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## Universal prevention efforts should address eating disorder pathology across the weight spectrum: Implications for screening and intervention on college campuses

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### Abstract

**Purpose**—Given shared risk and maintaining factors between eating disorders and obesity, it may be important to include both eating disorder intervention and healthy weight management within a universal eating disorder care delivery program. This study evaluated differential eating disorder screening responses by initial weight status among university students, to assess eating disorder risk and pathology among individuals with overweight/obesity versus normal weight or underweight.

**Methods**—1529 individuals were screened and analyzed. Screening was conducted via pilot implementation of the Internet-based Healthy Body Image program on two university campuses.

**Results**—Fifteen percent of the sample had overweight/obesity. Over half (58%) of individuals with overweight/obesity screened as high risk for an eating disorder or warranting clinical referral,

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#### Contributors

Kass, Jones, Trockel, Taylor, and Wilfley designed the study and wrote the protocol. Kolko, Altman, Fitzsimmons-Craft, Eichen, and Balantekin conducted literature searches and provided summaries of previous research studies. Kass, Jones, Altman, Trockel, Taylor, and Wilfley collected data. Kass conducted the statistical analyses. Kass and Jones wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

#### Conflict of interest

Jones currently works for Lantern, the current host of the Healthy Body Image program; Jones and the Healthy Body Image program were not affiliated with Lantern at the time this study was conducted. All other authors declare that they have no conflicts of interest.

and 58% of individuals with overweight/obesity endorsed a 10-pound weight change over the past year. Compared to individuals with normal weight or underweight, individuals with overweight/obesity were more likely to identify as Black, endorse objective binge eating and fasting, endorse that eating disorder-related concerns impaired their relationships/social life and made them feel badly, and endorse higher weight/shape concerns.

**Conclusions**—Results suggest rates of eating disorder pathology and clinical impairment are highest among students with overweight/obesity, and targeted intervention across weight categories and diverse races/ethnicities is warranted within universal eating disorder intervention efforts. Integrating eating disorder intervention and healthy weight management into universal prevention programs could reduce the incidence and prevalence of eating disorders, unhealthy weight control practices, and obesity among university students.

### Keywords

Overweight; Obesity; Screening; Intervention; Eating disorder risk

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## 1. Introduction

Eating disorders (EDs) and obesity are serious problems affecting university students (American College Health Association, 2007; Eisenberg, Nicklett, Roeder, & Kirz, 2011; Racette, Deusinger, Strube, Highstein, & Deusinger, 2008). EDs most typically onset between adolescence and young adulthood (Hudson, Hiripi, Pope, & Kessler, 2007; Nagl et al., 2016; Stice, Marti, Shaw, & Jaconis, 2009), and the college years are associated with a significant reduction in students' healthy lifestyle behaviors, which has implications for cardiovascular health and individuals' weight gain trajectories (Arts, Fernandez, & Lofgren, 2014; Nelson, Larson, Barr-Anderson, Neumark-Sztainer, & Story, 2009; Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008; Spring et al., 2014). Indeed, research has indicated that adults aged 18–29 years are more likely to develop obesity than individuals of older ages (Mokdad et al., 1999). Both EDs and obesity are associated with significant medical consequences and are commonly comorbid with psychiatric illnesses (Aspen et al., 2014; Balantekin, Birch, & Savage, 2015; Campbell & Peebles, 2014; Eddy et al., 2007; Glasofer et al., 2007; Goldschmidt, Aspen, Sinton, Tanofsky-Kraff, & Wilfley, 2008; National Heart Lung and Blood Institute, 2013; Rancourt & McCullough, 2015; Tanofsky-Kraff et al., 2007), are associated with impairment and stigmatization (Klump, Bulik, Kaye, Treasure, & Tyson, 2009; Puhl & Latner, 2007; Puhl & Suh, 2015), may interfere with academic achievement and impede academic outcomes (Krukowski et al., 2009), and result in high healthcare utilization and cost (Crow, 2014; Finkelstein, 2014).

Although universities represent an ideal setting for implementing behavioral interventions (Plotnikoff et al., 2015) and university health and counseling centers aim to provide mental and behavioral health care for their campus population, the high prevalence of mental health issues among college students precludes providing one-on-one treatment services to all students in need of care (Hunt & Eisenberg, 2010; Wilfley, Agras, & Taylor, 2013). Accordingly, efforts are needed that can complement the traditional model for health care delivery on college campuses (i.e., presenting for in-person treatment to the health or counseling center) by focusing on reducing incidence through providing prevention and

treatment through alternate modes of delivery in order to optimize the number of college students who can receive care for EDs and weight management.

Online approaches to screening, prevention, and treatment can increase reach and offset in-person clinical demands by (1) enabling widespread identification of mental and behavioral health issues using minimal resources from campus clinicians and other relevant stakeholders; (2) informing clinical decision-making to ensure interventions are precisely delivered to match individuals' needs; and (3) utilizing low-cost, low resource-intensive programs as first-line interventions while conserving in-person services for those most in need (Bauer & Moessner, 2013; Fairburn & Wilson, 2013; Kazdin & Blase, 2011; Paxton, 2013). One example of a comprehensive, online approach to ED screening and intervention is the Healthy Body Image program (HBI), an Internet-based program for delivering screening and intervention that aims to reduce the incidence and prevalence of EDs (Jones, Kass et al., 2014; Wilfley et al., 2013). Individuals are screened with a brief online assessment, and responses are used to classify individuals as low-risk for, high-risk for, or with a clinical or subthreshold ED. Users receive individualized feedback about their risk/clinical profile, and screen results inform the specific interventions that users are offered: (a) an online universal or targeted preventive intervention (i.e., Staying Fit™ or StudentBodies™, respectively)(Jones, Taylor Lynch, et al., 2014; Kass et al., 2014; Taylor et al., 2006, 2012); (b) an online cognitive-behavioral guided self-help treatment program (i.e., StudentBodies-Eating Disorders™); or (c) referral to in-person treatment services. The online platform is anonymous, accommodating to students' schedules via access at any time by computer or Smartphone, and can easily incorporate new modules for subpopulations of users. Campuses can also implement in-person community outreach programming and an online community culture change intervention for all students regardless of risk/clinical status, to promote universal messaging supporting a campus culture of positive body esteem and healthy lifestyle behaviors. Combined, HBI facilitates campus-wide intervention across multiple spheres of influence, such that intervention to impact individual behavior change is supported by health-oriented programming within the residence halls, among peer groups and academic courses, and from campus leadership instrumental in enacting policy changes for improving college mental health.

We embarked on a pilot project to implement HBI on two college campuses (Jones, Kass et al., 2014).<sup>2</sup> Results showed that implementation was feasible, offering colleges a comprehensive system for ED screening, intervention, and community culture change. However, to date, our team has not specifically addressed overweight or obesity within HBI. Indeed, integrating prevention for EDs and obesity that provides universal messaging around healthy eating and physical activity and addresses sociocultural factors related to weight represents a promising target for weight-related intervention (Ciao, Loth, & Neumark-Sztainer, 2014). Obesity is a potent risk factor for EDs (Hilbert et al., 2014; Jacobi, Hayward, de Zwaan, Kraemer, & Agras, 2004), and engaging in ED behaviors and/or unhealthy weight control practices confers risk for excess weight gain and obesity (Cuypers et al., 2012; Goldschmidt, Jones et al., 2008; Hilbert, Hartmann, Czaja, & Schoebi, 2013;

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<sup>2</sup>At the time of this study, the StudentBodies-Eating Disorder™ intervention was not yet integrated within the HBI program. Thus, participants with clinical or subthreshold EDs were offered care via an in-person referral.

Neumark-Sztainer et al., 2006; Sonnevile et al., 2013; Stice, Cameron, Killen, Hayward, & Taylor, 1999; Tanofsky-Kraff et al., 2009, 2011). Thus, given the shared risk and maintaining factors for EDs and obesity, we examined screening responses among university students with overweight/obesity versus those with normal weight or underweight to evaluate differences by weight status in ED risk/clinical status and in associated ED pathology. This work could influence opportunities for expansion and enhancement of HBI as well as have important implications for universal ED prevention programs more broadly, resulting in improved, comprehensive prevention of EDs and healthy weight management among university students.

## 2. Methods

### 2.1. Participants & procedure

Participants were male and female students at two universities engaged in the pilot implementation of HBI. At one campus (“University A”), all students were targeted for recruitment, and at a second campus (“University B”), first and second year undergraduates were targeted for recruitment. Participants were recruited via the HBI website, email, social media, word of mouth, presentations and workshops, flyers, staff training, and campus referral. Interested individuals completed the Stanford-Washington University Eating Disorder (SWED) Screen, hosted by HealthMunk LLC. Students provided online approval indicating their acknowledgement of the privacy practices prior to completing the screen and agreeing that their de-identified data could be used for research. Data were stored on HIPAA-compliant servers, accessible only by trained study staff. This study was deemed “exempt” from the universities’ Institutional Review Boards, as these projects were implemented as quality improvement initiatives and no identifying information was stored or used for research. Full study details have been published previously (Jones, Kass et al., 2014).

### 2.2. Measures

The SWED Screen (Jones, Kass et al., 2014; Wilfley et al., 2013) is a brief, online self-report tool that assesses ED pathology and risk. Questions assessed demographics, height and weight, weight/shape concerns (using the validated 5-item Weight Concerns Scale; Jacobi, Abascal, & Taylor, 2004; Killen et al., 1994), endorsement of objective binge eating over the past four weeks, vomiting over the past four weeks (using the prompt, “Have you made yourself throw-up?”), laxative or diuretic misuse over the past four weeks (using the prompt, “Have you used diuretics or laxatives?”), excessive exercise over the past four weeks (using the prompt, “Have you exercised excessively (e.g., pushed yourself very hard; had to stick to a specific exercise schedule no matter what; felt compelled to exercise?”), fasting over the past four weeks (using the prompt, “Have you fasted (intentionally not eaten anything at all for at least 8 waking hours?”), significant weight changes over the past year (assessed as, “In the past year, has your weight either increased or decreased by more than 10 pounds?”), loss of menses for three or more months (only pertaining to females, with text specifying “not related to contraceptive methods that affect hormonal regulation”), lifetime history of an ED (assessed as, “Have you ever had an eating disorder?”), and clinical impairment over the past four weeks. Questions regarding clinical impairment were based on

items from the Clinical Impairment Assessment Questionnaire (Bohn & Fairburn, 2008; Bohn et al., 2008) and inquired about whether concerns about eating, weight, or shape (1) interfered with school work; (2) interfered with relationships or social life; and (3) made the individual feel badly about him/herself over the past four weeks. Responses were rated as “not at all,” “a little,” “quite,” and “a lot.” For these analyses, “quite” and “a lot” response options were combined, as both were considered indicative of problematic levels of impairment and due to the low rates of endorsement for each item on its own. Individuals endorsing a significant weight change over the past year were subsequently queried on their amount of weight gain and loss, assessed separately (assessed as, for example, “If you lost weight over the past year, how many pounds did you lose?”).

For these analyses, race/ethnicity responses were categorized as White, Asian, Black, and Other, as the small number of individuals endorsing other races/ethnicities (e.g., Hispanic) precluded subgroup analyses. For the analysis evaluating gender, three individuals who identified as transgender or gender non-conforming were coded as “missing” and were thus excluded from this analysis, given the inability to conduct a subgroup analysis of three participants. Responses to items assessing vomiting, laxative misuse, and diuretic misuse were combined into “purging” given the low rates of endorsement for each item on its own.

Performance of the SWED was evaluated using a sample of 549 college-age women, in which participants completed the SWED at a screening visit, followed two weeks later by the Eating Disorder Examination (EDE). Estimates of screen performance and ED prevalence rates based on EDE-derived diagnoses were calculated. In analyzing the SWED Screen performance characteristics, diagnoses were not considered mutually exclusive and “trumping order” was ignored. Calculations of sensitivity and specificity were completed in two stages. First, sensitivity and specificity of categorical diagnostic items were calculated without the use of WCS scores. Second, receiver operating characteristic analysis was used to optimize sensitivity and specificity for cases with a positive screen on stage 1 items (categorical symptom criteria), with the use of WCS scores. Sensitivity and specificity for DSM-5 diagnoses were: anorexia nervosa (0.90, 0.99), bulimia nervosa (0.82, 0.88), binge eating disorder (0.78, 0.82), subthreshold bulimia nervosa (0.68, 0.84), subthreshold binge eating disorder (0.72, 0.78), and purging disorder (0.55, 0.95).

Individuals who screened positive for a clinical or subthreshold ED based on Diagnostic and Statistical Manual of Mental Disorders 5th Edition criteria (American Psychiatric Association, 2013), endorsed any purging behavior, or reported missing three consecutive menstrual cycles (not due to medication) were given a clinical referral. Students who endorsed elevated weight/shape concerns or a history of an ED were identified as high risk. Individuals who did not endorse the above criteria were identified as low risk (see Jones, Kass et al., 2014).

Individuals’ self-reported height and weight were used to calculate body mass index (BMI,  $\text{kg/m}^2$ ). Participants’ BMI was used to group individuals by weight status: BMI  $\geq 30$  indicated overweight or obesity, BMI  $< 30$  and  $\geq 25$  indicated normal weight, and BMI  $< 25$  indicated underweight. Individuals with overweight or obesity were grouped into one

category (herein referred to as overweight/obesity), as the small number of individuals meeting criteria for obesity ( $n = 39$ ) precluded conducting separate analyses.

### 2.3. Analytic plan

Data were screened for normality, and extreme data points exceeding three standard deviations on either the weight or height variables were excluded as outliers ( $n = 29$ ). Chi-square tests, analysis of variance with Tukey post-hoc tests, and multinomial logistic regression analyses were used to evaluate differences in study variables between individuals with overweight/obesity versus individuals with normal weight or underweight. Odds ratios and 95% confidence intervals (CI) are presented. Analyses were performed using SPSS version 23.  $p$ -Values less than .05 were considered statistically significant.

## 3. Results

Participants ( $N = 1529$ ) had a mean age of 18.8 (SD = 2.3) years,<sup>3</sup> and 63% identified as female. Across the sample, 57% of participants identified as White, 24% as Asian, 6% as Black, and 13% as Other. In terms of weight status, 124 (8%) individuals met criteria for underweight, 1170 (77%) for normal weight, and 235 (15%) for overweight/obesity. Among the participants included in these analyses, 416 participants were enrolled at University A and 1113 participants were enrolled at University B. There was a significant difference in weight status by site ( $\chi^2(2) = 11.74$ ;  $p = .003$ ), such that there were significantly less participants at University B vs. University A with overweight/obesity compared to both individuals with normal weight (OR = 0.64; 95% CI = 0.47–0.86) and individuals with underweight (OR = 0.48; 95% CI = 0.29–0.79).

Subgroup analyses by weight status group (i.e., overweight/obesity vs. normal weight and underweight) revealed that participants did not differ by gender ( $\chi^2(2) = 0.60$ ;  $p = .74$ ), but differed by race/ethnicity ( $\chi^2(6) = 33.21$ ;  $p < .001$ ). Specifically, individuals with overweight/obesity were significantly more likely to identify as Black vs. White compared to both individuals with normal weight (OR = 2.55; 95% CI = 1.57–4.17) and individuals with underweight (OR = 3.05; 95% CI = 1.13–8.26). Individuals with overweight/obesity were significantly less likely than individuals with underweight to identify as Asian vs. White (OR = 0.52; 95% CI = 0.30–0.89). Finally, individuals with overweight/obesity were significantly more likely than individuals with normal weight to identify their race/ethnicity as Other vs. White (OR = 1.84; 95% CI = 1.26–2.70).

Table 1 presents differences in ED pathology and clinical impairment across weight status groups. Significant differences emerged across weight status groups in the percentage screening as low risk, high risk, or warranting a clinical referral. Individuals with overweight/obesity also had higher scores on or endorsement of all variables except

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<sup>3</sup>Recruitment at University A targeted anyone enrolled as a student in the university, which included graduate professionals and postdoctoral scholars, as well as undergraduate students below age 18. Recruitment at University B targeted first and second year undergraduates, which also included students below age 18. As a result, the sample age range is between 16 and 62 years old. Results of this study were analyzed including all of these students, as all of these individuals were eligible for participation in the initiative. However, analyses were also conducted to restrict the age range of the sample to ages 18–30 ( $N = 1409$ ; removing 8% of participants), based on age restrictions used in a previous study (Taylor et al., 2006). The pattern of results remained the same. For parsimony, results on the full sample analyzed in this study ( $N = 1529$ ) are presented.

excessive exercise and purging compared to individuals with normal weight or underweight. Individuals with overweight/obesity were more likely than individuals with normal weight or underweight to endorse a weight change  $\geq 10$  lbs. in the past year. Further assessment of those who endorsed a significant weight change revealed that individuals with overweight/obesity were more likely than the other weight status groups to endorse weight loss ( $F(2,702) = 16.88; p < .001$ ) and weight gain ( $F(2,819) = 52.03; p < .001$ ) over the past year.

#### 4. Discussion

This study evaluated screening responses among individuals participating in the pilot implementation of HBI to determine whether individuals of varying weight status differ in rates of ED risk/clinical status and associated ED pathology. Individuals with overweight/obesity endorsed higher ED pathology, clinical impairment, and weight changes compared to individuals with normal weight or underweight. More than half (58%) of individuals with overweight/obesity met criteria for high ED risk or warranted a clinical referral, compared to 34% and 25% of individuals with normal weight and underweight, respectively, meeting these criteria. Results highlight the importance of screening for problematic eating behaviors among individuals across the weight spectrum and suggest the importance of providing intervention to address both ED behaviors and healthy weight management within universal care delivery programs for EDs on college campuses.

The percentage of individuals whose screen results identified them as having overweight/obesity was lower than the United States population average of overweight and obesity among children and adults (Ogden, Carroll, Kit, & Flegal, 2014) and lower than the 31% average prevalence of overweight/obesity among students at 4-year colleges (American College Health Association, 2007). Lower rates of overweight/obesity compared to national averages may reflect the fact that the average age of the current sample was 18.8 years (i.e., such that the majority of participants were first- or second-year undergraduates), which may reduce the ability to compare these rates to previous work among students at 4-year colleges. Given that 70% of students gain weight during college (Racette et al., 2008), the prevalence of overweight/obesity could increase over the course of college. Thus, had the average age of this sample been greater (e.g., included more third- and fourth-year undergraduate students), this would have likely increased the mean BMI and the proportion of students with overweight/obesity. Rates of overweight/obesity observed in this sample may also be the result of underestimated BMI, as published data indicate that individuals often inaccurately report their height and weight resulting in underestimated BMI (Merrill & Richardson, 2009). It is possible more participants would have met criteria for overweight/obesity using objective measurements.

Finally, given that no student was required to complete the screen, it is possible that the lower rates of overweight/obesity reflect a sampling bias and do not represent true population norms. In fact, the percentage of individuals who completed the screen at the two participating universities represented only a subset of the student body to which the screen was advertised, suggesting the need for caution in interpreting the generalizability of these results across all students at these two universities and across other university settings. Moreover, using estimates published by Jones, Kass et al. (2014) of the campus populations

who were targeted for recruitment at the two universities (i.e., approximately 21,745 students at University A and 2212 students at University B), approximately 2% of targeted students at University A and 50% of targeted students at University B completed the screen and were included in these analyses. These estimates suggest that, despite efforts to recruit all students within these targeted populations, engaging students in universal screening may be difficult and may yield differential rates of EDs and overweight/obesity than would be seen with a representative sample. Continued efforts are warranted to establish best practices for recruiting large groups of representative students into campus initiatives related to EDs.

Results showed that individuals with overweight/obesity had heightened ED pathology compared to those with normal weight or underweight, consistent with the wealth of past research indicating that EDs are not constrained to underweight/normal weight categories (Eichen, Conner, Daly, & Fauber, 2012; Flament et al., 2015; Goldschmidt, Wall, Loth, & Neumark-Sztainer, 2015; Sonnevile et al., 2013; Sysko, Hildebrandt, Wilson, Wilfley, & Agras, 2010). Indeed, these results lend continued support for integrating ED intervention and healthy weight management across the weight spectrum using a comprehensive approach targeting all ED-related problem behaviors (Austin, 2011; Ciao et al., 2014; Neumark-Sztainer, 2003, 2012). Given that obesity is a risk factor for EDs and that disordered eating behaviors increase risk for excess weight gain, a universal system for delivering screening and intervention that directly addresses shared risk and maintaining factors for EDs and obesity across the risk and diagnostic spectrum may maximize benefit across the campus community, as it facilitates an integrated and uniform message about healthy body image ideals, healthy weight management, and healthy eating and physical activity behaviors for all users. Thoughtfully addressing shared correlates of EDs and obesity may increase program efficacy and engage a wider stakeholder constituency. Appropriate attention to factors affecting both EDs and obesity can be useful in facilitating healthy weight management while ensuring weight/shape overvaluation does not increase. Further, this approach may minimize risk of inducing iatrogenic effects on ED or chronic obesity risk that may present with intervention strategies that disregard the relationship between obesity and EDs.

Given these findings, it is possible some individuals may benefit from a program focused on weight loss or weight gain prevention. Preventive interventions have been designed to reduce ED and obesity risk by concurrently addressing weight/shape concerns, ED behaviors, and healthy weight management (such as Doyle et al., 2008; Jones et al., 2008; Stice, Rohde, Shaw, & Marti, 2012, 2013; Taylor et al., 2012). Continued efforts are warranted to disseminate interventions that use non-stigmatizing approaches to help individuals achieve healthy behavior patterns and that harness peer networks and the built environment of the college campus for healthy behavior change. Universal screening programs for EDs should consider integrating questions to assess users' interest in receiving a weight loss or healthy weight management intervention, queried only for example among individuals reporting a medically-appropriate weight (e.g., not underweight) or who deny ED pathology. A weight loss or healthy weight management intervention may also be an appropriate maintenance program for individuals who have discontinued ED behaviors. Screening programs that utilize ongoing symptom monitoring can inform data-driven algorithms to direct individually-tailored programs to students based on changing health profiles over time (e.g.,



providing an intervention to address binge eating followed by providing a healthy weight management intervention once ED symptom abstinence is achieved).

Results from this study did not show a significant relationship between weight status and excessive exercise, with rates between 15% and 17% for each of the weight status groups. However, the presence of this behavior does suggest that increasing attention on healthy physical activity may be beneficial in promoting healthy weight management within universal ED intervention programs. In addition to reducing unhealthy physical activity patterns, promoting engagement in regular, healthful patterns of physical activity has important health benefits such as decreasing risk for chronic diseases, reducing depression and stress, improving emotional well-being, and increasing energy, self-confidence, and satisfaction with social activities (Sherwood & Jeffery, 2000), all of which are relevant factors for college students and individuals struggling with disordered eating and/or weight management. Given that the majority of college students do not meet physical activity recommendations (American College Health Association, 2007), increasing intervention content focused on healthy physical activity is ripe for opportunity and may have the added benefits of promoting healthy weight management and improving students' mental health.

Results showing differences in race/ethnicity between individuals at different weight statuses are consistent with national trends that indicate rates of overweight/obesity are highest among non-Hispanic Black adults (Ogden et al., 2014). Incidence rates for diabetes also increase at greater rates over time (i.e., from 1990 to 2008) for Non-Hispanic Black and Hispanic adults compared to non-Hispanic White adults (Geiss et al., 2014), suggesting that early intervention to address healthy weight management and prevent the onset of obesity-related diseases may be beneficial for some population subgroups. Past literature also shows differences in prevalence rates of particular ED diagnoses across races and ethnicities (Pike, Dohm, Striegel-Moore, Wilfley, & Fairburn, 2001; Striegel-Moore, Wilfley, Pike, Dohm, & Fairburn, 2000; Wilfley et al., 1996). Rates of treatment receipt have been shown to be proportionally lower among Black versus White women (Striegel-Moore et al., 2003), and one study found differential binge eating treatment response by race/ethnicity among women receiving psychological treatments for bulimia nervosa (Chui, Safer, Bryson, Agras, & Wilson, 2007). Taken together, universally-delivered programs may need to incorporate tailored interventions to minority or particularly vulnerable populations, and ensure interventions are sensitive to all populations.

One key study finding is the results showing higher levels of impaired relationship/social functioning and feeling badly among individuals with overweight/obesity compared to individuals in the underweight and normal weight categories. This finding builds on past literature showing higher rates of psychological impairment, a history of being teased, and impaired interpersonal functioning among youth with overweight/obesity compared to youth with normal weight (Goldschmidt, Aspen, et al., 2008; Goldschmidt, Jones et al., 2008; Rancourt & McCullough, 2015), as well as among youth with obesity who endorse binge eating compared to those who do not endorse binge eating (Ranzenhofer et al., 2012). However, more limited work has been conducted among college students on issues related to impairment and quality of life. A recent analysis showed that symptoms of binge eating disorder may be associated with academic and social impairment among college students

(Filipova & Stoffel, 2016). Thus, more research is warranted to understand the consequences of weight status and ED pathology on quality of life among the college population. Further, interventions that aim to improve interpersonal functioning, peer relationships, and negative affect may be indicated for the subpopulation of individuals with overweight/obesity identified in the present analyses.

Study strengths include use of screen responses from a large population of students on two college campuses, including students across sexes and racial/ethnic groups. However, limitations should be noted. This sample may not be representative of the student populations at large on the two campuses, despite efforts to recruit across the targeted student bodies, and results may not translate to other universities. Also, the SWED Screen is a brief screening tool that requires further evaluation on its psychometric properties among males. Moreover, use of a self-report tool is limited by the lack of objective measurement, such as for measures of height and weight. In an attempt to keep the number of screening items brief, we did not assess for pregnancy, which may have impacted participants' responses to questions about a significant weight change over the past year or loss of menses (notably, <1% of women endorsed loss of menses and weight gain over the past year, which could indicate pregnancy, and the pattern of results remained the same with these participants removed from the sample). Finally, data are cross-sectional, precluding drawing conclusions about causality.

#### 4.1. Conclusion

In sum, we evaluated differential ED screening responses by weight status among individuals participating in the pilot implementation of HBI. Higher ED pathology and clinical impairment was identified among individuals with overweight/obesity compared to those with normal weight or underweight. Results highlight the need to screen for problematic eating behaviors across the weight spectrum and across races/ethnicities. Integrating ED intervention and healthy weight management within universal care delivery programs for EDs could reduce the incidence and prevalence of EDs, unhealthy weight control practices, and obesity among university students.

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**Table 1**

Eating disorder pathology and clinical impairment by participants' weight status among students ( $N = 1529$ ) completing an online screen to assess eating disorder pathology and risk.

	Underweight ( $n = 124$ )	Normal weight ( $n = 1170$ )	Overweight or obesity ( $n = 235$ )	Test-statistic and $p$ -value	Pairwise comparisons U = underweight N = normal weight O = overweight/obesity
<i>Eating disorder pathology</i>					
Screen results				$\chi^2(4) = 62.61; p < .001$	1.0
Low risk, $n$ (%) <sup>†</sup>	93 (75.0%)	773 (66.1%)	99 (42.1%)		O v. N <sup>c</sup> : OR = 2.56; 95% CI = 1.89–3.45 O v. U <sup>c</sup> : OR = 5.00; 95% CI = 2.94–9.09
High risk, $n$ (%)	21 (16.9%)	347 (29.6%)	114 (48.5%)		O v. N <sup>c</sup> : OR = 3.45; 95% CI = 2.00–5.88 O v. U <sup>c</sup> : OR = 2.08; 95% CI = 0.93–4.55
Warranting a clinical referral, $n$ (%)	10 (8.1%)	50 (4.3%)	22 (9.4%)		O v. N <sup>c</sup> : $M_{\text{difference}} = 12.29$ O v. U <sup>c</sup> : $M_{\text{difference}} = 21.06$
WCS score, mean (SD)	24.85 (20.74)	33.62 (18.55)	45.91 (17.95)	$F(2,1526) = 61.70; p < .001$	
Objective binge eating in past 4 weeks, $n$ (%)	8 (26.7%)	161 (45.6%)	55 (64.0%)	$\chi^2(2) = 15.37; p = .001$	O v. N <sup>b</sup> : OR = 2.13; 95% CI = 1.30–3.45 O v. U <sup>b</sup> : OR = 4.76; 95% CI = 1.22–1.92
Purging in past 4 weeks, $n$ (%)	6 (4.8%)	50 (4.3%)	18 (7.7%)	$\chi^2(2) = 4.32; p = .11$	–
Excessive exercise in past 4 weeks, $n$ (%)	19 (15.3%)	194 (16.6%)	37 (15.7%)	$\chi^2(2) = 0.21; p = .90$	–
Fasting in past 4 weeks, $n$ (%)	14 (11.3%)	114 (9.7%)	37 (15.7%)	$\chi^2(2) = 6.74; p = .03$	O v. N <sup>b</sup> : OR = 1.72; 95% CI = 1.16–2.56 O v. U <sup>b</sup> : OR = 1.47; 95% CI = 0.76–2.56
Weight change in past year, $n$ (%)	16 (12.9%)	304 (26.0%)	136 (57.9%)	$\chi^2(2) = 107.59; p < .001$	O v. N <sup>c</sup> : OR = 3.85; 95% CI = 2.94–5.26 O v. U <sup>c</sup> : OR = 9.09; 95% CI = 5.26–16.7
Lifetime history of an eating disorder, $n$ (%)	10 (8.1%)	72 (6.2%)	21 (8.9%)	$\chi^2(2) = 2.63; p = .27$	–
<i>Clinical impairment</i>					
Interfered with school work					
Not at all, $n$ (%) <sup>‡</sup>	103 (83.0%)	959 (82.0%)	169 (71.9%)	$\chi^2(4) = 15.00; p = .005$	1.0
A little, $n$ (%)	13 (10.5%)	158 (13.5%)	53 (22.6%)		O v. N <sup>c</sup> : OR = 1.89; 95% CI = 1.33–2.70 O v. U <sup>b</sup> : OR = 2.50; 95% CI = 1.30–4.76
Quite/A lot, $n$ (%)	8 (6.5%)	53 (4.5%)	13 (5.5%)		O v. N <sup>c</sup> : OR = 1.39; 95% CI = 0.74–2.63 O v. U <sup>c</sup> : OR = 0.99; 95% CI = 0.40–2.44
Interfered with relationships/social life				$\chi^2(4) = 42.12; p < .001$	



	Underweight ( <i>n</i> = 124)	Normal weight ( <i>n</i> = 1170)	Overweight or obesity ( <i>n</i> = 235)	Test-statistic and <i>p</i> -value	Pairwise comparisons U = underweight N = normal weight O = overweight/obesity
Not at all, <i>n</i> (%) <sup>‡</sup>	93 (75.0%)	869 (74.3%)	128 (54.4%)		1.0
A little, <i>n</i> (%)	21 (16.9%)	212 (18.1%)	61 (26.0%)		O v. N <sup>c</sup> : OR = 1.96; 95% CI = 1.39–2.78 O v. U <sup>b</sup> : OR = 2.13; 95% CI = 1.20–3.70
Quite/a lot, <i>n</i> (%)	10 (8.1%)	89 (7.6%)	46 (19.6%)		O v. N <sup>c</sup> : OR = 3.45; 95% CI = 2.33–5.26 O v. U <sup>b</sup> : OR = 3.33; 95% CI = 1.61–7.14
Made you feel badly about yourself				$\chi^2(4) = 56.65; p < .001$	
Not at all, <i>n</i> (%) <sup>‡</sup>	65 (52.4%)	509 (43.5%)	65 (27.7%)		1.0
A little, <i>n</i> (%)	41 (33.1%)	422 (36.1%)	71 (30.2%)		O v. N: OR = 1.32; 95% CI = 0.92–1.89 O v. U <sup>d</sup> : OR = 1.72; 95% CI = 1.03–2.86
Quite/a lot, <i>n</i> (%)	18 (14.5%)	239 (20.4%)	99 (42.1%)		O v. N <sup>c</sup> : OR = 3.23; 95% CI = 2.27–4.55 O v. U <sup>c</sup> : OR = 5.56; 95% CI = 3.03–10.0

Note: WCS = Weight Concerns Scale; purging = vomiting + laxative misuse + diuretic misuse; weight change in past year = weight increase or decrease by more than 10 lbs. in the past year.

<sup>‡</sup>Reference category.

<sup>a</sup>*p* < .05.

<sup>b</sup>*p* < .01.

<sup>c</sup>*p* < .001.