced cognitive development in the early stages of their children post-partum (Casas et al., 2013).

College students who are overweight or obese report a range of emotional and social problems, including depression, stigmatization, and lower academic achievement (Adams and Colner, 2008; Desai et al., 2008). Both normal weight and obese women tend to report more mental symptoms than their male counterparts (Olsen et al., 2006; Luppino et al., 2008),

however, it is currently unclear whether sex is a moderator of the relationship between mental distress and overweight status in college students. Less is known about the wider range of mental health effects – including psychiatric disorders such as those associated with impulsivity – in college students. The literature suggests that overweight and obesity are associated with difficulties inhibiting behaviors and higher sensitivity to reward (Mobbs et al., 2010; García-García et al., 2014), both features of impulsivity and impulsive behaviors. Very little is currently known, however, about whether overweight or obese individuals report higher rates of impulsive disorders, including gambling disorder, trichotillomania, and skin-picking disorder (amongst others) than their normal weight counterparts.

Therefore, this study sought to examine both the prevalence of a wide range of mental health disorders and associated health issues in male and female college students, who were categorized as being either normal weight, overweight or obese. We hypothesized that overweight and obese young adults, and in particular female students, would exhibit higher rates of most mental health disorders and have poorer self-esteem and greater impairments in academic performance. In addition, research indicates that the neurobiological underpinnings of obesity can be considered from the perspective of impulsivity (i.e. a tendency towards repetitive or habitual behaviors that are premature, risky, or poorly thought out) (e.g. Ziauddeen and Fletcher, 2013). Since being overweight in many individuals may be conceptualized as a problem with impulse control (Holdkamp et al., 2004; Braet et al., 2007) and reward processing deficiencies (García-García et al., 2014), we further hypothesized that being overweight would be associated with a variety of other impulsive behaviors.

2. Methods

2.1. Subjects

A university psychiatry department and student health center collaborated to develop the College Student Computer User Survey (CSCUS) to assess mental and physical health in a large sample of college students. In addition to basic questions about age, sex, ethnicity, weight, and height, the CSCUS used questions from a number of different clinically validated screening tools to examine mental health, stress, quality of life, general physical health, and specific demographic information. All study procedures were carried out in accordance with the latest version of the Declaration of Helsinki and were approved by the Institutional Review Board.

A total of 6,000 full-time college and graduate students from a large Midwestern United States University were randomly invited via email to take part in the CSCUS. Invited participants were required to view the IRB-approved informed consent page at the beginning of the online survey. All individuals who completed the study either partially or fully were considered respondents. As compensation for the study, respondents were entered into a drawing to receive a gift certificate ($250, $500, and $1000 USD), as well as three portable music devices. From the initial group of 6000 students contacted, 2,108 (35.1%) completed the survey.

2.2. Assessments

The survey consisted of 129 questions, was entirely self-report, and took subjects approximately 30-45 minutes to complete. Survey questions consisted of demographic information, height and weight, health history, self-reported scholastic achievement (i.e., grade point average [GPA]), and psychosocial functioning. Subjects were also asked two questions about their perceived

attractiveness (e.g., On a scale from 1-10 [1 being extremely unattractive and 10 being extremely attractive] how attractive are you and how attractive do you think others find you?). Subjects were also asked about their participation in extracurricular activities (including employment), mood, stress, psychiatric comorbidities, and items related to weight or weight loss, including weight loss attempts (and methods for weight loss). Amount of exercise was also reported and compared to the Center for Disease Control and Prevention's recommended amount of exercise per week, which entails 150 minutes of moderate-intensity aerobic activity a week, 75 minutes of vigorous-intensity aerobic activity a week, or an equivalent mix (Centers for Disease Control and Prevention [CDC], 2008).

Subjects completed the following measures:

Internet Addiction Test (IAT) (Young, 1998). The IAT is comprised of 20 questions examining levels of Internet use. Scores on the IAT range from 0-100 with 20-49 points reflecting mild Internet use, 50-79 moderate Internet use and 80-100 points for severe Internet use.

Patient Health Questionnaire (PHQ-9) (Kroenke and Spitzer, 2002; Kroenke et al., 2001). The PHQ-9 is a nine-item, client-administered scale based upon the diagnostic criteria for Major Depressive Disorder in the DSM-IV. It screens for current symptoms and functional impairment and provides a measure of depression severity.

Perceived Stress Scale (PSS) (Cohen et al., 1983). The PSS is a 10 item self-report measure assessing the degree to which individuals find their lives to be unpredictable, uncontrollable, and stressful. Each question is answered on a five-point Likert scale (ranging

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from "never" to "very often") based on experiences of the previous month. Scores range from 0 to 40 with higher scores indicating greater life stress.

Minnesota Impulsive Disorders Interview (MIDI) (Christenson et al., 1994; Grant, 2008). The MIDI is a self-report scale for identifying intermittent explosive disorder, kleptomania, gambling disorder, compulsive sexual behavior, compulsive buying, excoriation (skin picking) disorder, and trichotillomania. The MIDI has been used in previous studies assessing impulse control disorders in college students with good reliability (Odlaug and Grant, 2010). The questions mirror those in DSM-IV-TR (American Psychiatric Association, 2004) except for compulsive sexual behavior, compulsive buying, and excoriation (skin picking) disorder which use criteria proposed by Black et al. (1997), McElroy et al. (1994), and Arnold et al. (2001), respectively.

Participants were asked a series of questions about being diagnosed with various psychiatric disorders within their lifetime. Based on responses to these questions, a dichotomous variable was created with where '0' = report never being diagnosed with any of eleven possible psychiatric disorder and '1' = report being diagnosed with at least one of the eleven possible psychiatric disorders.

2.3. Data Analysis

As this study sought to examine a more traditional cohort of college students, the age range of our sample was limited to participants aged 18-40 with complete data. We applied a conservative upper limit of age at 40 years old in our analysis of the data in order to address outliers in our sample. This removal of subjects over the age of 40 applied to approximately 2% of all survey

completers and was done to limit the negative effects on our statistical analysis (Osbourne and Overbay, 2004). These participants were then categorized *a priori* based on body mass index ranges as established by the CDC as being normal weight (BMI 18.5-24.9), overweight (BMI ≥ 25-29.9) or obese (BMI ≥ 30) (CDC, 2011). Analyses included: (1) prevalence of overweight and obese students and (2) cross-tabulation and *t*-test comparisons of those classified as being overweight versus the remaining respondents in terms of demographics, health behaviors, functioning and psychiatric diagnosis; (3) one-way ANOVA separated by normal weight, overweight, and obese, all stratified by sex; (4) logistic regression was conducted looking at an outcome of being diagnosed with at least one of the 11 listed psychiatric disorders run separately by sex and adjusting for age. Post hoc tests were conducted on significant variables, to correct for multiple comparisons, a Bonferroni correction was used which set significance at p≤.008. All analyses were conducted using SPSS version 22.

3. Results

A total of 2,108 (35.1%; mean age 22.6±5.1 [range 18–58]; 78.8% Caucasian; 41.8% male) students completed the survey. Respondent demographics were not significantly different from the overall demographic profile of the University (41.4% male; 79.5% Caucasian). Of the 2,108 participants that completed the survey, 4 students were eliminated for inappropriate or careless responses (e.g., students who checked every possible box in the survey, with many of the responses of course contradicting each other) an additional 226 were removed because of missing data on sex, age, weight and height, 33 students were over the age of 40. A total of 80 students whose BMI fell within the underweight category (n=80; 4.3%) were excluded as they

the research questions posed here corresponded solely on overweight and obese subjects

compared to normal weight individuals. After these exclusions, the final sample size was 1,765.

Of the 1,765 students, 492 (27.9%) had an overweight or obese BMI (n=356 [20.2%]

overweight and n=136 [7.7%] obese). Compared to students whose BMI placed them within the

normal category overweight students were less likely to be female (60.7% vs. 46.9% female

students) (Table 1). The overweight and obese students were more likely to be older age (Table

1). There were no other significant demographic differences between the groups. Data

surrounding behavioral activities engaged in, in order to lose weight, are given in Table 2. It can

be seen that overweight students were significantly more likely to try to lose weight than their

normal weight peers and they were more likely to use dieting and diet pills to lose weight.

Academic, physical and mental health comparison results are presented in Table 3. Obese

male students reported significantly more depressive symptoms (PHQ-9 scores) compared to

male students classified as normal weight (F[2,64]=5.19; p=0.006), and considered themselves

significantly less attractive than their normal weight and overweight peers (Table 3) while

overweight females had higher rates of perceived stress (F[2,944]=4.09; p=0.017).

In terms of categorical psychiatric diagnosis, obese male students were significantly more

likely to report histories of major depressive disorder compared to overweight and normal weight

male students (28.6%, 9.5% and 10.6%, respectively-; χ²=16.91; df=2; p<0.001). Obese female

students reported significantly higher rates of being diagnosed with major depressive and panic

disorders (Table 4). In addition, generalized anxiety, panic, and social anxiety disorders were

more common, and showed a statistical trend toward significance in obese males compared to

overweight and normal weight males (Table 4). Finally, on the MIDI, obese male students

screened positive for higher rates of trichotillomania (5.4%) compared to their overweight (0.6%) and normal (0.4%) weight peers (p=0.009).

Results of a logistic regression analyses of being diagnosed with at least one of the 11 listed psychiatric disorders stratified by sex and adjusting for age, are shown in Table 5. The results showed the odds of being diagnosed with a psychiatric disorder within lifetime in obese males was 156% higher than normal weight male students (OR= 2.56; 95% CI: 1.411-4.633), statistically significant at (p=0.002).

4. Discussion

We found a rate of overweight (20.2%) and obesity (7.7%) in this college student population, a rate significantly lower than the 68.5% of adults in the US who are overweight or obese (Ogden et al., 2014). Since the survey was entirely self-report, including height and weight, based on the literature (e.g., Elgar et al., 2005; Ezzati et al., 2006; Krul et al., 2010) it is likely that weight was under-estimated by subjects while height may have been over-reported. Any under-reporting of weight and over-estimation of height would have a significant impact on the calculation of BMI in these students. From a positive standpoint, it is likely that the population of overweight and obese that we did assess here were indeed overweight or obese and probably more so based on under-reporting of weight and over-reporting of height noted in previous research (Elgar et al., 2005; Ezzati et al., 2006; Krul et al., 2010).

Noteworthy findings from this study included that both male and female students who were overweight or obese reported significantly lower overall academic achievement as measured by Grade Point Average (GPA), had more depressive symptoms, perceived themselves

as being less attractive (both to themselves and others), and reported higher lifetime rates of major depression. Interestingly, obese males reported higher rates of trichotillomania (TTM), a disorder characterized as an impulsive disorder and largely thought to have a high female preponderance (Lochner et al., 2012), suggesting that screening for TTM should not be limited to the female population and may indicate a subtype in which TTM may be particularly common in males. Further, obesity and TTM have never been associated in the literature and our results perhaps warrant additional investigation as they may reflect some underlying commonality in compulsivity. While the rates of TTM did not differ in females in this sample as a function of weight status, overweight/obese females had higher rates of perceived stress and a lifetime history of panic disorder, all of which may influence overall academic achievement and quality of life. The significantly higher occurrence of panic disorder in obese females has been demonstrated in previous research (for a review see Lykouras and Michopoulos, 2011) and may indicate a possible biological connection between these conditions. Overall, these results further illustrate the deleterious effects of overweight and obesity in young adults noted in previous research (Adams and Colner, 2008; Desai et al., 2008).

Distorted body image and body dissatisfaction are prevalent among college students, particularly women. Research has shown that body and weight perceptions are more important for weight loss strategies than actual weight status (Harring et al., 2010). Previous research on college students noted that over 50% of college students report actively trying to lose weight despite the fact that only about 25% are overweight or obese (Wharton et al., 2008). This may explain why 75% of the normal weight participants reported to have tried to lose weight. We note that significantly more overweight and obese students engaged in activities to lose weight,

however, the significantly higher percentage of overweight and obese students using diet or diet pills raises concerns. While over 100 over-the-counter weight loss supplements currently exist on the market, the efficacy and safety of these supplements is far from clear (Saper et al., 2004). Indeed, the Food and Drug Administration (FDA) has banned the sale of a number of weight loss related products. Health officials at schools should be aware of the use of these supplements and ask students about them as part of routine health assessments while encouraging more traditional forms of weight loss and control, including healthy diet and exercise. Such results emphasize the importance of considering the degree to which inaccurate body weight perception may drive healthy or unhealthy weight loss practices (Malinauskas et al., 2006). If not, promising and well-intentioned programs may end up promoting unhealthy behavior.

The study also found lower academic achievement in overweight and obese males and females which is consistent with the extant literature. What is unclear and disputed in the literature, however, is whether having a lower grade point average predisposes one to becoming overweight or obese or vice versa and whether lifestyle interventions may help with both school success and weight management (Martin et al., 2014). A large study in the UK, examining longitudinal associations between weight and academic performance, found that weight at a young age was predictive of subsequent academic achievement in adolescence for girls but not boys (Booth et al., 2014). Such continued research using longitudinal methods may help to shed light on the impact of young-age overweight and obesity on later life achievement, health, and well-being.

There are a number of caveats from the current study that must be noted. The study design was cross-sectional with inherent difficulties in establishing causal relationships and data

were obtained by self-report (Internet-based questionnaires), rather than in person using clinical interviews. As such the findings may be affected by bias (e.g. under-reporting) and a lower degree of accuracy than might otherwise have been obtained. For example, and as noted earlier, previous research indicates that women underreport their current weight (Ezzati et al., 2006) which may have led to miscategorization of our sample into the three specified categories of weight for this study. Future studies utilizing direct interviews or using national health data may eliminate over- or under-reporting of weight and height and lead to a better understanding of the effects of weight on health and academic performance. Second, and although the promotion of healthy lifestyle and weight management are important, we did not ask follow-up questions about dieting practices, an item that was noted to be significantly higher in the overweight and obese population in this study. Recent research indicates that unhealthy weight loss behaviors, including fasting and purging, occurs in a significant proportion of overweight and obese college students (Davila et al., 2014) and could have been examined more thoroughly in this study. Third, and due to time constraints and in order to lessen the burden of questions for participants, we did not used validated measures to assess many conditions (for example, psychiatric history). As such, the reliability of the reported results cannot be fully assured. Fourth, there is a possible lack of generalizability of our results due to the Midwestern United States sample with a predominantly White student population. Further, we did not include a measure of socio-economic status nor did we clarify the duration of weight status (e.g., childhood onset versus adolescent onset), both of which are factors associated with weight status (Stunkard and Sørensen, 1993; Gortmaker et al., 1993). Finally, the cross-sectional nature of this study does not allow for conclusions of causal or predictive factors related to overweight or obesity in college

students. While longitudinal designs have been utilized in previous studies of children (e.g. Booth et al., 2014), tracking individuals from an even younger age should be considered to examine the causal effects of weight on health and achievement.

4.1. Conclusions

By the year 2030, it is projected that over half (51%) of the United States population will be obese (Finkelstein et al., 2012). Given the comorbid physical and mental health conditions often associated with overweight and obesity and the significant individual and societal health and economic burden, initiatives have been implemented to stem the further growth of these numbers in childhood (WHO, 2012), including recommendations from the CDC. While these initiatives and recommendations have been useful, higher educational institutions should be aware of the continued and significant burden associated with overweight and obesity in their students, and of the differing demographic and clinical associations between men and women with obesity. The results from the current study underscore the often significant and negative effects of weight on student psychiatric health, academic achievement, and self-perception. The recognition that weight plays a role in such facets of student health should prompt faculty and administrative entities within the collegiate system to form strategies for targeted invention in order to improve the overall quality of life for these individuals. With a ever-expanding cohort of overweight and obesity worldwide, such public health initiatives should comprise a priority within the academic sector of society.

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Table 1. Demographic Characteristics of College Students Grouped by Body Mass Index

Variable	Normal Weight N= 1273	Overweight N= 356	Obese N= 136	Test statistic	p-value
Age, Mean (SD)	21.82 (3.4)	23.02 (4.4)	23.74 (4.8)	$F_{(2,1762)}$ =26.79	<0.001
Gender Female	60.7 (773)	46.9 (167)	58.8 (80)	χ^2=21.82 df=2	<0.001
Body Mass Index, Mean (SD)	21.94 (1.7)	26.63 (1.3)	35.12 (6.4)	$F_{(2,1762)}$ =2291.31	<0.001
Race/Ethnicity					
White/Caucasian	81.5 (1038)	79.2 (282)	73.5 (100)		
African	0.9 (11)	2.2 (8)	2.9 (4)		
African-American	0.9 (12)	0.8 (3)	2.9 (4)		
Asian/Pacific Islander	10.3 (131)	9.6 (34)	10.3 (14)		
Latino	1.6 (20)	3.1 (11)	2.2 (3)		
Middle eastern	0.7 (9)	0.8 (3)	0.0 (0)		
Other	3.8 (49)	3.4 (12)	7.4 (10)		
*Non-White Only	18.3 (232)	20.1 (71)	25.9 (35)	χ^2=0.433 df=2	0.089
Relationship Status Single	57.9 (736)	57.7 (205)	60.7 (82)	χ^2=4.99 df=2	0.805
Student Status Undergraduate	79.3 (1007)	74.9 (263)	74.1 (100)	χ^2=4.378 df=2	0.112
International Students	5.0 (63)	6.5 (23)	5.2 (7)	χ^2=1.28 df=2	0.527

All values are % (n) unless otherwise noted

*Respondent did not select White/Caucasian but did select at least one of the other race/ethnicity groups

Table 2. Engagement in Activities to Lose Weight based on Body Mass Index

	Normal Weight N= 1273	Overweight N= 356	Obese N= 136	Test statistic*	p-value
Engaged in an activity to lose weight	73.4 (935)$_a$	87.4 (311)$_b$	90.4 (123)$_b$	χ^2=44.98 df=2	<0.001[**]
Among those who engaged in an activity to lose weight: activity they engaged in					
Skip meals	26.5 (248)	26.0 (81)	26.8 (33)	χ^2=0.038 df=2	0.980
Smoke tobacco	4.2 (39)	4.5 (14)	3.3 (4)	χ^2=0.345 df=2	0.865
Exercise	80.3 (751)	85.9 (267)	80.5 (99)	χ^2=4.864 df=2	0.089
Use diet pills	3.2 (30)$_a$	5.5 (17)$_{a,c}$	7.3 (9)$_{b,c}$	χ^2=6.618 df=2	0.036[**]
Use illegal drugs	0.9 (8)	0.3 (1)	0.0 (0)	*	0.549
Eat healthier	84.2 (787)	87.5 (272)	84.6 (104)	χ^2=1.991 df=2	0.379
Vomit after eating	3.1 (29)	3.2 (10)	1.6 (2)	*	0.789
Use laxatives	1.3 912)	0.3 (1)	0.0 (0)	*	0.231
Diet	10.8 (101)$_a$	17.4 (54)$_b$	18.7 (23)$_b$	χ^2=12.759 df=2	0.002[**]
Have had surgery	0.0 (0)	0.3 (1)	0.0 (0)	*	0.317

All values are % (n) unless otherwise noted; df=2; *Fisher's Exact Test [**]Significant using Holm Sequentially Rejective adjustment.

For each pair of columns, the column proportions are compared using a *z* test. If a pair of values is significantly different at the 0.05 level, the values have *different* subscript letters assigned to them.

Table 3. Academic and Health Indices of Weight Stratified by Sex

	Males N=745			Test statistic	p-value	Females N=1020			Test statistic	p-value
	Normal N=500	**Overweight N=189**	**Obese N=56**			**Normal N=773**	**Overweight N=167**	**Obese N=80**		
College Grade Point Average	3.34 (.50)	3.32 (.49)	3.13 (.57)	$F_{(2,734)}=4.67$	0.010[**]	3.42 (.42)	3.27 (.52)	3.23 (.54)	$F_{(2,1001)}=12.31$	<0.001[**] [a, b]
Meet adult CDC physical activity recommendations % (n)	61.3 (304)	63.5 (120)	49.1 (27)	$\chi^2=3.79$ df=2	0.148	54.7 (420)	46.3 (76)	52.5 (42)	$\chi^2=3.80$ df=2	0.150
PHQ-9 (Score 0-27)	4.12 (4.1)	4.43 (4.4)	6.04 (4.6)	$F_{(2,684)}=5.19$	0.006[**] [b]	5.07 (4.5)	6.15 (5.1)	5.59 (4.1)	$F_{(2,938)}=3.63$	0.027[**]
Perceived Stress Score (Score 0-40)	14.75 (6.5)	14.58 (6.0)	16.79 (6.7)	$F_{(2,692)}=2.62$	0.073	16.71 (6.4)	18.41 (8.0)	17.16 (6.1)	$F_{(2,944)}=4.09$	0.017[**]
Internet Addiction Score (Score 0-100)	29.85 (10.8)	29.58 (11.2)	33.36 (13.7)	$F_{(2,695)}=2.58$	0.077	29.48 (11.1)	31.24 (10.3)	30.23 (11.5)	$F_{(2,939)}=1.67$	0.189
Perceived Attractiveness (Perception of Self) (0-10)*	7.10 (1.4)	7.03 (1.2)	5.77 (2.0)	$F_{(2,728)}=23.19$	<0.001[**] [b, c]	6.97 (1.3)	6.15 (1.5)	5.49 (1.7)	$F_{(2,1003)}=59.69$	<0.001[**] [a, b, c]
Perceived Attractiveness (Perception by others) (0-10)*	7.44 (1.4)	7.25 (1.2)	6.39 (1.9)	$F_{(2,729)}=15.06$	<0.001[**] [b, c]	7.64 (1.3)	7.13 (1.4)	6.41 (1.6)	$F_{(2,1000)}=37.84$	<0.001[**] [a, b, c]

*Likert scale with 0 indicating lowest perception and 10 indicating highest perception **Significant using Holm Sequentially Rejective adjustment

Post hoc test: Multiple comparison: Used Bonferroni adjusted alpha levels of 0.008 (0.05/6); [a] Significant difference between normal weight and overweight; [b] Significant difference between normal weight and obese; [c] Significant difference between overweight and obese

Abbreviations: CDC: Center for Disease Control; PHQ-9: Patient Health Questionnaire version 9

Table 4. Psychiatric Disorder Screening Sorted by Weight and Stratified by Sex

	Males N=745			Test statistic	p-value	Females N=1020			Test statistic	p-value
	Normal N=500	Overweight N=189	Obese N=56			Normal N=773	Overweight N=167	Obese N=80		
Lifetime self-report diagnoses										
Major Depressive Disorder	10.6 (53) a	9.5 (18) a	28.6 (16) b	χ^2=16.91 df=2	<0.001**	19.1 (148) a	27.5 (46) b	31.3 (25) b	χ^2=10.67 df=2	0.005**
Bipolar Disorder	0.8 (4)	0.5 (1)	0.0 (0)	*	1.000	0.9 (7)	1.8 (3)	1.3 (1)	*	0.456
Generalized anxiety disorder	5.2 (26)	5.3 (10)	14.3 (8)	χ^2=7.65 df=2	0.027	10.6 (82)	11.4 (19)	15.0 (12)	χ^2=1.438 df=2	0.487
Panic Disorder	2.2 (11)	1.6 (3)	8.9 (5)	*	0.019	6.2 (48) a	7.2 (12) a, b	15.0 (12) b	χ^2=8.54 df=2	0.014**
Social Anxiety Disorder	3.6 (18)	4.8 (9)	12.5 (7)	*	0.018	4.1 (32)	3.0 (5)	2.5 (2)	*	0.806
Obsessive Compulsive Disorder	1.6 (8)	1.1 (2)	5.4 (3)	*	0.103	2.2 (17)	2.4 (4)	1.3 (1)	*	0.931
Post-Traumatic Stress Disorder	1.0 (5)	1.1 (2)	3.6 (2)	*	0.245	2.2 (17)	2.4 (4)	3.8 (3)	*	0.577
Any Substance Use Disorder	2.0 (10)	1.6 (3)	0.0 (0)	*	0.901	1.0 (8)	2.4 (4)	1.3 (1)	*	0.300
Anorexia Nervosa	0.4 (2)	0.5 (1)	0.0 (0)	*	1.000	4.3 (33)	1.2 (2)	3.8 (3)	*	0.153
Bulimia Nervosa	0.2 (1)	0.0 (0)	0.0 (0)	*	1.000	2.5 (19)	3.6 (6)	2.5 (2)	*	0.652
Schizophrenia	0.2 (1)	0.0 (0)	0.0 (0)	*	1.000	0.0 (0)	0.0 (0)	0.0 (0)	*	1.000
Attention Deficit Hyperactivity Disorder	5.6 (28)	4.8 (9)	5.4 (3)	*	0.964	2.8 (22)	2.4 (4)	3.8 (3)	*	0.845
Results of the MIDI										
Intermittent Explosive Disorder	0.4 (2)	0.0 (0)	0.0 (0)	*	1.000	0.3 (2)	0.6 (1)	0.0 (0)	*	.570
Compulsive Sexual	3.2 (15)	1.7 (3)	3.6 (2)	*	.532	1.4 (10)	1.3 (2)	1.3 (1)	*	1.000

Behavior										
Compulsive Buying	2.5 (12)	1.7 (3)	7.1 (4)	*	0.102	3.9 (29)	6.1 (10)	5.1 (4)	*	0.380
Kleptomania	0.0 (0)	0.0 (0)	1.8 (1)	*	0.079	0.0 (0)	0.0 (0)	0.0 (0)	*	1.000
Trichotillomania	0.4 (2) $_a$	0.6 (1) $_a$	5.4 (3) $_b$	*	0.009[**]	1.6 (12)	1.9 (3)	2.5 (2)	*	0.694
Gambling Disorder	1.1 (5)	1.1 (2)	7.4 (4)	*	0.013	0.3 (2)	0.0 (0)	0.0 (0)	*	1.000
Skin Picking Disorder	1.6 (8)	1.6 (3)	3.6 (2)	*	0.407	5.4 (41)	9.0 (15)	5.1 (4)	*	0.203

Notes: All values are % (n); *Fisher's Exact Test; [**]Significant using Holm Sequentially Rejective Adjustment **Abbreviations:** MIDI: Minnesota Impulsive Disorders Interview.

For each pair of columns, the column proportions are compared using a *z* test. If a pair of values is significantly different at the 0.05 level, the values have *different* subscript letters assigned to them.

Table 5. Logistic Regression Analysis for BMI categories Predicting Reported Lifetime Diagnosis of Psychiatric Disorder by Males (n= 745) and Females (n=1020), Controlling for Age

	B	S.E.	Wald	Sig	Exp(B)	95% CI
Males						
BMI normal (ref)			13.815	0.001		
BMI overweight	-0.312	0.235	1.763	0.184	0.732	0.461-1.160
BMI obese	0.939	0.303	9.588	0.002	2.557	1.411-4.633
Age	0.078	0.022	12.724	0.000	1.082	1.036-1.129
Constant	-3.224	0.510	40.002	0.000	0.040	
Females						
BMI normal (ref)			4.222	0.121		
BMI overweight	0.259	0.182	2.010	0.156	1.295	0.906-1.852
BMI obese	0.413	0.246	2.825	0.093	1.511	0.934-2.446
Age	0.043	0.019	4.897	0.027	1.042	1.005-1.081
Constant	-1.840	0.419	19.326	0.000	0.159	