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ABSTRACT

Background: Both eating disorders and body image dissatisfaction affect a high proportion of college students. Self-esteem and self-efficacy may be protective factors for eating disorders. The aim of this study was to evaluate diet self-efficacy, the confidence to maintain or lose weight, and its association with physical self-concept using data from an online survey of health literacy, body image, and eating disorders. **Study Population and Methods:** This cross-sectional study collected online survey data from college students within the United States. The inclusion criteria allowed for 1612 college students, ages 17-35 years (597 males, 1015 females) belonging to the following racial/ethnic categories: Black (187); White, non-Hispanic (244), Hispanic (1035), and other (146). Specifically, the study aimed to examine (a) whether and to what degree diet self-efficacy and physical self-concept were associated with risk of eating disorders; (b) the interaction of gender by ethnicity on diet self-efficacy, physical self-concept and risk of eating disorders; and, (c) the relationship of diet self-efficacy with physical self-description and body mass index (BMI) in college students. **Results:** Low diet self-efficacy was associated with a lower score on physical self-concept ($B = -0.52 [-0.90, -0.15], P = 0.007$). Males had a higher physical self-concept as compared to females ($B = 14.0 [8.2, 19.8], P < 0.001$). Racial/ethnic category, age, and smoking status were not associated with physical self-concept. When BMI was considered physical self-concept was no-longer associated with diet self-efficacy. **Conclusion:** College students in this study who had a poor body image were less confident with diet control. Poorer body image and low diet self-efficacy were associated with higher BMI. These findings suggest lifestyle management interventions may be of value to improve physical self-concept and lower risk of eating disorders for college students.

KEY WORDS: Body image, college students, diet self-efficacy, eating disorders, physical self-concept

INTRODUCTION

Eating disorders are considered mental health diseases whose types include anorexia nervosa, bulimia nervosa, and binge eating disorder, and eating disorder not otherwise specified [1]. They share the characteristics of disturbances in eating behavior and weight regulation [1]. A considerable proportion of young adults in the United States are at risk for eating disorders; 20 million women and 10 million men in the United States suffer from a clinically significant eating disorder at some time in their lives [2]. Adolescent and young adult women are approximately 2 and 1.5 times more likely to have an eating disorder compared with their male counterparts, respectively [1].

Eating disorders and body image dissatisfaction are common issues for American College Students [3]. Self-efficacy, the confidence to control one's life [4] and self-esteem, one's degree of self-worth, may be risk factors for eating disorders and negative body image [5]. There is evidence from worldwide interventions studies in adolescents that improvements in self-efficacy are positively associated with body satisfaction and negatively associated with eating disorders [6-9]. High self-efficacy has been associated with successful weight loss and maintenance throughout the literature [10]; whereas, negative emotions concerning treatment contribute to the perpetuation of eating disorders [11]. Alternatively, bolstering self-efficacy may be a protective factor for eating disorders since some

studies indicate low self-efficacy may contribute to issues with body image and eating [12]. Individuals with high self-efficacy may show more persistence and better-coping strategies to face challenges than their counterparts [10,13]. Self-efficacy applied to dieting refers to the individual's belief in their ability to adhere to a diet to lose or maintain weight [14].

This study aimed to examine (a) whether and to what degree diet self-efficacy and physical self-concept were associated with risk of eating disorders; (b) the interaction of gender by ethnicity on diet self-efficacy, physical self-concept and risk of eating disorders; and, (c) the relationship of diet self-efficacy with physical self-description and body mass index (BMI) in college students.

STUDY POPULATION AND METHODS

Participants

This analysis is from a cross-sectional, online survey of health literacy and weight-related behaviors of college students collected in 2013. Participants were selected from the survey who met the following characteristics: self-reported race, aged 17-35 years, BMI range from 12 to 50 kg/m² and completion of the physical concept and diet self-efficacy questionnaires. The final sample consisted of 1612 participants ($n = 597$ males, $n = 1015$ females) belonging to the following racial/ethnic categories: Black ($n = 187$); White, non-Hispanic (WNI) ($n = 244$), Hispanic ($n = 1035$), and Other ($n = 146$).

Measures

The demographic variables of interest included gender, race/ethnicity, age, self-reported weight, and height to calculate BMI and smoking status (yes/no). The primary outcome measure, physical self-concept was measured with the physical self-description questionnaire created by Marsh *et al.* [15]. The questionnaire has a 70 item scale with 11 subscales that measured physical self-concept and general self-esteem. Areas include global self-esteem, global physical competence, and areas of physical fitness such as strength, flexibility, endurance, coordination, sport competency, appearance, body fat, and health. Scores can range from 70 to 350 and a score of 231 or greater was considered having a high physical self-concept. The instrument has been validated as a psychometric tool with construct validity for adolescent populations [15] and the reliability and validity were reported for college student [16]. Diet self-efficacy was measured by the dieting self-efficacy scale (DIET-SE) [10]. The DIET-SE is an 11-item survey, which includes three subscales of eating challenges: High-caloric food temptations, social and internal factors, and negative emotional events. The authors Stich *et al.* [10] composed this 11 item, shortened version of DIET (30 items) developed by Schlundt and Zimering [17] of dieting competency. The scores could range from 0 to 33 for the 11 item version. Higher scores represented greater barriers to healthy eating. A score of 20 or more was considered a high-risk for having an eating disorder. The DIET-SE was validated

for reliability and construct validity, as well as predictive validity (association with weight-loss) [10].

Statistical Analysis

Statistical analyses were performed using IBM SPSS, version 22. A statistical significance level of $P < 0.05$ was employed for all tests. Demographic information was presented by race/ethnicity for the study variables. Pearson's correlation was used to test the association of diet self-efficacy and physical self-concept. Categorical variables were assessed with the Chi-square test, and continuous variables were tested by ANOVA and post hoc analysis to determine the differences between ethnicities. The hypotheses were tested with the general linear model and adjusted for age, gender, and smoking.

RESULTS

The general characteristics of the participants by race/ethnicity are shown in Table 1. There were no significant differences across race/ethnicity for physical self-description. Barriers for diet self-efficacy were significantly higher for WNI and Hispanics as compared to blacks and "others." WNI were about a year younger than other groups. Hispanics has the greatest percent of currently smoking, followed by WNI; compared to Blacks and Others blacks and "others." Low barriers to healthy eating (lower scores on diet self-efficacy) were associated with each of the following subscales of higher physical self-concept: health ($r = -0.123$, $P < 0.001$); general physical self-concept ($r = -0.129$, $P < 0.001$), physical appearance ($r = -0.100$, $P < 0.001$) and physical self-esteem ($r = -0.146$, $P < 0.001$) and body fat ($r = -0.248$, $P < 0.001$). There was no relationship between diet self-efficacy and strength ($r = 0.005$, $P = 0.797$), flexibility ($r = -0.014$, $P = 0.548$), endurance ($r = 0.019$, $P = 0.438$), coordination ($r = -0.034$, $P = 0.159$), and sports competence ($r = -0.024$, $P = 0.314$).

The relationship of diet self-efficacy and physical self-concept is presented in Table 2. Low diet self-efficacy was associated with a lower score on physical self-concept ($B = -0.52$ [-0.90, -0.15], $P = 0.007$). Males had a higher physical self-concept as compared to females ($B = 14.0$ [8.2, 19.8], $P < 0.001$). Racial/ethnic category, age, and smoking status were not associated

Table 1: General characteristics

Variable	Black	WNI	Hispanic	Other	P value
Physical self-description	283±57	284±61	280±57	276±64	0.624
Diet self-efficacy	6.26±7 ^a	8.38±8 ^b	7.92±7 ^b	6.60±6 ^a	0.004
Age (years)	21.4±4 ^a	20.5±3 ^b	21.0±3 ^a	21.1±3 ^b	0.031
BMI	26.0±5 ^a	23.7±4 ^b	24.2±5 ^b	23.9±5 ^b	<0.001
Smoke (yes)	5 (5.0) ^a	28 (27.7) ^b	60 (59.4) ^c	8 (7.9) ^a	<0.001

WNI: White, non-Hispanics, BMI: Body mass index. Data are presented with means±SD or N (%). Columns with the same letter are not significantly different. Physical self-concept scale range: 70-350; values ≥ 231 were considered having a high physical self-concept. Diet self-efficacy score (0-33) was based on barriers to healthy eating. Higher scores represented a lower diet self-efficacy. A score ≥ 20 was considered a high-risk for eating disorder, SD: Standard deviation

Table 2: Model 1. Relationship of negative dieting self-efficacy and physical self-concept

Variable	B (95% CI)	SE	P value
Diet self-efficacy*	-0.52 (-0.90, -0.15)	0.19	0.007
Race	-	-	0.811
Black	3.93 (-8.34, 16.2)	6.3	0.530
WNH	5.15 (-6.53, 16.8)	6.0	0.387
Hispanic	2.15 (-7.67, 12.0)	5.0	0.668
Other (reference)	0	-	-
Male	14.0 (8.20, 19.8)	3.0	<0.001
Female (reference)	0	-	-
Age (years)	-0.09 (-0.97, 0.78)	0.44	0.835
Currently smoking yes	-0.83 (-13.0, 11.4)	6.2	0.894
No (reference)	0	-	-

*WNH: White, non-Hispanics, Diet self-efficacy was measured with a negative construct as a lack of confidence to control eating behaviors. The dependent variable is physical self-concept. The major independent variable is diet self-efficacy. The model was adjusted for body mass index, race, gender, age and smoking status (variables shown), SE: Standard error, CI: Confidence interval

Table 3: Model 2. Association of negative dieting self-efficacy and BMI with physical self-concept

Variable	B (95% CI)	SE	P value
Diet self-efficacy*	-0.11 (-0.48, 0.26)	0.19	0.556
BMI kg/m ²	-3.3 (-3.9, -2.7)	0.30	<0.001
Race	-	-	0.358
Black	9.6 (-2.2, 21.5)	6.0	0.111
WNH	3.4 (-7.9, 14.7)	5.7	0.552
Hispanic	2.5 (-7.0, 12.0)	4.8	0.603
Other (reference)	0	-	-
Male	21.4 (15.6, 27.2)	2.9	<0.001
Female (reference)	0	-	-
Age (years)	0.57 (-0.28, 1.42)	0.43	0.189
Currently smoking (yes)	1.08 (-10.7, 12.8)	6.0	0.858
No (reference)	0	-	-

*BMI: Body mass index, WNH: White, non-Hispanics, Diet self-efficacy is a negative construct reflecting a lack of confidence to control eating behaviors. The major independent variables are diet self-efficacy and BMI. The model was adjusted for race, gender, age and smoking status (variables shown), SE: Standard error, CI: Confidence interval

with physical self-concept. Table 3 depicts model 2, which includes BMI with diet self-efficacy. Diet self-efficacy is no longer significant with BMI in the model. BMI is inversely associated with physical self-concept. The inclusion of BMI did not change the relationship of gender, age, and smoking with physical self-concept.

DISCUSSION

Major findings of this study were that college students with a confidence in their ability to regulate their diet (diet self-efficacy) were also confident in their physical image and that college students with higher BMI’s had lower physical image independent of race/ethnicity. Society’s emphasis on appearance can have a strong influence on college students and may result in poor body image and low self-esteem [8]. Since self-esteem is closely related to self-efficacy [6-9] diet self-efficacy (the individual’s belief in their ability to resist challenges to the diet from high calorie foods, social and internal factors, and

negative emotional events) could be lacking for individuals with poor body image and low self-esteem [5]. Lack of confidence in one’s ability to control eating together with negative emotions has been associated with eating disorder characteristics for a US cohort of undergraduate female students [18]. Specifically, these investigators reported that female college students who had low confidence to eat healthily and a negative physical body image were more likely to be preoccupied with body weight (a risk-factor for eating disorders) [18]. They conclude that self-efficacy related to one’s eating, weight, and body image predicts weight preoccupation [18].

Diet self-efficacy was associated with physical self-concept for this study; however, when BMI was considered, dieting self-efficacy was no longer associated with physical self-concept. Being over-weight was strongly associated with poor physical self-concept for this study. These findings indicate the strong connection between negative body image and obesity, which is supported in the literature. In fact, body image distress is considered a key risk factor for eating disorders in women [19,20]. Body image dissatisfaction partially negated the treatment effects of eating and weight management in overweight women [21]. These author’s findings indicate the need to consider physical self-concept when developing weight-loss programs as a means to reduce the risk of eating disorders.

In agreement with our study, Stich *et al.* [10] reported that higher BMI was associated with lower diet self-efficacy. Eating patterns and attitudes (self-efficacy) for regulating eating were found to be significantly poorer for obese versus non-obese woman even after a behavioral intervention [22]. In a wide-aged, primarily Caucasian group of obese adults, higher self-efficacy was a predictor of weight change for men but not for women [23]. A more positive body image was indicated for men as compared to women in the current study. These findings suggest that there is a complex relationship among body dissatisfaction, actual body weight, and eating behaviors.

Eating disorders is still a relatively new field and a greater understanding of interpersonal risk factors and protective factors is needed [12]. Health education programs that target low self-efficacy and body dissatisfaction are critical and they are currently lacking [5]. This study addressed a gap in the literature on the role of diet self-efficacy with physical self-concept and BMI in US college students of diverse racial/ethnic backgrounds. The study was limited since it was a convenience sample and may not be generalizable to all college student of the USA. The cross-sectional nature of this study does not allow causality for diet self-efficacy and body satisfaction. Future studies with a representative sample of college students from the USA and other countries are warranted.

CONCLUSIONS

Poor body image is a known risk-factor for eating disorders. College students in this study who had a poor body image were less confident with diet control. Poorer body image was associated with higher BMI. These findings suggest that

programs aimed at reducing obesity need to deal with the psychological components of body image to ensure healthy weight-loss. Lifestyle management interventions and health education programs, which are designed to improve self-esteem, diet self-efficacy and physical self-concept may lower risk of eating disorders for college students.

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