

# Development and validation of instruments measuring body image and body weight dissatisfaction in South African mothers and their daughters

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## Abstract

**Objective:** We sought to validate questionnaires concerning body image perception, body size dissatisfaction and weight-related beliefs in multi-ethnic South African mothers and their daughters.

**Settings and subjects:** Girls attending primary school (ages 9–12 years,  $n = 333$ ) and their mothers ( $n = 204$ ) were interviewed regarding their demographics and body image. Weight, height and skinfold thicknesses were measured. Body image questions and body mass index (BMI) were compared with silhouettes adapted from the Pathways Study for girls and Stunkard's body image figures for mothers. A Feel–Ideal Difference (FID) index score was created by subtracting the score of the silhouette selected by the participants as 'Ideal' from the one selected as most closely representing their current appearance or 'Feel'. We hypothesised that a higher FID index score would be associated with greater body size dissatisfaction.

**Results:** BMI percentiles in girls ( $r = 0.46$ ,  $P < 0.05$ ) and BMI in mothers ( $r = 0.68$ ,  $P < 0.05$ ) were positively correlated with the selected silhouettes based on size. Participants who reported feelings of being 'fat' and those who perceived that their family and friends were more dissatisfied with their body size had significantly higher FID index scores. Scores were lower in black than white girls (all  $P < 0.05$ ). No differences were found in FID index scores between ethnic groups of mothers. Internal reliability of the 'thin' and 'fat' belief constructs for girls was demonstrated by standardised Cronbach's  $\alpha$  values  $\geq 0.7$ .

**Conclusion:** Silhouettes, FID index, 'fat' and 'thin' belief constructs (in girls) are age-appropriate, culturally sensitive and can be used in further intervention studies to understand body image.

**Keywords**  
Overweight  
Obesity  
Body image  
Black women  
Ethnicity  
Children

Overweight and obesity are becoming global problems, with significance in countries undergoing epidemiological transition such as South Africa<sup>1–3</sup>. Overweight in adulthood is defined as the deviation in body weight above some standard of acceptable weight relative to height (body mass index (BMI) =  $25.0\text{--}29.9\text{ kg m}^{-2}$ ), while obesity refers to excessively high body weight in relation to height (BMI  $\geq 30\text{ kg m}^{-2}$ )<sup>4,5</sup>. In South Africa, more than 56% of urban women and 29% of urban men are either overweight or obese<sup>6</sup>. The group at greatest risk are black urban women, 62% of whom are overweight and obese, compared with white urban women, in whom the prevalence is lower at 53%<sup>6</sup>. Overwhelming evidence links

overweight and obesity to the development of chronic non-communicable disease such as type 2 diabetes mellitus, cardiovascular diseases, hypertension, dyslipidaemia, gallbladder diseases, sleep apnoea and certain types of cancers<sup>7–10</sup>. As a result, prevention and management of obesity have become part of a major international public health focus, with strategies depending to a large degree on acquiring an understanding of the underlying causes<sup>11–13</sup>.

South African and other international studies suggest that body image may be an important factor associated with increased prevalence of obesity<sup>14–18</sup>. It has been shown that ethnic differences in the prevalence of obesity

amongst women may be partly related to differences in body image<sup>14,17,19,20</sup>. Body image differences are manifested by the way women see their bodies (perceptual body image)<sup>17,21</sup> and also how they feel about their bodies (attitudinal body image)<sup>14,19,20</sup>. Therefore, body image may affect their response to weight changes and attitudes towards weight control<sup>20</sup>.

Evidence for the influence of factors such as culture and ethnicity on body image and body size dissatisfaction has been found in studies of African American and Caucasian American women. The results of these studies show that Caucasian American women experience more body size dissatisfaction and higher body image discrepancy levels, even when they are not overweight (BMI < 25 kg m<sup>-2</sup>), than do African American women after controlling for age, education, socio-economic status and body weight<sup>18,22–25</sup>. Additionally, Cash *et al.* found that black college women had body size ideals that were larger and more congruent with their current body weight compared with white college women<sup>16</sup>. In these studies it has also been suggested that African American women generally have higher tolerances of bigger body size, such that they are more likely to associate obesity with attractiveness than are their Caucasian counterparts when age, education and body weight are controlled<sup>22,25</sup>.

Similar body image acceptance has been observed in developing countries, such that, in certain traditions and cultures, obesity is portrayed as a sign of wealth, beauty and fertility<sup>26,27</sup>. For example, the high prevalence of obesity observed in the Pacific Islands (Nauru and Tahiti), which is 20% greater than in the USA, may be partially attributed to the use of rituals designed to fatten women, as they still regard obese women as sexually attractive, high-spirited, beautiful and fertile<sup>28</sup>. Similarly, there is a cultural preference for obesity among the traditional Saudi Arabian community, who consider it as a sign of beauty, good health and wealth<sup>29</sup>. As a result, women from these cultural groups have less dissatisfaction with their bodies than women from Westernised communities<sup>27,29</sup>.

The above studies are consistent with previous work undertaken in small samples of South African women, in which body image differences were found to be highly driven by cultural norms<sup>19,22,30</sup>, urbanisation<sup>10,31</sup> and socio-economic status<sup>30</sup>. In South Africa, a larger body size has many positive connotations in black rural communities and in some groups of urban black women, as a bigger body size is associated with affluence, health, attractiveness and happiness, as well as being taken as an indication that someone is not HIV-positive<sup>30,32</sup>. In a recent study of South African female college students, those from urban backgrounds were found to have greater body size dissatisfaction and were more likely to have attempted weight reduction compared with those from rural backgrounds<sup>31</sup>.

Although cultural and ethnic differences in body image have been investigated previously in South African

populations, few studies have provided evidence of cultural sensitivity and equivalence of the various instruments used to measure these constructs. To understand differences in body image constructs within different ethnic groups, a culturally sensitive and age-appropriate questionnaire is required<sup>33</sup>. The aims of our study, therefore, were to develop (adapting existing instruments to suit the multi-ethnic community of South African women) and validate (determine their cultural sensitivity) instruments for assessing body image constructs<sup>34</sup> in South African women and preadolescent schoolgirls.

## Methods and procedures

### Research design

This validation study was undertaken as part of a larger project in which diet, physical activity, knowledge, attitudes, beliefs and health behaviours in South African women and their daughters were evaluated, the results of which will be presented elsewhere.

### Subjects

Fifteen primary schools in the Cape Town Metropole Area were randomly selected and sampled on the basis of divergent socio-economic status, with ethical approval obtained from the Western Cape Department of Education as well as the UCT Research Ethics Committee. All girls (ages 9–12 years, grades 4–5) and their mothers were invited to take part in the study. Girls were given informed consent forms to be signed by their parents or caregivers. Thirty per cent of girls interviewed were from schools within the highest socio-economic stratum, 49% from the middle socio-economic stratum and 21% from the lowest. The final sample comprised black (32%), mixed ancestry (34%) and white (34%) girls. Of the 61% ( $n = 204$ ) of mothers who responded, 31% were black, 37% were of mixed ancestry and 32% were white. All participants completed informed consent forms.

### Tanner self-staging

To control for the potential confounding effects of diverging stages in sexual maturation on body weight, body fatness and body image, girls were also asked to estimate their pubertal stage using diagrammatic sketches of Tanner's classifications of breast development and pubic hair growth<sup>35</sup>. They were asked to select line drawings of breast developmental stage and pubic hair growth stage that most closely resembled their own bodies. They did this individually with privacy ensured by the interviewer. Of the 372 girls who participated, 89% were found to be in Tanner Stages 1 and 2, 7% were in Stages 3 and 4, and 4% could not correctly identify their stages of development. Therefore, only girls who were in Tanner Stages 1 and 2, and who returned to school with the signed consent forms ( $n = 333$ ), were included in the final analysis.

### **Anthropometry**

Body weight was assessed in light clothing, without shoes, and recorded to the nearest 0.5 kg using a calibrated electronic scale (TANITA HD 309). Height was measured without shoes to the nearest 0.5 cm using a calibrated height meter. BMI ( $\text{kg m}^{-2}$ ) was calculated as weight (in kg) divided by the square of height (in m) for the mothers, and for girls World Health Organization (WHO) BMI percentiles were determined. Triceps, biceps, subscapular and suprailiac skinfold thicknesses were measured using calibrated Harpenden callipers, and recorded to the nearest 0.1 mm. Percentage body fat was calculated using standard equations derived by Durmin and Womersley for mothers and Lohman for schoolgirls<sup>36,37</sup>. Additionally, body fat centralisation was determined based on the subscapular/triceps (s/t) ratio for both mothers and daughters<sup>38</sup>.

### **Questionnaire development and validation methods**

Two questionnaires, one for mothers and one for daughters, examining body image perception, body size dissatisfaction and body shape concerns (using the 34-item Body Shape Questionnaire (BSQ))<sup>39</sup>, as well as weight-related beliefs and attitudes, were adapted and modified from the American Indian Pathways Study for girls<sup>33</sup> and questions derived from focus groups in black women from the Cape Town Metropole Area<sup>32</sup> for both mothers and daughters. The constructs measured by each instrument are detailed in Table 1, as is the process for determining construct validity (comparing similar questions seeking the same response within the same construct or questionnaire) and concurrent validity (comparison of different constructs seeking the same response). Additionally, the questionnaires characterised sociodemographic factors such as age, ethnicity and employment status, level of education, household density (number of people residing in the same household, sleeping in the same household for at least 5 days a week) and asset index (total number of appliances in the household).

For girls, a set of eight silhouettes from the Pathways Study<sup>33</sup> (Fig. 1a) was redrawn and modified to represent ethnic diversity in South Africa, with permission obtained. These changes did not affect the original body sizes and shapes. Stunkard's body image figures<sup>40</sup> (eight silhouettes) were used for mothers (Fig. 1b). These silhouettes were allocated numbers 1 to 8 from left to right and the numbers were used for comparison analyses.

### **Body image perception**

Each participant was shown the respective silhouettes and was required to select the number of a silhouette that she felt best represented her current weight. The silhouette selected indicated how she saw herself ('*Feel*'). The selected silhouette was compared with the actual BMI (for mothers) or the actual WHO BMI percentile (for girls), using Spearman's correlation coefficients. The silhouettes were also compared with the actual body fat percentage

and the ratio of body fat centralisation for both mothers and daughters using Pearson product-moment correlation. In addition, each participant was asked to select whether she saw herself as being thin, normal weight or overweight. Finally, participants were asked to choose the silhouettes that they thought were thin, normal-weight or fat.

### **Body size dissatisfaction**

To assess body image attitudes, Feel-Ideal Difference (FID) index scores<sup>19</sup> were calculated using a procedure similar to the Body Image Discrepancy scores created in the studies of Bulik *et al.* and Fitzgibbon *et al.* for assessing body size dissatisfaction<sup>15,18</sup>. The FID index scores were created by determining the difference in the number of the silhouette selected that best represented their current appearance ('*Feel*') and the one they thought was their '*Ideal*' (the silhouettes they would want to look like). Subsequently, the body size dissatisfaction of girls and of mothers was also determined based on questions modified from focus groups in black women from the Cape Town Metropole Area<sup>32</sup>. The modified questions included asking participants whether they ever considered themselves to be 'thin' or 'fat'. In addition, they were asked how their families, friends, partners and children perceived their body size. Responses to these questions were compared with the FID index scores, to determine construct validity. Furthermore, the FID index scores were compared with BSQ scores to determine concurrent validity (in mothers only).

### **Weight-related belief constructs**

For both mothers and daughters, written constructs asking whether a 'thin' or 'fat' woman or girl would feel better about herself, feel more like a woman or girl, be happier, have more friends and be healthier, were modified from questions adapted from focus groups in black women from the Cape Town Metropole Area<sup>32</sup>. These constructs determined the 'thin' and 'fat' belief constructs. Internal reliability of these constructs was measured using item analysis by means of Cronbach's  $\alpha$ .

### **Statistical analysis**

For continuous variables, data are expressed as mean  $\pm$  standard deviation. Pearson product-moment correlations as well as multivariate regression analysis were used to determine factors associated with scores, and also to describe relationships between continuous variables. Spearman's rank-order correlations were used similarly for ordinal data. In addition, two-way analyses of variance were used to compare FID index scores and morphological characteristics between and across different main effects. These main effects included ethnicity and dichotomous categories based on, for example, whether or not the girl or her mother considered herself to be 'fat' (yes or no). For variables where overall differences were found, Scheffe's *post hoc* test was used to evaluate

**Table 1** Body image constructs and validation procedure

Construct	Validation procedure	
	Girls	Mothers
<b>1. Perceptual body image:</b> questions about the way participants see their body size status	Silhouette representing a participant's current weight ' <i>Feel</i> ' (selection done from the adapted American Indian Pathways silhouettes) <i>compared with</i> body fat percentage as well as WHO BMI percentile Locally adapted body weight status questions from the focus groups in black women from Cape Town Metropole Area about perpetual body image. The participants' response percentages are plotted against ethnicity	Silhouette representing a participant's current weight ' <i>Feel</i> ' (selection done from the Stunkard body image figures) <i>compared with</i> body fat percentage as well as BMI Locally adapted body weight status questions from the focus groups in black women from Cape Town Metropole Area about perpetual body image. The participants' response percentages are plotted against ethnicity
	Non-parametric (Spearman's) rank-order correlation, chi-square tests	Pearson product-moment correlation and chi-square tests
<b>2. Attitudinal body image:</b> questions about the way participants feel about their body size status (body size dissatisfaction)	FID index score <i>compared with</i> locally adapted questions about the girls' body weight status from the focus groups in black women from Cape Town Two-way analysis of variance as well as Pearson product-moment correlation	FID index score <i>compared with</i> locally adapted questions about the women's body weight status from the focus groups in black women from Cape Town FID index score <i>compared with</i> BSQ score
<b>3. Weight-related constructs:</b> questions about attitudes towards thinness and fatness	'Thin' and 'fat' belief constructs derived from locally adapted weight-related belief questions about a thin or fat girl being unhappy Internal consistency/item analysis: testing for internal reliability of the scales using Cronbach's $\alpha$	'Thin' and 'fat' belief constructs derived from locally adapted weight-related belief questions about a thin or fat woman being unhappy

WHO – World Health Organization; BMI – body mass index; FID – Feel-Ideal Difference; BSQ – Body Shape Questionnaire.

between-group differences. Where appropriate, we adjusted for the effect of socio-economic status, asset index and employment status, as the majority of the black participants were unemployed or on disability grants compared with the other groups, who were employed and/or self-employed. Chi-square analysis was used to determine ethnic differences in the silhouettes most frequently selected to represent a 'thin', 'normal' or 'fat' body type. In addition, item analysis was conducted to evaluate the internal consistency of the constructs of 'fat belief' and 'thin belief', and a series of attributes associated with being fat or thin.

## Results

### *Participants' anthropometry and demographic characteristics*

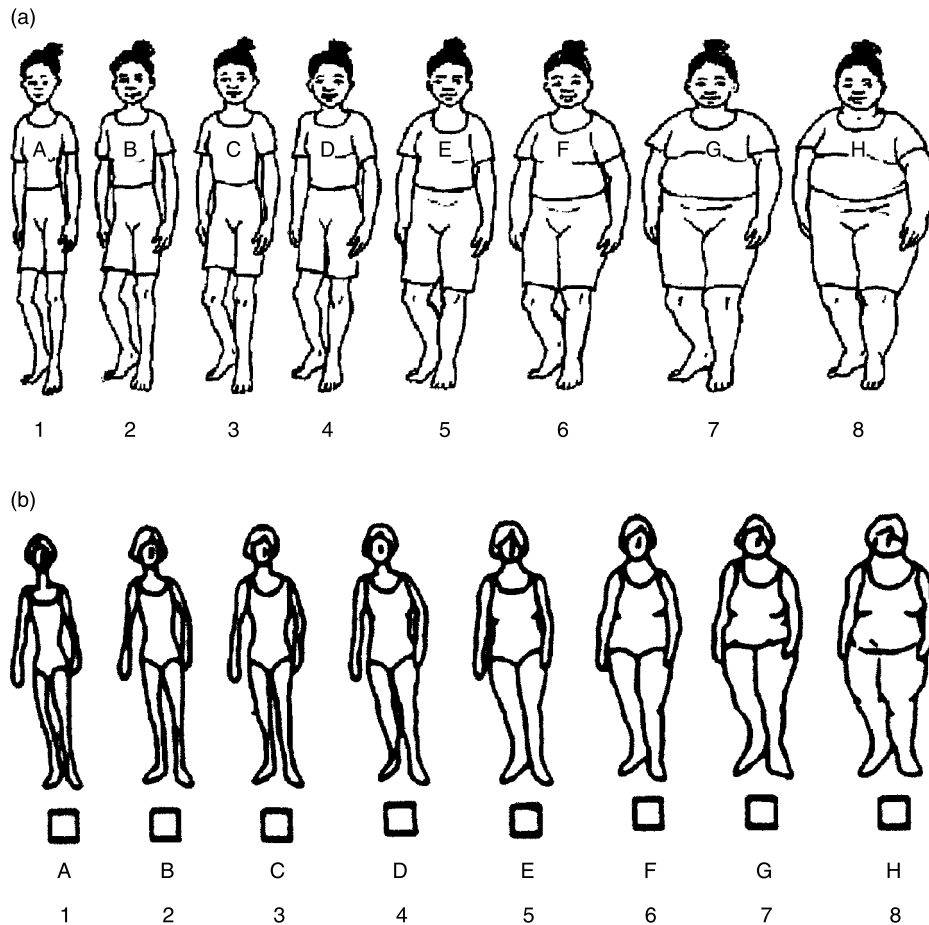
Black girls were found to be significantly older than girls of mixed ancestry and white girls, whereas white girls were found to be significantly heavier, in terms of BMI percentile, than girls from the other ethnic groups. Girls of mixed ancestry were found to have significantly greater body fat centralisation compared with other white girls. Conversely, white mothers were significantly older, taller and had greater body fat centralisation compared with the other white girls of mothers. On the other hand, black mothers were significantly heavier in terms of BMI and body fat percentage, than the mothers of mixed ancestry and white mothers (Table 2).

Compared with the other ethnic groups, black mothers had a significantly lower socio-economic status based on household density, as well as asset index. Moreover, more black mothers had education levels less than the Matric than had mothers of mixed ancestry as well as white mothers. Fewer black mothers were employed compared with mothers of mixed ancestry and white mothers (Table 3).

### *Body image perception*

Despite a similar proportion of girls as well as their mothers from different ethnic groups being equally happy with their weight, white girls as well as their mothers were significantly more inclined to consider themselves fat than were the black girls and their mothers. In addition, the mean BMI of black mothers who considered themselves to be fat was significantly higher than in the other ethnic groups of women who also considered themselves fat (Table 4).

A positive correlation was found between the girls' actual body fat percentage, body fat centralisation and WHO BMI percentile when compared with the silhouettes they selected as representing the way they saw themselves ('*Feel*':  $r = 0.43$ ,  $r = 0.41$  and  $r = 0.46$ , respectively; all  $P < 0.05$ ). There was also a positive correlation between their BMI percentile and their FID index score ( $r = 0.46$ ,  $P < 0.05$ ). For the mothers, there was a positive correlation between actual body fat percentage, body fat centralisation



**Fig. 1** Sets of eight silhouettes designed for use by (a) the girls and (b) the mothers. In both cases, body size is arranged in an increasing order from left to right

and BMI when compared with the silhouettes they selected as representing the way they saw themselves (*Feel*:  $r = 0.13$ ,  $r = 0.53$  and  $r = 0.68$ , respectively; all  $P < 0.05$ ). A significant positive correlation between BMI and FID index score of the mothers was also found.

As far as ethnic differences in perceptual body image are concerned, it was found that the majority of girls and their mothers recognised the first silhouette as the 'thin' girl or woman. Furthermore, participants of mixed ancestry and white participants largely recognised the fourth silhouette from the left as 'normal' in weight, whereas the majority of black participants recognised the bigger size, the fifth silhouette from the left, as 'normal' in weight. Thus, a significant difference (in selecting the 'normal'-weight silhouette) was observed between the three ethnic groups of mothers and daughters. Moreover, most participants selected the seventh or eighth silhouette from the left as the 'fat' girl or woman. There were no significant differences in the silhouettes chosen as 'fat' by the three ethnic groups of girls, whereas a significant difference was found between the three ethnic groups of mothers ( $P < 0.001$ ). A greater proportion of white mothers recognised even silhouettes 5, 6 and 7 as 'fat' compared with the other groups of mothers.

### **Body size dissatisfaction**

Table 5 presents the girls' mean FID index scores for perception of their own body size, as well as their perception of what their family and friends think about their body size.

The main effect of ethnicity was significant for the FID index score in the girls. White girls had significantly greater FID index scores or increased body size dissatisfaction irrespective of whether or not they considered themselves 'thin' or 'fat'. In addition, compared with black girls, white girls significantly perceived that their family and friends were more dissatisfied with their body size regardless of whether they were 'thin' or 'fat'.

Table 6 presents the mothers' mean FID index scores for perception of their own body size, as well as their perception of what their partners, friends and children think about their body size.

The main effect of ethnicity was not significant for FID index score in the mothers. All three groups of mothers had similar FID index scores irrespective of whether or not they considered themselves to be 'thin' or 'fat'. In addition, the three groups of mothers had similar perception of what their partners, friends and children thought about their body size.

**Table 2** Characteristics (mean  $\pm$  standard deviation) of participants in the Cape Town body image study

	Mothers (n = 204)			
	Girls (n = 333)		Boys (n = 333)	
	Black (n = 105)	White (n = 114)	Black (n = 63)	White (n = 65)
Age (months)	130 $\pm$ 11.1*	126 $\pm$ 9.5	40 $\pm$ 10.7	42 $\pm$ 4.6**
Weight (kg)	39 $\pm$ 10.6	39 $\pm$ 9.4	84 $\pm$ 22.2	69 $\pm$ 10.8*
Height (m)	1.42 $\pm$ 7.4	1.41 $\pm$ 10.7	1.57 $\pm$ 0.1	1.64 $\pm$ 0.1*
BMI percentile	57 $\pm$ 31.1†	61 $\pm$ 28.3	34 $\pm$ 7.8	25 $\pm$ 4.1*
Percentage body fat	24 $\pm$ 4.9	25 $\pm$ 4.8	34 $\pm$ 6.3*	32 $\pm$ 4.9*
Body fat centralisation (s/t)	0.41 $\pm$ 0.1	0.39 $\pm$ 0.1**	0.041 $\pm$ 0.02	0.050 $\pm$ 0.02†
				P-value
				0.001
				NS
				NS
				0.05
				NS
				0.02

BMI – body mass index; s/t – ratio of subscapular/triceps skinfold thicknesses; NS – not significant.

P-value – analysis of variance for ethnic differences for mothers and daughters.

Post hoc analysis results (all  $P < 0.05$ ): \*significant difference found between black and mixed ancestry as well as white groups; \*\*significant difference found between white and mixed ancestry groups; †significant difference found between black and white groups.

Table 7 presents relationships between actual BMI, BSQ scores and FID index scores of mothers. No ethnic differences were found in the BSQ scores of the mothers. A positive relationship was found between their actual BMI when compared with their BSQ score, as well as a positive relationship between the FID index score and the BSQ score in the mothers.

To control for potential confounding effects of socio-economic status and BMI on FID index score, household density, asset index and actual BMI (in mothers only) were adjusted for, using analysis of covariance and multiple linear regression. The results indicate that body size dissatisfaction was unaffected by socio-economic status, BMI or education level of a participant.

### Weight-related belief constructs

Table 8 presents the results of the ‘fat’ and ‘thin’ belief constructs, which were found to be internally reliable for girls (all  $P$ -values  $< 0.001$ ). However, the ‘thin belief’ and the ‘fat belief’ constructs were not as internally reliable for the mothers.

Furthermore, Table 9 presents results indicating that there were no differences between the three ethnic groups of participants with regard to the attributes associated with thinness. However, black girls and their mothers were significantly less likely to associate fatness with being unhappy.

### Discussion

In this study, we sought to develop and validate instruments to explore body image constructs, one for South African women and the other for their daughters. We demonstrated that written constructs and visual images (silhouettes) yield comparable results (show construct and concurrent validity) in terms of body image, and that the constructs reflecting attributes of fatness and thinness can be used in culturally diverse groups of South African women and their daughters of primary school age. These findings are similar to those previously described in groups of black, Hispanic, Indian and white American men, women and children in which body image and body shape differences have been evaluated<sup>15,18,33</sup>.

The silhouettes were found to provide a rapid and accessible means to understand the perceptual body image in South African women and their daughters. We also determined the extent to which these silhouettes corresponded to the participants’ (mothers and their primary school-aged daughters) actual body size. We found that the silhouettes selected for ‘Feel’ by both mothers and their daughters correlated with their body size (actual BMI or BMI percentile, body fat percentage as well as body fat centralisation). Moreover, the perceptual body image in these participants was not affected by culture, and participants recognised larger and smaller body sizes in themselves. These results are in agreement

**Table 3** Sociodemographic characteristics (mean  $\pm$  standard deviation or %) of mothers ( $n = 204$ ) in the Cape Town body image study

	Black ( $n = 63$ )	Mixed ancestry ( $n = 76$ )	White ( $n = 65$ )	<i>P</i> -value
Household density	1.9 $\pm$ 1.3*	0.8 $\pm$ 0.3	0.6 $\pm$ 0.2	<0.001
Total number of appliances in the house	5.4 $\pm$ 2.2*	8.5 $\pm$ 0.8	8.8 $\pm$ 0.5	<0.001
Education level less than a Matric (%)	54‡	5	1	<0.001
Employed (%)	36‡	63	72	<0.001

*P*-value – analysis of variance for ethnic differences for mothers.

*Post hoc* analysis results (all  $P < 0.05$ ): \*significant difference found between black and white, as well as between black and mixed ancestry, groups; ‡significant difference found between all ethnic groups.

with the studies of Bulik *et al.* and Stunkard *et al.* in which figural stimuli were correctly chosen to reflect current BMI in a sample of white American men and women<sup>15,40</sup>.

Despite the association between BMI levels and silhouettes found in this study, the results also demonstrated certain ethnic and cultural differences in attitudinal body image. The presence of ethnic and cultural differences in identifying a 'fat' body size status indicates the sensitivity of our constructs in highlighting body image concerns in the participants. For example, the actual mean BMI of black mothers who thought they were fat was higher compared with white mothers. These findings are consistent with those of Fitzgibbon *et al.*, in which African American women were found to perceive themselves as overweight at higher mean BMI levels (30 kg m<sup>-2</sup>) than their Caucasian counterparts (<25 kg m<sup>-2</sup>). Additionally, a greater proportion of black mothers and their daughters generally selected larger silhouettes as having 'normal weight' compared with their white counterparts, suggesting a preference for larger body size in the black women<sup>18</sup>. Moreover, black girls and their mothers were less likely to see themselves as overweight, despite the fact that black girls were smaller while their mothers were larger, than those from other ethnic groups. Thus, it would appear as if there are still greater tolerances for increased body size in the South African black African community.

The silhouettes also provide a useful and sensitive measure to identify body size dissatisfaction in women through the derived FID index scores<sup>15,18,41</sup>, in that values approaching zero reflect less body size dissatisfaction, while values greater than zero reflect more body size dissatisfaction. In our study, the FID index scores were found to be above zero for the participants regardless of whether they saw themselves as 'thin' or 'fat'. When the FID index scores were compared with the written constructs regarding attitudinal perception of thinness and fatness, it was found that the direction of body size dissatisfaction was similar for both FID index and constructs regarding thinness and fatness across the three ethnic groups of participants. Moreover, those participants who scored above 129 on the BSQ were described as having high scores exhibiting body size dissatisfaction<sup>19</sup>. Furthermore, the positive relationship found between BSQ scores and FID index scores in our

study clearly suggests that FID index is valid as an instrument to determine body size dissatisfaction in South African women.

Interestingly, the body size dissatisfaction (as reflected by FID index as well as BSQ) in our study was unaffected by ethnicity in mothers; however, there were ethnic differences in the FID index in girls. Black girls had lower FID index scores than their white counterparts. These findings are similar to those of a South African study previously undertaken in adolescent schoolgirls<sup>19</sup> in which black girls were found to exhibit less body image concerns and body image dissatisfaction compared with their white counterparts. In our study, the lower body size dissatisfaction in black girls may be explained by the fact that black girls were smaller in terms of BMI percentile and body fat percentage than the white girls, suggesting that body size dissatisfaction is affected by a person's body size status. However, ethnic differences in social and cultural acceptance of a larger body size cannot be discounted.

Other international studies have found that body image concerns might be perpetuated by additional sources of influence. These sources of influence may be regarded as social acceptability, that allow black and traditional women to feel attractive and satisfied with their appearance compared with Westernised and white women, even when they have larger body size<sup>18,26,41</sup>. These additional sources of influence were also observed in our own study, where black girls perceived less body size dissatisfaction from their family and friends with their body size regardless of whether they were 'thin' or 'fat' compared with the other groups.

Furthermore, white girls in our study were larger in terms of body fat percentage and BMI percentile than their black counterparts, and had greater body size dissatisfaction, whereas their mothers were thinner in terms of body fat percentage and BMI than their black counterparts, but still had greater body size dissatisfaction similar to their daughters. This may suggest that bigger body size early in life is associated with greater body size dissatisfaction, and may thereby promote the adoption of thinner body size by these young women later in life. Indeed, Schwartz and Puhl found that the onset of obesity at an early age increases the durability of poor body image followed by weight loss later in life<sup>11</sup>. Perhaps these differences in

**Table 4** Participants who responded by saying 'yes' on questions about feelings on perceptual body image in the Cape Town body image study (%) and their BMI (mean  $\pm$  standard deviation)

	Girls (n = 333)			Mothers (n = 204)			P-value
	Black (n = 58)	Mixed ancestry (n = 65)	White (n = 67)	Black (n = 43)	Mixed ancestry (n = 60)	White (n = 53)	
Happy feelings about body weight (%)	65	65	65	89	87	88	NS
Girls who thought they were fat (%)	17*	13	21	38†	65	64	<0.02
Calculated mean BMI (kg m <sup>-2</sup> ) of girls who thought they were fat	65 $\pm$ 30.4	67 $\pm$ 29.2	70 $\pm$ 23.2	35 $\pm$ 6.8*	27 $\pm$ 4.5	25 $\pm$ 4.0	<0.001

BMI – body mass index; NS – not significant.

P-value – chi-square test and analysis of variance for ethnic differences for mothers and daughters.

Post hoc analysis results (all  $P < 0.05$ ): \*significant difference found between black and white as well as mixed ancestry groups; † significant difference found between black and white groups.

body size dissatisfaction among different ethnic groups may explain differences in obesity prevalence between black and white South African women.

Finally, our study has shown the reliability of written constructs regarding attributes given to thin and fat women and girls. The constructs were found to be reliable as instruments measuring attitudinal body image in girls, but not in their mothers. Other studies have also shown that questions generating negative thinking about body size status are inappropriate in certain age groups and cultures<sup>26,28,30,32,33,41</sup>. While still using these 'thin' and 'fat' belief constructs, we also found that fewer black women and their daughters perceived a fat woman or a girl to be unhappy compared with either their mixed ancestry or white counterparts<sup>32</sup>.

In summary, we have derived a set of validated instruments measuring body image in mothers and their daughters in a cross-cultural setting. The instruments include visual images, which are sets of age-adjusted silhouettes, equivalent in capturing perceptual body image by showing a general recognition of a larger or a smaller body size by preadolescent daughters and their mothers of varying BMI levels. The FID index scores also derived from the silhouettes are useful in highlighting the attitudinal body image by showing the direction of dissatisfaction with body size in urban women of different ethnic groups and ages. Moreover, the FID index scores also highlight the perception of family and friends on women of different cultures and age groups about their body size status, regardless of whether they regard themselves as 'thin' or 'fat'. Furthermore, written constructs in the form of 'fat' and 'thin' beliefs are also satisfactory in evaluating attitudinal body image in South African girls.

In conclusion, we have reached our primary objective of finding construct validity as well as concurrent validity of two instruments measuring perceptual and attitudinal body image, one for mothers and one for their daughters. These instruments are culturally sensitive in multi-ethnic groups of South African women. These instruments can be used in future intervention studies and in cross-cultural research settings as they provide information about the relationships between body image and obesity. Furthermore, they can be used to identify behaviours that need to be corrected in order for South African women to adopt healthier lifestyles. These instruments appear in different forms. As visual images they seek ordinal response, reduce respondent burden, can be used without supervision (self-administered) and also trigger interest in the respondent. As written constructs, they seek nominal response, may increase the respondent's concentration burden and thus need of supervision, but they are also rapid.

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**Table 5** FID index scores (mean ± standard deviation) compared with thoughts of being ‘thin’ or ‘fat’ for girls in the Cape Town body image study

FID index compared with	Response	Black		Mixed ancestry		White		P-value main effect
		n	FID index	n	FID index	n	FID index	
Girl reported she thought she was thin	No	51	0.6 ± 2.0	51	0.7 ± 1.1	55	1.3 ± 1.2	Et (0.006)
	Yes	38	-0.6 ± 1.9†	60	0.2 ± 1.4	54	0.3 ± 1.3	Re (0.001)
Girl reported she thought she was fat	No	39	-0.2 ± 2.1	46	0.2 ± 1.1	42	0.3 ± 1.3	Et (0.03)
	Yes	50	0.3 ± 2.0†	65	0.5 ± 1.4	67	0.9 ± 1.4	Re (0.01)
Family has told her that she was thin	No	57	-0.2 ± 2.5	48	0.2 ± 1.3	27	0.4 ± 1.1	Et (0.0002)
	Yes	31	-0.9 ± 2.4†	62	-0.1 ± 1.3	79	0.5 ± 1.4	Re (0.06)
Family has told her that she was fat	No	41	-0.7 ± 2.6	82	0.0 ± 1.3	87	0.4 ± 1.2	Et (0.00004)
	Yes	47	-0.2 ± 2.4†	28	0.3 ± 1.2	19	1.3 ± 1.6	Re (0.01)
Friends have told her that she was thin	No	57	0.2 ± 1.8	53	0.5 ± 1.4	27	1.1 ± 1.5	Et (0.003)
	Yes	30	-0.3 ± 2.3†	57	0.1 ± 1.6	75	0.6 ± 1.3	Re (0.001)
Friends have told her that she was fat	No	48	0.2 ± 2.2	87	0.2 ± 1.6	91	0.3 ± 1.3	Et (0.0009)
	Yes	39	0.1 ± 1.7†	23	0.9 ± 1.3	11	2.0 ± 1.3	Re (0.01)

FID – Feel–Ideal Difference.

P-value main effect – two-way analysis of variance; Et = ethnic difference, Re = response difference.

No interaction significant difference found between ethnicity and the ‘yes’ or ‘no’ response.

Post hoc analysis results (all P < 0.05): †significant difference found between black and white groups.

**Table 6** FID index scores (mean ± standard deviation) compared with thoughts of being ‘thin’ or ‘fat’ for mothers in the Cape Town body image study

FID index compared with	Response	Black		Mixed ancestry		White		P-value main effect
		n	FID index	n	FID index	n	FID index	
Mother reported she thought she was thin	No	38	1.8 ± 2.3	49	1.4 ± 1.1	45	1.4 ± 1.1	Et (0.95)
	Yes	22	0.2 ± 1.7	26	0.7 ± 1.6	20	0.8 ± 0.9	Re (0.00004)
Mother reported she thought she was fat	No	19	1.2 ± 1.3	15	1.1 ± 1.5	11	0.6 ± 0.7	Et (0.86)
	Yes	41	1.7 ± 2.4	60	1.5 ± 1.2	54	1.4 ± 1.1	Re (0.00001)
Partner has told her that she was thin	No	37	1.5 ± 2.1	49	1.4 ± 1.4	41	1.4 ± 1.3	Et (0.51)
	Yes	14	1.1 ± 2.7	21	0.5 ± 1.0	20	0.7 ± 1.1	Re (0.02)
Partner has told her she was fat	No	18	0.9 ± 2.4	41	0.8 ± 1.4	35	0.8 ± 1.0	Et (0.92)
	Yes	33	1.6 ± 2.2	29	1.6 ± 1.1	26	1.7 ± 1.4	Re (0.0008)
Friends have told her that she was thin	No	46	1.4 ± 2.3	28	1.8 ± 1.3	28	1.6 ± 1.2	Et (0.92)
	Yes	14	0.7 ± 2.2	45	0.6 ± 1.3	33	0.6 ± 0.9	Re (0.0001)
Friends have told her that she was fat	No	18	0.8 ± 2.3	46	0.9 ± 1.6	45	0.9 ± 1.1	Et (0.99)
	Yes	42	1.5 ± 2.3	27	1.3 ± 1.1	16	1.4 ± 1.3	Re (0.05)
Children have told her that she was thin	No	49	2.0 ± 2.6	50	1.3 ± 1.5	38	1.3 ± 1.2	Et (0.87)
	Yes	11	0.5 ± 2.3	25	0.8 ± 1.4	26	0.7 ± 1.0	Re (0.003)
Children have told her that she was fat	No	20	1.0 ± 3.1	30	0.4 ± 1.6	37	0.8 ± 1.1	Et (0.23)
	Yes	40	2.1 ± 2.2	45	1.6 ± 1.1	27	1.4 ± 1.2	Re (0.0002)

FID – Feel–Ideal Difference.

P-value main effect – two-way analysis of variance; Et = ethnic difference, Re = response difference.

No interaction significant difference found between ethnicity and the ‘yes’ or ‘no’ response.

**Table 7** BMI values and construct scores (mean ± standard deviation), and their correlation (Pearson product–moment coefficient, r), for mothers (n = 204) in the Cape Town body image study

	Ethnicity			P-value	Relationship	Correlation	
	Black (n = 63)	Mixed ancestry (n = 76)	White (n = 65)			r	P-value
BMI (kg m <sup>-2</sup> )	34 ± 7.8	27 ± 4.7	25 ± 4.1*	0.05	BMI against FID index	0.54	0.05
FID index score	1.22 ± 2.2	1.19 ± 1.3	1.22 ± 1.1	NS	BMI against BSQ	0.27	0.05
BSQ score	80.8 ± 34.9	81.7 ± 28.1	86.7 ± 24.1	NS	FID index against BSQ	0.29	0.05

BMI – body mass index; FID – Feel–Ideal Difference; BSQ – Body Shape Questionnaire.

Post hoc analysis (P < 0.05): \*significant difference found between black vs. white.

**Table 8** Reliability/inter-item analysis of 'thin' and 'fat' belief constructs

Construct	Girls				Mothers			
	Number of questions	Mean inter-item correlation	Cronbach's $\alpha$	Standardised $\alpha$	Number of questions	Mean inter-item correlation	Cronbach's $\alpha$	Standardised $\alpha$
'Fat' belief	5	0.39	0.8*	0.8	3	0.16	0.4†	0.7
'Thin' belief	5	0.29	0.7*	0.7	5	0.17	0.4†	0.5

\* Cronbach's  $\alpha$  greater than or equal to 0.7 shows reliability.

† Cronbach's  $\alpha$  less than 0.7 not reliable.

**Table 9** Percentages of participants who responded 'yes' in the 'thin' and 'fat' belief constructs in the Cape Town body image study

	Girls (n = 333)				Mothers (n = 204)				
	Black (n = 58)	Mixed ancestry (n = 65)	White (n = 67)	P-value	Black (n = 43)	Mixed ancestry (n = 60)	White (n = 53)	P-value	
Girls who thought a thin girl was going to be unhappy (%)	80	95	95	NS	Mothers who thought a thin mother was going to be unhappy (%)	44	44	44	NS
Girls who thought a fat girl was going to be unhappy (%)	84*	98	100	<0.001	Mothers who thought a fat mother was going to be unhappy (%)	42*	82	90	<0.001

P-value – chi-square test of ethnic differences for mothers and daughters.

Post hoc analysis results (all  $P < 0.05$ ): \*significant difference found between black and white as well as the mixed ancestry groups.

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