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**ORIGINAL ARTICLE /** ARAŞTIRMA YAZISI

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# The Association Between Anthropometric Indexes Beyond Body Mass Index and Body Satisfaction of Females

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**ABSTRACT**

**Purpose:** The present study aimed to examine the associations between anthropometric indexes derived from body measurements and body satisfaction.

**Methods:** The study included voluntary female aged 19–64 years. The face-to-face questionnaire included questions on participants' sociodemographic characteristics (age, sex, educational level, marital status, employment status, and socioeconomic status), the Body Image Scale (BIS), and the Body Appreciation Scale (BAS). Anthropometric measurements were obtained by trained researchers in accordance with standardized procedures. Using measurements, anthropometric ratios and indices—waist-to-hip ratio (WHR), waist-to-height ratio (WHtR), body mass index (BMI), conicity index (CI), body shape index (BSI), abdominal volume index (AVI), and body adiposity index (BAI)—were calculated. Data were analyzed using SPSS 23.0.

**Results:** A total of 1.291 female participated in the study, with a mean age of 36.8 ± 12.7 years. Scale scores varied significantly across participants' sociodemographic characteristics ($p<0.001$). Scale scores differed significantly according to participants' history of dieting, reasons for dieting, satisfaction with their current body weight, and self-perceived physical appearance ($p<0.001$). Strong positive correlations were observed among anthropometric indices and BIS1 (current body shape) scores ($r>0.60$, $p<0.001$), whereas both body appreciation and body satisfaction was negatively associated with anthropometric measurements (WHR, WHtR, BMI) and indices (CI, BSI, AVI, BAI) ($p<0.001$). After adjustment for age and educational level, the negative associations of body satisfaction with BSI and BAI remained statistically significant ($p<0.001$).

**Conclusion:** The findings indicate that anthropometric indexes are associated with body appreciation and body satisfaction.

**Keywords:** Anthropometry, Body weight, Body image, Body satisfaction

**ÖZET**

**Amaç:** Bu güncel çalışmada, vücut ölçümleri kullanılarak hesaplanan antropometrik indekslerin beden memnuniyeti ile ilişkisinin araştırılması amaçlanmıştır.

**Yöntemler:** Çalışmaya 19-64 yaş gönüllü kadınlar dahil edilmiştir. Yüz yüze uygulanan soru formunda genel bilgi soruları, Beden Algısı Ölçeği (BAÖ) ve Bedeni Beğenme Ölçeği (BBÖ) yer almıştır. Katılımcıların antropometrik ölçümleri, tekniğine uygun olarak araştırmacılar tarafından alınmıştır. Ölçüm değerleri kullanılarak antropometrik oran ve indeksler [bel-kalça oranı (BKO), bel-boy oranı (BBO), beden kütle indeksi (BKİ), koniklik indeksi (Kİ), beden şekil indeksi (BŞİ), abdominal hacim indeksi (AHİ) ve beden adipozite indeksi (BAI)] hesaplanmıştır. Veriler SPSS 23.0 istatistik programında analiz edilmiştir.

**Bulgular:** Çalışmaya yaş ortalaması 36,8±12,7 yıl olan toplam 1291 yetişkin kadın katılmıştır. Ölçek puanları genel özelliklere göre farklılık göstermiştir ($p<0,001$). Daha önce diyet yapma durumu, diyet yapma nedeni, şu anki ağırlığından memnuniyet ve dış görünüşü tanımlama durumuna göre de ölçek puanları değişkenlik göstermiştir ($p<0,001$). Antropometrik indeksler ile BIS1 (şimdiki vücut şekil puanı) puanları arasında güçlü pozitif yönde korelasyonlar ($r>0,60$, $p<0,001$) gözlenirken; hem beden memnuniyeti, hem de bedeni beğenme ölçek puanı antropometrik ölçümler (BKO, BBO, BKİ) ve indekslerle (Kİ, BŞİ, AHİ , BAİ) negatif yönde ilişkili bulunmuştur. Yaş ve eğitim durumuna göre düzeltme yapıldığında beden memnuniyeti ile BŞİ ve BAI puanları ile ilişkisi değişmemiştir ($p <0,001$).

**Sonuç:** Bu çalışmanın sonuçları, antropometrik indekslerin bedeni beğenme ve beden memnuniyeti ile ilişkili olduğunu göstermektedir.

**Anahtar Kelimeler:** Antropometri, Vücut ağırlığı, Beden imajı, Beden memnuniyeti

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Body image refers to individuals' subjective assessments of their bodies, independent of their bodies' objective reality. Body image includes our perception of anthropometric measurements and body shape, as well as the emotions associated with these factors that influence satisfaction. Body image dissatisfaction includes an individual's attitude or emotional perception and negative feelings toward their body image (1). Body image dissatisfaction not only negatively affects physical and psychological health but can also significantly impact individuals' self-esteem, mood, perception of their abilities, social relationships, and occupational functioning (1). Negative body image often involves dissatisfaction with the entire body or certain parts of the body, excessive preoccupation with appearance, and behaviors such as frequent mirror checking, body weight measurement, or avoidance of social situations. In recent years, body image dissatisfaction, a significant factor affecting public health worldwide, has arisen from a discrepancy between perceived and idealized body images (2).

Body image dissatisfaction, low self-esteem, social isolation, and depression can lead to negative behaviors such as low-energy diets, excessive exercise, and indiscriminate use of nutritional supplements, and are associated with significant health problems that may necessitate cosmetic surgical procedures (3,4). Body image disorders are thought to manifest at both the perceptual level (e.g., a distorted body image) and behavioral level (for example, constant weight monitoring or dieting). One of the most important factors influencing body image is BMI, which includes body weight (5). The literature indicates that females, compared to males, focus more on BMI, frequently comparing themselves to societal ideals and adopting thinness as the ideal body type (6). This trend is creating a breeding ground for normative dissatisfaction among females. A descriptive study evaluating body satisfaction among female participants revealed that the vast majority of participants experienced dissatisfaction with their body weight and negative perceptions of body image. However, it was also reported that females tended to maintain their bodies at a lower body weight or within the normal BMI range; and associated a slim physique with more positive personality traits, social acceptance, and health indicators (7). Biological variables such as age, sex, and anthropometric measurements play an important role in the formation of body image perception. These variables can directly influence how an individual perceives and evaluates their body (8). Body image is a multifaceted concept that is being addressed with increasing interest in both developed and developing societies. In the literature, various factors influencing body image have been examined from different perspectives, and various findings have been reached regarding individuals' perceptions of their bodies (1). The influence of anthropometric variables on body image is not limited to physical measurements but also plays a decisive role in an individual's psychological well-being.

Body image dissatisfaction among females has become so widespread and ingrained today that it has gradually come to be seen as a natural element of female identity (9). Given the limited number of studies on body measurements in relation to body image dissatisfaction and body preference, this research aims to evaluate body measurements beyond body mass index in females in relation to their body satisfaction and body preference.

## Material and Methods

This study is a descriptive and cross-sectional study. The study was conducted between June and September 2024 with female living in Kırıkkale using a questionnaire and face-to-face interviews. The study population consisted of female individuals residing in Kırıkkale province who were accessible during the data collection period and met the inclusion criteria. In this study, the snowball sampling method was used to reach the participants. Snowball sampling is an effective method for reaching individuals with specific characteristics, and the sample is expanded through participants recommending each other. This method was chosen for the study to facilitate access to female participants aged 19–64 and to include individuals with diverse socio-demographic characteristics. The study was completed with 1291 female participants who met the inclusion criteria and completed the questionnaire in full. Inclusion criteria for the study were: i) volunteering to participate in the study, ii) being between 19 and 64 years of age, iii) being female, and iv) not having any condition that would prevent the measurement of the body parts included in the study. After the study was completed, the Free OpenEpi software (http://www.openepi.com/SampleSize/SSPropor.htm) "Power for X-Sectional Studies" module was used, and with a population size of 141,000, 50% anticipated frequency, 5% confidence limits, and a 1 design effect, the power of the study was determined to be 99.9% (10).

### 2.1. Data Collection Tools

The questionnaire used in the study included general descriptive information, questions about body image dissatisfaction and body satisfaction, the Body Image Scale (BIS, Stuncard Scale), and the Body Appreciation Scale (BAS). Anthropometric measurements were taken by the researchers following appropriate techniques.

#### 2.1.1. Identifying Information

Data were collected on participants' sociodemographic characteristics, including age, sex, educational level, marital status, employment status, and socioeconomic status.

#### 2.1.2. Body Image Dissatisfaction and Body Image Appreciation

Participants were asked about their thoughts on body image, how they categorized their own body weight (underweight, normal weight, overweight, or overweight), and their level of satisfaction with their body image.

#### 2.1.3. Body Image Scale (BIS, Stuncard Scale)

It is a figurative scale that allows an individual to subjectively evaluate their body shape. Participants were asked to rate their current body shape and their ideal body shape against the figure on the scale. The discrepancy between these two ratings represents a measure of body image dissatisfaction. These figure preferences, also called silhouette or contour line drawings, consist of a series of frontal views that vary from thin to plump. The first figure represents the leanest body shape, and the ninth figure represents the fattest. Figures one and two represent "lean," figures three and four represent "appropriate weight," figure five represents "slightly overweight," figures six and seven represent "moderately overweight," and figures eight and nine represent "very overweight," as shown in Figure 1. Participants evaluated their current and ideal body shapes by selecting the most representative figure from a standardized body silhouette scale (Figure 1). Body image dissatisfaction was defined as the numerical discrepancy between the current body shape score (BIS1) and the ideal body shape score (BIS2). Body satisfaction (BS) was computed by subtracting the current body shape rating (BIS1) from the ideal body shape rating (BIS2). A BS score of zero reflects body satisfaction, whereas any deviation from zero indicates body image dissatisfaction. Negative BS scores denote a preference for a thinner body shape (desire for weight loss), while positive scores indicate a preference for a larger body shape (desire for weight gain) (11).

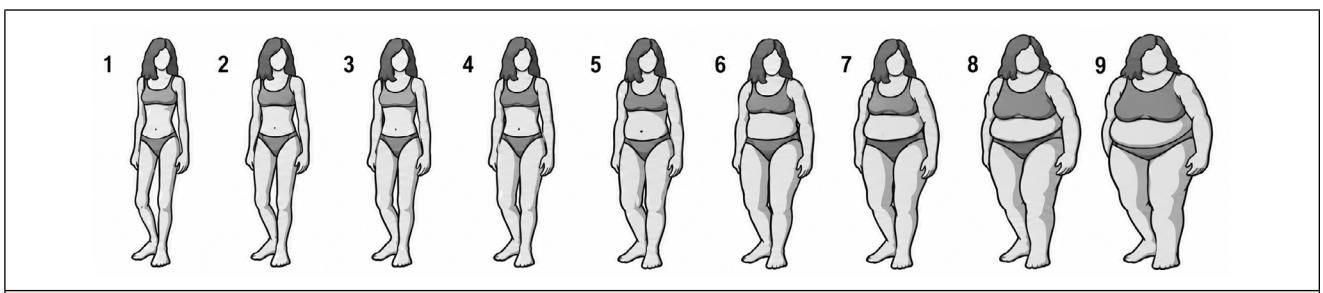


**Figure 1.** Body Image Scale (Stuncard Scale)

#### 2.1.4. Body Appreciation Scale (BAS)

This scale was developed by Tylka and Wood-Barcalow in 2015 to help individuals determine and improve their skill levels in managing negative attitudes about their bodies (12). The adaptation of the BAS into Turkish culture and the examination of the validity and reliability of the Turkish form were carried out by Gazanfer Anlı and colleagues in 2015 (13). The internal consistency reliability coefficient of the scale was 0.94 for females and 0.93 for males, while the test-retest reliability coefficient was 0.90 for both females and males (13). The BAS, a five-point Likert-type assessment tool, consists of 10 items. The scores of all items on the scale are added together to obtain a total body image satisfaction score. There are no items on the scale that are reverse scored. High scores on the scale indicate a high level of body image satisfaction (12,13).

### 2.1.5. Anthropometric Measurements

Height (cm), body weight (BW, kg), waist circumference (WC, cm), hip circumference (HC, cm), and neck circumference (NC, cm) were measured by researchers according to the appropriate technique. Anthropometric measurements were obtained using standardized measurement protocols. Waist circumference was measured with a non-elastic measuring tape at the midpoint between the lowest rib and the iliac crest, with participants standing upright and breathing normally. Each waist circumference measurement was taken three times, and the average of the three measurements was used for analysis. Hip circumference was measured at the widest point of the buttocks, ensuring the tape was horizontal and not compressing the skin. All measurements were conducted by trained researchers (dietitians) using calibrated instruments to ensure accuracy and reliability. Derived indices, including WHR, WHtR, CI, AVI, and BAI, were calculated using established formulas (18). Using these measurements, BMI (kg/m$^2$), WHR, and WHtR were calculated. BMI is defined as <18.5 kg/m$^2$ (underweight), 18.5-24.9 kg/m$^2$ (normal weight), 25.0-29.9 kg/m$^2$ (overweight), and ≥30.0 kg/m$^2$ (obese) (14). WC >80 cm, WHR>0.85 (15), NC ≥32 cm (16) and WHtR >0.50 (17) were considered risky. Anthropometric indices calculated were the CI, BSI, AVI and BAI (18).

### 2.2. Analysis of Data

Data analysis was performed using the SPSS 23.0 statistical software package for Windows. Descriptive statistics are presented as mean (standard deviation/SD), lower limit-upper limit for variables with a normal distribution, and as number (n) and percentage (%) for nominal variables. The normality of the distribution for each variable was assessed using the Kolmogorov–Smirnov test. Based on the evaluation, the data were determined to be normally distributed. In the study, the "independent samples t-test" was applied to compare the means of two groups, and when the number of groups was more than two, "one-way analysis of variance" (Bonferroni test for post hoc) was applied. The correlation coefficient and statistical significance between quantitative variables were evaluated using Pearson Correlation Analysis. Correlation coefficient evaluation was performed as follows: 0.00-0.10 (negligible), 0.10-0.39 (weak), 0.40-0.69 (moderate), 0.70-0.89 (strong), 0.90-1.00 (excellent) (19). Simple and multiple linear regression analyses were used to determine the changes in anthropometric measurements and indices related to body image and body satisfaction scale scores. First, an unadjusted regression model was constructed for each independent variable (Model 1). Then, age-adjusted analyses were performed by adding the age variable as a covariate (Model 2). Finally, a multiple linear regression model was established with age and education level variables included as covariates (Model 3). Thus, the effects of the independent variables (CI, BSI, AVI, and BAI) on the dependent variables (BIS1, BIS2, BS, and BAS) were evaluated while controlling for potential confounding variables. Separate regression models were conducted for each anthropometric index. Since the anthropometric indices were not included in the same model, there was no multicollinearity issue. The statistical significance level was accepted as $p<0.05$ and $p<0.001$.

## Results

The study included a total of 1291 female participants, the majority of whom were married (60.3%), high school graduates (37.0%), with an average age of 36.8±12.7 years (Table 1).

While the mean BIS1 score differed across all age groups ($F=61.510$, $p<0.001$), the BIS2 score was lowest in the 19-24 age group (3.0±0.9) and the 25-34 age group (3.1±1.0) ($F=33.447$, $p<0.001$). The mean body satisfaction score also differed among age groups ($F=20.970$, $p<0.001$). The mean BIS1 and BIS2 scores were higher in married individuals compared to single individuals ($t=9.849$, $p<0.001$ and $t=7.209$, $p<0.001$, respectively), whereas the BS score was lower in married individuals, indicating lower body satisfaction ($t=-6.123$, $p<0.001$). Those with a high school, university, and postgraduate education level had lower average BIS1, and BIS2 scores ($F=16.343$, $p<0.001$) and lower scores compared to those with only literacy, primary school, and secondary school education. BIS1 scores ($F=37.873$, $p<0.001$) and BIS2 scores ($F=21.442$, $p<0.001$) also differed according to occupation. However, individuals' BS scores differed significantly based on both educational level and occupation ($F=9.350$, $p<0.001$; $F=14.070$, $p<0.001$, respectively). The average BAS score also differed according to education level ($F=2.461$, $p=0.031$), and occupation ($F=2.766$, $p=0.017$). Unemployed females had higher average BIS1 and BIS2 scores compared to employed females ($t=11.087$, $p<0.001$, $t=9.256$, $p<0.001$, respectively) and had lower average body satisfaction scores. Those with a high economic level had a lower BIS1 score compared to those with a medium economic level ($F=4.286$, $p<0.014$). The mean BIS1 and BIS2 scores were higher in individuals with chronic diseases compared to those without them ($t=-9.064$, $p<0.001$, and $t=-6.409$, $p<0.001$, respectively). The mean BAS score was found to be lower in those with chronic disease compared to those without ($t=2.437$, $p=0.015$) (Table 1).

**Table 1.** Comparison of Body Image Scale, Body Satisfaction, and Body Appreciation Scale Scores According to Female's Descriptive Characteristics (n=1291)

| Descriptive Characteristics | n (%) | BIS1 | | BIS2 | | BS | | BAS | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean±SD | Min-Max | Mean±SD | Min-Max | Mean±SD | Min-Max | Mean±SD | Min-Max |
| **Age (year)** *Ort±SS (Min-Max) 36.8±12.7 (19-64)* | | | | | | | | | |
| 19-24 | 295 (22.9) | 3.7±1.4[a] | 1-8 | 3.0±0.9[a] | 1-6 | -0.7±1.3[a] | (-5)-(+3) | 39.4±7.8 | 10-50 |
| 25-34 | 319 (24.6) | 4.2±1.6[b] | 1-9 | 3.1±1.0[a] | 1-6 | -1.1±1.3[b] | (-5)-(+2) | 39.8±7.9 | 10-50 |
| 35-44 | 302 (23.4) | 4.7±1.5[c] | 1-9 | 3.4±1.0[b] | 1-6 | -1.4±1.3[bc] | (-6)-(+2) | 38.7±8.3 | 10-50 |
| 45-54 | 223 (17.3) | 5.2±1.4[d] | 1-9 | 3.7±1.1[c] | 1-7 | -1.4±1.2[cd] | (-5)-(+1) | 39.2±8.1 | 10-50 |
| 55-64 | 152 (11.8) | 5.7±1.6[e] | 2-9 | 3.9±1.2[c] | 2-7 | -1.8±1.4[d] | (-6)-(+3) | 38.5±8.6 | 14-50 |
| *Test value / p* | | F=61.510 **p<0.001** | | F=33.447 **p<0.001** | | F=20.970 **p<0.001** | | F=1.073 p=0.368 | |
| **Marital status** | | | | | | | | | |
| Married | 778 (60.3) | 4.9±1.6 | 1-9 | 3.5±1.1 | 1-7 | -1.4±1.3 | (-6)-(+3) | 39.0±8.2 | 10-50 |
| Single | 513 (39.7) | 4.0±1.5 | 1-8 | 3.1±1.0 | 1-7 | -0.9±1.4 | (-5)-(+3) | 39.5±7.9 | 10-50 |
| *Test value / p* | | t=9.849 **p<0.001** | | t=7.209 **p<0.001** | | t=-6.123 **p<0.001** | | t=-1.034 p=0.301 | |
| **Educational status** | | | | | | | | | |
| Illiterate* | 25 (1.9) | 5.9±1.5[a] | 2-9 | 4.3±1.3[a] | 2-7 | -1.6±1.5[ab] | (-6)-(+1) | 40.0±7.5[abc] | 25-50 |
| Primary school | 140 (10.8) | 5.5±1.6[a] | 1-9 | 3.8±1.1[a] | 1-7 | -1.7±1.5[a] | (-6)-(+3) | 37.7±9.4[ad] | 11-50 |
| Secondary school | 127 (9.8) | 5.3±1.5[a] | 1-9 | 3.7±1.3[a] | 1-6 | -1.7±1.3[a] | (-5)-(+2) | 38.9±7.7[abc] | 10-50 |
| High school | 478 (37.0) | 4.4±1.6[b] | 1-9 | 3.3±1.0[b] | 1-7 | -1.1±1.3[b] | (-5)-(+3) | 38.8±7.9[ab] | 10-50 |
| University | 450 (34.9) | 4.3±1.5[b] | 1-9 | 3.2±1.0[b] | 1-7 | -1.1±1.3[b] | (-6)-(+2) | 39.9±7.8[cd] | 14-50 |
| Postgraduate | 71 (5.5) | 4.0±1.5[b] | 2-8 | 3.0±1.0[b] | 1-5 | -1.0±1.4[b] | (-5)-(+2) | 40.8±9.3[bc] | 10-50 |
| *Test value / p* | | F=27.020 **p<0.001** | | F=16.343 **p<0.001** | | F=9.350 **p<0.001** | | F=2.461 **p=0.031** | |
| **Occupation** | | | | | | | | | |
| housewife/ unemployed | 442 (34.1) | 4.2±1.5[a] | 1-9 | 3.7±1.1[a] | 1-7 | -1.5±1.3[a] | (-6)-(+3) | 38.8±8.3[ab] | 11-50 |
| Student | 244 (18.9) | 3.7±1.3[b] | 1-8 | 3.0±0.9[b] | 1-6 | -0.7±1.3[b] | (-5)-(+3) | 39.3±7.6[ab] | 10-50 |
| Officer | 303 (23.5) | 4.2±1.6[c] | 1-9 | 3.1±1.0[bc] | 1-7 | -1.1±1.3[c] | (-6)-(+2) | 40.3±8.0[a] | 10-50 |
| Employee | 144 (11.2) | 4.7±1.7[d] | 1-9 | 3.3±1.0[bc] | 1-6 | -1.4±1.4[ac] | (-5)-(+3) | 38.8±8.5[ab] | 10-50 |
| Freelance | 108 (8.4) | 4.1±1.5[bc] | 2-9 | 3.2±1.0[bc] | 1-6 | -0.9±1.3[bc] | (-4)-(+2) | 39.4±7.3[ab] | 17-50 |
| Retired | 50 (3.9) | 5.2±1.9[ad] | 1-9 | 3.5±1.1[ac] | 1-6 | -1.7±1.6[a] | (-6)-(+1) | 36.3±8.8[b] | 10-50 |
| *Test value / p* | | F=37.873 **p<0.001** | | F=21.442 **p<0.001** | | F=14.070 **p<0.001** | | F=2.766 **p=0.017** | |
| **Employment status** | | | | | | | | | |
| Not working | 442 (34.1) | 5.2±1.5 | 1-9 | 3.7±1.1 | 1-7 | -1.5±1.3 | (-6)-(+3) | 38.8±8.4 | 11-50 |
| Working | 849 (65.9) | 4.2±1.6 | 1-9 | 3.2±1.0 | 1-7 | -1.1±1.4 | (-6)-(+3) | 39.4±8.0 | 10-50 |
| *Test value / p* | | t=11.087 **p<0.001** | | t=9.256 **p<0.001** | | t=-5.527 **p<0.001** | | t=-1.363 p=0.173 | |
| **Economic status**** | | | | | | | | | |
| Low | 252 (19.4) | 4.5±1.7[ab] | 1-9 | 3.3±1.0 | 1-6 | -1.2±1.4[ab] | (-6)-(+2) | 38.8±8.5 | 16-50 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Middle | 734 (56.9) | 4.7±1.6[a] | 1-9 | 3.4±1.0 | 1-7 | -1.3±1.3[a] | (-6)-(+3) | 39.1±8.0 | 10-50 |
| High | 306 (23.7) | 4.4±1.6[b] | 1-9 | 3.3±1.1 | 1-7 | -1.0±1.4[b] | (-5)-(+3) | 39.8±8.0 | 10-50 |
| *Test value / p* | | F=4.286 **p=0.014** | | F=1.885 p=0.152 | | F=3.038 **p=0.048** | | F=1.232 p=0.292 | |
| **Chronic disease** | | | | | | | | | |
| No | 934 (72.3) | 4.3±1.6 | 1-9 | 3.2±1.0 | 1-7 | -1.1±1.3 | (-6)-(+3) | 39.5±8.0 | 10-50 |
| Yes | 357 (27.7) | 5.2±1.6 | 1-9 | 3.7±1.2 | 1-7 | -1.5±1.4 | (-6)-(+3) | 38.3±8.3 | 10-50 |
| *Test value / p* | | t=-9.064 **p<0.001** | | t=-6.409 **p<0.001** | | t=5.374 **p<0.001** | | t=2.437 **p=0.015** | |
| **Total** | | 4.6±1.6 (1-9) | | 3.4±1.1 (1-7) | | -1.2±1.4 (-6)-(+3) | | 39.2±8.1 (10-50) | |

**Illiterate or only literate (not graduated from any level of education)*
***Low: income less than expenses, medium: income equal to expenses, high: income greater than expenses BIS1: current body shape score, BIS2: ideal body shape score, BS: body satisfaction, BAS: body appreciation scale score The p<0.05 and p<0.001 values are statistically significant.*
*"Independent samples t-test" and "One-way analysis of variance" were performed.*
*a-d showed the differences between the groups.*

**Table 2.** Comparison of Body Image Scale, Body Satisfaction, and Body Appreciation Scale Scores of Female According to Dieting Status and Body Views (n=1291)

| Dieting status and Body views | n (%) | BIS1 | | BIS2 | | BS | | BAS | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean±SD | Min-Max | Mean±SD | Min-Max | Mean±SD | Min-Max | Mean±SD | Min-Max |
| **Previous dieting status** | | | | | | | | | |
| Yes | 640 (50.4) | 5.1±1.5 | 1-9 | 3.5±1.1 | 1-7 | -1.6±1.3 | (-6)-(+3) | 37.6±8.3 | 10-50 |
| No | 651 (49.6) | 4.1±1.6 | 1-9 | 3.3±1.0 | 1-7 | -0.8±1.3 | (-6)-(+3) | 40.8±7.5 | 10-50 |
| *Test value / p* | | t=-11.466 **p<0.001** | | t=-3.378 **p=0.001** | | t=10.933 **p<0.001** | | t=7.380 **p<0.001** | |
| **Reason for dieting** | | | | | | | | | |
| Health | 280 (43.8) | 5.4±1.6[a] | 2-9 | 3.7±1.0[a] | 1-7 | -1.7±1.3[ab] | (-6)-(+2) | 37.8±8.8[a] | 10-50 |
| Physical anxiety | 290 (45.2) | 4.7±1.5[b] | 1-9 | 3.3±1.0[b] | 1-6 | -1.5±1.2[a] | (-5)-(+2) | 37.7±7.8[a] | 11-50 |
| Family/social pressure | 35 (5.5) | 5.5±1.5[a] | 2-8 | 3.4±1.3[ab] | 1-7 | -2.1±1.4[b] | (-4)-(+2) | 31.4±8.9[b] | 10-50 |
| Other* | 35 (5.5) | 4.8±1.2[ab] | 2-8 | 3.2±1.1[ab] | 2-5 | -1.6±1.7[ab] | (-6)-(+3) | 40.7±5.0[a] | 31-50 |
| *Test value/ p* | | F=10.180 **p<0.001** | | F=7.829 **p<0.001** | | F=3.444 **p=0.017** | | F=8.429 **p<0.001** | |
| **Regularly measuring body weight** | | | | | | | | | |
| No | 307 (23.8) | 4.6±1.8 | 1-9 | 3.4±1.1 | 1-7 | -1.2±1.4 | (-6)-(+2) | 40.0±7.5 | 10-50 |
| Yes | 530 (41.0) | 4.6±1.6 | 1-9 | 3.3±1.1 | 1-7 | -1.2±1.4 | (-6)-(+3) | 39.2±8.2 | 10-50 |
| Sometimes | 454 (35.2) | 4.5±1.6 | 1-9 | 3.3±1.0 | 1-7 | -1.2±1.3 | (-6)-(+3) | 38.7±8.3 | 10-50 |
| *Test value / p* | | F=0.077 p=0.926 | | F=0.760 p=0.468 | | F=0.272 p=0.762 | | F=2.378 p=0.093 | |
| **Satisfied with current body weight** | | | | | | | | | |
| Satisfied | 475 (36.8) | 3.7±1.3[a] | 1-8 | 3.1±1.0[a] | 1-7 | -0.5±1.0[a] | (-5)-(+3) | 42.8±6.7[a] | 10-50 |
| Not satisfied | 567 (43.9) | 5.4±1.5[b] | 1-9 | 3.6±1.1[b] | 1-7 | -1.8±1.4[b] | (-6)-(+3) | 35.7±8.4[b] | 10-50 |
| Undecided | 207 (16.0) | 4.3±1.4[c] | 1-9 | 3.2±1.0[a] | 1-6 | -1.1±1.2[c] | (-4)-(+3) | 39.9±6.5[c] | 20-50 |
| Doesn't care | 42 (3.3) | 4.8±1.8[bc] | 2-8 | 3.7±1.4[b] | 1-6 | -1.1±1.3[ac] | (-4)-(+1) | 41.3±7.7[ac] | 17-50 |
| *Test value / p* | | F=125.713 **p<0.001** | | F=17.122 **p<0.001** | | F=97.022 **p<0.001** | | F=80.654 **p<0.001** | |
| **Describing your appearance** | | | | | | | | | |
| Good/above average | 388 (30.1) | 3.7±1.4[a] | 1-8 | 3.1±1.0[a] | 1-7 | -0.6±1.2[a] | (-5)-(+3) | 43.5±6.8[a] | 15-50 |
| Average | 727 (56.3) | 4.6±1.4[b] | 1-9 | 3.4±1.0[b] | 1-7 | -1.3±1.2[b] | (-4)-(+3) | 38.8±7.0[b] | 10-50 |
| Bad/below average | 176 (13.6) | 6.3±1.6[c] | 1-9 | 3.8±1.3[c] | 1-7 | -2.5±1.5[c] | (-6)-(+3) | 31.5±8.6[c] | 10-50 |
| *Test value / p* | | F=200.942 **p<0.001** | | F=25.212 **p<0.001** | | F=150.368 **p<0.001** | | F=172.900 **p<0.001** | |

**Other: feeling psychologically unwell, low self-esteem, exercising, localized weight loss, etc.*
*BIS1: current body shape score, BIS2: ideal body shape score, BS: body satisfaction, BAS: body appreciation scale score*
*a-c It has shown the differences between the groups.*

Participants reported having dieted at least once before (50.4%), and the most common reason for dieting was physical (45.2%). While 43.9% of females were dissatisfied with their bodies, the average BS score was also lower in these individuals (-1.8±1.4). The mean BIS1 and BIS2 scores were found to be higher in those who had previously dieted compared to those who had not (t=-11.466, p<0.001 and t=-3.378, p=0.001, respectively), while the mean BS score was found to be lower in those who had previously dieted (-1.6±1.3). The mean BAS score was higher in those who had not previously dieted (40.8±7.5) compared to those who had (37.6±8.3) (t=7.380, p<0.001). Among those on a diet, the mean BIS1 (F=10.180, p<0.001), BIS2 (F=7.829, p<0.001) and BAS (F=8.429, p<0.001) scores varied according to the reasons. The mean BIS1 (F=125.713, p<0.001), BIS2 (F=17.122, p<0.001) and BAS (F=80.654, p<0.001) scores also differ according to the satisfaction level with current body weight. Mean BIS1, BIS2, BS, and BAS scores differed across all groups based on their self-description (F=200.942, p<0.001; F=25.212, p<0.001; F=150.368, p<0.001; F=172.900, p<0.001, respectively) (Table 2).

Anthropometric measurements of the female participants in the study revealed that 55.1% had WC, 68.1% had NC, 31.4% had WHR, and 51.1% had WHtR values in the risky range. In addition, more than half (51.2%) are overweight or with obesity. Mean BIS1 and BIS2 scores were higher in the at-risk group compared to the normal group according to anthropometric measurement groups (p<0.001), whereas the BS score was lower in the at-risk group (p<0.001). The mean BAS score was found to be higher in those in the normal anthropometric group compared to those in the at-risk group (p<0.001). When comparing body mass index groups, BIS1 scores were different in all groups (F= 474.664, p<0.001), while BIS2 scores were higher in overweight (3.5±1.0) and with obesity (4.1±1.2) individuals than in underweight (2.7±0.8) and normal (3.0±0.9) individuals (F= 94.573, p<0.001). The mean BS scores of females were also lower in the overweight and with obesity group (F= 178.132, p<0.001). However, the mean BAS score was higher in both underweight and normal weight individuals (F= 43.687, p<0.001) (Table 3). The relationship between anthropometric measurements, index values, and scale scores is shown in Table 4. A statistically strong and positive correlation was found between waist circumference and WHR (r=0.791), BMI (r=0.824), BSI (r=0.702), BAI (r=0.728), and BIS1 score (r=0.709); between WHR and WHtR (r=0.772), CI (r=0.709), BSI (r=0.756), and AVI (r=0.752); between WHtR and BMI (r=0.841); between BMI and AVI (r=0.837), BAI (r=0.801), and BIS1 score (r=0.777); between CI and BAI (r=0.754) and BIS1 score (r=0.762); and between AVI and BAI (r=0.743) and BIS1 score (r=0.711) (p<0.001). Excellent positive correlations were found between waist circumference and WHtR (r=0.976), CI (r=0.975), and AVI (r=0.991); between WHtR and CI (r=0.949) and AVI (r=0.967); between BMI and CI (r=0.916); and between CI and AVI (r=0.981) (p<0.001). A negative correlation was found between the body satisfaction score and all anthropometric measurements, indices, and BIS scores except BIS1 (p=0.001 or p<0.001). Among female participants, BS scores were negatively correlated with anthropometric measurements and indices, except for AVI and BAI, and weakly positively correlated with BAS scores (Table 4). A one-unit change in participants' CI values was related to an increase of 0.284 points in BIS1, 0.108 points in BIS2, a decrease of 0.176 points in BS, and a decrease of 0.494 points in BAS (p<0.001). When adjusted for age and education level, the results were not statistically significant (p>0.05). A one-unit increase in body shape index was related to an increase of 5.473 points in BIS1, 2.157 points in BIS2, and a decrease of 3.316 points in BS (p<0.001). When age and education level factors were included in the analysis, a negative correlation was found (p<0.001). Abdominal volume index and BAI also was related to an increase or decrease in scale scores (for AVI, ß1=0.230, t=36.305, p<0.001 for BIS1 score; ß1=0.088, t=16.537, p<0.001 for BIS2 score; ß1=-0.384, t=-8.789, p<0.001 for BAS score; for BAI, ß1=0.155, t=28.129, p<0.001 for BIS1 score; ß1=0.059, t=13.964, p<0.001 for BIS2 score; ß1=-0.339, t=-10.067, p<0.001 for BAS score). After adjustment for age and educational level, a statistically significant negative association was observed between BAI and BIS2 scores (β = −0.055, t = −1.997, p = 0.046). No statistically significant associations were found in the other analyses (p > 0.05) (Table 5).

## Discussion

In recent years, it has become clear that body image perception is a significant factor in weight management and can be associated with by various social or cultural factors in both Western and non-Western societies (20).

However, studies in the literature indicate that body image perception, especially in females, is associated with anthropometric measurements (20,21). This study aimed to determine the relationship between anthropometric indices, beyond BMI, one of the primary methods used, and body image perception in female participants. The research findings showed that individuals' ideal body shape scores were lowest in younger age groups, while their body satisfaction was higher.

Similarly, another study reports that females perceive their ideal body shape as thinner at younger ages and that body satisfaction is higher in younger ages (22,23). However, while this study associated higher education levels and employment status with lower body image scores (BIS1 and BIS2), other studies have shown that individuals with higher education levels and those employed in any job tend to have weaker body image (24,25). Another important factor associated with body image is socioeconomic status, and research findings show that those with higher socioeconomic status have lower body image scores (26). Furthermore, in this study, the body satisfaction score (BS) obtained from the difference in body image scores is also affected by factors such as age, occupation, and marital status, similar to other studies (6,20).

The study investigated individuals' body satisfaction, revealing that 43.9% were dissatisfied with their bodies, and those who reported body dissatisfaction had lower average body satisfaction scores. Similarly, a recent study found that 44.5% of females were dissatisfied with their bodies, and 66.0% had previously dieted to lose weight (27). The findings indicated that participants with a history of dieting had higher body image scale scores (BIS1 and BIS2) but lower body satisfaction and body appreciation scores. This suggests that individuals who have previously dieted have increased their awareness of their bodies; however, this awareness has also brought with it a more critical perspective. Individuals who frequently diet are more likely to experience distorted body image and dissatisfaction (28).

The anthropometric index is an important measurement tool that categorizes the physical characteristics of the body according to specific measurements and structural features, providing information about body types and proportions. In this study, females in the at-risk group based on anthropometric measurements were found to have high body image scale scores (BIS1 and BIS2) and low body satisfaction and body appreciation. However, females classified as overweight or with obesity according to BMI have lower levels of body satisfaction and body image (Table 3). This study found that female participants with obesity scored lower on body appreciation and body satisfaction, which aligns with current evidence showing a link between obesity and negative body image. The systematic review findings indicating that body dissatisfaction is significantly higher in individuals with obesity compared to their peers of normal body weight reveal that this situation is also observed in different societies (6). Another study conducted on females participants found that body image dissatisfaction was frequently observed; an independent association was found between obesity and general body dissatisfaction. This result shows that negative indicators of body composition (high fat mass/low lean mass) are associated with decreased satisfaction and demonstrates the strength of obesity's impact on body image (29). In another study, adiposity indicators, such as waist circumference, were identified as independent predictors of body image dissatisfaction in females with obesity and morbidly females with obesity (30). As shown in Table 4, anthropometric measurements (WC, NC, WHR, and WHtR) and derived anthropometric indices (CI, BSI, AVI, and BAI) were associated with scores on the body image, body satisfaction, and body appreciation scales. However, research findings have shown that waist circumference, WHR, WHtR, NC, BMI, CI BSI, AVI, and BAI are negatively correlated with body satisfaction and body apreciation scale scores. In other words, as anthropometric measurements and index values increase, body satisfaction and body appreciation decrease. Research findings indicate that, in addition to body weight and obesity, body fat distribution and anthropometric indicators may also be related to body image and body satisfaction. Adopting anti-stigma interventions is crucial, particularly to prevent body dissatisfaction in female participants with obesity.

**Table 3.** Comparison of Body Image Scale, Body Satisfaction and Body Appreciation Scale According to Anthropometric Measurements of Female (n=1291)

| Anthropometric measurements and indices | n (%) | BIS1 | | BIS2 | | BS | | BAS | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean±SD | Min-Max | Mean±SD | Min-Max | Mean±SD | Min-Max | Mean±SD | Min-Max |
| **WC (cm)** Mean±SD *(Min-Max)* *84.3±14.6 (40-139)* | | | | | | | | | |
| ≤80 cm (normal) | 580 (44.9) | 3.5±1.3 | 1-8 | 3.0±0.9 | 1-6 | -0.6±1.2 | (-5)-(+3) | 40.6±7.6 | 10-50 |
| >80 cm (risk) | 711 (55.1) | 5.4±1.3 | 2-9 | 3.7±1.1 | 1-7 | -1.7±1.2 | (-6)-(+3) | 38.1±8.3 | 10-50 |
| *Test value / p* | | t=-25.438 **p<0.001** | | t=-13.182 **p<0.001** | | t=17.037 **p<0.001** | | t=5.665 **p<0.001** | |
| **NC (cm)** Mean±SD *(Min-Max)* *34.1±3.9 (15-57)* | | | | | | | | | |
| <32 cm (normal) | 412 (31.9) | 3.6±1.3 | 1-8 | 3.1±0.9 | 1-6 | -0.6±1.3 | (-5)-(+3) | 39.9±8.2 | 15-50 |
| ≥32 cm (risk) | 879 (68.1) | 5.0±1.6 | 1-9 | 3.5±1.1 | 1-7 | -1.5±1.3 | (-6)-(+3) | 38.9±8.0 | 10-50 |
| *Test value / p* | | t=-16.096 **p<0.001** | | t=-7.519 **p<0.001** | | t=12.009 **p<0.001** | | t=2.232 **p=0.026** | |
| **WHR** Mean±SD *(Min-Max)* *0.81±0.09 (0.55-1.26)* | | | | | | | | | |
| ≤0.85 (normal) | 886 (68.6) | 4.1±1.5 | 1-9 | 3.2±1.0 | 1-6 | -1.0±1.3 | (-6)-(+3) | 39.7±7.8 | 10-50 |
| >0.85 (risk) | 405 (31.4) | 5.5±1.5 | 1-9 | 3.8±1.1 | 1-7 | -1.7±1.3 | (-6)-(+3) | 38.1±8.6 | 10-50 |
| *Test value / p* | | t=-15.005 **p<0.001** | | t=-9.647 **p<0.001** | | t=9.293 **p<0.001** | | t=3.295 **p=0.001** | |
| **WHtR** Mean±SD *(Min-Max)* *0.52±0.10 (0.24-0.86)* | | | | | | | | | |
| ≤0.50 (normal) | 631 (48.9) | 3.6±1.3 | 1-8 | 3.0±0.9 | 1-6 | -0.6±1.2 | (-5)-(+3) | 40.6±7.5 | 10-50 |
| >0.50 (risk) | 660 (51.1) | 5.5±1.4 | 2-9 | 3.7±1.1 | 1-7 | -1.8±1.2 | (-6)-(+3) | 37.8±8.5 | 10-50 |
| *Test value / p* | | t=-24.955 **p<0.001** | | t=-12.703 **p<0.001** | | t=16.910 **p<0.001** | | t=6.295 **p<0.001** | |
| **BMI** Mean±SD *(Min-Max)* *25.8±5.1 (15.4-45.9)* | | | | | | | | | |
| <18.5 (underweight) | 51 (4.0) | 2.3±1.1[a] | 1-5 | 2.7±0.8[a] | 1-4 | -0.4±1.2[a] | (-3)-(+3) | 42.2±7.0[a] | 21-50 |
| 18.5-24.9 (normal) | 579 (44.8) | 3.6±1.2[b] | 1-8 | 3.0±0.9[a] | 1-6 | -0.7±1.1[b] | (-4)-(+3) | 41.3±7.0[a] | 10-50 |
| 25.0-29.9 (overweight) | 419 (32.4) | 5.0±1.0[c] | 2-8 | 3.5±1.0[b] | 1-6 | -1.5±1.1[c] | (-5)-(+3) | 38.5±8.1[b] | 10-50 |
| ≥30.0 (obese) | 242 (18.8) | 6.5±1.2[d] | 2-9 | 4.1±1.2[c] | 1-7 | -2.4±1.2[d] | (-6)-(+3) | 34.8±8.9[c] | 10-50 |
| *Test value/ p* | | F= 474.664 **p<0.001** | | F= 94.573 **p<0.001** | | F= 178.132 **p<0.001** | | F= 43.687 **p<0.001** | |

*BIS1: current body shape score, BIS2: ideal body shape score, BS: body satisfaction, BAS: body appreciation scale score, WC: waist circumference, NC: neck circumference, WHR: waist-hip ratio, WHtR: waist-height ratio, BMI: body mass index*
*[a-d] It has shown the differences between the groups.*

**Table 4.** Relationship between Female's Anthropometric Measurements and Indices and Body Image Scale, Body Satisfaction, and Body Appreciation Scale Scores (n=1291) (r, p)

| | WC | NC | WHR | WHtR | BMI | CI | BSI | AVI | BAI | BIS1 | BIS2 | BS | BAS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **WC** | - | 0.613 **<0.001** | 0.791 **<0.001** | 0.976 **<0.001** | 0.824 **<0.001** | 0.975 **<0.001** | 0.702 **<0.001** | 0.991 **<0.001** | 0.728 **<0.001** | 0.709 **<0.001** | 0.414 **<0.001** | -0.529 **<0.001** | -0.221 **<0.001** |
| **NC** | | - | 0.417 **<0.001** | 0.580 **<0.001** | 0.588 **<0.001** | 0.635 **<0.001** | 0.299 **<0.001** | 0.605 **<0.001** | 0.466 **<0.001** | 0.478 **<0.001** | 0.252 **<0.001** | -0.378 **<0.001** | -0.126 **<0.001** |
| **WHR** | | | - | 0.772 **<0.001** | 0.508 **<0.001** | 0.709 **<0.001** | 0.756 **<0.001** | 0.752 **<0.001** | 0.269 **<0.001** | 0.463 **<0.001** | 0.267 **<0.001** | -0.348 **<0.001** | -0.074 **<0.001** |
| **WHtR** | | | | - | 0.841 **<0.001** | 0.949 **<0.001** | 0.681 **<0.001** | 0.967 **<0.001** | 0.810 **<0.001** | 0.698 **<0.001** | 0.410 **<0.001** | -0.519 **<0.001** | -0.225 **<0.001** |
| **BMI** | | | | | - | 0.916 **<0.001** | 0.197 **<0.001** | 0.837 **<0.001** | 0.801 **<0.001** | 0.777 **<0.001** | 0.452 **<0.001** | -0.581 **<0.001** | -0.314 **<0.001** |
| **CI** | | | | | | - | 0.533 **<0.001** | 0.981 **<0.001** | 0.754 **<0.001** | 0.762 **<0.001** | 0.445 **<0.001** | -0.568 **<0.001** | -0.266 **<0.001** |
| **BSI** | | | | | | | - | 0.663 **<0.001** | 0.335 **<0.001** | 0.250 **<0.001** | 0.151 **<0.001** | -0.183 **<0.001** | -0.010 0.727 |
| **AVI** | | | | | | | | - | 0.743 **<0.001** | 0.711 **<0.001** | 0.418 **<0.001** | -0.528 **<0.001** | -0.238 **<0.001** |
| **BAI** | | | | | | | | | - | 0.617 **<0.001** | 0.362 **<0.001** | -0.458 **<0.001** | -0.270 **<0.001** |
| **BIS1** | | | | | | | | | | - | 0.564 **<0.001** | 0.762 **<0.001** | -0.351 **<0.001** |
| **BIS2** | | | | | | | | | | | - | 0.106 **<0.001** | -0.089 **0.001** |
| **BS** | | | | | | | | | | | | - | 0.353 **<0.001** |
| **BAS** | | | | | | | | | | | | | - |

*BIS1: current body shape score, BIS2: ideal body shape score, BS: body satisfaction, BAS: body appreciation scale score, WC: waist circumference, NC: neck circumference, WHR: waist-hip ratio, WHtR: waist-height ratio, BMI: body mass index, CI: conicity index BSI: body shape index, AVI: abdominal volume index, BAI: body adiposity index*

The research findings show that an increase in indicators of abdominal adiposity (such as CI and BSI) raises body image scores and decreases body satisfaction and body appreciation scores; some relationships weaken when age and education variables were included (Table 5). Several studies have shown a negative correlation between higher levels of abdominal fat, increased BMI levels and lower body satisfaction (22,23). Given the potential relationship of age and educational level on these associations, interventions should consider age and educational background to ensure a more tailored approach. Anthropometric indicators are a measure of body fat distribution, and their impact on body image outcomes can differ from BMI; therefore, monitoring with multiple indicators can yield more accurate results.

Although BMI is widely used in both research and practice, it does not distinguish between fat and lean mass or capture fat distribution, which limits its ability to predict cardiometabolic risk and related health outcomes (18). Alternative measures such as waist circumference, waist-to-hip ratio, and body fat percentage have demonstrated superior associations with metabolic syndrome, cardiovascular disease, and all-cause mortality, independent of BMI (16,17). For example, central adiposity indicators are more strongly correlated with insulin resistance and atherogenic risk than BMI alone, suggesting that reliance on BMI may underestimate risk in individuals with high visceral fat but "normal" BMI (18). Therefore, emphasizing anthropometric indices derived from circumference-based measurements (such as CI, BSI, AVI, and BAI) beyond BMI not only enhances the clinical interpretation of body composition but also supports more targeted screening and intervention strategies in public health initiatives.

**Table 5.** Linear Regression Analysis of the Relationship Between Female's Anthropometric Indices and Body Image Scale, Body Satisfaction, and Body Appreciation Scale Scores (n=1291)

| Scale scores | BIS1 | | | | BIS2 | | | | BS | | | | BAS | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Indices** | **ß1** | **Beta** | **CI** | **t/p** | **ß1** | **Beta** | **CI** | **t/p** | **ß1** | **Beta** | **CI** | **t/p** | **ß1** | **Beta** | **CI** | **t/p** |
| **CI** | | | | | | | | | | | | | | | | |
| Model 1 | 0.284 | 0.762 | (272)-(297) | 42.197 **<0.001** | 0.108 | 0.445 | (0.096)-(0.120) | 17.843 **<0.001** | -0.176 | -0.568 | (-0.190)-(-0.162) | -24.763 **<0.001** | -0.494 | -0.266 | (-0.592)-(-0.396) | -9.901 **<0.001** |
| Model 2 | 0.003 | 0.026 | (-0.002)-(0.009) | 1.259 0.208 | 0.010 | 0.119 | (0.005)-(0.015) | 4.123 **<0.001** | -0.185 | -0.599 | (-0.202)-(-0.169) | -22.560 **<0.001** | 0.096 | 0.150 | (0.057)-(0.135) | 4.872 **<0.001** |
| Model 3 | 0.011 | 0.007 | (-0.047)-(0.068) | 0.358 0.720 | -0.044 | -0.047 | (-0.096)-(0.007) | -1.677 0.094 | -0.188 | -0.608 | (-0.205)-(-0.172) | -22.470 **<0.001** | 0.141 | 0.020 | (-0.283)-(0.566) | 0.653 0.514 |
| **BSI** | | | | | | | | | | | | | | | | |
| Model 1 | 5.473 | 0.250 | (4.316)-(6.630) | 9.280 **<0.001** | 2.157 | 0.151 | (1.387)-(2.926) | 5.497 **<0.001** | -3.316 | -0.183 | (-4.292)-(-2.340) | -6.666 **<0.001** | 1.061 | 0.010 | (-4.896)-(7.018) | 0.350 0.727 |
| Model 2 | 0.047 | 0.363 | (0.040)-(0.053) | 13.838 **<0.001** | 0.025 | 0.294 | (0.020)-(0.029) | 10.684 **<0.001** | -2.248 | -0.207 | (-3.245)-(-1.250) | -4.421 **<0.001** | -0.018 | -0.028 | (-0.054)-(0.019) | -0.955 0.340 |
| Model 3 | -0.182 | -0.126 | (-0.261)-(-0.104) | -4.551 **<0.001** | -0.108 | -0.115 | (-0.161)-(-0.054) | -3.929 **<0.001** | -2.168 | -0.119 | (-3.167)-(-1.169) | -4.257 **<0.001** | 0.623 | 0.087 | (0.188)-(1.058) | 2.811 **0.005** |
| **AVI** | | | | | | | | | | | | | | | | |
| Model 1 | 0.230 | 0.711 | (0.218)-(0.243) | 36.305 **<0.001** | 0.088 | 0.418 | (0.078)-(0.099) | 16.537 **<0.001** | -0.142 | -0.528 | (-0.154)-(-0.129) | -22.310 **<0.001** | -0.384 | -0.238 | (-0.469)-(-0.298) | -8.789 **<0.001** |
| Model 2 | 0.009 | 0.071 | (0.004)-(0.015) | 3.184 **0.001** | 0.012 | 0.141 | (0.007)-(0.017) | 4.900 **<0.001** | -0.145 | -0.540 | (-0.160)-(-0.131) | -19.849 **<0.001** | 0.080 | 0.125 | (0.041)-(0.119) | 4.048 **<0.001** |
| Model 3 | -0.008 | -0.005 | (-0.070)-(0.055) | -0.242 0.809 | -0.050 | -0.053 | (-0.102)-(0.002) | -1.883 0.060 | -0.147 | -0.548 | (-0.162)-(-0.133) | -19.710 **<0.001** | 0.197 | 0.027 | (-0.233)-(0.626) | 0.899 0.369 |
| **BAI** | | | | | | | | | | | | | | | | |
| Model 1 | 0.155 | 0.617 | (0.144)-(0.166) | 28.129 **<0.001** | 0.059 | 0.362 | (0.051)-(0.068) | 13.964 **<0.001** | -0.096 | -0.458 | (-0.106)-(-0.086) | -18.503 **<0.001** | -0.339 | -0.270 | (-0.405)-(-0.273) | -10.067 **<0.001** |
| Model 2 | 0.019 | 0.146 | (0.013)-(0.025) | 5.950 **<0.001** | 0.015 | 0.183 | (0.011)-(0.020) | 6.301 **<0.001** | -0.093 | -0.433 | (-0.104)-(-0.081) | -15.759 **<0.001** | 0.086 | 0.135 | (0.049)-(0.124) | 4.475 **<0.001** |
| Model 3 | -0.014 | -0.010 | (-0.084)-(0.056) | -0.402 0.688 | -0.055 | -0.058 | (-0.108)-(-0.001) | -1.997 **0.046** | -0.094 | -0.451 | (-0.106)-(-0.082) | -15.589 **<0.001** | 0.052 | 0.007 | (-0.377)-(0.480) | 0.813 |

*BIS1: current body shape score, BIS2: ideal body shape score, BS: body satisfaction, BAS: body appreciation scale score, CI: conicity index BSI: body shape index, AVI: abdominal volume index, BAI: body adiposity index*
*Simple and Multiple Linear Regression Analyses were used. Model 1: unadjusted; Model 2: age-adjusted; Model 3: Model 2 + education level adjusted*

## Conclusion and Recommendations

This study found that BMI, as well as newer anthropometric indices, including BSI, AVI, and BAI, were significantly associated with body image and body satisfaction. In particular, indices reflecting abdominal adiposity showed notable associations with body perception and body satisfaction. These findings suggest that, among females, perceptions of body weight may be accompanied by perceptions of body shape and abdominal fat distribution in relation to body satisfaction. However, given the cross-sectional design of the study, these associations should not be interpreted as evidence of causal relationships.

The findings may indicate that a broader perspective than weight-related measures alone could be relevant when considering body satisfaction and body image. From this perspective, future clinical and community-based research may consider anthropometric indices such as BSI, WHtR, and BAI alongside BMI when examining the relationships between adiposity-related characteristics and body image. In addition, approaches addressing weight-related stigma, body image, psychosocial well-being, and healthy lifestyle behaviors may warrant consideration in future intervention research. Further longitudinal and intervention studies are needed to determine whether changes in anthropometric characteristics are associated with subsequent changes in body image and body satisfaction and to evaluate the potential effectiveness of targeted strategies.

### *Limitations of the Study*

The study was limited to female participants aged 19-64. Therefore, the findings cannot be generalized to male individuals or different age groups. Due to the cross-sectional nature of the research, causal inferences cannot be made from the findings. The other limitation of this study is the use of snowball sampling for participant recruitment. While this approach facilitated access to

participants, it may have introduced selection bias by favouring individuals within similar social networks and with comparable characteristics. As reflected in the sample structure, this may limit the representativeness of the sample and, consequently, the generalisability of the findings. Therefore, the results should be interpreted with caution, and future studies are encouraged to employ more representative sampling methods to improve external validity.

### *Strengths*

The study was conducted with 1291 female participants and this large sample size enhances the statistical power of the findings and supports the reliability of the results. Given that females experience body image issues more frequently, the study's focus solely on females has allowed for an in-depth examination of a socially significant and sensitive topic. This study points to the need to consider more comprehensive anthropometric indices (e.g., BSI, BAI, CI, etc.) in relation to body image and body satisfaction, instead of relying solely on classical measures (e.g., BMI). These studies, which are few in number in the literature, contribute to a deeper understanding of the structural and biometric factors that shape body image. The findings can provide a basis for developing applied strategies in the fields of public health, psychology, and nutrition science. This research reveals that body image and body satisfaction are influenced not only by the classic indicator BMI, but also by newer anthropometric indices such as CI, BSI, AVI, and BAI.

The findings confirm that measures, particularly those addressing abdominal fat, show strong correlations with individuals' body image perceptions and satisfaction levels. These results suggest that female participants' of body shape and abdominal fat distribution, as well as their body weight, play a significant role in their body satisfaction. Research findings indicate that approaches focusing solely on weight loss are insufficient. Instead, it suggests a need to implement programs that strengthen individuals' body satisfaction, use communication methods that reduce weight-related stigma, and incorporate healthy lifestyle changes to prevent abdominal fat accumulation. In clinical and community-based interventions, considering indices such as BSI, CI, and BAI, instead of solely relying on BMI, can provide a more holistic assessment of body image and satisfaction. Healthcare professionals should not only focus on weight management for females with body dissatisfaction, but also provide psychosocial support and approaches aimed at improving body image. Public health programs should reduce stigma based on body weight and expand positive body image education.

## Declarations

### *Ethics Committee Approval*

Ethics approval for the study was obtained from the Non-Interventional Clinical Research Ethics Committee of Kırıkkale University (Date: 14.02.2024, Decision No: 2024.02.04).

### *Informed Consent*

Written and/or verbal informed consent was obtained from all participants. The Informed Voluntary Consent Form was signed.

### *Availability of Data and Material*

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

### *Peer-review*

Externally peer-reviewed.

### *Author Contributions*

Concept/Idea: S.E.D., A.B., A.D.; Design: S.E.D., A.B.,., A.D.; Supervision/Consultancy: A.B.,., S.E.D.; Analysis and/or Interpretation: A.B.,.; Literature Search: S.E.D., A.B.,., A.D.; Writing: S.E.D., A.B.,., A.D.; Critical Review: A.B.,., S.E.D.

### *Conflict of Interest*

The authors declare that they have no personal or financial conflicts of interest.

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## References

1. Shoraka H, Amirkafi A, Garrusi B. Review of body image and some of contributing factors in Iranian population. International Journal of Preventive Medicine. 2019;10(1).
2. Hosseini SA, Padhy RK. Body Image Distortion (Archived). Statpears Publishing; 2023. 1–30 p.
3. Farshidfar Z, Dastjerdi R, Shahabizadeh F. Acceptance of Cosmetic Surgery: Body Image, Self Esteem and Conformity. Procedia Soc Behav Sci. 2013;84:238–242.
4. Cevik E, Yanikkerem E. The factors affecting self-esteem, depression and body image of pregnant female in a state hospital in Turkey. J Pak Med Assoc. 2020; 70(7):1159–1164.
5. Alipour B, Abbasalizad Farhangi M, Dehghan P, Alipour M. Body image perception and its association with body mass index and nutrient intakes among female college students aged 18–35 years from Tabriz, Iran. Eating and Weight Disorders. 2015;20(4):465–471.
6. Weinberger NA, Kersting A, Riedel-Heller SG, Luck-Sikorski C. Body Dissatisfaction in Individuals with Obesity Compared to Normal-Weight Individuals: A Systematic Review and Meta-Analysis. Obes Facts. 2016;9(6):424.
7. Ergün C, Koc BM, Kaleoğlu S. 20-55 Yaş Arası Kadınların Beden Algılarının Değerlendirilmesi. IGUSABDER. 2022;18(18):892–906.
8. Grogan S. Body image: Understanding body dissatisfaction in men, female and children, third edition. Body Image: Understanding Body Dissatisfaction in Men, Female and Children, Third Edition . 2016;1–214.
9. Johnson-Munguia S, Doan AE, Sharma A, Thomeczek ML, Bowles B, Paul M, et al. "There aren't a lot of things that are made for Latinos": A qualitative investigation of factors that contribute to Latine female's positive and negative body image. Body Image. 2024;101802, 51.
10. Bujang MA, Omar ED, Baharum NA. A Review on Sample Size Determination for Cronbach's Alpha Test: A Simple Guide for Researchers. Malays J Med Sci. 2018;25(6):85.
11. Stunkard A, Sørensen T, Schulsinger F. Use of the Danish Adoption Register for the study of obesity and thinness. Res Publ Assoc Res Nerv Ment Dis. 1983; 60:115-120.
12. Tylka TL, Wood-Barcalow NL. The body appreciation scale-2: Item refinement and psychometric evaluation. Body Image. 2015.12(1):53–67.
13. Anlı G, Akın A, Eker H, Özçelik B. Bedeni Beğenme Ölçeği: Geçerlik ve Güvenirlik Çalışması. The Journal of Academic Social Science Studies. 2015;(36):505–511.
14. World Health Organization. Body mass index (BMI). Available from: https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/body-mass-index
15. World Health Organization. Waist Circumference and Waist–Hip Ratio. WHO Expert. 2011. 2025;64(1):2–5.
16. Hingorjo MR, Qureshi MA, Mehdi A. Neck circumference as a useful marker of obesity: a comparison with body mass index and waist circumference. J Pak Med Assoc. 2012; 62(1):36–40.
17. Ashwell M, Browning LM. The increasing importance of waist-to-height ratio to assess cardiometabolic risk: A plea for consistent terminology. Open Obesity Journal. 2011;3:70–77.
18. Demirel A, Toptaş MA, İl AS, Gök B, Gümüş AB. Beden Kütle İndeksinin Ötesindeki Antropometrik İndeksler ve Metabolik Parametreler ile İlişkisi. Beslenme ve Diyet Dergisi. 2024;52(1):110–116.
19. Schober P, Schwarte LA. Correlation coefficients: Appropriate use and interpretation. Anesth Analg. 2018;126(5):1763–1768.
20. Polat S, Işık Eİ, Nazik E, Arslan S. Evaluation of the anthropometric indices, posture, and body image of nursing students. Cukurova Medical Journal. 50(1):38–46.
21. Pelegrini A, Sacomori C, Santos MC, Sperandio FF, Cardoso FL. Body image perception in female: prevalence and association with anthropometric indicators. Revista Brasileira de Cineantropometria & Desempenho Humano. 2014;16(1):58–65.
22. Kilpela LS, Becker CB, Wesley N, Stewart T. Body Image in Adult Female: Moving Beyond the Younger Years. Adv Eat Disord. 2015; 3(2):144.
23. Bucchianeri MM, Arikian AJ, Hannan PJ, Eisenberg ME, Neumark-Sztainer D. Body Dissatisfaction from Adolescence to Young Adulthood: Findings from a 10-Year Longitudinal Study. Body Image. 2012;10(1).
24. Appelhans BM, Segawa E, Janssen I, Kazlauskaite R, Thurston RC, Lewis TT, et al. Employment status, depressive symptoms, and waist circumference change in midlife female: The Study of Female's Health Across the Nation (SWAN). Ann Epidemiol. 2013;24(3):187.
25. Jiotsa B, Naccache B, Duval M, Rocher B, Grall-Bronnec M. Social Media Use and Body Image Disorders: Association between Frequency of Comparing One's Own Physical Appearance to That of People Being Followed on Social Media and Body Dissatisfaction and Drive for Thinness. Int J Environ Res Public Health. 2021; 18(6):2880.
26. Khalaf A, Westergren A, Berggren V, Ekblom Ö, Al-Hazzaa HM. Perceived and Ideal Body Image in Young Female in South Western Saudi Arabia. J Obes. 2015:697163.
27. Kılıç S, Kabasakal Z. Yetişkin Kadınlarda Beden Algısı ve Yaşam Doyumu Arasındaki İlişkide Psikolojik Esnekliğin Rolü. Türk Dünyası Kadın Araştırmaları Dergisi. 2025;4(6):32–43.
28. Markey CN. Invited Commentary: Why Body Image is Important to Adolescent Development. J Youth Adolesc. 2010; 39(12):1387–1391.
29. de Morais MSM, Macêdo SGGF, Nascimento RA do, Vieira MCA, Moreira MA, da Câmara SMA, et al. Dissatisfaction with body image and weight gain in middle-aged female: A cross sectional study. PLoS One. 2024. 19(1):e0290380.
30. Raso V, Ewing C, Ii G, Mancini RB, Marcela S, Matsudo M. Body image in a representative sample of overweight, obese and normal weight active older female living in the community: associations with body composition, physical fitness and function. Medical Express. 2016;3(4):M160402.