

Original Article

# Usefulness of Standard BMI Cut-Offs for Quality of Life and Psychological Well-Being in Women

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## Key Words

Quality of life · Well-being · BMI · Obesity · Women

## Abstract

**Objective:** We examined BMI-based obesity categories and risk for poor health-related quality of life (HRQOL) and psychological well-being (PWB). **Methods:** Participants were 1,795 women aged  $35.3 \pm 10.2$  years with a mean BMI of  $26.6 \text{ kg/m}^2$ , not seeking treatment (55%) or upon entry into a weight control program. Assessments included general HRQOL, weight-related HRQOL, self-esteem, and body image. **Results:** All variables, except general HRQOL, were different ( $p < 0.001$ ) between normal-weight and overweight/obese women. For weight-related HRQOL and body image, worse psychosocial scores were observed linearly with higher obesity levels. Self-esteem was lower in overweight and obese women in comparison with normal-weight women, with no difference between class I and class II obesity. Participants entering a clinical program reported higher physical HRQOL, but lower self-esteem and poorer body image than community-dwelling women of equal weight. **Conclusions:** BMI categories are useful for identifying increased impairment in PWB and HRQOL in overweight and obese (class I or II) women. Women with a BMI under  $25 \text{ kg/m}^2$  reported improved well-being and HRQOL in comparison to overweight or obese women. However, this relation may not be linear across all psychosocial outcomes, with unique patterns emerging for the association of obesity level with specific dimensions of PWB and HRQOL. Copyright © 2012 S. Karger GmbH, Freiburg

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## Introduction

Obesity has a significant impact on physical health, and its negative medical consequences are well-documented. A high BMI has been linked to shorter life expectancy [1] and risk of several comorbidities such as metabolic syndrome, osteoarthritis, sleep apnea, cardiovascular disease, hypertension, diabetes, dyslipidemia, and certain forms of cancer [2–4]. In recent years, the psychological consequences of obesity have received more attention; research suggests that overweight and obesity negatively affect quality of life and well-being [5, 6] as well as subjective health status, particularly in the dimension of physical well-being [7]. For example, data from the Canadian Multicentre Osteoporosis Study showed that excess weight has a substantial negative effect on health-related quality of life (HRQOL), particularly in women [8]. Two review articles concluded that impairments on physical functioning and psychosocial functioning are associated with greater degrees of obesity [9] and that there appears to be a dose-response association between greater BMI and degree of HRQOL impairment, producing decreases in functional status and subjective well-being [10]. Additionally, a meta-analysis of studies on obesity and body image suggests a link between obesity and body image dissatisfaction among the obese population – obesity might affect body image through psychological distress, which has an impact on quality of life [11].

International guidelines classify overweight and obesity based on BMI ( $\text{kg}/\text{m}^2$ ). BMI categories – normal weight ( $18.9\text{--}24.9 \text{ kg}/\text{m}^2$ ), overweight ( $25.0\text{--}29.9 \text{ kg}/\text{m}^2$ ) as well as obesity class I ( $30.0\text{--}34.9 \text{ kg}/\text{m}^2$ ), class II ( $35.0\text{--}39.9 \text{ kg}/\text{m}^2$ ), and class III ( $40.0 \text{ kg}/\text{m}^2$  or higher) [12] – are important for specifying obesity-related physical health risk, for example, the transition from normal weight to overweight is a critical cut-point that predicts an increase in overall cardiovascular disease (CVD) risk factors [12, 13]; when a person's BMI exceeds  $30 \text{ kg}/\text{m}^2$  and especially  $35 \text{ kg}/\text{m}^2$ , an increase in mortality from several causes is well documented [14]. Accordingly, the National Institutes of Health (NIH) recommend weight loss therapy for persons with a BMI over  $30 \text{ kg}/\text{m}^2$ , and for persons with a BMI between 25 and  $29.9 \text{ kg}/\text{m}^2$  or a high-risk waist circumference and two or more risk factors [15]. In Portugal, the prevalence of overweight and obesity is 53.6% for adults, 14.4% of whom are obese; in adult women, 13.4% are obese and 34.4% are overweight [16]. However, very few of these women have a BMI above  $40 \text{ kg}/\text{m}^2$ . In fact, the majority of obese Portuguese women fit into class I and class II obesity.

Despite their widespread use, it is unclear whether standard BMI cut-offs are meaningful and useful with respect to the social and psychological consequences of overweight and obesity [11]. Several review articles and meta-analyses have found an inconsistent relation between obesity and psychological outcomes, including psychological well-being and quality of life [17–19]. Moreover, mixed evidence has been shown for body image and self-esteem as predictors of weight control [20]. For instance, a large study with US American adults showed that overweight or obese treatment seekers are generally more impaired in obesity-specific quality of life than overweight or obese individuals who do not seek treatment [21]. Fontaine et al. [22] concluded that obese persons who had sought treatment were significantly more impaired in the domains of bodily pain, general health, and vitality HRQOL previous to treatment than those who were not trying to lose weight. Body image problems are highly prevalent in overweight and obese persons [23], especially among those seeking treatment [24], and these persons often engage in treatment with the goal of improving body image, which can result in higher body shape concerns and greater body image dissatisfaction. The previous evidence points out the need to study overweight and obese individuals who are seeking treatment separately from those who are not.

**Table 1.** Sample characteristics

	Total sample (n = 1,795) Mean ± SD
Age, years	35.3 ± 10.2
Weight, kg	69.5 ± 14.0
Height, m	1.62 ± 0.1
BMI, kg/m <sup>2</sup>	26.6 ± 5.3
	Total sample %
Overweight	29.0
Obese	26.6

The goal of this study was to examine the association of obesity level with quality of life and psychological well-being in a large sample of women, comparing normal-weight, overweight, and obese (classes I and II) participants. More specifically, we sought to investigate whether BMI-defined cut-offs are useful for identifying levels at which quality of life and psychological well-being might be at risk. As a complementary analysis, we studied the potential moderating role of treatment seeking status on the relation between obesity level and psychological well-being. We hypothesized that HRQOL and psychological well-being would be decreased in women with higher BMI and in those seeking treatment. To our knowledge, this is the first study examining both HRQOL and psychological well-being variables in overweight/obese individuals entering obesity treatment and in the community at large.

## Material and Methods

### Sample

Participants were 1,795 adult women with a BMI between 18 and 40 kg/m<sup>2</sup>, recruited from the community (54.8%) or upon entry into two weight control programs (45.2%). Sample characteristics used in the main analysis of this work are described in table 1. For the purpose of the complementary analysis, we considered two sub-samples: 'non-clinical' and 'clinical'. Women in the community ('non-clinical') sub-sample (n = 984) had to be over 18 years old, not enrolled in a formal weight loss treatment program, and stated that they were not presently attempting to lose weight. The majority of these women met the criteria for being premenopausal and not being pregnant (n = 585 out of 984). For the remaining women in the sample, information on menopause is not available but it can be assumed that most of them are premenopausal as 380 out of 399 participants were younger than 50 years old. They were recruited in multiple contexts such as schools, worksites, and health/medical centers through flyers, newsletters, listserv/emailing, and word of mouth. Among the treatment seeking ('clinical') group, 811 women entered one of two behavioral weight loss programs targeting changes in physical activity and dietary habits [25, 26], or volunteered to participate in a 4-month obesity prevention community-based program targeting changes in physical activity and diet [27]. Approval was obtained from the Faculty of Human Kinetics' Ethics Committee, and all participants signed an informed consent form.

### Instruments

#### Psychosocial Variables

For women in the clinical group, data were collected at baseline in each weight loss program during one laboratory session. For women in the non-clinical group, questionnaires were generally completed at the location of recruitment, individually or in small groups, in some cases without direct supervision.

Instruments were validated Portuguese versions of some of the most commonly used psychosocial instruments in obesity research and are described in detail below. Due to different assessment protocols in each sub-study, not all participants filled out all assessment instruments. The following numbers of participants were available for each of the instruments: general HRQOL N = 1,270; weight-related measure of HRQOL N = 1,310; self-esteem N = 1,374; body image dissatisfaction N = 1,639; body shape concerns N = 975.

#### *Health-Related Quality of Life*

To measure general HRQOL, 985 participants completed the SF-36 questionnaire [28] composed of two scales and a total of 36 items, reflecting physical (physical component summary (PCS)) and psychological (mental component summary (MCS)) composite values (Cronbach's  $\alpha$  for the PCS and MCS were 0.76 and 0.85, respectively). An additional 285 women completed the SF-12 questionnaire (Cronbach's  $\alpha$  for the PCS and MCS were 0.65 and 0.78), which consists of a subset of 12 items that make up the original SF-36 [29]. When cross-validated in the Medical Outcomes Study, the physical and mental components of the 12-item version explained a major portion of the variance in the SF-36 composite scores ( $R^2 = 0.905$  for PCS and  $0.938$  for MCS) [30]. It has been shown that the SF-12 correlates highly with SF-36 in obese and non-obese patients [31]. Furthermore, in our sub-sample measured with SF-36, we calculated an SF-12 score. Thus all HRQOL analyses are expressed using SF-12 scores, with higher scores indicating better HRQOL. Weight-related quality of life was also assessed using the Impact of Weight on Quality of Life-Lite (IWQOL-Lite) [32, 33], a 31-item questionnaire consisting of five subscales: physical function (e.g. 'Because of my weight, I have difficulty getting up from stairs'), self-esteem (e.g. 'Because of my weight, I don't like myself'), sexual life (e.g. 'Because of my weight, I have little or no sexual desire'), public distress (e.g. 'Because of my weight, I worry about finding chairs that are strong enough to hold my weight'), and work (e.g. 'Because of my weight, I have trouble getting things accomplished or meeting my responsibilities'). Cronbach's  $\alpha$  was between 0.77 and 0.92. They can be summarized into a total score (Cronbach's  $\alpha$  was 0.93), which was used in this study. Items are answered using a 5-point Likert scale from 'never true' to 'always true' and higher scores indicate better weight-related quality of life.

#### *Psychological Well-Being*

Self-esteem was assessed with the Rosenberg Self-Concept/Self-Esteem Scale [34], composed of ten items such as 'I feel I do not have much to be proud of' or 'I feel that I have a number of good qualities', evaluated on a 4-point Likert scale from 'strongly agree' to 'strongly disagree' (Cronbach's  $\alpha = 0.86$ ). Higher scores represent greater self-esteem. Body image dissatisfaction was measured with the Body Image Assessment Questionnaire [35], which consists of nine silhouettes of increasing size. Participants are asked to choose their current (i.e., perceived actual body size) and ideal figures. The difference between the actual and ideal body size is an indicator of body image dissatisfaction (Cronbach's  $\alpha = 0.80$ ) and addresses the evaluative dimension of body image. Higher scores represent higher body image dissatisfaction. The Body Shape Questionnaire [36], a 34-item instrument, was applied to measure several dimensions of body image, especially the experience of, and preoccupation with, 'being fat' (Cronbach's  $\alpha$  was 0.97), addressing the investment dimension of body image (i.e., the cognitive-behavioral importance of one's appearance) [37]. Higher values indicate greater body shape concerns and poorer body image.

#### *Body Habitus*

For women in the clinical group, body weight at baseline was measured twice with a standardized procedure [38], with subjects wearing light clothes and no shoes (average was used), using an electronic scale (SECA model 770, Hamburg, Germany). Height was measured twice, and the average of the two values was used for analyses. For women in the non-clinical group, weight and height were self-reported. BMI was calculated for all women. To overcome one possible study limitation, we considered an empirically driven adjustment for self-reported weight and height, based on an epidemiological study with a Portuguese sample [39]. In that study, the percentage of women who had a different obesity category by self-report versus actual BMI measurement was very small: 1.1% change from 'normal weight' to 'overweight', 0.9% change from 'normal weight' to 'class I obesity', and 0.3% change from 'normal weight' to 'class II obesity'. Thus, we used self-reported measures without adjustments.

**Table 2.** Health-related quality of life and psychological well-being by obesity status

	Normal weight (NW) (n = 798)	Overweight (Ov) (n = 520)	Class I obesity (Ob.I) (n = 339)	Class II obesity (Ob.II) (n = 138)	Orthogonal contrasts <sup>a</sup>					
					NW × (Ov,Ob)		(NW,Ov) × Ob		Ob.I × Ob.II	
					C1 <sup>b</sup>		C2 <sup>c</sup>		C3 <sup>d</sup>	
	mean ± SD	mean ± SD	mean ± SD	mean ± SD	ES	p	ES	p	ES	p
Age, years	30.5 ± 8.7	38.6 ± 9.7	40.3 ± 9.9	39.5 ± 9.2						
BMI, kg/m <sup>2</sup>	21.8 ± 1.8	27.4 ± 1.4	32.2 ± 1.4	37.3 ± 1.7						
HRQOL physical health	51.3 ± 6.8	50.0 ± 6.0	48.4 ± 7.0	47.5 ± 7.5	0.33	0.628	0.38	0.001	0.12	0.228
HRQOL mental health	45.9 ± 10.2	46.9 ± 9.7	46.9 ± 9.9	46.4 ± 9.4	0.09	0.502	0.06	0.610	0.05	0.708
Weight-related HRQOL	93.0 ± 8.2	82.4 ± 13.1	73.3 ± 14.8	63.5 ± 18.6	1.37	<0.001	1.20	<0.001	0.59	<0.001
Self-esteem	34.1 ± 4.2	30.9 ± 5.9	30.1 ± 6.4	31.0 ± 6.6	0.67	<0.001	0.47	0.406	0.14	0.154
Body image dissatisfaction	0.6 ± 0.8	1.9 ± 0.8	2.4 ± 0.8	3.0 ± 1.0	1.88	<0.001	1.47	<0.001	0.67	<0.001
Body shape concerns	63.2 ± 26.1	86.2 ± 30.1	94.0 ± 29.1	101.7 ± 29.3	0.99	<0.001	0.76	<0.001	0.26	0.069

HRQOL = Health-related quality of life

<sup>a</sup>Orthogonal contrasts using linear regression adjusting for age and treatment group.

<sup>b</sup>C1 = Comparison between normal weight and overweight or obese, reported values are p values.

<sup>c</sup>C2 = Comparison between non-obese and obese, reported values are p values.

<sup>d</sup>C3 = Comparison between class I obesity and class II obesity, reported values are p values.

## Statistical Analyses

Statistical analyses were completed using the Statistical Package for the Social Sciences, version 19 (SPSS Inc., Chicago, IL, USA). Linear regression was performed using BMI category as independent variable and quality of life and psychological well-being as dependent variables, adjusting for age. Group differences were determined with orthogonal contrasts, where C1 represents the comparison between normal weight (BMI < 25 kg/m<sup>2</sup>) and overweight or obese, C2 represents the comparison between non-obese (BMI < 30 kg/m<sup>2</sup>) and obese, C3 represents the comparison between class I obesity and class II obesity. Mean differences in quality of life and psychological well-being between clinical and non-clinical groups were tested using independent t-tests, within BMI levels. Analysis of covariance (ANCOVA) was used to study the effects of treatment group, obesity level, and their interaction (treatment seeking status × BMI category) on quality of life and psychological well-being outcomes using age as a covariate. For the effects of treatment, we further adjusted for actual BMI considering that there were significant differences in BMI between the clinical and non-clinical groups. Type 1 error was set at  $\alpha = 0.05$  (two-tailed) for all tests.

## Results

Quality of life and psychological well-being among the four BMI groups (normal weight, overweight, class I obesity and class II obesity) as well as significance testing for the orthogonal contrasts between the groups or effect sizes are shown in table 2. The sample sizes shown in table 1, table 2, and table 3 refer to the number of participants whose BMI scores were assessed. Results showed that physical HRQOL and weight-related measure of



**Table 3.** Treatment seeking and obesity impact on health-related quality of life and psychological well-being

	Overweight		Obesity		Treat. group	Treat. group × Ob.Categ.
	clinical (n = 317) mean ± SD	non-clinical (n = 203) mean ± SD	clinical (n = 403) mean ± SD	non-clinical (n = 74) mean ± SD	p <sup>a</sup>	p <sup>b</sup>
Age, years	39.6 ± 8.6	37.3 ± 10.7*	39.8 ± 9.1	41.3 ± 12.1	(0.034)	(<0.001)
BMI, kg/m <sup>2</sup>	27.6 ± 1.3	27.1 ± 1.3***	33.8 ± 2.8	32.6 ± 2.2***	(<0.001)	<0.001
HRQOL physical health	51.5 ± 5.6	48.7 ± 6.1***	49.1 ± 6.8	45.0 ± 7.5***	<0.001	0.096
HRQOL mental health	46.0 ± 10.1	47.7 ± 9.3	46.9 ± 9.5	46.2 ± 10.7	0.215	0.035
Weight-related HRQOL	80.2 ± 13.5	86.3 ± 11.3***	69.9 ± 16.0	73.7 ± 19.7	0.496	0.021
Self-esteem	28.3 ± 6.5	32.8 ± 4.6***	29.5 ± 6.7	32.9 ± 4.8***	<0.001	0.073
Body image dissatisfaction	2.1 ± 0.8	1.6 ± 0.8***	2.6 ± 0.9	2.3 ± 1.1**	0.036	0.004
Body shape concerns	97.8 ± 26.4	74.6 ± 29.2***	99.6 ± 27.7	83.7 ± 31.6***	<0.001	0.051

HRQOL= Health-related quality of life; Treat. = treatment; Ob.Categ. = obesity category.

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001 for independent t-test comparing clinical and non-clinical groups within obesity levels.

<sup>a</sup>p Values for analysis of covariance (ANCOVA) testing treatment group influence with age and BMI as covariate (note: comparison for age and BMI, indicating in parenthesis, are not adjusted).

<sup>b</sup>p Values for analysis of covariance (ANCOVA) testing (treatment group × obesity category) interaction with age as covariate (note: comparison for age, indicating in parenthesis, is not adjusted).

HRQOL differ among the four BMI categories (normal weight, overweight, obesity classes I and II). Generally, participants in higher BMI categories had lower HRQOL than participants in lower categories. However, there were no differences among BMI categories for mental HRQOL. Concerning self-esteem, individuals with normal weight had a higher score than participants classified as overweight or obese. For body image dissatisfaction and body shape concerns, we again found that individuals classified as normal weight had the lowest dissatisfaction and concern scores. Overweight participants showed lower dissatisfaction and body shape concern than obese participants, with the p value between class I and class II obesity for body shape concerns falling just short of statistical significance (p = 0.069).

Figure 1 provides a graphical summary of the direction of changes for each independent variable, separated for BMI category.

Next we tested the role of seeking treatment in HRQOL and psychological well-being. We did not include participants with normal weight in these comparisons, as they are less likely to seek weight loss treatment. Also, we did not differentiate class I and class II obesity due to the limited number of non-clinical participants in these two categories. For this analysis, the sample was split into two groups: women who were about to enter a weight control program (clinical group) and women not seeking treatment and not trying to lose weight (non-clinical group). Table 3 shows the comparison between the clinical and non-clinical group, separately for overweight and obesity classifications.

Participants seeking treatment reported significantly higher physical HRQOL, lower self-esteem, and higher body image dissatisfaction and body shape concerns, compared to women in the non-clinical group (p < 0.001). Despite no main effects of treatment seeking status, there was a significant interaction between treatment status and obesity category for mental health and weight-related measure of HRQOL. For mental health, overweight non-clinical women were the most protected; the same was true for the IWQOL-Lite measure (higher scores for the overweight community group), whereas being obese and seeking

	BMI cut-offs			
	normal weight	overweight	class I obesity	class II obesity
HRQOL physical health	↔	↘		↔
HRQOL mental health	↔	↔		↔
Weight-related HRQOL	↘	↘		↘
Self-esteem	↘	↔		↔
Body image dissatisfaction	↘	↘		↘
Body shape concerns	↘	↘		↔

Arrow represents, for each variable, the direction of change in comparison with the immediately lower BMI category: ↘, statistically significant worsening of health-related quality of life and psychological well-being; ↔, no difference

**Fig. 1.** Arrow represents, for each variable, the direction of change in comparison with the immediately lower BMI category: ↘ = statistically significant worsening of HRQOL; ↔ = no difference.

treatment was predictive of markedly poorer quality of life. Interactive effects were also noted for body image measures, generally showing worse psychosocial profiles for the clinical obese group. Overall, the analysis of the interaction between treatment seeking status and obesity category shows that the difference in psychological function between clinical and non-clinical was more pronounced in the overweight group.

## Discussion

The primary goal of this study was to examine the relation of obesity level with quality of life and psychological well-being and investigate whether BMI-defined cut-off categories are useful for identifying levels at which psychological well-being is at risk. To briefly summarize our findings, all psychosocial variables, except general HRQOL, were different between normal-weight and overweight or obese individuals. Physical HRQOL was lower in obese than in non-obese women. Furthermore, the higher the BMI category, the lower the weight-related HRQOL scores and the higher body image dissatisfaction. Self-esteem was lower in overweight and obese women than in normal-weight women, and body shape concerns were also lower in overweight and class I obesity women in comparison with normal-weight women (no difference between class I and class II obesity; fig. 1). Overweight and obese individuals seeking treatment reported higher physical HRQOL, lower self-esteem, and poorer body image in comparison to community-dwelling women of similar average body weight. For the overweight group, there were greater differences between clinical and non-clinical women.

The results of this study are generally in line with previous findings regarding HRQOL associations with BMI; for example, the Nurses Health Study in which physical functioning, vitality, bodily pain, and role limitations were inversely related to self-reported BMI in 56,510 participants [40], the Monitoring Cardiovascular Health (MORGEN) study in which physical functioning and bodily pain were associated with higher BMI in 4,041 Dutch individuals [41], and a large study of 109,076 individuals in which physical functioning was more strongly related to self-reported BMI than mental functioning [42]. Two other studies concluded that changes in body weight were associated more strongly with changes in physical health (as measured by PCS) than with changes in mental health (as measured by

MCS) [43, 44]. Additionally, Jia et al. [45] found the same pattern of association between scores from the SF-12 and BMI, with larger decrements in the PCS-12 in class II obesity compared to the decreases in MCS-12. As in our study, mental HRQOL was not associated with BMI in the MORGEN study [46]. A novel aspect of the present findings is the analysis of BMI categories across different dimensions of HRQOL and well-being. The differences reported between women with and without obesity could reflect worse physical functioning, which in turn might lead to impaired perceived HRQOL. Obese women reported more physical limitations in their daily tasks, such as walking to the supermarket and climbing stairs, and also more bodily pain, which likely impairs their functioning in daily life [40]. Beyond these individual factors, there are also environmental factors that can contribute to explain the differences in HRQOL and psychological well-being across BMI categories. Overweight and obese people are under constant social pressure to conform to society's standards regarding weight and appearance [47]. At the same time, it is clear that bias, prejudice, and discrimination are part of everyday life for many overweight individuals; these again are associated with negative social and psychological consequences which affect health and well-being [48].

It should be pointed out, however, that there is substantial individual variability in psychosocial functioning among members of the same (high) BMI category. A number of studies conducted by Fitzgibbon and colleagues [49] suggest that obese individuals are not a homogeneous group and thus may not uniformly respond to standardized treatment programs. In fact, treatment seeking status may influence or be a reflection of higher psychological suffering among the overweight/obese. Kolotkin and colleagues [21] showed that obesity-specific HRQOL varied by treatment seeking status and across treatment modalities in a large study ( $n = 3,353$ ) of overweight and obese adults with 67% women; the more intense the treatment modality (from non-treatment seeking individuals, over clinical trial participants, outpatient weight loss participants, day treatment participants, to gastric bypass patients) the lower the weight-related measure of HRQOL. Although in our sample treatment group did not significantly predict weight-related HRQOL, mean scores were higher in the obese non-clinical group. The small size for this particular group and corresponding large standard deviation may have reduced statistical power for this comparison. In another study using general measures of HRQOL (SF-36), obese persons seeking treatment reported greater bodily pain as well as lower general health, vitality, physical functioning, role-physical functioning [22], which is partially consistent with the findings of the present study. Trying to lose weight proved to be a particularly important factor in overweight persons, with a greater impact on HRQOL and psychological well-being compared to obese individuals. For the overweight group, as expected, weight appears to have less impact on HRQOL than for the heavier group. However, our results show that differences in HRQOL and psychological well-being were more pronounced, according to attempting to lose weight status among overweight women. The higher physical HRQOL scores reported in the clinical group, compared to the non-clinical group, were unexpected and run contrary to the worse psychosocial functioning impairment displayed by the treatment seekers. It is possible that persons entering treatment perceive themselves in better physical condition, which then leads them seek programs where physical activity and exercise might be included. Regardless, this finding is not common and needs to be confirmed in future studies.

Strengths of this study include the large sample size and the use of general and specific quality of life instruments, which is a methodological recommendation from previous obesity HRQOL research [50]. Generic measures are applicable to any population and scores may be compared to general population norms as well as across diseases, while disease-specific measures contain items of particular relevance to patients with the disease and



have the potential to be more sensitive to smaller differences between groups and smaller changes over time than generic measures, because of their specificity [51]. These factors can potentially explain the differences between BMI categories in specific, but not generic HRQOL measures. To our knowledge, this is the first study to simultaneously measure general and specific HRQOL together with different aspects of psychological well-being in this population.

One limitation of this study is the reduced generalization of results because the sample was exclusively composed of women. Due to the varying data collecting procedures across participants in this study, we do not have complete socioeconomic data for all our participants, which preclude us from analyzing the impact of socioeconomic status on BMI and HRQOL. Therefore, we cannot entirely exclude the possibility that outcomes were influenced by socioeconomic characteristics, for instance if they differed substantially across some of the groups analyzed. Nevertheless, these results present a sufficiently solid tentative case about the nature and usefulness of the classical cut-offs for psychological well-being, although they will need to be confirmed with complementary analyses that can control for additional variables. Furthermore, this is a cross-sectional study, which does not allow inferences about cause and effect. Despite the fact that obesity may impair quality of life, poor HRQOL could be due to other factors and in turn contribute to weight gain and obesity.

Understanding the relation between weight status and psychological well-being is important for informing decisions in clinical practice, such as achieving a better tailoring between weight control treatments and participants, and generally for a better recognition of the quality of the subjective experience (of being overweight and obese) in a large and increasing segment of the population. While the physical outcomes of obesity are relatively well-known, psychological correlates are much less well-understood [52]. The results of this research show that psychological well-being differs with weight status and that addressing well-being in weight control programs might be especially important given that individuals seeking treatment have lower well-being scores than individuals with an equally high weight but not seeking outside help. Unfortunately, relatively few studies have addressed psychological changes during conservative or lifestyle weight control programs [53]. Some treatment studies have shown that losing weight and participating in behavioral group weight control programs including a component addressing well-being is associated with decreases in body dissatisfaction and increased self-esteem [54, 55], suggesting that including strategies to improve psychological well-being pays off; for example, establishing more realistic goals and expectations for participants' weight and body shape, confronting ideal physiques with the real limits in biological capacities, helping participants understand the concept of body image (i.e., a subjective construct independent of physical appearance), providing choice to participants physical activities, increasing physical activity knowledge and self-efficacy, and depreciating eating rigid restraint and valuing more flexible forms of restraint.

In conclusion, BMI categories appear useful in identifying increased psychological risk in women with a BMI below 40 kg/m<sup>2</sup>. Across most psychosocial outcomes, significantly higher impairment in quality of life and well-being were observed at a BMI above 25 kg/m<sup>2</sup>. HRQOL measures may provide a better understanding of psychological factors that impact on an individual's efforts to control his or her weight in the long term. Thus, health care providers working in this area should be aware of these findings and include measures of quality of life and psychological well-being in treatment assessment batteries, and design programs that address HRQOL and well-being independently of weight loss.

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## Disclosure Statement

The authors declare no conflict of interest.

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