Original Article

Psychometric properties of a silhouette scale on body image in adults

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Abstract:

Body image is a multifaceted construct involving several dimensions. It is socially defined and the way we feel about our own image influences various aspects of our lives. Dozens of scales have been developed to measure the perception of body image, however, they are made up of contoured images which represent bodies from the leanest to the fattest, not contemplating silhouettes with more apparent muscle mass. Thus, the aim of this study is to validate psychometric qualities of the silhouette scale proposed by Damasceno (2004) for measuring body image in adults. The sample consisted of 59 students of both genders from the Department of Physical Education in a University. Anthropometric measurements followed the recommendations of ISAK and in order to standardize the measurements the participants were asked: "What figure best represents your body?" (actual silhouette); "What figure represents the best the body you would like to have?" (ideal silhouette). The second visit occurred in an interval of 15 days after the first one and the same questions were then asked to them. The instrument's validity was calculated from the correlation coefficient with second-order polynomial adjustment of SA in relation to BMI ($r = 0.77$, $p = 0.001$) and G% ($r = 0.58$, $p = 0.001$). The Intraclass Correlation Coefficient (ICC) for the test and re-test of the Actual Silhouette (AS) and Ideal Silhouette (IS) were calculated for reliability, with values of 0.94 and 0.93, respectively. The effect size was also calculated, showing a trivial result for SA and small for SI. The presented instrument has good psychometric qualities and can generally be applied to the adult Brazilian population.

Keywords: -Reliability; Body ideal; Validity and reliability; validity of studies.

Introduction

Body image is a multifaceted construct characterized by its complex definition due to subjective aspects such as cognition, affective responses, behavioral traits, and perception (Cash & Smolak, 2011; Slade, 1994). These characteristics constantly interact among each other, restructuring the body image of the individual itself. Therefore, it is a continuous process which lasts for one's entire life and is developed by sociocultural aspects, interpersonal relationships, values, attitudes inherent to culture, and media influence (Banfield & McCabe, 2002; Cash & Smolak, 2011; Slade, 1994).

In addition, the way an individual perceives themselves influences behavior, relationships, and how we comprehend the world (Barros, 2005). It is common to find people who are unsatisfied with their body image, and this issue might be considered a risk factor since it is related to eating disorders, depression, and suicide (Adami et al., 2012; Tritschler & Barrow, 2000). Thus, body image perception and body dissatisfaction are measured by body size estimate techniques; one such technique is the silhouette scale which is simple, efficient, and feasible instrument (Cash & Smolak, 2011; Tritschler & Barrow, 2000). It is composed of frontal images of silhouettes which are ordered horizontally in a crescent way of silhouettes which vary from thin to fat or strong bodies (Figure 1). The instrument asks the individual which of the silhouettes represent their actual body, and which body the individual would like to have. The calculus of the difference between the actual body and the desired one is used to define body image dissatisfaction level (Ahmadi, Heyrani, & Yoosefy, 2018; Cash & Smolak, 2011; R. Gardner & Brown, 2010; R. M. Gardner, Jappe, & Gardner, 2009).

In fact, dozens of scales for different populations have been created and several were tested (Castro, Damasceno, Miranda, Lima, & Vianna, 2011; R. Gardner & Brown, 2010; R. M. Gardner et al., 2009; Hildebrandt, Langenbucher, & Schlundt, 2004; Kakeshita, 2008; Li, Hu, Ma, Wu, & Ma, 2005; Lima, Orlando, Teixeira, Castro, & Damasceno, 2008; Lønnebo et al., 2018; Peterson, Ellenberg, & Crossan, 2003; Stunkard, Sorensen, & Schulsinger, 1983; Yepes, Viswanathan, Bovet, & Maurer, 2015). R. Gardner and Brown (2010) assessed many of them in a review about perceptual scales. In Brazil, Kakeshita (2008) proposed a silhouette scale for children and adults, which is the only one that has been validated for the Brazilian

population. Nevertheless, the scale does not include muscular bodies, which are highly appreciated nowadays. Moreover, it seems that athletic bodies are preferred, being characterized by voluminous muscle mass (Damasceno, 2004; Damasceno et al., 2011; Lima et al., 2008; Pope, Olivardia, Gruber, & Borowiecki, 1999) mainly motivated by media with toys and advertisements selling the desire for sculptured bodies (Pope et al., 1999). Additionally, Voracek and Fisher (2002) analyzed anthropometric characteristics of women photographed in Playboy Magazine from its first publication to nowadays, showing a visible decrease in body mass index and waist-hip ratio.

In fact, according to the desired perfect body, Benkeser, Biritwum, and Hill (2012); Damasceno (2004); Damasceno et al. (2011); Damasceno et al. (2008) verified that females are the most affected. A thin body characterized by low weight is the most pursued by women, while large volumes of muscles and low body fat is the most wanted among men (Damasceno, 2004; Damasceno et al., 2011). Therefore, it is likely both genders want a more muscular body when compared to the ones they have (Damasceno et al., 2011). However, instruments which measure body image throughout several types of silhouettes including muscular, thin, and fat bodies are lacking in the literature (Hildebrandt et al., 2004). Scales which are concerned about muscle mass are included in studies by Damasceno et al. (2008); Lima et al. (2008), Castro et al. (2011), Gyory, Brandão, Agresta, and Rebutini (2003) and Pedretti, Neves, Silva, Toledo, and Lima (2003); however, none of them were validated. Thus, the aim of this study is to validate the psychometric qualities of the silhouette scale proposed by Damasceno (2004) and adapted by Pedretti et al. (2003) for measuring body image in adults (Figure 1).

Material & methods

Study design

This is a transversal study performed in two visits. The study was approved by the ethical committee and all participants signed the informed consent form. The study protocol was approved by the Human Research Ethics Committee (no. 1.140.803, CAAE - 1.140.803), Federal University of Pernambuco, Brazil. All the volunteers agreed to participate in the study, and parents/guardians also signed the written informed consent.

Participants

The sample consisted in 59 students of the Department of Physical Education in a University, 38 of them are men and 21 women (Table 1).

Table 1. Anthropometric characteristics of the participants

	Total (n=59)	Men (n=38)	Women (n=21)
	Mean ± SD	Mean ± SD	Mean ± SD
Age (years)	21.8 ± 2.7	21.8 ± 2.9	21.9 ± 2.5
Weight (Kg)	70.7 ± 13.5	75.5 ± 11.8	62.1 ± 12.3
Height (m)	1.69 ± 0.08	1.74 ± 0.06	1.62 ± 0.07
BMI (Kg·m ²)	24.5 ± 4.2	25.0 ± 3.7	23.6 ± 4.9
ΣSK (TR + MC) (mm)	30.5 ± 12.9	25.6 ± 10.1	39.5 ± 12.6

Legend: BMI - body mass index; ΣSK - skinfold sum; TR - triceps; MC - medial calf.

Procedure

In the first visit, all participants were oriented about the aim and procedures of the study and signed the consent term. Anthropometric measurements were then performed. In addition, in order to standardize the measurements the participants were asked: "What figure best represents your body?" (actual silhouette); "What figure best represents the body you would like to have?" (ideal silhouette). Next, the second visit occurred after an interval of 15 days from the first one and the same questions were asked to them.

Anthropometric measurements

Anthropometric measurements followed the recommendations of the International Society for Advancement of Kinanthropometry, International Conference (International Society for Advancement of Kinanthropometry, International Conference (8th: 2002: Manchester England), Reilly, & Marfell-Jones, 2003). Thus, weight, height, and skinfolds (triceps, medial gastrocnemius) were quantified. Materials used for the assessments were: electronic scale (Filizola, Brazil), measuring tape (Sanny, Brazil), and adipometer (Lange, USA). In addition, body mass index (BMI) was obtained by the formula weight/height². Criterion validity was determined as a result of the correlation between anthropometric characteristics and the silhouette scale.

Body image measurements

The silhouette scale created by Damasceno (2004) and adapted by Pedretti et al. (2003) is composed of 15 images. Its values vary from -7, which represents a silhouette with high levels of fat tissue, to +7

representing high levels of muscular mass. The scale also includes different bodies for men and women. The central silhouette, represented by the value of 0, denotes a thin body with lower muscle mass and body fat.

Statistical analysis

All analyses are presented in mean and standard deviation. Validity was measured by the correlation coefficient. Reliability was measured using intraclass correlation coefficient (ICC), effect size, and Wilcoxon test. Alpha level was estimated in 5%. Analyses were done by SPSS for Windows v. 20.

Results

Scale validity was calculated by correlation coefficient with polynomial adjustment between actual silhouette, BMI, and body fat% altogether and stratified by gender (Table 2).

Table 2. Correlation coefficient between silhouette, BMI, and body fat%.

Adjusted Polynomial Correlation (Quadratic)		Total (n=59)		Men (n=38)		Women (n=21)	
		BMI	$\sum SK$ (TR + MC)	BMI	$\sum SK$ (TR + MC)	BMI	$\sum SK$ (TR + MC)
Silhouette	r^2	0.69	0.45	0.49	0.31	0.79	0.59
	r	0.83	0.67	0.70	0.56	0.89	0.77
	p	0.01	0.01	0.001	0.01	0.001	0.01

Legend: $\sum SK$ – skinfold of sum; TR - triceps; MC - medial calf

Figure 2a and 2b depict the actual silhouette, BMI, and body fat%. As shown, BMI and body fat % present a U distribution; this means a reduction in BMI is observed as long as the silhouette scale values move from -7 to 0, following an increase when it moves from 0 to 7.

Legend: BMI – body mass index; SF – sum of skinfolds

Figure 2. a) distribution of actual silhouette and BMI. b) distribution of actual silhouette and body fat%.

The intraclass correlation coefficient (ICC) of the actual and ideal silhouette presented values of 0.94 and 0.93, respectively. Moreover, the effect size of the responses in the first visit related to the second was calculated. The results for the actual silhouette were considered trivial, whereas the desired silhouette was weak (Table 3).

Table 3. Reliability measurements for actual silhouette and desired silhouette (n=59).

	ICC	ES	Classification
Actual silhouette _(moment 1) – Actual silhouette _(moment 2)	0.94	0.03	S
Ideal silhouette _(moment 1) – Ideal silhouette _(moment 2)	0.93	0.05	S

ICC = intraclass correlation coefficient; ES = effect size; S = Small.

Figure 3 confirms that the scale presents reliability. The actual silhouette yielded a standard error of 0.08 ± 1.3 , whereas the ideal silhouette presented -0.1 ± 0.9 .

Figure 3. (a) Bland Altman for the difference in the Actual silhouette (moment 1) – Actual silhouette (moment 2); (b) Bland Altman for the difference in the ideal silhouette (moment 1) – Actual silhouette (moment 2).

In addition, body image measurements were compared by the Wilcoxon test. The analyses showed no differences between the first and second moments for actual silhouette ($z=-0.459$; $p=0.659$) and ideal silhouette ($z=-0.819$; $p=0.413$) (Table 4).

Table 4: Median and interquartile interval between moment 1 and 2 for actual silhouette and ideal silhouette ($n=59$).

	Moment 1		Moment 2		Wilcoxon test
	Median	Q1 — Q3	Median	Q1 — Q3	z ; p
Actual silhouette	0	-2 — 2	1	-2 — 2	-0.459; $p=0.659$
Ideal silhouette	3	2 — 4	4	2 — 4	-0.819; $p=0.413$

Discussion

The results showed a correlation between anthropometric measurements with the silhouette scale proposed by Damasceno (2004), indicating good construct validity. Therefore, the instrument interprets how well the participants perceive themselves; thus, the silhouette scale is a valid instrument for measuring body image in the adult population.

A correlation coefficient with quadratic adjustment was used to report the results due to the scale presenting a “U” correlation with variables such as BMI. This occurred because BMI increases on the extremities of the scale since one extremity is related to increased body fat index and the opposite to augmented lean mass index; therefore, linear regression is inappropriate since the slope would be insufficient to demonstrate tendency. Another study by your research group found the same behavior of a correlation between BMI and AS (Damasceno et al., 2011).

The scale presented reasonable results according to validity. Even though body image is a dynamic variable, participants maintained the same or really close perceptions of actual and desired silhouette within 15 ± 5 days of interval between measurements. Furthermore, in a review conducted by R. Gardner and Brown (2010), scale validity for the adult population presented lower values when compared to this study, however with only one exception for the scale of Stunkard et al. (1983) which yielded a correlation of 0.99. However, regarding reliability, the scale presented values of 0.81 for actual and 0.92 for desired silhouette. The only scale which presented higher reliability values than the present study was created by Tucker et al.; nevertheless, the scale is only for men, and presented values of 0.94 and 0.96 for actual and desired silhouette, respectively. In addition, Kakeshita (2008) validated a body image scale in the Brazilian population using the Pearson correlation ($r=0.93$, $p<0.05$) in which the reliability of the scale was also measured ($r=0.79$). Their findings show good psychometrics results; however, it does not consider muscular bodies.

Thus, in considering the values presented, the scale proposed by Damasceno (2004) reports similar values when compared with those related in the literature. However, it is important to emphasize that the proposed scale includes both bodies with high adiposity levels as well as those with increased muscle mass. Therefore, the scale attends to the ideal body present in society nowadays, especially in the young population. The instrument is also feasible and might be easily used in gyms and other locations where body image is important to measure.

Conclusions

The body image scale yielded good psychometric qualities and could be applied to the adult population. The scale also not only enables measurements for bodies with high levels of fat, but also for increased muscle mass.

Conflicts of interest –The authors do not have any conflicts of interest to declare.

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