

## I Feel Overweight: Discrepancies Between Self-reported BMI and Stunkard Figure and Associations with Psychological Indicators Among Two Saudi Adult Samples

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**Abstract:** Accurate weight perception is critical for both physical and psychological health, yet misperceptions remain prevalent globally. In Saudi Arabia (SA), where obesity rates are among the highest worldwide, cultural factors may uniquely shape weight perceptions. However, research on weight perception accuracy and its psychological correlates in this cultural context is limited. This study examined discrepancies between self-reported BMI and Stunkard Figure Rating Scale (FRS), associations between BMI categories, gender, group membership and weight misperception, and differences in psychological well-being indicators between individuals with accurate and inaccurate weight perceptions. A cross-sectional online survey recruited 900 SA adult participants (Sample 1:  $n = 635$  students, sample 2:  $n = 265$  general population) with a mean age of 24 years ( $SD = 8.46$ ). Participants self-reported BMI, selected Stunkard FRS silhouettes, and completed validated psychological measures. Chi-square tests, Mann-Whitney  $U$  tests, and Bonferroni-corrected post hoc analyses were conducted. Stunkard FRS demonstrated a strong positive correlation ( $\rho = 0.82, p < .001$ .) with self-reported BMI. Overall, 45.3% of participants misperceived their weight, with rates increasing across BMI categories ( $\chi^2(3) = 40.22, p < .001$ ). Males reported more misperceptions than females (50.3% vs. 42.3%;  $OR = 1.38, 95\% CI [1.06, 1.80]$ ), and the general adult population exhibited higher misperceptions than students (51.7% vs. 42.7%;  $OR = 1.44 [1.08, 1.92]$ ). Individuals with weight misperceptions reported higher weight stigma ( $r = -0.23$ ), lower body appreciation ( $r = 0.20$ ), and gratitude ( $r = 0.11$ ) at adjusted  $p < .0083$ . No significant differences were identified in satisfaction with life or self-esteem. Overall, weight misperception is widespread in SA, particularly among males and individuals with higher BMI. Targeted interventions and integration of the Stunkard FRS into health assessments may improve early identification of at-risk groups and inform culturally tailored interventions to address weight misperceptions.

**Keywords:** weight perception; body image; Stunkard Figure Rating Scale (FRS); psychological health; obesity

أشعر بأن وزني زائد: التباين بين مؤشر كتلة الجسم ومقياس ستونكارد والعلاقة ببعض

المؤشرات النفسية لدى عينتين من البالغين السعوديين

محسن محمد اليامي

جامعة حائل

أُسْتُثِم بتاريخ 2025/8/6 وقُبِل للنشر بتاريخ 2025/9/14

**المستخلص:** يُعد الإدراك الدقيق للوزن حاسماً للصحة النفسية والجسدية، لكن التصورات الخاطئة تظل شائعة. هدفت هذه الدراسة لفحص الفروق بين مؤشر كتلة الجسم المبلغ عنه ذاتياً ومقياس ستونكارد الشكلي، وعلاقة ذلك بالصحة النفسية. شملت العينة 900 مشارك (635 طالباً، 265 من عامة الناس البالغين) بمتوسط عمر 24 سنة. استخدم الباحثون مقياس معتمدة لمؤشر كتلة الجسم، الصورة الذاتية، وصمة الوزن، الرضا عن الحياة، وتقدير الذات. أظهرت هذه الدراسة أن التصورات الخاطئة عن وزن الجسم منتشرة بشكل ملحوظ، حيث أساء 45.3% من المشاركين تقدير أوزانهم، مع زيادة هذه النسبة بين الأفراد ذوي مؤشر كتلة الجسم المرتفع. وكشفت النتائج وجود ارتباط ذات دلالة إحصائية بين مؤشر كتلة الجسم ومقياس ستونكارد، مع وجود فروق دالة إحصائية حيث أظهر الذكور والبالغين من عامة الناس مستويات أعلى من سوء التقدير مقارنة بالإناث وطلبة الجامعة. كما لوحظ أن الأفراد الذين يسيئون تقدير أوزانهم يعانون من مستويات أعلى من وصمة الوزن وانخفاض في تقدير الجسد والامتنان، بينما لم تظهر فروق ذات دلالة إحصائية في مستويات تقدير الذات أو الرضا عن الحياة. وتؤكد هذه النتائج على أهمية دمج المقاييس البصرية مثل

مقياس ستونكارد في التقييمات الصحية الأولية، وضرورة تطوير برامج توعية وتدخلات نفسية تستهدف بشكل خاص الذكور وذوي الوزن المرتفع لتصحيح التصورات الخاطئة لتعزيز الصحة النفسية.

**الكلمات المفتاحية:** إدراك الوزن، صورة الجسد، مقياس ستونكارد، الصحة النفسية، السمعة

## Introduction

Weight perception refers to the individual's subjective evaluation of their own body weight relative to objective measures such as Body Mass Index (BMI) (Grogan, 2021; Tremblay & Limbos, 2009). Research suggests that weight perceptions are associated with both weight-related behaviors such as weight gain, obesity risk, and weight loss attempts (Duncan et al., 2011; Haynes et al., 2018; Park et al., 2019; Robinson et al., 2015) and psychological well-being (Fisman et al., 2022; Fuchs et al., 2012; Patte et al., 2021). For example, perceiving oneself as overweight is associated with poorer emotional well-being and higher depression risk (Farhat et al., 2015; Haynes et al., 2019). These results appear across cultures, with individuals who misperceive their weight reporting more depressive symptoms (Thorup et al., 2024) and anxiety symptoms (Zhang et al., 2021). Furthermore, a study found that females who underestimate their weight status were less likely to engage in diet control, while those who overestimate their weight status showed significantly higher rates of extreme behaviors like fasting and diet pill use (Park et al., 2019). These behavioral and emotional outcomes can be effectively understood through cognitive-behavioral models. Specifically, Fairburn's transdiagnostic model posits that an individual's over-evaluation of their shape and weight, where self-worth is disproportionately based on these factors, is a core mechanism driving both dysfunctional behaviors (e.g., extreme weight control) and negative emotional states (Fairburn et al., 2003). These findings suggest that weight perceptions are associated with healthy behaviors and psychological well-being, underscoring the importance of having accurate weight perceptions in promoting both physical and mental health.

Despite the importance of accurate weight perception, weight misperception is widespread globally across diverse populations (Bhuiyan et al., 2003; Chung et al., 2013; Johnson et al., 2008, 2014; Park et al., 2019). For instance, among Korean women, 12.8% of those with normal BMI, 44.3% with overweight, and 17.4% with obesity underestimated their weight, while 17.9% of women with normal weight overestimated their weight (Park et al., 2019). Similarly, in a large Danish adolescent sample, 49% of adolescents misperceived their body weight (35% perceived themselves as overweight and 14% as underweight) (Thorup et al., 2024). The cognitive processes underlying these perceptual discrepancies are illuminated by Cash's cognitive-behavioral model of body image. This model suggests that weight perceptions are not simple reflections of reality but are instead shaped by historical and developmental antecedents (e.g., cultural socialization), which lead to enduring negative self-schemas and cognitive errors (e.g., selective attention to certain body parts) (Cash, 2012). Nonetheless, weight perception is influenced by societal and cultural factors and social media trends (Abdoli et al., 2024; Alqahtani et al., 2025; Merino et al., 2024), and therefore, the prevalence and patterns of weight perceptions may differ between populations, highlighting the need for context-specific research.

In Saudi Arabia (SA), where overweight and obesity rates are among the highest worldwide (World Obesity Federation, 2024), weight perceptions remain understudied. A study with 4,709 adults found that 42% misperceived their weight, with individuals with overweight particularly underestimating their weight. This study found no significant gender difference for weight misperceptions, although females were slightly more inclined to misperceive their weight compared to males (Althumiri et al., 2021). Another study of university female students revealed that over 60% of participants with overweight and obesity misperceived themselves as normal weight, whereas participants with normal weight overestimated their weight (Albeeybe et al., 2018). In this study, under and over-estimation of weight status was associated with reduced

likelihood of engaging in weight control practices higher body dissatisfaction, respectively (Albeeybe et al., 2018).

Urbanization and the adoption of Western lifestyles, alongside the influence of social trends and social media influencers, are established factors shaping how individuals perceive their weight (Abdoli et al., 2024; Alqahtani et al., 2025). Given the rapid sociocultural changes in Saudi Arabia in recent years—including increased digital connectivity and shifting beauty standards, these factors may exacerbate discrepancies between objective weight status (e.g., BMI) and subjective weight perceptions. Within a cognitive-behavioral framework, these sociocultural factors act as powerful "activating events" (Cash, 2012) that can trigger and reinforce negative cognitive schemas and perceptual biases about one's body. Therefore, more research is needed to better understand weight perceptions across different groups and the factors associated with weight misperceptions.

The present study extends previous research by providing novel data from a Saudi Arabian context and by integrating cognitive-behavioral models (Cash, 2012; Fairburn et al., 2003) to interpret weight perception discrepancies. Furthermore, it investigates understudied psychological constructs, specifically weight self-stigma and gratitude, and directly compares university students with a general adult population to explore contextual influences.

The present study aims to (1) describe weight perceptions among university students and general adult population, (2) assess whether individuals with higher BMI underestimate their weight more frequently than other BMI categories, (3) examine group membership and gender differences in weight perception status, and (4) compare psychological well-being indicators—including satisfaction with life, subjective well-being, body appreciation, weight self-stigma, and gratitude—between those with and without weight misperceptions. By framing our investigation within these cognitive-behavioral models, we can better interpret weight perception discrepancies not merely as errors in judgment, but as manifestations of underlying cognitive and self-evaluative processes with significant behavioral and emotional consequences. In line with the literature, the following hypotheses were formulated:

**Hypothesis 1:** Individuals with overweight/obesity would exhibit greater BMI-Stunkard discrepancies than other BMI groups.

**Hypothesis 2:** Individuals with overweight/obesity would underestimate their weight more frequently than those in other BMI categories.

**Hypothesis 3:** Females would report higher weight misperceptions than males.

**Hypothesis 4:** No group membership (student vs. general population) differences in weight misperceptions will exist.

**Hypothesis 5:** Individuals with weight misperceptions would report lower life satisfaction, subjective well-being, body appreciation, dispositional gratitude, and higher weight self-stigma compared to those with accurate weight perceptions.

## Methods

### Design and participants

The study utilized an anonymous online cross-sectional design and recruited two convenience samples: Sample 1 (university students) via university newsletters, flyers, and in-person invitations during lectures. Sample 2 (general adult population) via social media platforms. Eligible participants were those aged 18 or older and fluent in Arabic. All participants completed a structured online questionnaire administered via Google Forms between December 2024 to April 2025. All participants provided electronic informed consent, and no study credits or financial incentives were offered for participation. The research received approval from the

Research Ethics Committee at University of Ha'il (H-2025-580), and all procedures adhered to the Declaration of Helsinki.

## Sample

A priori power analysis was conducted using GPower 3.1 (Faul et al., 2007). Based on a large correlation between weight perceptions and BMI ( $r = 0.65$ ) from prior SA research conducted with university female participants, with  $\alpha = .05$  (two-tailed) and 95% power, the minimum sample size was 21. However, to ensure robust subgroup analyses across four BMI categories and two populations (student and general adult population), and to account of Bonferroni corrections for multiple comparisons, and potential non-normal distributions, the target sample size was increased 1,000 participants. This provides sufficient power to detect medium effects ( $r \geq 0.30$ ) in primary analyses and maintains 95% power for small effects ( $r = 0.15$ ) in secondary analyses.

## Measures

Participants were administered a multicomponent questionnaire including sociodemographic variables and psychological measures. All questionnaires were administered in Arabic. Participants provided information about their age, gender, marital status, education level, and academic major.

## BMI

Participants self-reported their weight (kg) and height (cm). This information was used to calculate Body Mass Index (BMI), and group participants into four BMI categories in accordance with the World Health Organization's (WHO) standards (underweight  $< 18.5$ ; normal  $18.5$ – $24.9$ ; overweight  $25$ – $29.9$ ; obese  $\geq 30$ ).

## Weight perceptions

To measure weight perceptions, participants were administered the Stunkard Figure Rating Scale (FRS) (Stunkard et al., 1983). The Stunkard FRS asks participants to “*select the image that best resembles your current appearance*” and comprises 9 gender-non-specific silhouettes ranging from ‘emaciated’ to ‘morbidly obese’. The Stunkard FRS and similar analogue instruments have been shown to be reliable and valid tools of assessing perceptions of current body weight (Bulik et al., 2001; Lo et al., 2012; Lombardo et al., 2022; Parzer et al., 2021).

Weight perception status was evaluated by comparing self-reported BMI categories with FRS silhouette selections. To match the Stunkard FRS to self-reported BMI, multiple methods have been used in the literature such as assigning BMI values for each of the Stunkard silhouette based on large normative population data (Bulik et al., 2001; Parzer et al., 2021). However, other studies have classified the silhouettes as follows: 1 and 2 (underweight); 3 and 4 (normal weight); 5, 6, and 7 (slightly and moderately overweight); and 8 and 9 (obese) (Bhuiyan et al., 2003; Bjerggaard et al., 2015). Due the absence of population-based normative SA data, this method was used to identify the difference between self-reported BMI and the Stunkard FRS scores (weight perception status).

A weight misperception was present if participants' FRS selection fell outside expected ranges for their BMI group (Bhuiyan et al., 2003; Bjerggaard et al., 2015), indicating a discrepancy between self-reported BMI and body weight perceptions. Misperceptions were identified based on the following predefined criteria. For underweight individuals, the expected FRS range was 1–2; a misperception was assigned if FRS was greater than 2. For normal weight individuals, the expected range was 3–4, and a misperception was recorded if FRS was below 3 or above 4. Overweight individuals had an expected FRS range of 5–7, with misperceptions occurring if FRS was below 5 or above 7. For individuals with obesity, the expected range was

8–9, and a misperception was assigned if FRS was below 8. All other cases were coded as having accurate weight perceptions.

### **Satisfaction with life**

Participants' satisfaction with life was assessed using the Arabic Satisfaction With Life Scale (SWLS) (Abdallah, 1998; Diener et al., 1985): The SWLS is a unidimensional measure of 5 items and is scored on a 7-point Likert-type scale with response ranging from 1 (strongly disagree) to 7 (strongly agree). Total scores can range from 5 to 35, with higher scores indicating higher satisfaction with life (Diener et al., 1985). The SWLS has demonstrated validity and reliability and measurement invariance across various populations and languages (Ali et al., 2025; Swami et al., 2025).

### **Self-esteem**

Self-esteem was assessed using the Arabic version of the Rosenberg Self-Esteem Scale (RSES) (Rosenberg, 1965; Zaidi et al., 2015). The Arabic version of the RSES consists of 10 items, all of which scored on a 4-point Likert scale from 0 (strongly disagree) to 3 (strongly agree). 5 items (Items 2, 5, 6, 8, 9) are negatively worded and thus must be reversed before calculating a total score. Total score ranges from 0 to 30, with higher total scores denote higher self-esteem. The RSES is a reliable and valid measure of global self-esteem (Gray-Little et al., 1997; Silber & Tippet, 1965), and has been widely used in Arabic-speaking samples (Abdel-Khalek et al., 2012; Zayed et al., 2019).

### **Subjective well-being**

Subjective well-being was evaluated using the Arabic version of the World Health Organization Well-Being Index (WHO-5) (Alshayea, 2023). The WHO-5 is a short version of the WHO 10-item version (Bech et al., 1996). The WHO-5 consist of 5 items, and each is scored on a 6-point Likert scale ranging from 0 (at no time) to 5 (all the time). The total score ranges from 0 to 25, with higher scores indicating best possible well-being. The WHO-5 has been shown to have adequate reliability and validity in various populations, including Arabic (Alshayea, 2023; Hajos et al., 2013; Topp et al., 2015).

### **Weight self-stigma**

Internalized weight stigma, also known as self-stigma, was assessed using the Arabic version (BinDhim et al., 2020) of the Weight Self-Stigma Questionnaire (WSSQ) (Lillis et al., 2010): The WSSQ includes 12 items, scored on 5-point Likert scale, ranging from 1 (completely disagree) to 5 (completely agree). A total score is calculated by summing the scores for all items, with higher scores indicating greater self-stigma. BinDhim and colleagues recently developed and evaluated the Arabic version of the WSSQ and found it has robust psychometric properties including high internal consistency and factor structure (BinDhim et al., 2020).

### **Body appreciation**

Body appreciation was assessed using the Arabic version (Fekih-Romdhane et al., 2023) of the Body Appreciation Scale (BAS-2) (Tylka & Wood-Barcalow, 2015). The BAS-2 assesses the individual's positive feelings toward their body, focusing on aspects such as acceptance, respect, and overall satisfaction with one's physical appearance. BAS-2 consists of 10 items, scored on a 5-point Likert scale, ranging from 1 (never) to 5 (always). Higher scores on the BAS-2 indicates greater body appreciation. Recent validation studies have indicated the scale's appropriateness in diverse populations, including its Arabic version, which demonstrates strong psychometric properties such as internal consistency and construct validity (Fekih-Romdhane et al., 2023; Swami et al., 2023).

## Gratitude

Dispositional gratitude was assessed using the Arabic version (Alyami et al., 2025) of the modified Gratitude Questionnaire (GQ4) (McCullough et al., 2002). The GQ is a 4-item self-report measure designed to assess an individual's level of gratitude. Items are rated on a 7-point Likert-type scale (where 1 = strongly disagree and 7 = strongly agree). The total score is the sum of individual items scores, with higher scores corresponding to higher levels of gratitude. The original GQ-6 version has been found to have sound psychometric properties across cultural groups (Bartholomew et al., 2022; Cowles & Medvedev, 2022; Garg et al., 2021).

## Data analysis

Descriptive statistics are summarized using medians (Mdn) and interquartile ranges (IQRs) for continuous variables due to significant deviations from normality (Shapiro-Wilk  $p < .001$ ). Categorical variables are reported as frequencies and percentages. Bonferroni corrections were applied to control for Type I error inflation in multiple comparisons while maintaining power to detect meaningful effects across the primary and secondary objectives.

For primary objectives, weight perception status (misperception vs. accurate perception) was determined by comparing self-reported BMI to Stunkard FRS scores. Chi-square tests of independence were used to assess associations between BMI category and weight perception status, with post-hoc pairwise comparisons using Bonferroni correction (adjusted  $\alpha = .008$ ). Group membership (students vs. general adult population) and gender (male vs. female) differences in weight perceptions were examined using chi-square tests of independence comparing misperception frequencies between the groups. All effect sizes were reported as Cramer's V (interpreted per Cohen's guidelines: 0.10 = small, 0.30 = medium) (Cohen, 1988).

For the secondary objective, non-parametric Mann-Whitney  $U$  tests were used to compare psychological well-being indicators (SWLS, WHO-5, RSES, WSSQ, BAS-2, GQ4) between weight perception groups (misperception vs. accurate perception). Bonferroni correction adjusted for six comparisons ( $p = .0083$ ). Effect sizes were calculated using rank-biserial correlations ( $r$ ), with 95% confidence intervals derived from standard errors. All analyses were conducted using JASP (Version 0.19.3).

## Results

### Descriptive analysis

The entire sample consisted of 900 adult participants, with a mean age of 24 years ( $SD = 8.46$ ;  $Mdn = 22$ ,  $IQR = 6$ ). The student sample had a mean age 20.49 year ( $SD = 1.69$ ;  $Mdn = 20$ ,  $IQR = 3$ ) while the general adult population was older, with a mean age of 35.09 year ( $SD = 9.26$ ;  $Mdn = 33$ ,  $IQR = 12$ ). As shown in Table 1, the sample was predominantly single females, with 90% of participants either pursuing their or having bachelor's degrees. Participants were from various academic majors, including Sciences, Humanities, Business, Computer Science, and Health Sciences.

**Table 1.** Demographic characteristics of participants

| Characteristic    | Total Sample<br>(N = 900)<br>n (%) | Student sample<br>(n = 635)<br>n (%) | Adult sample<br>(n = 265)<br>n (%) |
|-------------------|------------------------------------|--------------------------------------|------------------------------------|
| Sex               |                                    |                                      |                                    |
| Male              | 338 (37.56%)                       | 195 (30.71%)                         | 143 (53.96%)                       |
| Female            | 562 (62.44%)                       | 440 (69.29%)                         | 122 (46.04%)                       |
| Marital Status    |                                    |                                      |                                    |
| Single            | 728 (80.89%)                       | 606 (95.43%)                         | 122 (46.04%)                       |
| Married           | 172 (19.11%)                       | 29 (4.57%)                           | 143 (53.96%)                       |
| Educational Level |                                    |                                      |                                    |

| Characteristic        | Total Sample<br>(N = 900) | Student sample<br>(n = 635) | Adult sample<br>(n= 265) |
|-----------------------|---------------------------|-----------------------------|--------------------------|
| Bachelor              | 817 (90.78%)              | 632 (99.53%)                | 185 (69.81%)             |
| Master                | 44 (4.89%)                | 1 (0.16%)                   | 43 (16.23%)              |
| PhD                   | 39 (4.33%)                | 2 (0.32%)                   | 37 (13.96%)              |
| <b>Academic Major</b> |                           |                             |                          |
| Humanities            | 179 (19.89%)              | 99 (15.59%)                 | 80 (30.19%)              |
| Education             | 311 (34.56%)              | 253 (39.84%)                | 58 (21.89%)              |
| Computer Science      | 121 (13.44%)              | 78 (12.28%)                 | 43 (16.23%)              |
| Health Sciences       | 119 (13.22%)              | 89 (14.02%)                 | 30 (11.32%)              |
| Business              | 86 (9.56%)                | 54 (8.50%)                  | 32 (12.07%)              |
| Sciences              | 84 (9.33%)                | 62 (9.76%)                  | 22 (8.30%)               |

### Self-reported BMI and weight perceptions status

All variables demonstrated significant deviations from normality (Shapiro-Wilk  $p < .001$ ), with most showing either substantial skewness or kurtosis (Table 2). BMI values ranged from 12.3 to 48.7, with a Mdn of 24.0 (IQR = 7.7) and a mean of 24.88 (SD = 5.91). Weight perceptions as measured by the Stunkard FRS yielded a Mdn score of 4.0 (IQR = 2, range 1-9), with a mean of 3.63 (SD = 1.76) for the entire sample (student sample [Mdn = 4, IQR = 3], and general adult population sample [Mdn = 5, IQR = 3]).

The distribution of Stunkard FRS scores revealed distinct patterns between the two samples. Among students, responses peaked at figure 3 (20.5%), with 67.9% selecting mid-range figures (2-5), while only 9.6% chose heavier figures (7-9) and 8.8% selected the leanest figure (1). In contrast, general adults showed a right-skewed distribution peaking at figure 5 (26.0%), with 42.6% selecting above-midrange figures (5-9) and only 10.9% choosing the two leanest figures (1-2).

**Table 2.** Descriptive statistics and reliability of the study measures (N = 900)

|                  | BMI    | Stunkard<br>FRS | WHO-5  | SWLS   | RSES   | WSSQ   | BAS-2  | GQ4    |
|------------------|--------|-----------------|--------|--------|--------|--------|--------|--------|
| Mean             | 24.88  | 4.06            | 16.33  | 26.60  | 17.93  | 29.01  | 38.34  | 24.93  |
| SD               | 5.91   | 1.88            | 5.56   | 6.39   | 5.62   | 10.95  | 11.48  | 3.71   |
| Mdn              | 24.00  | 4.00            | 17.00  | 28.00  | 18.00  | 28.00  | 41.50  | 26.00  |
| IQR              | 7.71   | 2.00            | 8.00   | 8.00   | 8.00   | 14.00  | 18.00  | 4.00   |
| Skewness         | 0.83   | 0.43            | -0.22  | -0.81  | -0.07  | 0.66   | -0.86  | -1.74  |
| Kurtosis         | 0.85   | -0.30           | -0.63  | 0.25   | -0.70  | 0.22   | -0.27  | 4.10   |
| Shapiro-<br>Wilk | 0.96   | 0.95            | 0.97   | 0.94   | 0.98   | 0.96   | 0.88   | 0.80   |
| p-value          | < .001 | < .001          | < .001 | < .001 | < .001 | < .001 | < .001 | < .001 |
| $\alpha$         | -      | -               | 0.91   | 0.87   | 0.77   | 0.92   | 0.96   | 0.85   |

*Note:* BMI, Body Mass Index; Stunkard FRS, Stunkard Figure Rating Scale; SWLS, Satisfaction With Life Scale; WHO-5, World Health Organization Well-Being Index 5-item form; RSES, Rosenberg Self-Esteem Scale; WSSQ, Weight Self-Stigma Questionnaire; BAS-2, Body Appreciation Scale 10-item form; GQ4, Gratitude Questionnaire 4-item form; SD, standard deviation; Mdn, median; IQR, interquartile range,  $\alpha$ ; Cronbach's alpha.

Overall, the prevalence of weight perception status was assessed by examining discrepancies between self-reported BMI and Stunkard FRS selections. 45.33% of participants (n = 408) reported weight misperceptions, while 54.67% (n = 492) demonstrated accurate perceptions. Table 3 demonstrates a progressive increase in weight misperceptions with higher BMI categories, ranging from 23.5% in underweight BMI group to 58.9% in obese BMI group. Spearman's correlation indicated a strong positive correlation ( $\rho = 0.82$ ,  $p < .001$ .) between self-reported BMI and scores on the Stunkard FRS.

**Table 3.** Weight perceptions status by BMI category, gender, and group membership (N = 900)

| n (%)              |              | Weight perceptions |                   |
|--------------------|--------------|--------------------|-------------------|
|                    |              | Accurate n (%)     | Discrepancy n (%) |
| BMI Category       |              |                    |                   |
| Underweight        | 102 (11.33%) | 78 (76.47%)        | 24 (23.5%)        |
| Normal weight      | 394 (43.78%) | 233 (59.1%)        | 161 (40.9%)       |
| Overweight         | 236 (26.22%) | 112 (47.5%)        | 124 (52.5%)       |
| Obese              | 168 (18.67%) | 69 (41.1%)         | 99 (58.9%)        |
| Total              |              | 54.67%             | 45.33%            |
| Gender             |              |                    |                   |
| Male               | 338 (37.56%) | 168 (49.70%)       | 170 (50.30%)      |
| Female             | 562 (62.44%) | 324 (57.65%)       | 238 (42.35%)      |
| Group membership   |              |                    |                   |
| Student            | 635 (70.56%) | 364 (57.32%)       | 271 (42.68%)      |
| General population | 265 (29.44%) | 128 (48.30%)       | 137 (51.70%)      |

A chi-square test revealed a significant association between BMI category and weight perception status,  $\chi^2(3, N = 900) = 40.22, p < .001$ , with a small effect size (Cramer's  $V = 0.21$ ). Standardized residuals showed underweight participants had fewer misperceptions than expected (residual = -4.70), while those with obesity had more (residual = 3.93). Normal weight individuals showed more accurate perceptions (residual = 2.38), and overweight participants showed more misperceptions (residual = 2.59) than expected. Post-hoc comparisons (Table 4) indicated higher misperceptions in obese vs. normal weight ( $OR = 2.07$ , 95% CI [1.51, 2.84]) and underweight ( $OR = 4.67$ , 95% CI [2.76, 7.89]) groups. Post-hoc comparisons also showed higher misperceptions in overweight vs. underweight ( $OR = 3.60$ , 95% CI [2.16, 6.00]) groups. No significant differences between obese vs. overweight or normal vs. underweight groups after Bonferroni correction ( $p = .008$ ).

**Table 4.** Post-hoc comparisons of weight perception status across BMI categories (N= 900)

| Comparison                 | $\chi^2(1)$ | p-value | Adjusted p | OR [95% CI]       |
|----------------------------|-------------|---------|------------|-------------------|
| Obese vs. Normal weight    | 18.74       | < .001  | < .001     | 2.07 [1.51, 2.84] |
| Obese vs. Underweight      | 26.83       | < .001  | < .001     | 4.67 [2.76, 7.89] |
| Overweight vs. Underweight | 15.92       | < .001  | < .001     | 3.60 [2.16, 6.00] |
| Obese vs. Overweight       | 2.15        | .142    | .852       | 1.29 [0.91, 1.83] |
| Normal vs. Underweight     | 4.81        | .028    | .168       | 2.26 [1.36, 3.76] |
| Normal vs. Overweight      | 5.37        | .020    | .120       | 1.57 [1.15, 2.14] |

Note. OR, Odds Ratio; Bonferroni-adjusted  $\alpha = .008$ . Confidence intervals excluding 1 indicate significance. Effect sizes interpreted using Cohen's (1988) conventions for Cramer's  $V$ : 0.10 = small, 0.30 = medium, 0.50 = large.

### Gender and Group membership differences in weight misperceptions

To examine gender (male vs. female) and group membership (student vs. general adult population) differences in weight perception status, chi-square tests were conducted. For gender difference, results revealed a statistically significant association between gender and weight perception status,  $\chi^2(1, N = 900) = 5.38, p = .020$ . Male participants (50.3% misperception rate,  $n = 170/338$ ) demonstrated significantly higher rate of weight misperceptions compared to female participants (42.3%,  $n = 238/562$ ). The magnitude of this association was small, as indicated by

Cramer's  $V = 0.077$ , with females having 1.38 times higher odds of misperceiving their weight than their female counterparts ( $OR = 1.38$ , 95% CI [1.06, 1.80]). Standardized residuals supported this pattern, showing males had significantly more misperceptions than expected (+2.32) while females had fewer than expected (-2.32).

For group membership, a separate chi-square test showed a significant association between group membership and weight perception status,  $\chi^2(1, N = 900) = 6.14$ ,  $p = .013$ , with a small effect size (Cramer's  $V = 0.08$ ). The general adult population sample exhibited significantly higher rate of weight misperceptions (51.7%,  $n = 137/265$ ) compared to the university student sample (42.7%,  $n = 271/635$ ). Standardized residuals supported the general population was overrepresented in the misperception group (+2.48), while students were underrepresented (-2.48). The odds of misperceiving their own weight were 1.44 times higher for the general population than for students ( $OR = 1.44$ , 95% CI [1.08, 1.92]).

### Psychological outcomes by weight perception status

To test our hypothesis that individuals with weight misperception have lower scores on positive psychological measures (SWLS, WHO-5, RSES, BAS-2, and GQ4) and higher scores on the negative psychological measure (WSSQ), several Mann-Whitney U tests with a Bonferroni-adjusted alpha of .0083 were conducted (Table 5). Analysis revealed that participants with weight misperceptions reported significantly higher weight stigma ( $U = 77,692$ ,  $p < .001$ ,  $r = -0.23$ ), lower body appreciation ( $U = 120,139$ ,  $p < .001$ ,  $r = 0.20$ ), and lower gratitude ( $U = 105,508$ ,  $p = .003$ ,  $r = 0.11$ ) compared to those with accurate weight perceptions. No significant differences were observed for satisfaction with life, subjective well-being, or self-esteem after Bonferroni correction ( $p = .0083$ ).

**Table 5.** Psychological outcomes by weight perception status ( $N = 900$ )

| Variable | Weight perception     |                            | $U$     | $p$     | $r$ [95% CI]         |
|----------|-----------------------|----------------------------|---------|---------|----------------------|
|          | Accurate<br>Mdn [IQR] | Misperception<br>Mdn [IQR] |         |         |                      |
| SWLS     | 28 [9]                | 27 [9]                     | 105,838 | .158    | 0.05 [-0.01, 0.12]   |
| WHO-5    | 17 [8]                | 16 [9]                     | 107,006 | .087    | 0.07 [-0.01, 0.14]   |
| RSES     | 18 [9]                | 17 [9]                     | 108,469 | .037    | 0.08 [0.00, 0.15]    |
| WSSQ     | 26 [13]               | 30 [14]                    | 77,692  | < .001* | -0.23 [-0.30, -0.16] |
| BAS-2    | 44 [17]               | 39 [18]                    | 120,138 | < .001* | 0.20 [0.13, 0.27]    |
| GQ4      | 26 [4]                | 25 [5]                     | 105,508 | .003*   | 0.11 [0.04, 0.18]    |

*Note.* SWLS, Satisfaction with Life Scale; WHO-5, World Health Organization Well-Being Index 5-item form; RSES, Rosenberg Self-Esteem Scale; WSSQ, Weight Self-Stigma Questionnaire; BAS-2, Body Appreciation Scale 10-item form; GQ4, Gratitude Questionnaire 4-item form. Mdn, median; IQR, interquartile range; U, Mann-Whitney U tests;  $r$ , rank-biserial correlation; CI, confidence interval. \*Significant results ( $p < .0083$ ) after Bonferroni corrections. CI for  $r$  calculated using standard error of 0.039 for all scales.

### Discussion

The study sought to explore weight perceptions among Saudi university students and general adult population, assess whether individuals with higher BMI underestimate their own body weight more frequently, examine gender and group membership (student vs. general adult population) differences in weight misperceptions, and compare psychological indicators between those with accurate perceptions and those with weight misperceptions. Consistent with our hypotheses, weight misperceptions were common and participants with overweight/obesity exhibited significantly greater BMI-Stunkard discrepancies, with 58.9% of individuals in the obese BMI category and 52.5% of individuals in the overweight BMI category misperceiving their weight compared to 23.5% of those in the underweight category. Contrary to global trends, males demonstrated higher misperception rates than females (50.3% vs. 42.3%), while adults

from the general population showed greater misperceptions than students (51.7% vs. 42.7%). Additionally, as hypothesized, weight misperception was associated with higher weight self-stigma, reduced body appreciation, and lower gratitude, though no differences emerged for satisfaction with life or self-esteem.

The strong positive correlation observed between self-reported BMI and Stunkard FRS scores found in this study underscores the validity of this visual measuring tool for assessing weight perceptions in SA student and adult populations. This finding aligns with prior validations in Western contexts including American, Chinese, Italian, and Swedish samples (Bulik et al., 2001; Lo et al., 2012; Lombardo et al., 2022; Parzer et al., 2021; Scagliusi et al., 2006), which have shown strong associations between Stunkard FRS and objective and self-reported BMI measurements. The scale's reliability in these SA cohorts highlights its cross-cultural utility, even in contexts where sociocultural norms around body image may differ from Western ideals. This finding supports the adoption of the Stunkard FRS in clinical and public health settings to help identify individuals with distorted weight perceptions, thereby enabling tailored interventions to address psychological and behavioral outcomes linked to weight misperceptions.

A large proportion of both students (42.68%) and general adult population (51.70%) reported weight misperceptions, with participants classified as having obesity and overweight exhibiting significantly greater weight misperceptions compared to those in the other weight BMI categories. This finding is consistent with findings from a major review spanning studies from 25 countries, concluding that most weight misperceptions was based on underestimates (Freigang et al., 2020). Our findings also align with earlier research among Danish adolescents (Thorup et al., 2024), Korean women (Park et al., 2019) and Saudi participants (Albeeybe et al., 2018; Althumiri et al., 2021). For instance, in their study, (Albeeybe et al., 2018) found 60% of university female students with overweight and obesity misperceived "underestimated" their actual weight as normal weight, and such misperception was significantly associated with reduced likelihood of engaging in weight control practices. This study also found that those with normal weight who overestimated their weight reported higher body dissatisfaction (Albeeybe et al., 2018).

Similarly, Park et al. (2019) found that more women with overweight (44.3%) and obesity (17.4%) underestimated their weight status, compared to those with normal weight (17.9%) who to overestimated their weight. Underestimation of weight status was associated with lower likelihood of dieting higher likelihood to fasting and skipping meals (Park et al., 2019). These behavioral patterns can be interpreted through Fairburn's transdiagnostic model. The model suggests that the overvaluation of shape and weight is a core driver of psychopathology; conversely, an undervaluation or underestimation of weight status may reflect a cognitive avoidance strategy that protects self-worth in the short term but prevents engagement in healthy weight management, thereby perpetuating the condition (Fairburn et al., 2003). Together, these cross-cultural consistencies underscore the global prevalence of weight misperceptions as a public health concern, particularly among individuals with higher BMI, and emphasize the need for interventions that address both perceptual inaccuracies and their behavioral consequences.

Based on previous literature, it was hypothesized that more females would report weight misperceptions compared to males (Abalkhail et al., 2002; Freigang et al., 2020; Rasheed, 1998; Wardle et al., 2006). However, contrary to this hypothesis, our findings instead showed that more males reported misperceptions than females. This unexpected finding may reflect cultural normalization of larger body sizes among SA males, who may associate weight with strength, muscularity or social status, alongside potential gender differences in health literacy (Alshahrani et al., 2024) or self-reporting biases (e.g., males underreporting their weight). From a cognitive-behavioral perspective (Cash, 2012), these sociocultural norms represent powerful "developmental antecedents" that shape distinct self-schemas for men and women. For many SA males, a larger body size may be integrated into a positive self-schema associated with power and success, reducing the likelihood of negative cognitive appraisal and leading to underestimation.

For females, who are often socialized towards thin ideals, the same body size might activate a negative self-schema, leading to more accurate or overestimated perceptions. Furthermore, more general population adult participants reported weight misperceptions than did university students, with adults outside academic settings being 1.44 times more likely to inaccurately perceive their weight. University students are frequently exposed to health education through coursework and campus wellness programs, which may enhance their awareness of BMI thresholds and body composition compared to the general population.

Finally, in line with our final hypotheses, participants with weight misperceptions reported higher weight self-stigma, reduced body appreciation, and lower gratitude compared to those with accurate weight perceptions, though no significant differences emerged for satisfaction with life or self-esteem. These results provide partial support for the emotional consequences pathway outlined in Cash's (2012) cognitive-behavioral model. The act of misperceiving one's weight (a perceptual and cognitive event) appears to trigger specific negative emotional outcomes related to body shame (stigma) and an inability to appreciate the body's functionality (low body appreciation). The lower levels of gratitude further suggest a broader impairment in the capacity for positive cognitions about one's life and body. These findings align with earlier research showing inaccurate weight perceptions to correlate with compromised psychological well-being including higher depression and anxiety risk (Farhat et al., 2015; Haynes et al., 2019; Zhang et al., 2021) as well as diminished optimism and sense of coherence (Fuchs et al., 2012). The results underscore the nuanced associated psychological burden of weight misperception, emphasizing the need for interventions targeting stigma reduction and body acceptance while acknowledging cultural buffers that may protect overall well-being.

### Limitations and future research directions

This study has several limitations. First, the cross-sectional design precludes causal inferences about the relationship between weight misperception and psychological indicators. While associations were identified, it remains unclear whether inaccurate weight perceptions precede compromised psychological well-being or vice versa. Second, reliance on self-reported BMI introduces measurement bias, as participants may over- or underreport weight and height, potentially misclassifying BMI categories, nonetheless self-reported measurement is widely used on research (Fayyaz et al., 2024; Ng, 2019; Nikolaou et al., 2017; Pérez et al., 2015) due to its utility, reliability, and cost-effectiveness. Future studies should incorporate objective anthropometric data (e.g., clinician-measured BMI) to enhance accuracy. Third, the use of convenience sampling limits generalizability. This sampling constraint also risks overrepresenting health-literate individuals, potentially underestimating misperception patterns in underserved groups or less literate groups. Addressing these limitations in future research through longitudinal designs, mixed-method approaches, and stratified sampling would broaden the applicability of findings.

### Conclusion

This study highlights pervasive weight misperceptions among SA adults, with males and the general adult population exhibiting higher rates than females and students. The Stunkard FRS demonstrated strong validity in this SA context, supporting its utility for identifying weight perceptual inaccuracies. Cultural normalization of larger male body sizes and limited health literacy outside academic settings may drive these observed patterns. Findings underscore the urgency of culturally tailored interventions addressing weight misperceptions, particularly among high-BMI groups, through public health education and integration of validated tools like the Stunkard FRS.

## Declarations

**Ethics approval and consent to participate:** The research received approval from the Research Ethics Committee at University of Ha'il (H-2025-580), and all procedures adhered to the Declaration of Helsinki.

**Consent for publication:** NA

**Availability of data and material:** The dataset generated and analyzed in the current study is not publicly available due to restrictions from the Ethics Committee but are available from the corresponding author (M.M.A.) upon reasonable request.

**Competing interests:** The author report there are no competing interests to declare.

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**Authors' contributions:** M.M.A., designed the study, collected data, conducted statistical analysis, interpreted the results, drafted the initial manuscript, and reviewed and edited the manuscript.

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