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## ORIGINAL ARTICLE

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## Weight discrimination, BMI, or weight bias internalization? Testing the best predictor of psychological distress and body dissatisfaction

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#### Abstract

**Objective:** This study aimed: (1) to compare psychological distress (PD) and body dissatisfaction (BD) in terms of BMI, weight bias internalization (WBI), and weight discrimination (current and past); (2) to assess the best predictor of PD and BD and assess the relationships with weight discrimination, BD, and WBI.

**Methods:** The sample consisted of 1283 participants across all BMI categories, recruited through the internet voluntarily. People with obesity were the most predominant (26.1%). Experiences of weight-based discrimination were reported by participants across all BMI categories, and they were more prevalent in people with obesity.

**Results:** People with obesity, those with WBI, and those who faced current and past weight discrimination reported higher PD and higher BD. However, WBI was the best predictor after controlling for BMI, WBI, and current and past weight discrimination. Mediation analyses revealed that the relationship between weight discrimination and BD through WBI was significant, as was the relationship between weight discrimination and WBI through BD.

**Conclusions:** These results stressed the importance of WBI in PD and the role of weight discrimination in WBI and BD. Hence, there is a need to better understand how WBI is formed and to design effective interventions to reduce it.

## INTRODUCTION

Body mass index (BMI) has been widely used as a measure of body fat as well as a cutoff point for overweight and obesity. Individuals are classified as having overweight if their BMI is between 25 and 29.9 kg/m<sup>2</sup> and as having obesity if their BMI is equal to or greater than 30 kg/m<sup>2</sup> [1]. Obesity has tripled in prevalence since 1975. In 2016, 13% of adults worldwide had obesity and 39% had overweight [2].

Obesity has been linked to relevant psychological outcomes, such as anxiety [3], depression [4], stress [5], and body dissatisfaction [6]. Previous studies have found that being young, being female, living in a non-Western area, and having obesity are potential risk factors for developing depression or depressive symptoms [7]. However, other studies have not found a relationship between weight status and mental health [8, 9]. Nevertheless, the few meta-analyses of longitudinal studies have revealed a bidirectional relationship between depression and obesity [10, 11]. Although the odds ratios of the bidirectional relationships are quite similar, the results have revealed that people with depression have an increased risk of obesity, rather than people with obesity developing depression [11]. Despite that, there is less evidence regarding the relationship

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 Obesity is linked to several psychological outcomes. • Weight bias internalization (WBI) has been associated with important psychological consequences.

· People who perceive/experience weight-based discrimination reveal more psychological distress.

## What does this study add?

**Study Importance** 

What is already known?

- BMI is not the best predictor of psychological well-being.
- Among BMI, WBI, and experiences of weight discrimination, WBI is the best predictor for psychological distress
- Recent weight-based discrimination is a better predictor of psychological distress than past discrimination.

## How might these results change the direction of research or the focus of clinical practice?

- · Our results compared the different variables that classically have been related to psychological distress in the field of obesity (BMI, WBI, and weight-based discrimination). Our results highlighted the importance of WBI as the best predictor of psychological distress. This indicates the importance of WBI as a target to reduce the associated psychological distress.
- Considering that WBI is present among all BMI groups, but especially among people living with obesity, it is extremely important to work not to reinforce it. Hence, clinicians must try to avoid and reduce every intervention that could reinforce WBI with all patients.

respect to weight discrimination; (3) analyze whether WBI is positively correlated with psychological distress; (4) test to identify the best predictor of psychological distress among BMI, two time frames of weight discrimination experiences, and WBI; (5) test the mediation effect of WBI between weight discrimination and body satisfaction; and (6) test the mediation effect of body satisfaction between weight discrimination and WBI.

We hypothesized that we would identify differences in psychological distress among BMI categories and expected WBI to be positively correlated with psychological distress. Moreover, we expected to find higher levels of psychological distress in participants who are subject to weight-based discrimination. In terms of predictors, we expected to find BMI, weight discrimination, and WBI to be significant predictors of psychological distress and body dissatisfaction. Last, we expected to find significant mediation results among weight discrimination, WBI, and body satisfaction.

between obesity and other outcomes such as anxiety or stress because of the lack of longitudinal studies.

Obesity has also been linked to stigma because people with obesity are at higher risk of experiencing weight discrimination [12]. Even though it is more prevalent among people with overweight or obesity, weight discrimination has also been reported among people across the whole weight spectrum [13]. However, there are gender differences. Experiences of weight discrimination have been reported more by women than men [14, 15].

Weight-based discrimination is widely prevalent in our societies. It has increased in prevalence by 5% over the past 10 years [16], with rates extremely close to those of racial discrimination [17].

Like all types of discrimination, evidence shows the severe impact of weight discrimination on physical and mental well-being. With respect to mental health, weight stigma has been linked to depression. anxiety, substance use, eating disturbances, and body dissatisfaction [18, 19].

Additionally, people can apply negative stereotypes and value themselves based on their weight [20, 21]. This phenomenon is called self-directed weight stigma or weight bias internalization (WBI). Some examples of self-directed stigma include people considering themselves lazy, unattractive, or worthless as a person, which are the most common stereotypes in our societies that are associated with a person with obesity [22]. Although it was initially considered that only people with overweight or obesity could internalize negative beliefs about their weight, further research has revealed that WBI is also present in participants with normal weight [23, 24]. Nevertheless, WBI is higher in people with overweight or obesity [25]. Some studies have found that the most significant predictors of WBI are the highest BMI values [26] and having experienced weight stigma [23]. Moreover, WBI has also been linked to several psychological outcomes. A systematic review revealed a connection between WBI and more than eight mental health outcomes [27], including unhealthy weight control behaviors [28], disordered eating [29], anxiety, and depressive symptoms [30]. Psychological disturbances such as depressive or anxious symptoms have also been identified in children with the highest WBI scores [31]. In addition, WBI has also been linked to body dissatisfaction [32, 33].

In conclusion, BMI, weight discrimination, and WBI are linked to significant psychological consequences. In most cases, they are associated with the same psychological outcomes, such as depression or anxiety. However, the variables that are closely related to psychological distress have not yet been identified.

Some studies evinced the mediational effect of different psychological variables in the relationship between weight-based discrimination and psychological distress. WBI [34] or eating disturbances [35] have been identified as significant mediators between these two variables. Despite that, it is still unknown whether other variables, such as body dissatisfaction, can mediate the relationship between weight discrimination and WBI.

Considering all these aspects, the aims of the study were the following: (1) explore whether there are differences in psychological distress among the different BMI categories; (2) identify whether there are differences in psychological distress with

## **METHODS**

## Procedure

The study was first approved by the Committee of Bioethics of the University of Barcelona (IRB00003099). It was designed as an online study using a secure website survey platform. It was posted by the authors of the present study on different social networks, in particular Twitter and Facebook. Several pages and profiles were contacted to post our study among their followers. No company and no individuals were paid to post our research. No bots were used in any phase of the sample recruitment.

The study was published as a body image research project. As the study was designed online, and taking into consideration the harmful comments and posts that sometimes are published on social networks, it needed to be controlled. We thought that posting the study as a study calling for people who experienced weight discrimination could cause harmful comments and reactions from different social network users. By posting the study as body image research, we wanted to avoid any comments or reactions that could promote weight stigma.

After reading the research information and giving their informed consent, the participants were allowed to take part in the study. Participation was voluntary, and no participant was paid or received any compensation.

## Participants

The initial sample consisted of 1423 participants. Being pregnant, being younger than 18 years old, or not correctly reporting height/ weight information were the exclusion criteria. Hence, the final sample of the study consisted of 1281 participants. The mean age was 33.35 years (SD = 10.53), ranging from 18 to 73 years. The mean BMI was 26.83 kg/m<sup>2</sup> (SD = 6.86), ranging from 15.24 to 65.91 kg/m<sup>2</sup>. By BMI categories, there were 65 participants with underweight (5.10%), 562 with normal weight (43.90%), 319 with overweight (24.90%), and 335 with obesity (26.10%).

More than half of the participants had education above the secondary level (66.40%) and were single (63.90%). Approximately a quarter of the sample had no income (24%) or two times the minimum wage (25.70%). Participants with the minimum wage were the most predominant group (39.20%). White participants were the most predominant (92.50%), whereas Black participants were the least (0.30%).

## Measures

## Sociodemographic information

A questionnaire was self-created to assess the main sociodemographic data. Participants had to self-report their weight and height. BMI was later calculated and classified into BMI categories in accordance with the World Health Organization classification [1].

## Weight discrimination

A yes/no question was used to measure both past and current weight discrimination. Participants were asked whether they have experienced or perceived weight discrimination in the last 6 months (current discrimination) or at some point in their lives (past discrimination).

## **Psychological distress**

Psychological distress was measured using the Depression, Anxiety, and Stress Scale (DASS-21). This scale contains 21 items divided into three subscales: depression, anxiety, and stress. For this study, the Spanish version of the scale was used [36]. Higher scores in each factor indicate greater psychological distress. In the Spanish version, Cronbach  $\alpha$  was 0.84, 0.70, and 0.82 for depression, anxiety, and stress, respectively [36]. In our study, Cronbach  $\alpha$  was 0.93, 0.82, and 0.84, respectively.

## Body dissatisfaction

The "Evaluation of physical attractiveness" subscale from the Multidimensional Body-Self Relations Questionnaire was used, specifically from the Spanish validation [37]. This is a three-item subscale, with a five-point Likert scale. Higher scores indicate better body satisfaction. Cronbach'  $\alpha$  of the Spanish validation was 0.84 [37] and 0.88 in the present study.

#### WBI

The internalization of negative attitudes about participants' own weight was assessed using the Spanish version of the Modified Weight Bias Internalization Scale [24]. This is a unidimensional scale containing 11 items, with a seven-point Likert scale. Higher scores reveal higher WBI. Cronbach  $\alpha$  of the Spanish version was 0.94 and 0.93 in the two subsamples of the validation [24]. In our study, Cronbach  $\alpha$  of the test was 0.93.

#### Statistical analysis

SPSS Statistics version 26 (IBM Corp., Armonk, New York) was used to conduct all the statistical analyses.

First, BMI was calculated and classified into BMI categories using the participants' self-reported data. Then descriptive and frequency analyses were conducted with sociodemographic information.

Second, to analyze the relationships among psychological distress, BMI, and WBI, bivariate Pearson correlations tests were conducted and interpreted in line with Akoglu criteria [38]. Moreover, to study these relationships in greater depth, ANOVA was conducted among the different psychological distress components with BMI category as the independent variable. Tukey and Games-Howell post hoc comparisons were conducted. Additionally, the *t* test was carried out to study the relationship between psychological distress and weight discrimination. ANOVA and the *t* test were also reported with the Hedges *g* coefficient with a 95% confidence interval (CI), interpreted in accordance with Cohen criteria for the *g* coefficient [39].

Third, a four-block hierarchical multiple regression was carried out to assess whether BMI, WBI, and weight discrimination predict depression, anxiety, and stress. Homoscedasticity, normality, linearity, and multicollinearity were checked to assess the assumptions for hierarchical multiple regression. To study multicollinearity, tolerance and variance inflation factor were chosen. Multicollinearity was not violated because the variance inflation factor was less than 10 and tolerance values were above 0.10, according to the conditions for multiple regression analysis [40, 41].

Finally, to test the mediational hypotheses, mediation analyses (model 4) were carried out using the PROCESS macro (version 4.1) for SPSS [42], with a bootstrapping sample size of 10,000 and 95% Cls. All models included sex and BMI as covariates. The indirect effect was considered significant if the CI established did not include the value zero.

## RESULTS

#### Sociodemographic information and descriptive data

The sample consisted of 1281 participants. Table 1 displays the sociodemographic information of the participants. In general, women (77.40%) and participants with normal weight (43.90%) were the most prevalent participants.

Among participants who reported experiencing current weight discrimination, the BMI categories of the participants were as follows: 3.24% had underweight, 30.79% had normal weight, 26.41% had overweight, and 39.56% had obesity.

In terms of past weight discrimination, the BMI categories of those who answered affirmatively were the following: 5.30% had underweight, 44.05% had normal weight, 24.59% had overweight, and 26.06% had obesity.

# Relationships among BMI, WBI, and psychological distress

Table 2 shows the bivariate Pearson correlations among BMI, WBI, and the different psychological distress outcomes. BMI was significantly correlated with depression, anxiety, and stress. Despite the statistical significance, all the associations were weak. Likewise, WBI was also correlated with depression, anxiety, and stress, with moderate associations. Body satisfaction was significantly associated with BMI and WBI, with weak to moderate correlations.

Table 3 displays the ANOVA comparisons of depression, anxiety, stress, and body satisfaction among the different BMI categories.

## **TABLE 1** Sociodemographic information of the sample (N = 1281)

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Variable	n	%
Sex		
Male	289	22.6
Female	992	77.4
BMI		
Underweight	65	5.1
Normal weight	562	43.9
Overweight	319	24.9
Obesity	335	26.1
Educational level		
Primary	9	0.7
Secondary	421	32.9
High studies	851	66.4
Income		
No income	307	24
Minimum wage	503	39.2
Minimum wage $\times$ 2	329	25.7
Minimum wage $ imes$ 2.5	142	11.1
Marital status		
Single	818	63.9
Partnered/married	388	30.2
Separated/divorced	70	5.5
Widowed	5	0.4
Race		
White	1185	92.5
Black	4	0.3
Latin	61	4.8
Combined	31	2.4

Statistically significant differences were found in all psychological variables among BMI categories. With respect to depression, participants with obesity reported higher levels of depressive symptoms than those with underweight (p < 0.05), normal weight (p < 0.001), and overweight (p < 0.001). For anxiety, participants with obesity revealed higher levels of anxiety than those with normal weight (p < 0.001) and overweight (p < 0.001). With regard to stress, participants with obesity showed the highest level of stress compared with those with normal weight (p < 0.001) and overweight (p < 0.001). In terms of body satisfaction, people with obesity reported worse body satisfaction than participants with overweight (p < 0.001), normal weight (p < 0.001), and underweight (p < 0.001).

## Relationship between weight discrimination and psychological distress

Table 4 displays the differences between past and current discrimination regarding psychological distress.

#### TABLE 2 Bivariate Pearson correlation analyses

	1. BMI	2. WBI	3. Depression	4. Anxiety	5. Stress	6. Body satisfaction
1. BMI	-					
2. WBI	0.440***	-				
3. Depression	0.160***	0.490***	-			
4. Anxiety	0.106***	0.395***	0.650***	-		
5. Stress	0.090**	0.404***	0.660***	0.736***	-	
6. Body satisfaction	-0.394***	-0.724***	-0.440***	-0.294***	-0.305***	-

Abbreviation: WBI, weight bias internalization.

\*\*p < 0.01;

\*\*\*p < 0.001.

TABLE 3	ANOVA comparisons	s of psychological distre	ess and body satisfactio	n among BMI categories
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	UW, mean (SD)	NW, mean (SD)	OW, mean (SD)	O, mean (SD)	ANOVA	Post hoc comparisons	Hedges g (95% CI)
Depression	11.78 (11.67)	11.91 (10.87)	12.38 (11.02)	16.41 (11.79)	$F_{(3)} = 12.579^{***}$	UW < 0*	-0.39 (-0.66 to -0.13)
						NW < 0***	-0.40 (-0.54 to -0.26)
						OW < 0***	-0.35 (-0.51 to -0.20)
Anxiety	11.05 (10.07)	7.89 (7.71)	8.04 (7.55)	10.59 (8.65)	$F_{(3)} = 10.518^{***}$	NW < 0***	-0.33 (-0.47 to -0.20)
						OW < 0***	-0.31 (-0.47 to -0.16)
Stress	16.55 (10.00)	14.02 (8.61)	14.46 (8.64)	16.85 (9.79)	$F_{(3)} = 7.935^{***}$	NW < 0***	-0.31 (-0.45 to -0.18)
						OW < 0**	-0.26 (-0.41 to -0.10)
Body	3.17 (1.11)	3.25 (1.02)	2.51 (0.97)	2.15 (0.99)	$F_{(3)} = 87.293^{***}$	OW < UW***	0.66 (0.39 to 0.93)
satisfaction						O < UW***	1.01 (0.73 to 1.28)
						OW < NW***	0.74 (0.60 to 0.88)
						O < NW***	1.09 (0.94 to 1.23)
						0 < 0W***	0.37 (0.52 to 0.21)

Abbreviations: NW, normal weight; O, obesity; OW, overweight; UW, underweight.

\*p < 0.05.

\*\*p < 0.01.

\*\*\*p < 0.001.

For both weight discrimination time frames, the results revealed that participants who faced weight discrimination presented higher levels of depression (p < 0.001), anxiety (p < 0.001), and stress (p < 0.001) and worse body satisfaction (p < 0.001) than those who did not.

## Predictors of psychological distress

In order to assess the predictors of depression, anxiety, stress, and body satisfaction, a four-step multiple regression analysis was carried out (Table 5).

With respect to depression, the four different steps were significant. In the first step, BMI was a significant predictor ( $\beta = 0.140$ , p < 0.01). In the second step, past discrimination ( $\beta = 0.174$ , p < 0.001) was the only significant predictor. When incorporating current discrimination, it was a significant predictor ( $\beta = 0.201$ , p < 0.001), as was past discrimination ( $\beta = 0.106$ , p < 0.05). Finally, in the fourth step, WBI was a significant predictor ( $\beta = 0.487$ , p < 0.001), as was current

discrimination ( $\beta = 0.108$ , p < 0.05). BMI was also a significant negative predictor of depression ( $\beta = -0.120$ , p < 0.01). This final step accounted for 23.9% of the variance in depression.

For anxiety, the four different steps were significant. In the first step, BMI was a significant predictor ( $\beta = 0.108$ , p < 0.01). In the second step, only past discrimination ( $\beta = 0.100$ , p < 0.05) was a significant predictor. In the third step, current discrimination was the only significant predictor ( $\beta = 0.155$ , p < 0.01). In the final step, which accounts for 15.3% of the variance, only WBI was a significant predictor tor of anxiety ( $\beta = 0.408$ , p < 0.001).

In terms of stress, the four steps were all significant. BMI was a significant predictor in the first step ( $\beta = 0.097$ , p < 0.05). In the second step, past discrimination was a significant predictor ( $\beta = 0.127$ , p < 0.01). In the third step, only current discrimination was a significant predictor ( $\beta = 0.139$ , p < 0.01). When adding WBI in the fourth step, it was a significant predictor ( $\beta = 0.426$ , p < 0.001). BMI also predicted anxiety but in a negative way ( $\beta = -0.109$ , p < 0.05).

TABLE 4 Comparisons of psychological distress and body satisfaction among past and current weight discrimination

	Past discrimination ( $n = 1151$ )				Current discrimination ( $n = 1151$ )			
	Yes (n = 617), mean (SD)	No (n = 534), mean (SD)	Student t	Hedges g (95% CI)	Yes (n = 260), mean (SD)	No (n = 891), mean (SD)	Student t	Hedges g (95% Cl)
Depression	15.35 (11.86)	10.14 (9.88)	-8.124***	0.47 (0.36 to 0.59)	18.47 (12.09)	11.31 (10.51)	-8.637***	0.66 (0.52 to 0.80)
Anxiety	9.87 (8.51)	7.31 (7.32)	-5.486***	0.32 (0.20 to 0.44)	12.11 (8.86)	7.68 (7.55)	-7.313***	0.56 (0.42 to 0.70)
Stress	16.30 (9.41)	13.16 (8.22)	-6.036***	0.35 (0.24 to 0.47)	18.40 (9.52)	13.81 (8.59)	-6.988***	0.52 (0.38 to 0.66)
Body satisfaction	2.48 (1.10)	3.11 (1.02)	10.034***	-0.59 (-0.71 to -0.47)	2.09 (1.00)	2.97 (1.06)	11.880***	-0.84 (-0.98 to -0.70)

\*\*\*p < 0.001.

#### TABLE 5 Hierarchical regression model to predict depression, anxiety, stress, and body satisfaction

	Depression	Anxiety	Stress	Body satisfaction
Step 1				
BMI	0.140**	0.108**	0.097*	-0.375***
R <sup>2</sup>	0.020	0.012	0.009	0.140
F	11.427**	6.676**	5.370*	91.869***
Step 2				
BMI	0.071	0.068	0.046	-0.309***
Past discrimination	0.174***	0.100*	0.127**	-0.165***
R <sup>2</sup>	0.045	0.020	0.023	0.163
$\triangle R^2$	0.026	0.008	0.014	0.023
riangle F	15.252***	4.894*	7.854**	15.341***
Step 3				
BMI	0.004	0.016	0.000	-0.268***
Past discrimination	0.106*	0.047	0.079	-0.122**
Current discrimination	0.201***	0.155**	0.139**	-0.125**
R <sup>2</sup>	0.073	0.036	0.036	0.174
$\triangle R^2$	0.028	0.016	0.013	0.011
riangle F	16.826***	9.675**	7.771**	7.198**
Step 4				
BMI	-0.120**	-0.088	-0.109*	-0.088*
Past discrimination	-0.011	-0.051	-0.023	0.047
Current discrimination	0.108*	0.077	0.058	0.016
WBI	0.487***	0.408***	0.426***	-0.712***
R <sup>2</sup>	0.239	0.153	0.164	0.529
$\triangle R^2$	0.167	0.117	0.128	0.355
riangle F	123.930***	78.188***	86.357***	422.671***

Note: All standardized regression coefficients are from the final step in the analyses.

Abbreviation: WBI, weight bias internalization.

\*p < 0.05.

\*\*p < 0.01.

\*\*\*p < 0.001.

Finally, in assessing body satisfaction, BMI was a significant negative predictor ( $\beta = -0.375$ , p < 0.001) in the first step. When adding past discrimination in the second step, both BMI and past discrimination were significant predictors ( $\beta = -0.309$ , p < 0.001;  $\beta = -0.165$ , p < 0.001, respectively). In the third step, BMI

 $(\beta = -0.268, p < 0.001)$ , past discrimination  $(\beta = -0.122, p < 0.01)$ , and current discrimination  $(\beta = -0.125, p < 0.01)$  were significant predictors. When adding WBI in the fourth step, WBI  $(\beta = -0.712, p < 0.001)$  and BMI  $(\beta = -0.088, p < 0.05)$  were the only significant predictors for body satisfaction.

# Relationships among weight discrimination, WBI, and body satisfaction

To better understand the relationships among weight discrimination, WBI, and body satisfaction, two mediation analyses were carried out. In the first one (model 1), WBI was placed as a mediator between weight discrimination and body satisfaction. Meanwhile, in the second one (model 2), body satisfaction was placed as a mediator between weight discrimination and WBI. BMI and sex were added as covariates in each model.

Figure 1 displays the results for model 1. This model was significant ( $F_{(4, 560)} = 159.075$ , p < 0.001) and all variables accounted for 53% of the variance in body satisfaction ( $R^2 = 0.53$ ). Results showed that weight discrimination was a significant predictor of WBI (B = 1.01, SE = 0.15, p < 0.001), and that WBI was a significant predictor of higher body dissatisfaction (B = -0.49, SE = 0.02, p < 0.001). Weight discrimination was not a significant predictor of body satisfaction (B = 0.07, SE = 0.09,

p > 0.05). However, weight discrimination influenced body dissatisfaction through WBI (B = -0.50, SE = 0.07, 95% CI: -0.64 to -0.35). With respect to covariates, BMI and sex were significant predictors for both WBI and body satisfaction. This means that women and participants with the highest BMI presented higher levels of WBI.

Figure 2 displays the results for model 2. The model was significant ( $F_{(4, 560)} = 201.647$ , p < 0.001), and all variables accounted for 59% of the variance in WBI ( $R^2 = 0.59$ ). Results indicated that weight discrimination was a significant predictor of higher body dissatisfaction (B = -0.43, SE = 0.11, p < 0.001), and, at the same time, that body dissatisfaction was a significant predictor of WBI (B = -0.90, SE = 0.04, p < 0.001). Weight discrimination was still a significant predictor of WBI after controlling for body satisfaction (B = 0.63, SE = 0.11, p < 0.001). In terms of covariates, both sex and BMI were significant predictors of body satisfaction and WBI. These results indicated that men and those participants with the lowest BMI presented higher body satisfaction. In addition, the



**FIGURE 1** Mediation analysis of WBI as a mediator between weight discrimination and body satisfaction. \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001. WBI, weight bias internalization



**FIGURE 2** Mediation analysis of body satisfaction as a mediator between weight discrimination and WBI. \*\*\**p* < 0.001. WBI, weight bias internalization

## DISCUSSION

The current study was designed to answer several research questions. On one hand, we wanted to analyze the differences in psychological distress (depression, anxiety, stress, and body dissatisfaction) regarding BMI, WBI, and current and past weight discrimination. On the other hand, we wanted to assess which was the best predictor for each psychological distress outcome. Additionally, we wanted to test the relationships between current weight discrimination, WBI, and body satisfaction.

To the best of our knowledge, this is the first study assessing the predictors for psychological distress and body dissatisfaction to include two weight discrimination time frames and participants who faced weight discrimination across all BMI categories.

In terms of BMI, the analyses revealed significant positive correlations between BMI and depression, anxiety, and stress and a significant negative correlation between BMI and body satisfaction. The more in-depth analyses that compared these psychological distress outcomes among the BMI categories provided evidence that people with obesity report more depression, anxiety, and stress and higher body dissatisfaction. These results highlight the link between obesity and psychological distress. In general, these results are in line with previous studies that have provided evidence of the associations between obesity and depression [43], anxiety [43, 44], stress [5], and body dissatisfaction [6]. However, despite the significant relationship between obesity and anxiety in our study, some studies have found a negative correlation between BMI and anxiety [43] or only a relationship in the case of women [44]. Nevertheless, a meta-analysis confirmed this association between anxiety disorders and obesity [3]. Further research on this link would be useful in order to provide clearer evidence.

Additionally, higher levels of depression, anxiety, stress, and body dissatisfaction were found among people who reported current weight discrimination compared with those who did not. The same was found in terms of past weight discrimination. Generally, participants who perceived current weight discrimination had slightly higher scores of psychological distress and body dissatisfaction compared with those who reported past weight discrimination. In general, our results agree with former research that has found that people who deal with weight discrimination have more depression, anxiety, and stress, as well as higher body dissatisfaction [18, 19]. However, no studies have assessed differences on several weight discrimination time frames. In our study, the means of the outcomes were higher among people who reported current discrimination compared with past weight discrimination. These results might suggest a recency effect of weight discrimination on psychological well-being. However, clearer results cannot be concluded as this was a cross-sectional study. Longitudinal studies, controlling for accumulative weight discrimination or combined types of discrimination, would be interesting in order to provide clearer evidence.

With regard to WBI, the positive significant Pearson correlations show that higher levels of WBI were associated with higher levels of depression, anxiety, stress, and body dissatisfaction. A previous systematic review already identified the relationships between WBI and depression, anxiety, and stress before and after bariatric surgery [30]. Likewise, body dissatisfaction also was associated with WBI in previous literature [33]. Our results also found a significant association between WBI and BMI. However, mixed results were found with regard to the association between WBI and BMI in a systematic review [27].

Therefore, as previous literature has shown that obesity, WBI, and experiences of weight discrimination are associated with psychological distress, the present study aimed to assess the best predictor among those variables for depression, anxiety, stress, and body dissatisfaction. This would enable the design of effective interventions to reduce WBI. Hierarchical multiple regression analyses revealed that BMI was a significant predictor of depression, anxiety, stress, and body dissatisfaction. In terms of depression, these findings are partly consistent with previous studies [45]. However, they are inconsistent with two meta-analyses of longitudinal studies that stated that the risk of developing obesity in people with depression is slightly higher than the risk of developing depression in people with obesity [11, 46]. Nevertheless, the risk difference was only 3% higher [11]. BMI was also a significant predictor of anxiety (Table 5), in line with a previous meta-analysis that found that obesity had a pooled odds ratio of 1.40 for anxiety [3].

Additionally, BMI was no longer a positive predictor of depression, anxiety, or stress when controlling for current and past weight discrimination. Despite that, BMI was still a significant negative predictor of body dissatisfaction controlling for current and past weight discrimination. In terms of discrimination, only current weight discrimination was a significant predictor of depression, anxiety, stress, and body dissatisfaction. Past discrimination was also a significant predictor of depression and body dissatisfaction, but the regression coefficient was lower than for current discrimination. These results seem to reinforce the idea of the impact of recent weight discrimination on psychological well-being. This implies that implementing early effective interventions in this acute phase can reduce the psychological impact and improve psychological adjustment.

When additionally controlling for WBI, results indicated that WBI presented the strongest significant regression coefficients for depression, anxiety, stress, and body dissatisfaction. This is in line with a previous systematic review that revealed that WBI was still a significant predictor of depression, anxiety, and body image even when controlling for BMI [27]. Interestingly, BMI was also a significant negative predictor of depression, stress, and body dissatisfaction. This indicated that obesity predicted lower symptoms of depression and stress and worse body image. These results are not in line with previous research, especially those that found biological mechanisms explaining the relationship between depression and obesity [47].

The previous literature seems to concur that WBI is a significant predictor of depression and anxiety, controlling for BMI [27]. These results seem to highlight the importance of working on WBI reduction to improve the associated psychological distress. However, results are inconsistent with respect to the direction of this association. For example, one study found a positive regression coefficient between BMI and depression, also controlling for WBI [48]. However, another study found a negative regression coefficient between BMI and the total DASS-21 score after controlling for WBI [21], whereas another study found a positive regression coefficient between BMI and the total DASS-21 score, also after controlling for WBI [20].

Last, when assessing the relationships among current weight discrimination, WBI, and body satisfaction, two mediation models were proposed. The first, which incorporated WBI as a mediator, demonstrated the significant effect of weight discrimination on body dissatisfaction through WBI. WBI was a significant predictor of body dissatisfaction, as found in other studies [20, 21, 32]. However, the direct effect of weight discrimination on body satisfaction was not significant when controlling for WBI. Covariates revealed that participants with obesity had higher WBI and higher body dissatisfaction. Additionally, women presented higher WBI and worse body image than men. In general, these results are in line with previous studies [49].

The second model, which incorporated body satisfaction as a mediator between weight discrimination and WBI, revealed the significant effect of weight discrimination on WBI through body satisfaction. Weight discrimination was a significant predictor of body dissatisfaction and WBI. Additionally, body dissatisfaction was a significant predictor of WBI. Regarding covariates, in this model, a higher BMI was associated with higher body dissatisfaction and higher WBI. Meanwhile, men revealed better body satisfaction and lower WBI. In general, these results are in line with previous studies [6].

The first mediation model seems to reinforce the important mediation role that WBI plays in explaining psychological distress, as stated in previous research [34]. However, the second mediation model provided evidence that body dissatisfaction also mediated the effect of weight discrimination on WBI, which provided more information on how WBI is formed. Nevertheless, it is still important to study these relationships in depth.

Despite the strengths of this study, it is important to highlight certain limitations. First, height and weight were self-reported by the participants. This procedure could bias the real BMI if participants did not report their weight and height correctly. Second, intersectionality, in terms of the combination of different types of discrimination, was not evaluated. Further research must assess other types of discrimination to provide more results of the interaction of different discriminative reasons. Third, weight discrimination was assessed using a yes/no question. Although other studies have assessed it this way, no scale was used that may also be able to provide the frequency of the discrimination. Finally, although one of the main aims of the study was to find the best predictor for psychological distress, we would like to stress that causality cannot be concluded because of the cross-sectional design of the study.

In conclusion, our results revealed novel aspects in the field of weight discrimination. People with obesity, participants with the highest WBI, and people who perceived/experienced weight discrimination reported worse psychological adjustment and worse body satisfaction. In addition, WBI was the best predictor of depression, anxiety, stress, and body dissatisfaction. Regarding mediation, analyses revealed that WBI significantly mediated the relationship between weight discrimination and body dissatisfaction, but body dissatisfaction also significantly mediated the relationship between weight discrimination and WBI.

These results can have several implications in different domains. In a clinical setting, health care professionals should be aware of any sign of WBI that clients may express in order to reduce it. The results also emphasized the urgent need that health care providers work on their weight bias in order not to perpetuate negative stereotypes about patients' weight in health assistance. At the same time, in a research setting, effective interventions to reduce WBI as a key factor to reduce the associated psychological impact are urgently needed. Additionally, it is still important to assess how WBI is formed and how, why, and when WBI drives worse psychological adjustment. Finally, it is also vital that the mass media does not perpetuate negative stereotypes about weight in the representation of characters with obesity.O

#### AUTHOR CONTRIBUTIONS

Sergio Macho collected data and conducted all data analyses. Ana Andrés and Carmina Saldaña oversaw and provided support in all these steps. All authors were involved in the manuscript preparation.

## CONFLICT OF INTEREST STATEMENT

The authors declared no conflict of interest.

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