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How scale and mirror influence attitudes towards an obese figure

Como la báscula y el espejo influyen en actitudes hacia una figura obesa

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Abstract: The current study evaluates anti-fat attitudes (AFA) relative to BMI, and whether these can be influenced via seeing oneself in a mirror or by weighing oneself. 134 female students assigned to four conditions: mirror; scale; scale and mirror; and control, had their BMI, appearance self-esteem, and AFA measured. To assess AFA a 12-item semantic differential was applied with an obese and average-weight image. Results showed that participants evaluated average-weight image as more beautiful, younger, happier, more responsible, more agile, harder-working, healthier, stronger, friendlier, more familiar, and yet more unfaithful relative to obese images. AFA was not related to BMI. Scale condition evoked the most AFA, while seeing oneself in a mirror resulted in the highest appearance self-esteem scores. Studies suggest that those without eating disorders who look in the mirror focus on positive body parts. Stepping on the scale seemed to make the issue of body-weight salient and accessible resulting in more elaborate and critical assessment of the obese image.

Keywords: obesity, BMI, antifat attitudes, objective self-awareness, women.

Resumen: Este estudio evalúa las actitudes antiobesidad (AFA) en relación con IMC, y si estas pueden influirse con verse al espejo o pesarse. A 134 universitarias asignadas a cuatro condiciones: espejo, báscula, báscula y espejo, y control, se midió IMC, autoestima de apariencia, y AFA. AFA se midió con un diferencial semántico de 12 ítems con una imagen obesa y de peso promedio. Las participantes evaluaron la imagen de peso-promedio como más: bella, joven, feliz, responsable, ágil, trabajadora, sana, fuerte, amigable, familiar, pero menos fiel. AFA no se relacionó con IMC. La condición de báscula evocó AFA más alto, mientras el espejo resultó en la autoestima más alta. Los estudios sugieren que aquellos sin trastornos alimenticios al mirarse en el espejo se centran en partes que les agradan. Subirse la báscula pudo enfocar la atención en el peso, haciendo esta información más saliente y accesible, llevando a la evaluación más elaborada y crítica de la imagen obesa.

Palabras clave: obesidad, IMC, actitudes antiobesidad, autoconciencia objetiva, mujeres.

Introduction

In Mexico, overweight prevalence, obesity included, reached 72.5% (Secretaría de Salud, 2016). Although the problem of excessive weight

affects the whole population, women are more often affected. Historically a “larger body figure” had positive connotations in Mexico, such as abundance and protection (Moreno-García & Cantú-Martínez, 2010), yet recent studies indicate that attitudes towards a larger silhouette have become less favorable (Bacardí-Gascón, Jiménez-Cruz, Castillo-Ruiz, Bezares-Sarmiento, & León-González, 2015). This negative assessment of overweight individuals is referred to as anti-fat attitudes (AFA) (Crandall & Biernat, 1990). Crandall et al. (2001) based on studies in the USA proposed that AFA have symbolic meaning because they express beliefs and values that reflect: self-determination - being in control of one’s life including one’s weight, and intolerance related to excessive weight. The authors additionally indicated that AFA was not correlated with one’s own weight.

Evaluating anti-fat attitudes and how these can be influenced is critical from both a social and health perspective, as an obese person is affected not only by compromised physical health but also by discrimination, which may interact with each other (Puhl & Heuer, 2010). Moreover, what makes this discrimination unique is that both people with obesity and average-weight report similar levels of bias, meaning that people with obesity lack in-group bias (Crandall et al., 2001).

The dominant line of studies with regard to AFA has focused on identifying its levels in different domains of life. Anti-fat discrimination was seen for instance in employment, education, health care, public transportation and in interpersonal relationships with friends and relatives (Puhl & Brownell, 2001; Puhl & Heuer, 2009). One of the most researched groups are health professionals, due to the implications their work has for obese patients. Yet, research related to altering these attitudes has been limited. Teachman, Gapinski, Brownell, Rawlins, and Jeyaram (2003) were one of the first to study ways to modify anti-fat bias. These included providing information that obesity is mainly due to genetics or evoking empathy through stories of discrimination against an overweight young woman, versus providing information that obesity is predominantly caused by behavioral factors, such as overeating and lack of exercise. None of the attempts resulted in lower bias across the whole sample.

McClure, Puhl, and Heuer (2010) examined media portrayals of obese people and their effect on AFA. Viewing photography that negatively portrayed an obese woman (unflattering portrayal or engaging in stereotypical actions e.g., eating fast food) resulted in higher levels of weight bias, despite pairing photographs with a news story neutral to the topic of obesity. The mean level was higher than means reported elsewhere. Participants who saw a positive portrayal (flattering or engaging in non-stereotypical actions e.g., exercising) reported lower levels of weight bias versus those who saw a negative portrayal or a story with no photographs, yet the mean level of weight bias was no lower than reported in previous research. The authors proposed presenting positive portrayals of obese persons to challenge weight-based stereotypes and prevent negative attitudes from worsening.

Alberga et al. (2016) reviewed 17 intervention studies designed to reduce weight bias in students or professionals in a health-related field. Four primary approaches to modify attitudes included: (1) providing basic information on weight; being overweight; obesity and weight-related bias; stigma and discrimination; (2) evoking empathy with the lived experiences of people with obesity; (3) emphasizing self-awareness through self-reflection and gaining an understanding of ones' own attitudes and biases; (4) the respected and trusted opinions of leaders and peers. The authors concluded that there were no definitive approach that demonstrated effectiveness in reducing weight bias in participants.

In this study we propose to investigate the influence of a mirror and scale, objects commonly used in our daily lives to evaluate anti-fat attitudes. A mirror and scale were chosen based on the assumption that these can induce a state of objective self-awareness. Objective self-awareness refers to the state in which attention is directed inwards and the awareness of a person is focused on oneself (Duval & Wicklund, 1972). The state of self-focus is not usual, yet environmental cues and situations can evoke it for instance, such as gazing into a mirror (Sentyrz & Bushman, 1998).

Focusing attention on the self leads to self-evaluation. Self-evaluation can result in negative or positive affect depending on whether attention is directed toward a negative or a positive discrepancy. People will be negatively affected and dissatisfied if they do not live up to their personal standards. For instance, those who consider themselves too heavy will become dissatisfied. The question is how this (dis)satisfaction with their own body and weight influences attitudes towards the obese. In a sample of Latina and European American women, Pepper and Ruiz (2007) found a positive correlation between own body dissatisfaction and AFA. Participants who were highly dissatisfied with their body reported higher levels of prejudice toward overweight and obese individuals than those with less dissatisfaction. Body image dissatisfaction in return, has been shown to be positively correlated with self-esteem: the lower one's body satisfaction, the lower one's self-esteem (Shahyad, Pakdaman, & Shokri, 2015).

The aim of this study was to assess AFA relative to BMI and whether these can be influenced via objective self-awareness related to self-appearance, operationalized via seeing oneself in a mirror and/or stepping on a scale. Our hypotheses were:

- 1) No correlation between AFA and BMI;
 - 2) Negative correlation between AFA and appearance self-esteem;
- Regarding four conditions, we hypothesized:
- 3) For those with higher BMI, the scale and/or mirror would reduce self-esteem, and augment AFA;
 - 4) For the average BMI group, no effect of the scale and/or mirror on AFA.

Method

Participants

134 female undergraduate medicine students from Universidad Autónoma de Mexico (UNAM) in Mexico City, Mexico were recruited, with the inclusion criteria of a BMI ≥ 18.5 (BMI calculated as weight in kg/ height squared in m², where BMI < 18.5 represents underweight, 18.5-24.9 average-weight, 25–29.9 overweight, ≥ 30 obesity). 70 participants had average BMIs and 64 had BMIs which were ≥ 25 . This is depicted in Table 1. Data was collected between October and November 2018 during pre-scheduled appointments. Informed consent was obtained before every interview and the responses of participants were anonymous and confidential.

Table 1

Participants height, weight, BMI and weight satisfaction

| | N | % | Height | Weight | BMI | Weight satisfaction kg |
|----------------|------------|-------------|-----------------|-----------------|-------------------|------------------------|
| | | | Measured cm | Measured kg | Measured | (Ideal-Measured) |
| | | | Mean SD | Mean SD | Mean SD | Mean SD |
| BMI 18.5-24.99 | 70 | 52% | 158 4.62 | 55 5.12 | 22.09 1.62 | - 1.91 4.07 |
| BMI ≥ 25 | 64 | 48% | 159 5.84 | 75 10.81 | 29.44 3.66 | - 13.86 7.48 |
| Total | 134 | 100% | 158 5.29 | 64 13.03 | 25.60 4.61 | - 7.62 8.42 |

Design

In this quasi-experimental study, participants were segmented into two groups, based on BMI: (1) BMI: 18.5-24.9 and (2) BMI ≥ 25 , including being overweight and obese. Participants of each group were randomly assigned to one of four conditions: (1) asking a participant to step on a scale and look at their weight; (2) look at their reflection in a mirror; (3) step on a scale in front of a mirror and look at their weight and reflection; and (4) the control group, in which they were asked to write down a list of words on 'the space that people occupy in their world'.

Procedure

Participants were informed that this was a study on the space that people occupy in their world. AFA was not mentioned to avoid bias. Block randomization was applied when assigning the four conditions. In conditions one, two and three the interviewer instructed participants to focus on their weight and/or figure and asked about their emotions and thoughts to induce the objective self-awareness state. Participants

then filled in a self-esteem questionnaire and semantic differentials. Participants in conditions without the scale, were weighed at the end. All the participants were weighed with the OMRON HBF-514C scale to the nearest 0.1 kg without shoes and outerwear. At the end all participants had their height measured with a stadiometer to the nearest half centimeter. In the mirror condition a full-length mirror was used to allow participants to see their full silhouette. After each intervention the participants' BMIs were calculated at the end of the day and the list of block randomizations were prepared for the following day.

Measures

Appearance and Self-Esteem

A 6-item appearance self-esteem scale from the State Self-esteem Scale (Heatherton & Polivy, 1991) was translated into Spanish. Items were measured on a 5-point Likert response scale ranging from 1 (not at all) to 5 (extremely). The scale was used to evaluate the effect of objective self-awareness across different conditions.

The instrument showed good consistency after removing item 3: "I am dissatisfied with my weight" which in Spanish is "No estoy satisfecho con mi peso" scale ranging from 1 (para nada) to 5 (muchísimo), (6 items: $\alpha=.76$; 5 items: $\alpha=.84$). Item-3 was removed based on the low item-total correlation .06. Item-total correlation for other items fell between .50 and .72 indicating a good discrimination. Negation in Spanish may have caused item 3's low discrimination. Overall the self-esteem mean score was calculated using five items.

Weight Satisfaction

Participants completed a single item regarding ideal-weight: "how much would you like to weigh?". Their weight satisfaction was calculated according to the formula: Weight satisfaction = the ideal weight (kg) - measured weight (kg).

Anti-fat Attitudes

AFA was measured via semantic differentials created for this study. A set of 14 bipolar adjectives were preselected based on a literature review of the associations between obesity and other factors. An example of these bipolar adjectives included: healthy – sick; the Mexican culture of female stereotyping, such as egoistic-self-sacrificing; rebellious-docile; and anti-fat associations in the USA, such as stupid - intelligent, lazy - motivated, ugly - pretty. Adjectives were presented in two conditions (1) an average-weight image and (2) an obese weight image. The images presented women's bodies in underwear, from their necks to their knees, showing differences in body size only. Faces were not

visible in order to limit distractions. The order of presenting images was rotated. Adjective pairs were presented on a 7-point scale e.g. beautiful ----:----:----:----:----:---- ugly. Participants evaluated the images by checking the space that most closely expressed their attitudes. A check closest to the negative-descriptor e.g. ugly was coded as 1, and one next to the positive one e.g. beautiful, as 7. Adjectives were presented in four different orders: reversed left-right, bottom-top.

Semantic differential frequencies indicated the accumulation of answers in the theoretical mean for: rebellious-docile- obese image: 54%, average-weight: 62%; and egoistic-self-sacrificing-70%, 63% respectively. Item-total correlation for these two items was low: rebellious-docile .16 and egoistic-self-sacrificing .22. We assume that none of the two contrasted adjectives were a positive option for participants, meaning that paired adjectives did not represent true oppositions. Item-total correlation for other items fell within .24 till .66. Further analysis was done with a 12-item instrument which showed good internal consistency ($\alpha=.86$) both with obese and average-weight image; for the distances between values with average-weight image versus obese one $\alpha=.75$.

The 12-item mean score and means for each item were calculated with average-weight image and the obese weight image. The average mean distance was calculated for each item and the total instrument. Higher scores indicated that the image was rated as more unpleasant when shown as obese in relation to average-weight. Distances were used for between group comparisons and the average mean distance was used in correlations.

Data Analysis

Analyses was performed with SPSS 25. To validate instruments the reliability frequencies, kurtosis, asymmetry and Cronbach's Alpha were calculated. Data was screened for outliers and normality. As normality was not met, non-parametric tests were applied, such as the Wilcoxon and Mann-Whitney U test. Spearman correlations were calculated. Differences for all analyses were considered significant when p-values were $<.05$.

Results

Anti-Fat Attitudes

Participants rated the image more negatively when shown as obese relative to average-weight. Still, the average score for the obese images indicated a somewhat neutral, slightly positive attitude ($M=4.20$, $SD=.98$; on the scale range: 1 negative to 7 positive). The average-weight image yielded an average score of 5.08 ($SD=.84$), reflecting positive attitudes. The average-weight image was considered more beautiful, younger, happier, more responsible, more agile, harder-working, healthier, stronger, friendlier,

more familiar, but also more unfaithful, versus the obese-weight image. Differences were significant, with the exception for intelligence. This is visually depicted in Table 2. Both BMI groups expressed similar bias and no significant differences were found between the groups, except for familiarity ($U=1597$, $p=.002$). The average BMI group considered the image more familiar when presented as the average-weight silhouette relative to the obese-weight image, and the opposite was true for those with $BMI \geq 25$. AFA was not correlated with BMI, confirming hypothesis 1.

Table 2

AFA: Total sample & by BMI

| Pairs of adjectives | Total sample, N=134 | | | | | | BMI average, N=70 | | | | | | BMI ≥ 25 , N=64 | | | | | |
|--------------------------------|---------------------|-----|------------------------|-----|------|------|-------------------|-----|------------------------|-----|------|------|----------------------|-----|------------------------|-----|------|------|
| | obese vignette | | normal-weight vignette | | | | obese vignette | | normal-weight vignette | | | | obese vignette | | normal-weight vignette | | | |
| | M | SD | M | SD | Z | p | M | SD | M | SD | Z | p | M | SD | M | SD | Z | p |
| 1 Ugly... beautiful | 4.5 | 1.6 | 5.4 | 1.3 | -6.0 | 0.00 | 4.6 | 1.6 | 5.5 | 1.2 | -4.2 | 0.00 | 4.3 | 1.7 | 5.3 | 1.3 | -4.3 | 0.00 |
| 2 Old... young | 4.6 | 1.5 | 5.7 | 1.2 | -6.4 | 0.00 | 4.7 | 1.5 | 6.0 | 1.2 | -4.8 | 0.00 | 4.3 | 1.6 | 5.5 | 1.2 | -4.3 | 0.00 |
| 3 Sad... happy | 3.9 | 1.6 | 5.0 | 1.3 | -6.4 | 0.00 | 4.0 | 1.6 | 5.0 | 1.3 | -4.7 | 0.00 | 3.7 | 1.6 | 5.0 | 1.2 | -4.4 | 0.00 |
| 4 Stupid... intelligent | 5.0 | 1.4 | 4.9 | 1.3 | -0.5 | 0.64 | 5.1 | 1.4 | 5.0 | 1.4 | -0.9 | 0.36 | 4.8 | 1.4 | 4.9 | 1.2 | -0.2 | 0.80 |
| 5 Irresponsible... responsible | 4.3 | 1.8 | 4.9 | 1.3 | -4.1 | 0.00 | 4.3 | 1.8 | 4.9 | 1.4 | -2.9 | 0.00 | 4.2 | 1.7 | 4.8 | 1.3 | -2.9 | 0.00 |
| 6 Clumsy... agile | 3.5 | 1.5 | 5.0 | 1.4 | -7.7 | 0.00 | 3.7 | 1.5 | 5.3 | 1.3 | -5.7 | 0.00 | 3.3 | 1.5 | 4.7 | 1.4 | -5.2 | 0.00 |
| 7 Lazy... hardworking | 3.8 | 1.7 | 4.8 | 1.3 | -5.7 | 0.00 | 3.8 | 1.7 | 4.9 | 1.3 | -4.5 | 0.00 | 3.8 | 1.6 | 4.6 | 1.2 | -3.6 | 0.00 |
| 8 Unfaithful... faithful | 5.2 | 1.4 | 4.8 | 1.4 | -3.5 | 0.00 | 5.2 | 1.4 | 4.8 | 1.3 | -2.7 | 0.01 | 5.1 | 1.5 | 4.8 | 1.5 | -2.2 | 0.02 |
| 9 Sick... healthy | 2.5 | 1.4 | 5.5 | 1.3 | -9.3 | 0.00 | 2.6 | 1.4 | 5.3 | 1.3 | -6.6 | 0.00 | 2.4 | 1.5 | 5.6 | 1.3 | -6.7 | 0.00 |
| 10 Weak... strong | 4.1 | 1.7 | 4.9 | 1.4 | -5.1 | 0.00 | 4.2 | 1.8 | 4.8 | 1.4 | -3.1 | 0.00 | 4.0 | 1.6 | 5.1 | 1.3 | -4.2 | 0.00 |
| 11 Unfriendly... friendly | 4.7 | 1.5 | 5.2 | 1.3 | -3.2 | 0.00 | 4.8 | 1.4 | 5.2 | 1.3 | -2.4 | 0.02 | 4.6 | 1.5 | 5.1 | 1.3 | -2.1 | 0.04 |
| 12 Unfamiliar... familiar | 4.5 | 1.9 | 5.0 | 1.7 | -2.5 | 0.01 | 4.1 | 1.8 | 5.1 | 1.5 | -4.1 | 0.00 | 4.9 | 1.9 | 4.8 | 1.8 | -0.6 | 0.58 |
| Mean negative... positive | 4.2 | 1.0 | 5.1 | 0.8 | -9.2 | 0.00 | 4.3 | 1.0 | 5.2 | 0.9 | -6.9 | 0.00 | 4.1 | 1.0 | 5.0 | 0.8 | -6.1 | 0.00 |

Physical Appearance and Self-Esteem

Average self-esteem was 3.29 (SD=.79; on the scale range: 1 negative to 5 positive), indicating somewhat positive self-esteem. The average BMI group had a significantly higher score ($M=3.54$, $SD=.70$), than the $BMI \geq 25$ group ($M=3.01$, $SD=.79$), $U=1375.5$, $p < .001$. Overall those with higher BMIs tended to have lower self-esteem ($rs=-.35$) and lower weight satisfaction ($rs=-.91$). Self-esteem was positively correlated with weight satisfaction ($rs=.40$). Within the overweight group self-esteem was correlated with AFA ($rs=-.33$), the lower one's self-esteem the more negatively the obese image was perceived in relation to the average-weight image, partially confirming hypothesis 2. This confirmation was partial because the relationship was not observed across all participants.

Comparing Four Conditions: 1 Scale, 2 Mirror, 3 Scale & Mirror, and Control

Randomization Check

Within each of the BMI groups four conditions did not differ on any of the baseline characteristics of weight, height, and BMI.

Physical Appearance and Self-Esteem

Seeing oneself in a mirror yielded the highest self-esteem score (M=3.56, SD=.57), significantly higher than in any other condition. The same was true within the BMI ≥ 25 group. Participants felt the best about their appearance when they were in front of the mirror. This was in contradiction to hypothesis 3, in which we expected the mirror to reduce levels of self-esteem in the BMI ≥ 25 group. Those with average BMI had the highest self-esteem score standing in front of the mirror (M = 3.80, SD = .85). This score was significantly higher than in any other condition. Stepping on the scale did not seem to influence self-esteem, which was also contrary to hypothesis 3. This is depicted in Table 3.

Table 3

Self-esteem & AFA across conditions; conditions comparison: Total sample & by BMI

| | Self esteem | | | | | | | | | AFA | | | | | | | | | | |
|-----------------------|-------------|-----|-----|-------|-----|-----|--------|-----|-----|--------------|-----|-----|---------|-----|-------|-----|--------|-----|--------------|-----|
| | Control | | | Scale | | | Mirror | | | Scale&Mirror | | | Control | | Scale | | Mirror | | Scale&Mirror | |
| | N | M | SD | N | M | SD | N | M | SD | N | M | SD | M | SD | M | SD | M | SD | M | SD |
| Total | 34 | 3.2 | 0.7 | 34 | 3.2 | 0.9 | 33 | 3.6 | 0.6 | 33 | 3.2 | 0.9 | 0.7 | 0.7 | 1.2 | 0.7 | 0.8 | 0.9 | 0.9 | 1.0 |
| BMIavg | 18 | 3.4 | 0.6 | 17 | 3.4 | 0.7 | 18 | 3.6 | 0.5 | 17 | 3.8 | 0.8 | 0.8 | 0.7 | 1.2 | 0.8 | 0.8 | 0.6 | 0.8 | 0.8 |
| BMI≥25 | 16 | 2.9 | 0.7 | 17 | 3.0 | 1.0 | 15 | 3.5 | 0.6 | 16 | 2.6 | 0.6 | 0.6 | 0.8 | 1.1 | 0.7 | 0.9 | 1.2 | 0.9 | 1.2 |
| <i>Mann-Whitney U</i> | | | | | | | | | | | | | | | | | | | | |
| Total | | | | | | | | | | | | | | | | | | | | |
| Scale | 558 | | | -- | | | | | | | | | 378 | | -- | | | | | |
| | 0.13 | | | | | | | | | | | | 0.00 | | | | | | | |
| Mirror | 364 | | | 414 | | | -- | | | | | | 547 | | 383 | | -- | | | |
| | 0.00 | | | 0.01 | | | | | | -- | | | 0.14 | | 0.00 | | | | -- | |
| Scale&Mirror | 557 | | | 561 | | | 421 | | | | | | 526 | | 414 | | 536 | | | |
| | 0.16 | | | 0.17 | | | 0.02 | | | | | | 0.11 | | 0.01 | | 0.15 | | | |
| BMI average | | | | | | | | | | | | | | | | | | | | |
| Scale | 149 | | | -- | | | | | | | | | 91 | | -- | | | | | |
| | 0.15 | | | | | | | | | | | | 0.01 | | | | | | | |
| Mirror | 119 | | | 118 | | | -- | | | | | | 150 | | 93 | | -- | | | |
| | 0.03 | | | 0.04 | | | | | | -- | | | 0.12 | | 0.01 | | | | -- | |
| Scale&Mirror | 96 | | | 94 | | | 116 | | | | | | 148 | | 106 | | 148 | | | |
| | 0.01 | | | 0.01 | | | 0.04 | | | | | | 0.14 | | 0.03 | | 0.14 | | | |
| BMI ≥25 | | | | | | | | | | | | | | | | | | | | |
| Scale | 131 | | | -- | | | | | | | | | 99 | | -- | | | | | |
| | 0.14 | | | | | | | | | | | | 0.03 | | | | | | | |
| Mirror | 65 | | | 87 | | | -- | | | | | | 119 | | 90 | | -- | | | |
| | 0.00 | | | 0.02 | | | | | | -- | | | 0.16 | | 0.03 | | | | -- | |
| Scale&Mirror | 85 | | | 107 | | | 34 | | | | | | 117 | | 103 | | 113 | | | |
| | 0.02 | | | 0.05 | | | 0.00 | | | | | | 0.11 | | 0.04 | | 0.13 | | | |

Weight Satisfaction

Across conditions the difference for weight satisfaction was significant only between the control group (M=-6.84, SD=9.81) and the scale group (M=-8.57, SD=7.21), U=488.5, p=.045. There were no significant differences within the BMI ≥ 25 group. Those with an average BMI were the least dissatisfied in the control condition (M=-.31, SD=5.11) versus standing in front of the mirror (M=-3.07, SD=4.13) or on the scale (M=-3.20, SD=3.45). Also their dissatisfaction was lower when on the scale in front of the mirror (M=-1.09, SD=2.56) than when they were just on the scale. This is in line with the results on self-esteem.

Anti-Fat Attitudes

Participants rated the image the most negatively when shown as obese relative to average-weight in the scale condition. The same was true for both BMI groups, contrary to hypothesis 4. This can be seen in Table 3. Looking at individual items, more items were significantly different in the control and scale conditions than in the conditions including standing in front of the mirror. Manipulation did not affect the image evaluation with respect to beauty, youth, agility, work and health. The image was perceived more favorably when presented as average-weight relative to obese in terms of these characteristics, and intelligence was not associated with figure size in any of the conditions.

When split by BMI, both groups in the scale condition evaluated the average-weight image significantly more positively relative to the obese-weight image on the majority of characteristics. This was not the case in other conditions. Intelligence and health were not affected, neither by manipulation nor by BMI. This highlights how intelligence assessment was not related to image weight, whilst health was consistently related across conditions and BMI groups. See Table 4.

Those with average BMIs perceived more significant differences between the obese-weight image versus the average-weight image in favor of the latter across conditions. It was particularly notable in the control condition, where those with the average BMI perceived the image more positively when presented with an average-weight image. The image was perceived positively in terms of most of the characteristics, with the exception of faithfulness, strength, friendliness and intelligence. Those with BMI ≥ 25 perceived the differences only in terms of factors such as youth and happiness.

Table 4

AFA related samples comparison within each condition: total sample & by BMI

| Pair of adjectives | Control N = 34 | | | | Scale N = 34 | | | | Mirror N = 33 | | | | Scale&Mirror N = 33 | | | | | | | | | | | |
|--------------------------------|----------------|------|------------------------|------|----------------|------|------------------------|------|----------------|------|------------------------|------|---------------------|------|------------------------|------|-------|------|------|------|------|------|-------|------|
| | obese vignette | | normal-weight vignette | | obese vignette | | normal-weight vignette | | obese vignette | | normal-weight vignette | | obese vignette | | normal-weight vignette | | | | | | | | | |
| | M | SD | M | SD | Z | p | M | SD | M | SD | Z | p | M | SD | M | SD | Z | p | | | | | | |
| 1 Ugly... beautiful | 4.4 | 1.6 | 5.1 | 1.2 | -2.8 | 0.00 | 4.2 | 1.7 | 5.6 | 1.3 | -3.8 | 0.00 | 4.5 | 1.6 | 5.5 | 1.3 | -2.9 | 0.00 | 4.8 | 1.7 | 5.3 | 1.3 | -2.0 | 0.04 |
| 2 Old... young | 4.3 | 1.7 | 5.5 | 1.2 | -3.4 | 0.00 | 4.4 | 1.7 | 5.9 | 1.0 | -3.7 | 0.00 | 4.7 | 1.1 | 5.6 | 1.5 | -2.6 | 0.01 | 4.8 | 1.6 | 5.9 | 1.2 | -3.2 | 0.00 |
| 3 Sad... happy | 3.9 | 1.4 | 4.8 | 1.2 | -3.3 | 0.00 | 3.4 | 1.6 | 4.9 | 1.2 | -3.6 | 0.00 | 4.5 | 1.6 | 5.1 | 1.4 | -1.8 | 0.07 | 3.8 | 1.6 | 5.2 | 1.4 | -4.1 | 0.00 |
| 4 Stupid... intelligent | 5.0 | 1.3 | 4.8 | 1.3 | -1.4 | 0.17 | 4.6 | 1.4 | 4.7 | 1.1 | -0.4 | 0.72 | 5.3 | 1.4 | 5.2 | 1.4 | -0.3 | 0.76 | 4.9 | 1.5 | 5.1 | 1.4 | -0.3 | 0.78 |
| 5 Irresponsible... responsible | 4.3 | 1.8 | 4.9 | 1.3 | -2.7 | 0.01 | 4.3 | 1.7 | 4.6 | 1.2 | -1.4 | 0.17 | 4.2 | 1.8 | 5.1 | 1.5 | -2.3 | 0.02 | 4.3 | 1.8 | 4.9 | 1.4 | -2.2 | 0.03 |
| 6 Clumsy... agile | 3.8 | 1.7 | 4.5 | 1.4 | -2.7 | 0.01 | 3.1 | 1.4 | 5.3 | 1.3 | -4.7 | 0.00 | 4.0 | 1.4 | 5.3 | 1.2 | -3.6 | 0.00 | 3.2 | 1.4 | 5.0 | 1.5 | -4.1 | 0.00 |
| 7 Lazy... hardworking | 3.8 | 1.7 | 4.5 | 1.1 | -2.1 | 0.04 | 3.5 | 1.6 | 4.7 | 1.3 | -3.7 | 0.00 | 4.0 | 1.7 | 5.4 | 1.2 | -3.4 | 0.00 | 3.8 | 1.6 | 4.5 | 1.3 | -2.2 | 0.03 |
| 8 Unfaithful... faithful | 4.9 | 1.3 | 4.6 | 1.3 | -1.9 | 0.05 | 5.1 | 1.5 | 4.7 | 1.3 | -2.1 | 0.03 | 5.2 | 1.6 | 4.7 | 1.6 | -1.5 | 0.13 | 5.4 | 1.4 | 5.1 | 1.3 | -1.4 | 0.16 |
| 9 Sick... healthy | 2.5 | 1.6 | 5.4 | 1.3 | -4.7 | 0.00 | 2.1 | 1.2 | 5.4 | 1.4 | -4.8 | 0.00 | 2.7 | 1.6 | 5.8 | 1.2 | -4.7 | 0.00 | 2.6 | 1.4 | 5.3 | 1.4 | -4.5 | 0.00 |
| 10 Weak... strong | 3.9 | 1.9 | 4.7 | 1.4 | -2.2 | 0.03 | 3.5 | 1.3 | 4.9 | 1.3 | -4.0 | 0.00 | 4.8 | 1.6 | 5.2 | 1.3 | -2.1 | 0.03 | 4.3 | 1.7 | 4.8 | 1.4 | -1.8 | 0.08 |
| 11 Unfriendly... friendly | 4.6 | 1.4 | 5.1 | 1.2 | -2.2 | 0.03 | 4.6 | 1.4 | 5.1 | 1.3 | -1.2 | 0.23 | 4.7 | 1.7 | 5.2 | 1.4 | -1.6 | 0.12 | 4.8 | 1.4 | 5.2 | 1.5 | -1.7 | 0.08 |
| 12 Unfamiliar... familiar | 4.9 | 1.5 | 4.9 | 1.6 | -0.5 | 0.62 | 4.5 | 2.1 | 5.4 | 1.6 | -2.2 | 0.03 | 4.7 | 1.8 | 4.9 | 1.7 | -0.6 | 0.53 | 3.9 | 2.0 | 4.7 | 1.7 | -1.7 | 0.09 |
| Mean negative... positive | 4.2 | 1.1 | 4.9 | 0.7 | -4.3 | 0.00 | 3.9 | 0.8 | 5.1 | 0.8 | -5.0 | 0.00 | 4.4 | 1.0 | 5.3 | 0.9 | -4.5 | 0.00 | 4.2 | 0.9 | 5.1 | 1.0 | -4.5 | 0.00 |
| BMI average | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 Ugly... beautiful | 4.44 | 1.72 | 5.33 | 1.33 | -2.23 | 0.03 | 4.18 | 1.88 | 5.47 | 1.28 | -2.62 | 0.01 | 4.61 | 1.29 | 5.61 | 1.14 | -2.54 | 0.01 | 5.35 | 1.32 | 5.41 | 1.33 | -0.32 | 0.75 |
| 2 Old... young | 4.50 | 1.82 | 5.78 | 1.17 | -2.83 | 0.00 | 4.94 | 1.64 | 6.41 | 0.62 | -2.74 | 0.01 | 4.72 | 1.13 | 5.56 | 1.65 | -1.62 | 0.11 | 4.82 | 1.33 | 6.18 | 1.07 | -2.67 | 0.01 |
| 3 Sad... happy | 3.83 | 1.15 | 4.72 | 1.27 | -2.68 | 0.01 | 3.53 | 1.74 | 5.00 | 1.37 | -2.85 | 0.00 | 4.72 | 1.60 | 5.06 | 1.30 | -0.90 | 0.37 | 4.00 | 1.58 | 5.41 | 1.42 | -3.02 | 0.00 |
| 4 Stupid... intelligent | 4.89 | 1.41 | 4.83 | 1.42 | -0.45 | 0.65 | 4.71 | 1.53 | 4.76 | 1.20 | -0.26 | 0.79 | 5.39 | 1.33 | 5.28 | 1.41 | -0.38 | 0.71 | 5.35 | 1.37 | 5.12 | 1.45 | -0.97 | 0.33 |
| 5 Irresponsible... responsible | 4.28 | 1.96 | 5.00 | 1.28 | -1.98 | 0.05 | 4.35 | 2.00 | 4.65 | 1.50 | -0.72 | 0.47 | 4.17 | 1.82 | 5.17 | 1.25 | -2.11 | 0.04 | 4.47 | 1.70 | 4.88 | 1.58 | -1.32 | 0.19 |
| 6 Clumsy... agile | 4.17 | 1.62 | 5.00 | 1.33 | -2.23 | 0.03 | 3.41 | 1.58 | 5.59 | 1.18 | -3.43 | 0.00 | 3.72 | 1.32 | 5.33 | 1.19 | -2.87 | 0.00 | 3.53 | 1.33 | 5.18 | 1.38 | -2.96 | 0.00 |
| 7 Lazy... hardworking | 3.78 | 1.77 | 4.78 | 1.22 | -2.08 | 0.04 | 3.53 | 1.70 | 4.88 | 1.36 | -2.84 | 0.00 | 3.94 | 1.86 | 5.44 | 1.20 | -2.73 | 0.01 | 3.94 | 1.71 | 4.53 | 1.33 | -1.57 | 0.12 |
| 8 Unfaithful... faithful | 5.06 | 1.30 | 4.78 | 1.35 | -1.09 | 0.28 | 5.18 | 1.55 | 4.76 | 1.48 | -1.22 | 0.22 | 5.33 | 1.28 | 4.44 | 1.10 | -2.41 | 0.02 | 5.24 | 1.44 | 5.18 | 1.33 | -0.18 | 0.85 |
| 9 Sick... healthy | 2.72 | 1.41 | 5.11 | 1.37 | -3.43 | 0.00 | 2.06 | 1.34 | 5.47 | 1.37 | -3.32 | 0.00 | 2.72 | 1.45 | 5.67 | 1.19 | -3.43 | 0.00 | 2.76 | 1.52 | 5.06 | 1.48 | -3.10 | 0.00 |
| 10 Weak... strong | 4.00 | 2.09 | 4.44 | 1.34 | -1.46 | 0.14 | 3.18 | 1.42 | 4.59 | 1.42 | -2.73 | 0.01 | 4.94 | 1.59 | 5.11 | 1.45 | -0.70 | 0.48 | 4.59 | 1.46 | 4.88 | 1.50 | -1.09 | 0.27 |
| 11 Unfriendly... friendly | 4.89 | 1.45 | 5.39 | 1.29 | -1.64 | 0.10 | 4.53 | 1.55 | 4.94 | 1.48 | -0.56 | 0.57 | 4.94 | 1.51 | 5.28 | 1.32 | -0.84 | 0.40 | 4.65 | 1.37 | 5.35 | 1.32 | -2.14 | 0.03 |
| 12 Unfamiliar... familiar | 4.61 | 1.24 | 5.11 | 1.23 | -2.53 | 0.01 | 4.06 | 2.44 | 5.76 | 1.68 | -2.38 | 0.02 | 4.33 | 1.46 | 4.83 | 1.65 | -1.23 | 0.22 | 3.41 | 1.97 | 4.82 | 1.47 | -2.42 | 0.02 |
| Mean negative... positive | 4.26 | 1.21 | 5.02 | 0.87 | -3.55 | 0.00 | 3.97 | 1.02 | 5.19 | 0.85 | -3.53 | 0.00 | 4.46 | 0.81 | 5.23 | 0.80 | -3.53 | 0.00 | 4.34 | 0.85 | 5.17 | 0.95 | -3.23 | 0.00 |
| BMI >= 25 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 Ugly... beautiful | 4.25 | 1.57 | 4.88 | 1.02 | -1.90 | 0.06 | 4.18 | 1.47 | 5.65 | 1.27 | -2.83 | 0.00 | 4.47 | 1.88 | 5.33 | 1.45 | -1.45 | 0.15 | 4.25 | 1.98 | 5.25 | 1.34 | -2.23 | 0.03 |
| 2 Old... young | 4.13 | 1.59 | 5.19 | 1.22 | -2.04 | 0.04 | 3.82 | 1.63 | 5.35 | 1.11 | -2.56 | 0.01 | 4.73 | 1.16 | 5.67 | 1.35 | -2.39 | 0.02 | 4.75 | 1.81 | 5.69 | 1.30 | -1.61 | 0.11 |
| 3 Sad... happy | 3.88 | 1.63 | 4.88 | 1.15 | -2.17 | 0.03 | 3.18 | 1.51 | 4.76 | 1.03 | -2.49 | 0.01 | 4.13 | 1.60 | 5.20 | 1.52 | -1.28 | 0.20 | 3.63 | 1.59 | 5.00 | 1.32 | -2.81 | 0.00 |
| 4 Stupid... intelligent | 5.06 | 1.29 | 4.69 | 1.20 | -1.30 | 0.19 | 4.59 | 1.28 | 4.65 | 1.11 | -0.18 | 0.85 | 5.20 | 1.52 | 5.20 | 1.37 | 0.00 | 1.00 | 4.50 | 1.63 | 5.06 | 1.34 | -1.67 | 0.10 |
| 5 Irresponsible... responsible | 4.31 | 1.74 | 4.81 | 1.33 | -1.81 | 0.07 | 4.18 | 1.42 | 4.59 | 0.87 | -1.19 | 0.23 | 4.20 | 1.78 | 5.00 | 1.73 | -1.12 | 0.26 | 4.13 | 1.89 | 5.00 | 1.26 | -1.86 | 0.06 |
| 6 Clumsy... agile | 3.31 | 1.74 | 3.94 | 1.39 | -1.72 | 0.08 | 2.82 | 1.07 | 5.00 | 1.32 | -3.32 | 0.00 | 4.27 | 1.44 | 5.20 | 1.21 | -1.78 | 0.08 | 2.94 | 1.53 | 4.81 | 1.60 | -2.95 | 0.00 |
| 7 Lazy... hardworking | 3.81 | 1.60 | 4.13 | 0.81 | -0.60 | 0.55 | 3.47 | 1.62 | 4.47 | 1.18 | -2.40 | 0.02 | 4.13 | 1.64 | 5.33 | 1.29 | -2.12 | 0.03 | 3.75 | 1.53 | 4.44 | 1.41 | -1.93 | 0.05 |
| 8 Unfaithful... faithful | 4.81 | 1.22 | 4.44 | 1.15 | -1.89 | 0.06 | 5.12 | 1.41 | 4.59 | 1.23 | -1.84 | 0.07 | 5.00 | 1.85 | 4.93 | 2.12 | 0.00 | 1.00 | 5.50 | 1.41 | 5.06 | 1.34 | -1.84 | 0.07 |
| 9 Sick... healthy | 2.25 | 1.73 | 5.63 | 1.31 | -3.32 | 0.00 | 2.24 | 1.03 | 5.41 | 1.37 | -3.54 | 0.00 | 2.73 | 1.79 | 5.93 | 1.22 | -3.20 | 0.00 | 2.38 | 1.36 | 5.56 | 1.31 | -3.42 | 0.00 |
| 10 Weak... strong | 3.88 | 1.67 | 4.94 | 1.39 | -1.81 | 0.07 | 3.76 | 1.20 | 5.18 | 1.07 | -2.95 | 0.00 | 4.60 | 1.64 | 5.40 | 1.24 | -1.90 | 0.06 | 3.94 | 1.91 | 4.75 | 1.39 | -1.71 | 0.09 |
| 11 Unfriendly... friendly | 4.38 | 1.31 | 4.69 | 1.08 | -1.39 | 0.16 | 4.65 | 1.27 | 5.24 | 1.03 | -1.31 | 0.19 | 4.47 | 1.96 | 5.20 | 1.52 | -1.27 | 0.20 | 4.88 | 1.41 | 5.13 | 1.63 | -0.49 | 0.62 |
| 12 Unfamiliar... familiar | 5.13 | 1.75 | 4.56 | 1.86 | -0.84 | 0.40 | 5.00 | 1.70 | 5.12 | 1.50 | -0.29 | 0.77 | 5.13 | 2.13 | 4.93 | 1.91 | -0.32 | 0.75 | 4.44 | 1.97 | 4.63 | 2.00 | -0.05 | 0.96 |
| Mean negative... positive | 4.10 | 1.02 | 4.73 | 0.57 | -2.78 | 0.01 | 3.92 | 0.61 | 5.00 | 0.67 | -3.52 | 0.00 | 4.42 | 1.24 | 5.28 | 0.99 | -2.36 | 0.02 | 4.09 | 1.04 | 5.03 | 1.00 | -3.24 | 0.00 |

Discussion

In the study on AFA with female students, the silhouette image was evaluated more positively when presented as an average-weight image relative to an obese-weight image. Participants considered the average-weight image as more beautiful, younger, happier, more responsible, more agile, harder-working, healthier, stronger, friendlier, more familiar, but more unfaithful in comparison to the obese-weight image. Differences were significant, except for intelligence. The overall results are in line with those obtained in Mexico, for instance by Bacardí-Gascón et al. (2015). They reported moderate amounts of fat phobia among nutrition college students. Similar results were obtained in México by Soto, Jimenez-Cruz, Armendariz-Anguiano and Bacardí-Gascon (2015) among psychology and medical students at universities. Puhl, Wharton, and Heuer (2009) also reported a moderate level of fat phobia among dietetics students in the USA, consistent with earlier findings of Bacon, Scheltema y Robinson (2001) obtained for the general population in the USA. On the specific characteristics associated with obesity Puhl et al. (2009) reported that university students believed that obese individuals were unattractive, slow, insecure, and inactive. Himmelstein and Tomiyama (2015) rated personal profiles on a number of characteristics with an obese photo and the profile of the same person with a thin photo. Participants rated the subjects as more unpleasant when shown as obese relative to thin.

In the present study we found intelligence unrelated to weight image, which is contrary to results obtained in the USA by Himmelstein and

Tomiyama (2015). In their study, participants rated the subject as less intelligent when shown as obese relative to thin. Several other studies, with samples other than from Mexico, indicate associating stupidity with excessive weight. Puhl and Brownell (2001) in their review of studies on discrimination in the U.S employment context reported that obese employees were believed to think slower and be poor role models.

AFA was not directly associated with BMI or with weight satisfaction. The lack of correlation amongst these factors is consistent with some prior studies, such as Crandall and Martinez (1996) and Perez#Lopez, Lewis y Cash (2001). Himmelstein and Tomiyama (2015) explain the lack of correlation between AFA and BMI, indicating that BMI may act on AFA by affecting self-perceptions of body size. In their study, increases in BMI were associated with increases in perceived size and decreases in AFA via perceived size, especially among women. Yet, results on the relationship between BMI and AFA are not unequivocal. Other researchers highlight some inner group bias. In the study by Schwartz, Vartanian, Nosek and Brownell (2006) all weight groups expressed significant AFA, however thinner people expressed stronger bias. They were more likely to associate negative attributes (bad, lazy) to “bigger” people. They preferred people of the same size, and they explicitly rated overweight people as lazier and less motivated.

There were significant differences in physical appearance self-esteem and weight satisfaction between BMI groups. The higher the BMI the lower weight satisfaction and self-esteem scores were. This is consistent with earlier studies showing that body image distress is associated with obesity, meaning that those with obesity are less satisfied with their physical appearance. The degree of the relationship may be influenced by the assessment applied, as is the case with the global self-esteem measure, the Rosenberg scale, which does not identify different self-esteem dimensions (Hill, 2011). In this study self-esteem was related to AFA, yet only within the group of those with higher BMIs. Within this group, the lower self-esteem was, the more negatively the obese body image was perceived relative to the average-weight one. Himmelstein and Tomiyama (2015) proposed a model which indicates that weight stigma originates, in part, from disliking one's own body, in addition to disliking out-group targets, they found that increases in body shame are associated with increases in AFA. Increases in perceived size are associated with decreases in AFA.

AFA was evaluated under four different conditions: (1) scale, (2) mirror, (3) scale and mirror and control. The scale condition resulted in the highest AFA score, regardless of BMI. We propose that looking at one's weight on a scale resulted in more elaborate information-processing, giving a negative meaning to a number seen, and leading to more accessible and salient negative attitudes towards the obese figure. The scale on its own had no effect on self-esteem, yet combined with the mirror, resulted in the lowest self-esteem score for the overweight group. We hypothesize that the unsatisfactory number seen on the scale might have directed attention to the negative aspects of the extra kilograms seen in

the mirror. The opposite effect could be assumed for the average weight group, with the highest self-esteem and least weight dissatisfaction value in the scale and mirror condition. The studies on the effects of the scale typically focus on repetitive long-term effects of weighing oneself, and do not provide information on the effect of a one-time event. Pacanowski, Linde and Neumark-Sztainer (2015) reviewed four articles examining the effect of self-weighing on self-esteem. Three research studies found a negative relationship and one found no relationship. Wrzcionkowska, Díaz-Loving and Flores-Cano (2019) proposed that the number on the scale becomes meaningful once it is put in the context of social norms and comparisons, otherwise it represents just a number with no strong meaning associated.

The mirror condition had no effect on AFA, yet it resulted in the highest appearance self-esteem score across all conditions. Research shows that people without eating disorders look at themselves in the mirror less frequently and for a shorter period of time (Tuschen-Caffier et al., 2015). They also tend to focus on the parts of their body that they like, while those with anorexia nervosa and bulimia nervosa display longer and more frequent gazes and focus on the parts they dislike, applying selective attention to shape and weight-related information (Tuschen-Caffier et al., 2015). In a study that registered eye movement while participants were exposed to digitalized pictures of their own body (Jansen, Nederkoorn, & Mulken, 2005), high symptomatic participants were found to focus less on their beautiful body parts, giving priority to inspecting ugly body parts. Participants in the 'normal' control group focused more on their beautiful body parts and less on dissatisfying parts. Assuming that the participants in the present study did not suffer from eating disorders, selective visual attention with self-serving cognitive bias could explain higher levels of self-esteem in the mirror condition. It is hypothesized that heightened physical appearance self-esteem had a softening effect on AFA in that condition.

Five items of AFA were not influenced by any condition. Across conditions participants considered the average-weight image as younger, more agile, harder working, and healthier, and intelligence was not associated with figure size in any condition. Attitudes in respect to health and intelligence were not influenced by manipulation or BMI.

Although many studies have studied the existence of AFA, to our knowledge, this study is the first to examine the effects of the mirror and scale on attitudes toward people with obesity, and is one of few to attempt to modify AFA. Change in this domain is quite challenging when compared to changing other stereotyped beliefs, as not everyone is motivated to alter their anti-fat beliefs, and the media promotion of a thin figure contributes to the pervasiveness of pro-thin and anti-fat biases. Being aware that a scale induces a more critical judgement of an obese figure, regardless of the BMI of the person that steps on the scale, and that a mirror elevates self-esteem and may have a softening effect on AFA, advances knowledge in the area of weight bias alteration. Still, more research is needed to corroborate the mirror effect on AFA.

The findings of our study should be considered in light of the following limitations. Firstly, there were no validity indicators in the instrument to control for socially desirable answers. Research in social psychology suggests that when prejudice is assessed via obvious methods, people can hide their true attitudes, yet when more subtle and indirect techniques are used these reappear (Teachman & Brownell, 2001). Secondly, BMI was used to differentiate between two weight groups, yet recent studies indicate that many do not know their BMI (Easton, Stephens, & Sicilia, 2017) and even when they do, it does not translate into knowing one's weight status. Further research is needed to assess the relationship between AFA and perceived weight status. Thirdly, it needs to be taken into account that participants while looking at their reflection in the mirror wore everyday clothing (without outerwear). The use of more revealing clothing may intensify body focus, causing more negative feelings about one's own figure and fat in general. And finally, given that our sample was relatively small and limited to students, the findings of our study may not be generalized to a larger population.

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