



Helpful or harmful? The comparative value of self-weighing and calorie counting versus intuitive eating on the eating disorder symptomology of college students

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Abstract

Objective The current study evaluated the comparative implications of self-weighing and calorie counting versus intuitive eating (IE) on the eating disorder (ED) severity of college students.

Methods In this cross-sectional study, college students in the US [$N=902$; 68% female; mean body mass index (BMI)=24.3] completed the web-based Healthy Bodies Study in 2015.

Results A hierarchical multiple regression analysis revealed that elevated BMI, more frequent self-weighing and calorie counting, and lower IE scores predicted increased ED severity. The results of Kruskal–Wallis H tests indicated that participants with elevated weight statuses engaged in self-weighing and calorie counting more frequently, and possessed lower IE scores, than their lower weight counterparts.

Conclusion Engaging in self-weighing and calorie counting was adversely associated with ED severity among the present sample of college students. Cultivating IE within health promotion efforts may, instead, lead to favorable eating-related outcomes that may translate to the holistic health of this population.

Level of Evidence V cross-sectional descriptive study.

Keywords Eating disorders · Obesity · Self-monitoring · Intuitive eating · Young adult

Introduction

Eating disorders (EDs)—mental illnesses characterized by maladaptive eating patterns, such as binge eating, purging, and dietary restriction—and overweight/obesity (OW/OB) are often co-morbid, possess similar risk and maintaining factors, and increased body mass index (BMI) is associated with heightened ED risk [1–3]. Despite this interconnectivity, the treatment paradigms that guide interventions for OW/

OB versus EDs vastly differ. Indeed, the main aim of OW/OB interventions is weight reduction, often via behavioral self-monitoring (e.g., self-weighing, calorie counting) [2, 4]. Weight loss (WL)-focused initiatives demonstrate limited efficacy in the long-term, however, and are associated with adverse outcomes including weight cycling, poor physical and mental health, weight stigma, and ED symptoms [5–7].

These limitations have led to calls for a paradigm shift away from the WL-focused perspective to weight-neutral approaches [5, 7]. Rather than targeting weight loss, weight-neutral approaches aim to improve the holistic health and well-being of individuals across the weight spectrum from a non-dieting perspective, typically by augmenting intuitive eating (IE) abilities [7]. IE is an adaptive eating style shown to support favorable physical and mental health and is considered a viable treatment target for both OW/OB and EDs [5, 8]. At present, however, the comparative implications of the fundamental treatment targets of the WL-focused and weight-neutral paradigms—self-weighing and calorie counting versus IE—relative to the ED severity of college students have not been duly evaluated. The current study addresses

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this research gap to identify potential ED-related implications of promoting self-monitoring versus IE in treatment programs for college students across the weight spectrum.

The weight loss focused paradigm

The central aim of current treatment guidelines for OW/OB is weight reduction via comprehensive lifestyle interventions that encourage behavioral self-monitoring, particularly self-weighing and calorie counting [4]. First, self-weighing is often promoted in WL-focused treatments due to findings that, among adults with OW/OB, frequent self-weighing is associated with weight loss and less weight regained after initial losses [9–11]. Yet, little evidence attests to the long-term maintenance of these weight-based outcomes following behavioral interventions that encourage frequent self-weighing [11, 12], and weight regain occurs over time for most individuals following weight loss or management interventions at large [13]. In addition, there is a comparably limited and equivocal evidence-base on relationships between self-weighing and mental health and these associations vary based on population characteristics. Indeed, among non-OW/OB and younger populations, strong associations have been found between frequent self-weighing and negative affect [14–16], body dissatisfaction [17], ED behaviors, and adverse weight control practices [18]. Conversely, non-significant or positive self-weighing-psychological well-being relationships have been found among OW/OB treatment-seeking people [19]. Although, whether these latter results extend to college students in the community with elevated BMIs is not known.

Calorie counting is also frequently encouraged in OW/OB treatments [12]. The quantitative focus of counting calories and adhering to specific arithmetic calorie goals, however, overlooks the qualitative nutritional value of the types of foods individuals consume. When the focus falls on counting calories, higher-fat higher-calorie foods that preclude weight gain (e.g., avocados, nuts, fatty fish) can be overlooked in place of lower-calorie, synthetic substitutes (e.g., artificial sugars, refined grains) [20, 21]. Indeed, weight maintenance extends beyond a focus on calories alone and warrants consideration of the types of food consumed in tandem. Frequent calorie counting also characterizes restrictive- and binge/purge-spectrum EDs: Individuals with EDs commonly calculate and monitor their dietary intakes to ensure adherence to self-set caloric limits [22], and binge eating and other ED symptoms commonly arise when energy deficits are maintained [20, 22]. Consequently, encouraging calorie counting for OW/OB treatment purposes, particularly when coupled with the aim of inducing caloric deficits, can be considered prescribing a symptom of, and perpetuating, a related debilitating health condition.

Further, limiting caloric intakes to levels recommended in OW/OB treatment guidelines (women: 1200–1500 kilocalories (kcal)/day; men: 1500–1800 kcal/day) [4] has been shown to promote OB and EDs. For one, individuals who restrict their caloric intakes often experience increased fatigue and hunger which, in turn, translates to elevated food consumption [20]. Weight cycling (repeated weight losses and gains) frequently arises as a result and, subsequently, leads to adverse health and well-being and ED symptoms [7, 23]. In addition, dieting more generally is associated with EDs, depression, negative self-perceptions, feelings of worthlessness, and heart problems [5, 24–26]. Since dieting and dietary restraint are foremost ED symptoms, and as self-monitoring behaviors are indicative of and further promote EDs [22, 27], it is useful to evaluate alternative approaches for eating-related concerns that promote holistic health.

Weight-neutral approaches

As an alternative to WL-focused treatments, weight-neutral approaches uphold a non-dieting acceptance-based perspective to holistic health promotion [7]. Enhancing mental and physical health at any weight are core elements that are targeted. Weight loss may or may not occur, as this is not a treatment goal; although, weight loss or maintenance often occurs after non-dieting interventions are administered [24, 28–30]. A core component of weight-neutral approaches, IE, has gained support as a beneficial treatment target in interventions that address OW/OB and EDs. IE includes the ability to eat based on hunger and satiety cues, eating for physical versus affective purposes, granting oneself unrestricted permission to eat, and the ability to consume the types of foods one's body requests for optimal functioning [8]. In prior research, IE has been inversely associated with BMI [31–33] and favorably linked to cholesterol and triglyceride levels, systolic blood pressure [24, 29], ED symptoms, depression, body dissatisfaction, and self-esteem [28, 30, 34].

Study purpose

The extant literature on the treatment targets of the WL-focused and weight-neutral perspectives, concomitantly, relative to ED symptoms is underdeveloped, and largely consists of studies that used small samples. Research has yet to specifically examine the comparative implications of self-weighing and calorie counting frequencies versus IE on the ED severity of a large sample of college students. Young adults, the normative age range for college students, are at risk for developing health behaviors that subsist into adulthood and this life-stage places individuals at increased

risk for elevated weight gain and EDs [35]. Thus, evaluating behaviors that impact this population's health may help inform treatment programming efforts. Consequently, the current study examines relationships between core aspects of the WL-focused and weight-neutral paradigms—self-weighing, calorie counting, IE—relative to the ED severity of college students. This study also examines whether individuals' self-weighing and calorie counting frequencies, IE abilities, and ED severity differ by weight class.

Method

Participants and procedures

Participants included 902 college students ($M_{\text{age}} = 24.4$ years, $SD = 6.1$; $M_{\text{BMI}} = 24.3 \text{ kg/m}^2$, $SD = 5.0$) at a large public university in the Southeast US. Most identified as White (77.3%), female (68.2%), had BMIs between 18.5 and 24.9 kg/m^2 (61.4%), and were pursuing graduate-level degrees (59.2%). Approximately, 59% of respondents reported dieting over the past 12 months, 5% reported lifetime EDs, and 4% exhibited clinically severe EDs the time of assessment via Eating Disorder Examination-Questionnaire (EDE-Q) Global scores ≥ 4.0 [36].

The current assessment is part of the Healthy Bodies Study (HBS), a multi-institute study of college students' body images, and eating, exercise, and dieting behaviors [37]. Each university that participated in the HBS could elect to administer other measures beyond the core topics, and the present sample of students additionally completed an IE measure. Study approval was acquired from the University's Institutional Review Board. A random sample of 3,500 prospective participants was then obtained from a list of enrolled students ages 18 or older in 2015. There was a 26% response rate. All students who chose to proceed provided informed consent and completed the online survey. All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Measures

Demographics

Participants answered demographic questions, including those targeting age and gender identity, and provided self-reported heights and weights which were used to calculate BMIs. Age, gender, and BMI have upheld explanatory power in predicting ED severity in past research and, consequently, were controlled for in our regression analysis. BMI weight classes were calculated based on clinical guidelines for

adults to assess weight-related differences on study variables of interest: underweight, $< 18.5 \text{ kg/m}^2$; average weight, $18.5\text{--}24.9 \text{ kg/m}^2$; OW, $25.0\text{--}29.9 \text{ kg/m}^2$; OB, $\geq 30.0 \text{ kg/m}^2$ [4].

Self-monitoring

Two, single-item variables were used to determine self-monitoring frequencies. The frequencies of participants' self-weighing behaviors were captured by the question, "About how often do you weigh yourself?" (0 = Never to 8 = More than once per day). Participants' calorie counting frequencies were assessed with, "How often do you typically count the calories that you consume?" (0 = Never to 4 = Always).

The Intuitive Eating Scale 2 (IES-2)

The IES-2 [8] is a 23-item measure of IE that examines the extent to which individuals' eating habits are driven by their physiological hunger and satiety cues. It generates a total and four subscale scores: Unconditional Permission to Eat (UPE); Eating for Physical Rather than Emotional Reasons (EPER); Reliance on Hunger and Satiety Cues (RHSC); Body-Food Choice Congruence (BFCC). The IES-2 has demonstrated high levels of reliability and validity among college students [8]. In the present sample, there was good internal consistency (Cronbach's alpha: Total = 0.884; UPE = 0.743; EPER = 0.900; RHSC = 0.879; BFCC = 0.873).

EDE-Q

The EDE-Q [36] assesses ED attitudes, behaviors, and feelings over the past 28 days. It has four subscales—eating concern (EC), restraint, weight concern (WC), shape concern (SC)—and a Global score that reflects overall ED severity. Higher scores suggest greater ED severity. Acceptable internal consistency (Cronbach's alpha 0.70–0.93) and reliability have been demonstrated in assessments of university and community-based samples of young adults [38], making the EDE-Q a well-suited metric for the present study. There was good internal consistency in the current sample (Cronbach's alpha: Global = 0.932; EC = 0.759; Restraint = 0.775; SC = 0.907; WC = 0.827).

Data analyses

After determining that all assumptions were met, a hierarchical multiple regression analysis was run. The following predictors were entered in successive blocks relative to EDE-Q Global scores as a criterion variable: Step (1) age, gender, BMI; Step (2) self-weighing frequency, calorie counting frequency, IES-2 Total. To determine whether participants'

self-weighing and calorie counting frequencies, IE abilities, and ED severity differed by weight class (underweight, average weight, OW, OB) a series of between-group analyses were run. Preliminary analyses revealed violations of normality and homogeneity of variance assumptions, making the non-parametric Kruskal–Wallis H test best suited for our data; all assumptions necessary for running these tests were met.

Results

Predicting eating disorder severity

The full and final hierarchical regression model that included age, gender, BMI, frequencies of self-weighing and calorie counting, and IE relative to EDE-Q Global scores (Model 2) was significant ($R^2 = 0.567$, $p < 0.001$). Adding the frequency of self-weighing and calorie-counting variables and IE scores to the prediction of ED severity (Model 2) significantly increased the proportion of variance explained ($\Delta R^2 = 0.382$, $p < 0.001$). See Table 1.

Weight class differences

Kruskal–Wallis H tests were run to determine potential weight status differences in self-weighing and calorie-counting frequencies, IE scores, and ED severity. The distributions of each variable significantly differed between weight classes (all p values ≤ 0.003). For all presented

analyses, pairwise comparisons were subsequently conducted using Dunn's [39] procedure; $\alpha = 0.01$ was used to indicate statistical significance, given the multiple comparisons. First, for self-weighing, OW participants weighed themselves more frequently (mean rank: 497.86) than average weight respondents (430.28). There were no significant self-weighing frequency differences for any other weight class combinations. Next, for calorie counting, compared to participants classified as underweight (282.60), respondents classified as average weight (416.29), OW (527.11), and OB (507.58) counted calories more frequently. Those within the OB and OW classes also counted calories more often than average weight participants, and there were no calorie-counting differences between the OB and OW weight classes ($p = 1.00$).

Regarding IE, compared to individuals in the OB weight class (290.31), participants classified as average weight (466.34) and underweight (609.09) exhibited superior IE abilities. Participants within the underweight and average weight classes also had higher IE scores than those classified as OW (364.04). Finally, participants in the underweight category had higher IE scores than their average weight counterparts. There were no IE differences between the OB and OW weight classes ($p = 0.094$). Next, relative to ED severity, compared to individuals within the underweight category (197.13), those classified as average weight (395.58), OW (557.38), and OB (614.04) exhibited elevated ED severity. Participants within the OB and OW classes also had higher ED severity than average weight respondents. EDE-Q Global scores did not differ between the OW and OB weight classes ($p = 0.407$). See Table 2.

Table 1 Predicting eating disorder symptom severity from age, gender, BMI, self-weighing frequency, calorie-counting frequency, and intuitive eating

Predictor variable	EDE-Q Global Scores			
	Model 1		Model 2	
	<i>B</i> (SE)	β	<i>B</i> (SE)	β
Constant	−0.40 (0.23)		3.96 (0.28)**	
Age	−0.01 (0.01)	−0.05	−0.01(0.01)	−0.03
Gender	−0.56 (0.08)**	−0.21	−0.27 (0.06)**	−0.10
BMI	0.09 (0.01)**	0.39	0.04 (0.01)**	0.16
Self-weighing frequency			0.08 (0.01)**	0.13
Calorie-counting frequency			0.22 (0.03)**	0.21
IES-2 total score			−1.07 (0.05)**	−0.52
R^2	0.184		0.567	
F	63.36**		182.63**	
ΔR^2	0.184		0.382	
ΔF	63.36**		236.43**	

$n = 845$

BMI Body Mass Index, *IES-2* The Intuitive Eating Scale-2, *EDE-Q* The Eating Disorder Examination Questionnaire

** $p < 0.001$; * $p < 0.05$

Table 2 Differences in self-monitoring behaviors, intuitive eating, and eating disorder severity based on weight class

Outcome	Underweight		Average weight		Overweight		Obese		Comparisons	
	n	Mean Rank	n	Mean rank	n	Mean rank	n	Mean rank		Test statistic
Self-weighting frequency	41	380.70	554	430.28	190	497.86	109	472.39	13.82*	OW > AW**
Calorie-counting frequency	41	282.60	549	416.29	190	527.11	109	507.58	54.36***	OB > UW***; OW > UW***; AW > UW*; OB > AW*; OW > AW**
IES-2 total	40	609.09	533	466.34	182	364.04	104	290.31	78.14***	AW > OB***; UW > OB***; AW > OW***; UW > OW***; UW > AW**
EDE-Q global	41	197.13	554	395.58	190	557.38	109	614.04	140.69***	OB > UW***; OW > UW***; AW > UW***; OB > AW***; OW > AW**

Higher mean ranks indicate higher scores on the respective outcome variable

IES-2 The Intuitive Eating Scale-2, OB obese, OW overweight, AW average weight, UW underweight; statistical significance is accepted as $\alpha = 0.01$ to account for multiple comparisons

* $p < 0.01$; ** $p < 0.001$

Discussion

Prevailing interventions for OW/OB place primary emphasis on weight loss, often via behavioral self-monitoring [2, 4]. Yet, the long-term inefficacy of these interventions and adverse correlates of treatments with a weight loss focus have led researchers to examine the viability of alternative, weight-neutral approaches that promote IE as a way of improving holistic health [5, 7]. Adding to the literature, this study examined the comparative implications of the core treatment targets of the WL-focused versus weight-neutral perspectives, self-weighting and calorie-counting versus IE, relative to the ED severity of a large sample of college students. More frequent self-weighting and calorie counting by participants predicted heightened ED severity, whereas higher levels of IE predicted lower ED scores. These data support cultivating IE among college students in treatment programs that target eating-related concerns and suggest that self-monitoring may be adversely associated with ED outcomes for this population.

The weight loss-focused paradigm

Although the WL-focused perspective encourages self-monitoring [4], the present results suggest these tactics may be harmful for college students in the community. Indeed, more frequent self-weighting and calorie counting were associated with increased ED severity. Prior studies have similarly found relationships between harmful weight-control practices, negative affect, and ED-related symptoms relative to elevated self-monitoring among young adults and individuals with non-OW/OB BMIs [14, 15, 17–19]. Encouraging use of these behaviors in health promotion efforts and treatment programs may consequently harm, rather than improve, the health of these groups. Further, participants at the higher end of the weight spectrum in the present study engaged in self-weighting and calorie counting more frequently than their lower weight counterparts, and those with OW engaged in these behaviors most often. These findings contrast prior research on this topic that has linked more frequent self-monitoring to lower BMIs [11, 40, 41]. These previous results, however, stem from studies that have either exclusively targeted or oversampled individuals with OW/OB BMIs and who were enrolled in weight loss or management programs. Findings particular to college students in the general population and who represent the full weight spectrum cannot be generalized from these prior studies in effect. As such, the present results add to the limited evidence base on how often community-based samples of college students use self-monitoring behaviors.

Weight-neutral approaches

Further exploring the viability of non-dieting weight-neutral approaches aimed at helping college students develop acceptance-based relationships with themselves and food seems worthwhile in light of the results of the current study. IE, a central target of weight-neutral approaches, was inversely associated with ED severity in the present study. This finding aligns with prior research that found favorable relationships between IE and ED symptoms and body dissatisfaction [28, 30, 34] and, further, underscores the usefulness of continuing to examine IE as a target for ED prevention and intervention programs. In addition, it is noteworthy that when participants were compared by weight class, those at the lowest end of the weight spectrum had the highest level of IE. Other researchers have also found that IE is more prevalent among individuals with lower BMIs [31–33]. Yet, whether our finding that participants with underweight BMIs had more favorable levels of IE than their higher weight counterparts is beneficial from a holistic health perspective cannot be gleaned from these results. Although IE is associated with favorable physical and mental health more generally [28–30], and although participants with lower BMIs in the current study had lower ED severity than higher weight respondents, it is possible that participants classified as underweight faced other health concerns not accounted for. Future research should assess this possibility to determine whether IE is a favorable health behavior for people comprising this weight class or whether IE masks various health concerns among underweight college students.

Future research and clinical implications

The present results provide various directions for future research and implications for clinical practice. First, it is possible that the unfavorable relationships between self-monitoring and EDs found in the present study can be explained by the unfounded belief that lower body weight alone is indicative of favorable health [5, 7]. Indeed, individuals who endorse this belief may diligently count their caloric intakes and/or turn to the scale to monitor changes in their eating and weights, respectively, to ensure that they are not deterring from this “health indicator.” Yet, frequent calorie counting is a prominent ED symptom [22] and the scale may serve as an emotional barometer for some individuals, wherein this quantitative feedback subsequently dictates affect, food and exercise-related behaviors in potentially harmful ways [14]. It would be useful for future research to use moderated-mediation analyses to identify how and which subgroups of college students are apt to engage in self-monitoring-ED behavior cycles (calorie count→self-weigh→weight gain/no loss→ED behavior→calorie count, etc.) and the impact

on psychophysiological health. It may be particularly useful to explore these relationships among young adults in the community with higher weights, a group identified by this study that engages in self-monitoring more frequently, and possesses higher ED severity, than their lower weight counterparts. This can help determine novel markers that identify groups in need of clinical or preventive care.

Next, results of this study suggest that IE should be further explored as a treatment target for OW/OB and/or EDs in initiatives designed for college students in the community, possibly via programs that address eating- and weight-concerns concomitantly. Indeed, promoting a uniform message about healthy eating (e.g., IE) and body acceptance may help decrease ED symptoms conducive to threshold EDs and OB, and can help bridge gaps between mental and physical health professionals working in the areas of EDs and OB. It may be useful for such programs to target shared risk and perpetuating factors that promote both eating- and weight-concerns [2, 3]. Efforts of this nature can augment college students’ holistic, mental and physical, health.

Limitations

Although strengths of the current study include the large sample and the novelty of the research questions addressed, certain limitations are noted. First, the self-monitoring variables were single-item data points rather than validated measures. Similar single-item questions that assess self-weighing frequency, for one, have been implemented in prior research, however [9–11, 16, 18, 40], and appear to suitably address this construct. In addition, as the self-monitoring behaviors were self-reported and assessed at one time-point, they may not accurately reflect actual behavior longitudinally. Other limitations include the use of self-reported height and weight in the BMI calculations and that most participants identified as White, female, and were college students. Our study should be replicated with a varied sample to generalize to a more diverse demographic.

Conclusion

Results of the present study suggest self-monitoring behaviors (self-weighing, calorie counting) may be adversely associated with the ED severity of college students. IE, in contrast, was favorably related to this outcome in the present sample and warrants further attention by researchers to determine how and for whom targeting this construct may generate favorable ED and related psychophysiological outcomes. In addition, the present research suggests that cultivating IE in combined programs that address both eating- and weight-concerns may exact benefits relative to

EDs and OB, and such efforts may help bridge gaps between mental and physical health professionals working in these two overlapping disciplines.

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Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent All participants provided informed consent prior to participating in the present study.

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