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# The Impact of Target Weight and Gender on Perceptions of Likeability, Personality Attributes, and Functional Impairment

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## Summary

**Background:** Bias against individuals who are overweight is well documented. However, little is known about biased perceptions of men and women at varying specified degrees of overweight. **Methods:** Men and women (N = 308) rated male and female figures (low normal weight, overweight, obese, extremely obese) on measures of dislike, personality characteristics, and functional limitations. **Results:** Little or no bias was observed against overweight figures (BMI approximately 25 kg/m$^2$); however, strong bias was observed against obese and extremely obese figures. Men's ratings of extremely obese females were more negative than those of comparable males. However, for other weight categories, participants evidenced similar or greater weight bias against overweight and obese men than against female targets of corresponding weight. Furthermore, male participants tended to perceive heavier females as having more functional deficits and disliked them somewhat more than female participants. **Conclusion:** By using targets of known BMI categories, the current study enhances our understanding of who is likely to be impacted by weight bias. As individuals with a BMI < 30 kg/m$^2$ are typically not the targets of weight-related bias, research and efforts regarding weight-related bias should focus more specifically on those individuals who are obese or extremely obese.

## Introduction

Roughly two-thirds of Americans meet the criterion for overweight (BMI $\geq$ 25 kg/m$^2$) [1]. Despite this high prevalence, individuals who are overweight report that they experience bias as a result of their body size [2]. Similarly, survey research that asks people to answer questions about people who are overweight also finds that overweight individuals are disliked, assigned negative personality attributes, and assumed to be limited in their abilities [3, 4]. Furthermore, this bias is associated with discrimination against and negative psychological outcomes for overweight individuals [5, 6].

Despite this consistent pattern of findings, research has yet to examine how men and women of particular BMI categories are perceived. That is, almost no research has examined how individuals are perceived if they are overweight (BMI $\geq$ 25 kg/m$^2$), obese (BMI $\geq$ 30 kg/m$^2$), or extremely obese (BMI $\geq$ 40 kg/m$^2$). Thus, the goal of this study was to examine how people rate male and female figures depicting a range of BMI categories (low normal: 18.5 kg/m$^2$, overweight: 25 kg/m$^2$, obese: 30 kg/m$^2$, extremely obese: 40 kg/m$^2$) on dislike, personality, and functional limitations.

### Weight Bias and Target BMI

A variety of approaches have been used in the measurement of weight bias. Regardless of how weight bias is measured, the findings are strikingly similar. Weight bias is strong, pervasive, and resistant to change [7]. Nonetheless, current measures of weight bias share a common limitation; namely, the BMI category of the target individual is not known. For example, surveys [3, 4, 8] might ask individuals their attitudes about 'fat people' and 'people who weigh too much', relying on the participant's own characterization of these groups to determine bias. Thus, it is unknown whether responses apply to individuals who are overweight, obese, or extremely obese by currently accepted medical definitions [9, 10].

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Some pictorial measures exist to assess bias, and these measures allow researchers to determine what is meant by overweight, rather than leave that open to the participants' interpretation. For example, participants may see a line drawing of an overweight figure [11] and make judgments about the figure. Similarly, implicit tests of weight bias [12] might use faces of thin and overweight individuals as stimuli. Nonetheless, these stimuli have not been mapped onto weight classifications to allow researchers to assess the degree of bias toward individuals of a particular BMI category.

In contrast, only a few studies have used target stimuli depicting individuals whose actual BMIs are known. One innovative research team [13] photographed men and women of known BMIs (from underweight to class III obesity) and added a composite head to each body. Participants rated the weight classification of each figure. Generally, participants rated a figure as obese at a BMI of about 39 kg/m$^2$. Although this study did not measure bias, most participants rated the normal weight figures (BMI of about 21 kg/m$^2$) as ideal.

One other set of known BMI figures has been used to assess perceptions of people of varying weights [14]. Men rated the attractiveness of photographed women (heads were not visible) whose BMI ranged from 11.6 to 41.2 kg/m$^2$. The relationship between weight and attractiveness ratings was curvilinear, with women with a BMI around 20 kg/m$^2$ rated as the most attractive. These photographs were used in other studies [15, 16] with similar findings cross-culturally, for hiring decisions, and helping behavior. It is important to note, however, that these stimuli only include female targets and ratings are only made by men. Therefore, these studies cannot shed light on gender differences.

*Weight Bias and Target Gender*
There is indeed reason to expect that men and women of the same BMI are not subject to the same degree of bias. In a study of both men and women [17], participants reported whether they had been affected by weight discrimination. Among women, 28% of extremely obese (BMI ≥ 35 kg/m$^2$), 10% of obese (BMI 30–34.9 kg/m$^2$), and 4% of overweight (BMI 25–29.9 kg/m$^2$) participants reported experiencing weight-based discrimination. Among men, rates of discrimination were lower with 12, 4, and 2% of extremely obese, obese, and overweight participants reporting discrimination, respectively. Similarly, research on employment-related bias has consistently found that overweight women experience more bias than overweight men [18–21].

*The Current Study*
Although the extant literature clearly demonstrates that there is a strong bias against overweight individuals, it is impossible to predict, based on existing evidence, the degree to which an individual of a particular BMI category will be a target of this bias. Thus, the current study examined participants' perceptions of the dislike, personality characteristics, and functional deficits of male and female figures with a range of BMIs. Realistic figures were created to depict BMIs ranging from approximately 18.5 (low normal weight) through to 40 kg/m$^2$ (extremely obese). Given low reports of discrimination by individuals in the overweight category (BMI 25–29.9 kg/m$^2$), it was hypothesized that figures with an approximate BMI of 25, though overweight by medical standards, would not be perceived more negatively than low normal weight figures. Conversely, it was hypothesized that participants would show bias against figures designed to depict an obese individual and even stronger bias against those designed to be extremely obese. Finally, it was hypothesized that bias against overweight and obese women would be stronger than that against overweight and obese men.

## Participants and Methods

*Participants*
Participants were 308 young adults (62% women) recruited from psychology classes. Of the participants, 84% self-reported their race as Caucasian, 10% as African American, and 6% reported other races (Asian, Hispanic, and mixed race). The mean age of the participants was 19.9 years (range 18–37 years). BMI was calculated based on self-reports of height and weight (M (men) = 25.2, SD = 4.73; M (women) = 23.8, SD = 4.26).

*Measures*
*Weight Ratings and Bias:* Participants saw images of 8 individuals (4 men, 4 women) which were created using My Virtual Model [22]. The target individuals were created to represent people of average height (5'4" for the women and 5'10" for the men) and BMIs of approximately 18.5, 25, 30, and 40 kg/m$^2$. These BMIs represented the lower bounds of 'normal weight', 'overweight', 'obese', and 'extremely obese' [9, 10]. Lower bounds were chosen to reflect a consistent reference point across all weight categories (only a lower bound exists for the extremely obese category). The same faces were used for all targets. All figures depicted Caucasian individuals with younger facial features, and hair style and color was varied across BMIs.

Participants completed 4 sets of ratings about each figure. Dislike included 6 questions about the extent to which the participant found the target figure to be unlikable (e.g. 'people like this make me somewhat uncomfortable'). 2 items were adapted from Crandall and Martinez [4], 1 item from Quinn and Crocker [23], and 3 items were created for this study (e.g. 'I'd like to be friends with someone like this' (reverse coded)). Participants responded on a 9-point scale from 1 = 'strongly disagree' to 9 = 'strongly agree.' Cronbach's α for the 6 items ranged from 0.88 to 0.92 across the 8 figures.

The 2nd set of ratings assessed participants' perceptions of the targets' personality attributes. Participants saw 17 pairs of adjectives and rated targets on a 5-point continuum between these adjectives (e.g., 1 = 'industrious'; 5 = 'lazy'). Higher scores indicated more negative personality attributes. Adjectives were selected from the Fat Phobia Scale [8]. Cronbach's α for the 17 items ranged from 0.79 to 0.89 across the target figures.

Third, participants rated each target figure's functional deficits. These items asked how hard it would be for the figure to walk a mile, climb 2 flights of stairs, and do chores such as vacuuming or yardwork on a 4-point scale from 1 = 'no difficulty' to 4 = 'unable to do'. Items were adapted from the Health Assessment Questionnaire [e.g. 24]. Cronbach's α for the 3 items ranged from 0.56 to 0.83 across the 8 figures.

**Table 1.** Figure dislike, personality attributes, and functional deficits repeated-measures ANOVA ratings (mean, standard deviation (SD)) for male participants

| | Male figure, mean (SD) | | | | Female figure, mean (SD) | | | |
|---|---|---|---|---|---|---|---|---|
| | low normal | overweight | obese | extremely obese | low normal | overweight | obese | extremely obese |
| Dislike | 3.24 (1.45) | 3.37 (1.50)[b] | 4.06 (1.56)[c] | 4.36 (1.65) | 2.31 (1.44)[d] | 2.53 (1.26)[e] | 3.69 (1.51)[f] | 5.04 (2.01)[g] |
| Attributes | 1.99 (0.50)[a] | 2.39 (0.54)[b] | 3.46 (0.53)[c] | 3.92 (0.53) | 2.10 (0.51)[d] | 2.29 (0.45) | 3.32 (0.54)[f] | 4.08 (0.55)[g] |
| Functional deficits | 1.06 (0.19)[a] | 1.15 (0.33)[b] | 1.84 (0.55)[c] | 2.31 (0.58) | 1.12 (0.28)[d] | 1.17 (0.35) | 1.73 (0.50)[f] | 2.56 (0.69)[g] |

Superscripts indicate $p < 0.05$; df for all comparisons = 110. Effect size estimates (e.g. Cohen's d) in correlated designs are inflated unless the influence between measures is accounted for. Thus, here, the following effect size estimation [25] was utilized: $d = t(2(1 – r)/n)^{a/b}$ where r is the correlation across pairs of measures.

[a]Weight: low normal vs. overweight (attributes t = 7.31, d = 0.73; FD t = 3.09, d = 0.26).
[b]Weight: overweight vs. obese (dislike t = 7.42, d = 0.73; attributes t = 17.20, d = 2.19; FD t = 17.18, d = 1.57).
[c]Weight: obese vs. extremely obese (dislike t = 9.42, d = 0.50; attributes t = 14.89, d = 1.3; FD t = 14.98, d = 1.23).
[d]Low normal: male vs. female (dislike t = 5.56, d = 0.64; attributes t = 2.06, d = 0.22; FD t = 2.93, d = 0.22).
[e]Overweight: male vs. female (dislike t = 6.03, d = 0.60).
[f]Obese male vs. female (dislike t = 2.66, d = 0.24; attributes t = 2.56, d = 0.25; FD t = 2.12, d = 0.21).
[g]Extremely obese: male vs. female (dislike t = 5.27, d = 0.36; attributes t = 3.42, d = 0.31; FD t = 4.66, d = 0.39).

Finally, participants rated the degree to which the figures were overweight (scale 1–10, 1 = 'extremely underweight', 5 = 'normal weight', and 10 = 'extremely overweight') and estimated the weight of the figure in pounds (given a height of 5'4" for the women and 5'10" for the men).

*Procedures*
Participants who expressed interest in participating were sent a link to 1 of 4 on-line surveys. Surveys were identical except for the order of presentation of the figures. Participants completed the survey independently, and data were recorded automatically. Participants received class credit for participation. Procedures were approved by the Human Subject Review Board of Bowling Green State University.

*Data Analysis*
Four 4 (weight: low normal, overweight, obese, extremely obese) × 2 (figure gender: male, female) × 2 (participant gender: male, female) repeated-measures ANOVA examined the impact of the figures' weight and gender as well as the participants' gender on ratings of dislike, personality attributes, and functional disability. To assist in the interpretation of the 3-way interactions, separate 4 (weight) × 2 (figure gender) repeated-measures ANOVA for dislike, personality attributes, and functional disability were conducted for male and female participants. Post hoc paired-sample contrasts between low normal, overweight, obese, and extremely obese figures collapsed across gender, and paired-sample contrasts between male and female figures of each weight category were examined. Finally, independent samples t-tests were conducted between male and female participants on dislike, personality attributes, and functional disability ratings for figures of each weight category.

## Results

*Estimates of Weight and Degree of Overweight*
When estimating the degree of overweight for each of the figures, participants rated the low normal weight figure as slightly underweight (male: M = 4.3, SD = 0.8; female: M = 3.8, SD = 1.1), the overweight figure as normal weight (male: M = 5.1, SD = 0.8; female: M = 5.0, SD = 0.7), and the obese (male: M = 7.1, SD = 0.9; female: M = 6.5, SD = 0.9) and ex-

tremely obese (male: M = 8.0, SD = 1.0; female: M = 8.3, SD = 1.1) figures as overweight.

Participants also estimated the weight (lbs) of each figure. Estimates were used to calculate BMI. Participant estimates were: i) low normal (BMI male: M = 22.9, SD = 2.4; BMI female: M = 19.5, SD = 1.8), ii) overweight (BMI male: M = 25.1, SD = 2.8; BMI female: M = 22.5, SD = 2.2), iii) obese (BMI male: M = 31.0, SD = 4.3; BMI female: M = 27.8, SD = 3.6), and iv) extremely obese (BMI male: M = 35.2, SD = 4.9; BMI female: M = 36.6, SD = 6.7).

*Repeated Measures: Weight, Figure Gender, and Participant Gender*
The results of the 4 (weight) × 2 (figure gender) × 2 (participant gender) repeated-measures ANOVAs indicated significant 3-way interactions for dislike, $F(3,299) = 27.74$, $p < 0.001$, personality attributes, $F(3,299) = 7.65$, $p < 0.001$, and functional disability, $F(3,299) = 6.44$, $p < 0.001$. The results of the separate male and female 4 (weight) × 2 (figure gender) repeated-measures ANOVAs are below.

*Figure Dislike*
For male participants, the 4 (weight) × 2 (figure gender) repeated-measures ANOVA indicated a significant weight × figure gender interaction, $F(3,108) = 28.63$, $p < 0.003$. Post hoc paired-sample contrasts indicated a significantly greater dislike of obese relative to overweight figures and extremely obese relative to obese figures. However, a significant difference in dislike of low normal weight relative to overweight figures was not observed. Additional paired-sample contrasts indicated that men reported significantly less dislike for low normal weight, overweight, and obese female figures compared to the comparable male figures. However, for extremely obese figures, men reported significantly greater dislike of the

**Table 2.** Figure dislike, personality attributes, and functional deficits repeated-measures ANOVA ratings (mean, standard deviation (SD)) for female participants

| | Male figure, mean (SD) | | | | Female figure, mean (SD) | | | |
|---|---|---|---|---|---|---|---|---|
| | low normal | overweight | obese | extremely obese | low normal | overweight | obese | extremely obese |
| Dislike | 2.52 (1.43) | 2.80 (1.46)[b] | 3.50 (1.53)[c] | 4.08 (1.71) | 2.80 (1.56)[d] | 2.60 (1.44)[e] | 2.97 (1.40)[f] | 3.90 (1.77)[g] |
| Attributes | 1.93 (0.56)[a] | 2.32 (0.55)[b] | 3.30 (0.53)[c] | 3.72 (0.49) | 2.22 (0.55)[d] | 2.27 (0.48) | 2.96 (0.47)[f] | 3.72 (0.53) |
| Functional deficits | 1.04 (0.15)[a] | 1.10 (0.25)[b] | 1.78 (0.57)[c] | 2.25 (0.58) | 1.09 (0.25)[d] | 1.11 (0.28) | 1.50 (0.51)[f] | 2.25 (0.62) |

Superscripts indicate $p < 0.05$; df for all comparisons = 191.
[a]Weight: low normal vs. overweight (attributes t = 7.32, d = 0.48; FD t = 2.79, d = 0.21).
[b]Weight: overweight vs. obese (dislike t = 6.13, d = 0.40; attributes t = 17.69, d = 1.64; FD t = 17.85, d = 1.33).
[c]Weight: obese vs. extremely obese (dislike t = 9.70, d = 0.49; attributes t = 19.31, d = 1.31; FD t = 20.92, d = 1.19).
[d]Low normal: male vs. female (dislike t = 2.63, d = 0.18; attributes t = 7.54, d = 0.52; FD t = 3.34, d = 0.27).
[e]Overweight: male vs. female (dislike t = 2.18, d = 0.13).
[f]Obese: male vs. female (dislike t = 5.66, d = 0.36; attributes t = 9.11, d = 0.68; FD t = 7.14, d = 0.52).
[g]Extremely obese: male vs. female (dislike t = 2.25, d = 0.10).

female figure compared to the male figure. Overall, while men generally disliked heavier figures compared to thinner figures, they reported a greater liking of the low normal weight female figure and a greater dislike of the extremely obese female figure relative to male figures of comparable weight (table 1).

For female participants, a significant weight × figure gender interaction was also observed, F(3,189) = 4.8, p < 0.003. Post hoc contrasts indicated a significantly greater dislike of obese relative to overweight figures and extremely obese relative to obese figures. However, a significant difference in dislike of low normal weight relative to overweight figures was not observed. Additional paired-sample contrasts indicated that women reported significantly less dislike for the overweight, obese, and extremely obese female figures, compared to the male figures. However, women reported a significantly greater dislike of the low normal weight female figure compared to the male figure. Overall, women generally preferred figures with lower weight compared to higher weight, but evidenced a greater liking of higher weight female figures and a greater dislike of the low normal weight female figures relative to male figures of comparable weight (table 2).

*Personality Attributes*
For male participants, the results of the 4 (weight) × 2 (figure gender) repeated-measures ANOVA indicated a significant weight × figure gender interaction, F(3,108) = 8.63, p < 0.003. Post hoc paired-sample contrasts indicated that men assigned significantly more negative personality attributes to overweight relative to low normal weight figures, obese relative to overweight figures, and extremely obese relative to obese figures. Additional paired-sample contrasts indicated that men ascribed significantly fewer negative personality attributes to the obese female figure than to the male figure, but men ascribed significantly fewer negative personality attributes to the low normal weight male figure and the extremely obese male figure, relative to the female figures. Overall, while men at-

tributed significantly fewer negative attributes to figures with lower weight compared to figures with higher weight, men ascribed significantly more negative personality attributes to the low normal weight and extremely obese female figure and significantly fewer negative personality attributes to the obese female figure relative to male figures with a comparable weight (table 1).

For female participants, a significant weight × figure gender interaction was observed F(3,189) = 49.74, p < 0.003. Post hoc paired-sample contrasts indicated that women assigned significantly more negative personality attributes to overweight relative to low normal weight figures, obese relative to overweight figures, and extremely obese relative to obese figures. Additional paired-sample contrasts indicated that women ascribed significantly fewer negative personality attributes to the obese female figure compared to the male figure. However, women ascribed significantly fewer negative personality attributes to the low normal weight male than the female figure. Overall, while women ascribed significantly fewer negative personality attributes to figures with lower weight compared to figures with higher weight, women assigned fewer negative personality attributes to the obese female figure but more negative personality attributes to the low normal weight female figure relative to male figures with a comparable BMI (table 2).

*Functional Deficits*
For male participants, the results of the 4 (weight) × 2 (figure gender) repeated-measures ANOVA indicated a significant interaction, F(3,299) = 4.8, p < 0.003. Post hoc paired-sample contrasts indicated that men perceived significantly greater functional deficits for overweight relative to low normal weight figures, obese relative to overweight figures, and extremely obese relative to obese figures. Additional paired-sample contrasts indicated that low normal weight and extremely obese male figures were perceived to have significantly fewer functional deficits than female figures, but for obese figures, this pattern was

**Table 3.** Significant differences (t-value, p-value, Cohen's d) between male and female participants on ratings of figure dislike, personality attributes, and functional deficits

| | Male figure, t-value (Cohen's d) | | | | Female figure, t-value (Cohen's d) | | | |
|---|---|---|---|---|---|---|---|---|
| | low normal | overweight | obese | extremely obese | low normal | overweight | obese | extremely obese |
| Dislike | 4.16*** (0.48) | 3.26**(0.38) | 2.98**(0.35) | | 2.63** (0.30)[a] | | 4.18*** (0.48) | 5.10*** (0.59) |
| Attributes | | | 2.48* (0.29) | 3.18** (0.37) | | | 6.10*** (0.70) | 5.56*** (0.64) |
| Functional deficits | | | | | | | 3.87*** (0.45) | 4.07*** (0.47) |

df = 301.
*p < 0.05.
**p < 0.01.
***p < 0.001.
[a]For this comparison, male participants' ratings were more favorable than those of female participants. In all other comparisons, the male participants' ratings were more critical than those of female participants.

reversed. Overall, men perceived figures with lower weights to have fewer deficits compared to figures with higher weights, but some gender differences were observed (table 1).

For female participants, a significant weight × figure gender interaction was also observed F(3,299) = 4.8, p < 0.003. Paired-sample contrasts indicated that women perceived significantly greater functional deficits for the overweight relative to low normal weight figure, obese relative to overweight figure, and extremely obese relative to obese. Additional paired-sample contrasts indicated that low normal weight male figures were perceived to have significantly fewer functional deficits than the female figures, but for obese figures, males were perceived to have significantly greater functional deficits than females. Overall, while women perceived figures with lower weight to have fewer deficits compared to figures with higher weight, again, some gender differences emerged (table 2).

*Participant Gender Differences*
Independent samples t-tests were used to examine male versus female participants on ratings (table 3). Compared to female participants, male participants reported significantly greater negative personality attributes for the male and female figures that were obese and extremely obese. Compared to female participants, male participants also reported significantly greater dislike for the male figures that were low normal weight, overweight, and obese, and the female figures that were obese and extremely obese. Male participants reported significantly lower dislike for the low normal weight female figures, relative to female participants. Finally, male participants perceived greater functional deficits for the obese and extremely obese female figures, relative to female participants.

## Discussion

Weight bias is pervasive in American society, and yet, researchers have noted that the level of overweight necessary to evoke bias has not been clearly established [5]. While terms such as 'overweight' or 'obese' are employed in weight bias research, it is not apparent whether overweight individuals (BMI 25–30 kg/m$^2$) or individuals with obesity (BMI 30–40 kg/m$^2$) are targets of weight bias or if this bias only applies to extremely obese individuals. Similarly, despite evidence that women experience more weight bias [26], it is unknown how the gender of the participant or target influences weight bias at various degrees of overweight.

As expected, relative to the low normal weight and overweight figures, weight bias was greater in the current study for obese and extremely obese figures. The highest levels of dislike, negative personality attributes, and perceived functional deficits were reported for extremely obese figures regardless of gender. Conversely, in nearly all instances, the low normal weight figure was rated most favorably across dimensions.

It is notable that in this investigation there was minimal evidence for weight bias against overweight individuals (BMI approximately 25 kg/m$^2$). This suggests that when research finds bias against individuals described as 'overweight', participants may visualize an individual who is obese. Indeed, when participants estimated the degree of overweight for each figure, they rated the overweight figure as normal weight. With rates of overweight in the United States around 66% [1], it may be that mild degrees of overweight are considered normative and do not evoke bias. This is consistent with the finding that only a small percentage of overweight individuals (BMI 25–29.9 kg/m$^2$) report experiencing bias [27]. In contrast, ratings of obese and extremely obese targets were consistently much more negative.

Relative to the large effect that BMI had on evaluations of the figures (average Cohen's d = 0.96), the impact of figure gender (average Cohen's d = 0.34) and participant gender (average Cohen's d = 0.46) were more modest. Nevertheless, interpretable sex differences emerged. For example, female participants evaluated the low normal weight female more negatively across dimensions compared to the low normal weight

male figure and the overweight female figure. There is abundant anecdotal evidence in popular culture and print media that women hold a negative bias against thin women [28]. To our knowledge, there has been little empirical evidence to support these allegations. Nevertheless, evolutionary theories suggest that perceived or actual mate competition might promote negative evaluations of physically attractive women [29]. It is important to note, however, that the bias of female participants against obese and extremely obese women was far greater than their bias against low normal weight women.

Surprisingly, female participants reported either comparable or greater dislike, attributed more negative personality traits, and perceived greater functional deficits for overweight, obese, and extremely obese *male* figures, relative to *female* figures of the same size. Again, it is not entirely clear why women preferred larger female figures relative to comparable male figures. However, research suggests that young (aged 18–22 years) female judgments of male attractiveness across a variety of domains (e.g. caring, strength, power) are influenced by physical features [30]. Specifically, women prefer normal weight males with smaller waist-hip ratios. It is possible that women judged the male figures as a potential mate and the female figures as a potential friend or acquaintance, and thus judged the heavier male figures more harshly than female figures. Future research might specifically direct participants to evaluate opposite sex figures of varying weights as potential friends and as potential romantic partners to ascertain if there is support for this interpretation. One study [31] found that men in particular made choices of sexual partner based on weight; however, this study did not compare these preferences to those made for friendship.

In contrast, men exhibited significantly greater dislike of low normal weight, overweight, and obese male figures, relative to female figures. However, for extremely obese figures, this phenomenon was reversed. Males reported significantly greater dislike for the extremely obese female figure relative to the male figure.

While researchers have suggested that weight bias may be greater for females [26], little research has examined this directly. The findings in this investigation were mixed. First, with the exception of male participant ratings of extremely obese females, both male and female participants generally rated the male figures more negatively. Furthermore, consistent with previous research [e.g. 32], male participants tended to rate targets more negatively than female participants, particularly the obese and extremely obese figures. Clearly, further research is needed to examine the impact of target gender on weight bias and to understand how the gender of the target and the gender of the participant interact to produce differing levels of bias at various degrees of overweight.

Although the findings here contribute to our understanding of weight bias, the current study also has several limitations that should be noted and addressed in future research. First, despite clear evidence for prejudicial attitudes toward the obese, the impact of these perceptions on the treatment of obese people is unknown. A recent laboratory study on employment-related discrimination against obese individuals failed to find an association between antifat attitudes and antifat discrimination [33]. Second, the current sample's limited age range and racial diversity suggests that replication of these findings with more diverse samples is clearly warranted, as is research using non-Caucasian target figures. Third, the current analyses did not examine individual difference variables other than gender which might be associated with weight bias. For example, participants of various BMIs might have responded differently to the target figures. Finally, the range of BMIs of the figures presented here was clearly restricted. Research using figures spanning a greater range (e.g. including underweight targets and targets with even higher BMIs) as well as making finer distinctions within weight categories (e.g. a BMI of 25 kg/m$^2$ vs. a BMI of 28 kg/m$^2$) would shed further light on this issue.

In addition, while 3-dimensional body scanners can capture surface typology [34, 35], the relationship between specific regional adiposity (e.g. gynoid, android) and weight bias was not explored here. Participants tended to underestimate the weight of overweight, obese, and extremely obese female figures and slightly overestimate the weight of the low normal weight figure. Similarly, participants were accurate at estimating the weight of the overweight and obese male figures; however, they overestimated the weight of the low normal weight male figure and underestimated the weight of the extremely obese male figure. It is not known whether manipulation of regional adiposity or other potential moderators such as target age [36] would influence perceptions.

In sum, the current results suggest that obese (and especially extremely obese) individuals are likely to be evaluated negatively. Negative attitudes toward the obese may contribute to diminished emotional well-being of obese individuals [5], particularly if obese individuals are regular targets of discrimination. As almost one-third of American adults has a BMI that exceeds 30 kg/m$^2$, a large segment of the US population are likely recipients of prejudicial attitudes. Given that weight-based prejudice comes with significant economic and psychological costs [5], a better understanding of the parameters of this bias may yield considerable benefit.

## Disclosure

The authors declared no conflict of interest.

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