

The association between the body mass index of first-year female university students and their weight-related perceptions and practices, psychological health, physical activity and other physical health indicators

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Abstract

Objective: To investigate the association between the weight status of first-year female students (FYFS) and various weight management-related characteristics to identify possible components of a weight management programme for students.

Design: Cross-sectional study.

Setting: Female residences at a South African university.

Subjects: A total of 360 FYFS.

Results: Mean (\pm standard deviation (SD)) body mass index (BMI) of the FYFS was $21.8 \pm 2.6 \text{ kg m}^{-2}$, with 7.2% being underweight, 81.9% normal-weight, 10.0% overweight and 0.8% obese. Underweight, normal-weight and overweight students differed with regard to their perception of their weight ($P < 0.001$), weight goals ($P < 0.001$) and previous weight-loss practices ($P < 0.001$). Mean \pm SD score on the 26-item Eating Attitudes Test (EAT-26) was 8.5 ± 9.0 with 8.4% classified as high scorers. Mean \pm SD score on the 34-item Body Shape Questionnaire (BSQ) was 87.7 ± 32.2 , with 76.1% classified as low, 11.9% as medium and 11.9% as high scorers. The self-concept questionnaire indicated that 36.7% had a high, 43.9% a medium and 19.4% a low self-concept. Higher BMI correlated with a higher BSQ score ($P < 0.001$), a lower self-concept ($P = 0.029$) and a higher EAT-26 score ($P < 0.001$). Smoking was prevalent amongst 13.1% of students, and 51.2% used vitamin and/or mineral supplements. Students who quitted smoking had higher ($P = 0.006$) BMI ($22.7 \pm 2.9 \text{ kg m}^{-2}$) than those who never smoked before ($21.6 \pm 2.5 \text{ kg m}^{-2}$). Normal-weight students were more physically active than underweight or overweight students ($P = 0.038$).

Conclusions: The specific weight management-related needs of FYFS include information about supplement use, smoking, realistic weight goals, safe and sound weight-loss methods, weight cycling, body-shape perceptions, eating attitudes and behaviours, self-concept and physical activity. Interventions aimed at correcting these problems should target all students, regardless of their BMI.

Keywords
 Female students
 Body mass index
 Weight goals
 Weight-loss practices
 Weight perception
 Eating attitudes
 Self-concept
 Body shape
 Physical activity
 Weight management

The health of students studying at tertiary educational institutions (e.g. college or university) is a matter of increasing concern^{1,2}. The transition from high school to a tertiary institution is known to be an especially problematic stage in adult development³ and has been found to be associated with a decrease in self-concept^{4,5}, psychological distress^{3,6}, depression and anxiety². The transition implies that students have to adapt to a new social, academic and psychological environment in which they are now suddenly free to make their own decisions. In order to adapt and find a way of becoming accepted or popular with their peer group, young women become increasingly concerned about maintaining an attractive

and culturally acceptable body shape^{4,7}. To reach their often unrealistically low weight goals, many female students engage in regular dieting behaviours^{5,7–10} which are often unsound and extreme, such as self-induced vomiting, crash diets, fasting, diet pills and laxatives^{5,11–13}. Chronic dieting is furthermore related to the development of abnormal eating attitudes, concerns about body image, a decrease in self-concept and psychological well-being, and an increase in eating disorders, which have all been noted among female students^{14–17}. However, despite this intense focus on thinness and weight reduction, obesity is increasing among all age groups in both developed and developing

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countries^{18,19}. Obesity, in combination with other lifestyle factors such as smoking and inactivity, which are behaviours that have been noted among female students^{2,9,11,20}, could increase the risk of the development of chronic diseases of lifestyle (CDL)^{19,21}. It is clear that female students are a high-risk group for the development of a wide range of weight-related problems and that they do not seem to have the necessary weight management skills to address these problems. Early intervention to ensure proper weight management practices is therefore essential to prevent weight gain and obesity and to reduce other lifestyle-associated risk factors for CDL development. However, for effective intervention planning it is important to obtain a clear picture of the association between weight status, health and lifestyle indicators, weight management practices and related psychological parameters of the target group. The aim of the present research was to investigate these relationships among a group of first-year female students (FYFS) at a South African university.

Methods

Study design and sample

This paper is based on the baseline (cross-sectional) data of FYFS participating in a weight-management intervention trial. Seven (FYFS: $n = 509$) of 12 (FYFS: $n = 883$) eligible residences exclusively for female students on the campus of a South African university were selected by the researchers. Random sampling was not a feasible option as it would have resulted in contamination of the control group with the intervention. As students are randomly assigned to a residence by the university's administration, no differences in baseline variables between the FYFS from the different residences were expected. After an information session, students had the opportunity to volunteer for participation. Voluntary participation in a study that involves anthropometric assessment could cause a bias towards students who do not have weight-related problems. This needs to be considered in the interpretation of the results. The final sample included $n = 360$ students. Permission to conduct the research was obtained from the Faculty of Science Ethical Committee of the University of Stellenbosch and each volunteer signed a consent form.

Anthropometric measurements

Two standardised fieldworkers took all measurements using the techniques described by Lee and Nieman²². Weight was measured in light clothing without shoes to the nearest 0.1 kg using a calibrated electronic scale (model BW-150; You-We Scales). Height without shoes was measured to the nearest 0.1 cm with a stadiometer. Body mass index (BMI)²³ was computed as weight in kilograms divided by the square of height in metres and categorised according to the World Health Organization guidelines¹⁹:

BMI $< 18.5 \text{ kg m}^{-2}$, underweight; BMI = $18.5\text{--}24.9 \text{ kg m}^{-2}$, normal; BMI = $25.0\text{--}29.9 \text{ kg m}^{-2}$, overweight; BMI $\geq 30.0 \text{ kg m}^{-2}$, obese. The triceps skinfold thickness was taken to the nearest 0.2 mm using a calibrated Harpenden calliper. The percentiles (for females aged 18.0–24.9 years) published by Frisancho²⁴ were used to classify triceps skinfold thickness into five categories: ≤ 5 th percentile, low fat content; > 5 th and ≤ 15 th percentile, below average; > 15 th and ≤ 85 th percentile, average; > 85 th and ≤ 95 th percentile, above average; > 95 th percentile, high fat content. Although it is generally not recommended that single-site measurements be used to estimate percentage body fat, Lee and Nieman²² maintain that triceps skinfold thickness, which is the most commonly used single-site skinfold measurement to assess body composition, could be used cautiously as an index of subcutaneous adipose tissue or fat stores if compared with existing reference data. Waist circumference (WC) was measured to the nearest 0.1 cm using a non-stretchable measuring tape and categorised as low risk (< 80 cm), increased risk (80.0–87.9 cm) or substantial risk (≥ 88 cm) for the development of CDL^{19,25}.

Blood pressure

Blood pressure was measured using a Microlife™ BP 3BA0 Automatic Blood Pressure Monitor. Normal blood pressure was defined as a systolic blood pressure (SBP) < 130 mmHg and a diastolic blood pressure (DBP) < 85 mmHg²⁶.

Physical activity

The self-administered 16-item Baecke Questionnaire of Habitual Physical Activity, developed by Baecke *et al.*, was used to measure three components of physical activity: physical activity at work (work index), sport during leisure time (sport index) and physical activity during leisure time excluding sport (leisure-time index)²⁷. The questionnaire was developed, calibrated and tested for reliability using men and women between the ages of 20 and 32 years in The Netherlands²⁷. Validation studies showed significant relationships between the Baecke physical activity indices and other physical activity questionnaires^{28–30}, energy intake^{28,30}, maximum oxygen uptake ($\text{VO}_{2\text{max}}$), percentage body fat, Caltrac readings and activity diaries^{31–33}. The mean scores of each index were computed and compared between the students in the different BMI categories.

Body shape

The self-administered 34-item Body Shape Questionnaire (BSQ) developed by Cooper *et al.* to measure concerns with body weight and shape was used³⁴. High scores can be associated with probable cases of bulimia nervosa, women who are concerned about weight and shape, a greater dissatisfaction with body shape, and patients with an eating disorder³⁴. Definite cut-off points for high

scorers have not been published. For the purposes of the present research a score of ≥ 129 was used to identify high scorers based on the mean scores found for probable cases of bulimia nervosa (129.3 ± 17.0)³⁴, body image therapy patients (129.9 ± 29.0) and obese dieters (123.1 ± 27.9)³⁵. A lower cut-off point of < 112 based on $129 - 17$ (standard deviation for probable bulimia nervosa cases) identifies low scorers who are probably satisfied with their bodies. These cut-off points were previously used for a student sample¹⁰.

Eating attitudes

The 26-item Eating Attitudes Test (EAT-26) developed by Garner *et al.*, which may be used as a screening test for eating disturbances and anorexia nervosa in non-clinical situations, was used to assess eating attitudes and behaviour^{36–39}. The cut-off point of ≥ 21 to identify high scorers, which is reported to be associated with the highest sensitivity and specificity in unselected groups in the general population⁴⁰, was used in this research. A high score should be interpreted as indicative of experiencing abnormal eating patterns^{37,41}.

Self-concept

The 100-item Adolescent Self-Concept Scale (ASCS) developed by Vrey and Venter was used to measure self-concept⁴². The scale is based on the Tennessee Self-Concept Scale developed by Fitts⁴³, but specifically adapted for South Africans. The ASCS has been used for black South African female university students¹⁰. The cut-off points suggested by Vrey and Venter were used to classify students with a high self-concept (> 78), a medium self-concept ($63–78$) and a low self-concept (< 63)⁴².

Additional questions

Additional questions were included to obtain descriptive sociodemographic and health information including birth date, whether in school the previous year, accommodation the previous year, medication use, chronic diseases or illnesses, and present and past smoking habits. Questions regarding perception of current weight, weight-loss practices over the past two years and at present, dissatisfaction with different body parts and present weight goals were also included.

Statistical analysis

Data were analysed using SPSS computer software (SPSS/PC, Version 11.0, 2003)⁴⁴. Continuous variables were tested for normality using the Kolmogorov–Smirnov and Shapiro–Wilk tests. Means and standard deviations (SD) were computed for continuous variables and frequencies were tallied for categorical variables. To determine the differences between the BMI categories for the responses to categorical variables, cross-tabulations were constructed with BMI category as classification variable. The Pearson's chi-square statistic was used to test

for significant differences in group profiles. To determine the difference in the mean \pm SD BMI of the response categories for each categorical variable, the independent samples *t*-test was used in the case of two response categories and one-way analysis of variance (ANOVA) followed by the Bonferroni *post hoc* test in the case of three or more response categories. The mean \pm SD scores for each of the three indices of the Baecke questionnaire were compared between the three BMI categories using one-way ANOVA followed by the Bonferroni *post hoc* test. The correlations between the BSQ, EAT-26 and ASCS scores and BMI were determined using Pearson's correlation coefficient.

Results

Sociodemographic information

The mean \pm SD age of the students was 18.6 ± 0.4 years. Most were in school (94.2%) and stayed with their parents (80.3%) the year before entering university and were Afrikaans-speaking (80.8%). The self-reported prevalence of chronic diseases and other conditions was 0.3% for coronary heart disease, 0.6% for high blood pressure, 0.6% for diabetes mellitus, 1.7% for high blood cholesterol, 6.7% for constipation, 0.8% for anorexia nervosa and 0.8% for bulimia nervosa. Half used vitamin and/or mineral supplements (51.2%) and 14.2% indicated that they used oral contraceptives.

Smoking habits

At the time of the survey, 13.1% ($n = 47$) of the students smoked a mean of 7.84 ± 5.67 cigarettes per day. Of those students who did not smoke, 13.1% ($n = 41$) indicated that they had smoked previously but stopped 14.0 ± 12.9 months ago. These students had a significantly higher ($P = 0.006$) BMI ($n = 41$; mean \pm SD: $22.7 \pm 2.9 \text{ kg m}^{-2}$) than the students who did not smoke at the time of the survey or had never smoked before ($n = 272$; mean \pm SD: $21.6 \pm 2.5 \text{ kg m}^{-2}$).

Anthropometric measurements and blood pressure

Mean BMI, WC, triceps skinfold thickness, SBP and DBP fell within the normal range of their respective categories (Table 1). The WC indicates that very few students had an increased risk for the development of CDL due to increased android fat deposits. Triceps skinfold thickness indicates that the majority of students had an average body fat content. Blood pressure results indicate that hypertension was not prevalent.

Weight-related perceptions and practices

Although only 10% of the students were actually overweight or obese, Table 2 indicates that more than a third thought that they were overweight, only 15.8% were satisfied with their weight and more than half had tried to lose weight during the two years preceding the study.

Table 1 Mean \pm SD and distribution according to categories of anthropometric measurements and BP of FYFS ($n = 360$)

Measurement	Mean \pm SD	Cut-off points	Interpretation	%
Weight (kg)	60.4 \pm 8.5	–	–	–
Height (m)	1.665 \pm 0.06	–	–	–
BMI (kg m ⁻²)	21.8 \pm 2.6	< 18.5	Underweight	7.2
		18.5–24.9	Normal	81.9
		25.0–29.9	Overweight	10.0
		\geq 30.0	Obese 1	0.8
WC (cm)	69.8 \pm 6.3	< 80	Ideal	93.1
		80.0–87.9	Increased risk	5.3
		\geq 88	Substantial risk	1.7
Triceps skinfold thickness (mm)	19.5 \pm 5.8	\leq 5th	Low fat content	1.1
		> 5th but \leq 15th	Below average	8.9
		> 15th but \leq 85th	Average	72.5
		> 85th but \leq 95th	Above average	16.4
		> 95th	High fat content	1.1
SBP (mmHg)	101 \pm 10.7	< 130	Normal	98.3
		\geq 130	High	1.7
DBP (mmHg)	60 \pm 8.7	< 85	Normal	98.1
		\geq 85	High	1.9

SD – standard deviation; BP – blood pressure; FYFS – first-year female students; BMI – body mass index; WC – waist circumference; SBP – systolic blood pressure; DBP – diastolic blood pressure.

A significantly higher mean BMI was found for students who perceived their current weight as overweight, had weight-loss goals, had been on a weight-reduction diet, attempted to lose weight in the preceding two years and had regained the weight. The results also clearly show that the higher the mean BMI, the less satisfied the students were with their weight.

Underweight, normal-weight and overweight students differed significantly with regard to their perception of their weight, their weight goals and their previous weight-loss practices. Underweight students mostly perceived their weight as normal, were satisfied with their weight and had not tried to lose weight previously, although almost a third still wanted to lose 1–3 kg. Although

Table 2 Weight-related perceptions and practices of FYFS, mean \pm SD BMI for response categories and association with BMI categories

	Frequency		BMI (kg m ⁻²)		Column % of actual BMI category by weight-related perceptions and practices			Pearson chi-square P -value
	n	%	Mean \pm SD	P -value	Underweight (%)	Normal (%)	Overweight (%)	
Perception of current weight								
Underweight	5	1.4	19.1 \pm 2.6 ^a	< 0.001*	11.5	0.7	0	< 0.001
Normal	221	61.4	20.8 \pm 1.9 ^a		88.5	67.0	7.7	
Overweight	130	36.1	23.6 \pm 2.6 ^b		0	32.3	92.3	
Weight goals								
Satisfied	57	15.8	19.3 \pm 1.5 ^a	< 0.001*	61.5	13.7	2.6	< 0.001
Lose 1–3 kg	161	44.7	21.2 \pm 1.8 ^b		26.9	51.2	10.3	
Lose \geq 4 kg	136	37.8	23.7 \pm 2.5 ^c		0	34.8	87.2	
Weight gain	4	1.1	17.5 \pm 1.1 ^a		11.5	0.3	0	
Currently on weight-reduction diet								
Yes	14	3.9	23.8 \pm 2.0	0.001†	0	3.8	7.7	0.279
No	343	95.3	21.7 \pm 2.6		100	96.2	92.3	
Tried to lose weight past 2 years								
Yes	199	55.3	22.5 \pm 2.3	< 0.001†	19.2	56.5	71.8	< 0.001
No	160	44.4	20.9 \pm 2.7		80.8	43.5	28.2	
Tried to lose weight and...								
Did lose weight	167	87.0	22.6 \pm 2.3	0.721†	80.0	87.4	85.7	0.868
Did not lose weight	25	13.0	22.4 \pm 2.3		20.0	12.6	14.3	
Did lose weight and...								
Maintained new weight	68	41.0	22.0 \pm 2.1	0.002†	50.0	42.8	26.1	0.298
Gained weight back	98	59.0	23.0 \pm 2.4		50.0	57.2	73.9	

FYFS – first-year female students; SD – standard deviation; BMI – body mass index.

* One-way analysis of variance, means with unlike superscript letters differ significantly using Bonferroni *post hoc* test.

† Independent samples *t*-test.

two-thirds of normal-weight students perceived their weight as normal, most wanted to lose weight and had tried to lose weight previously. Overweight students were significantly more inclined to be realistic about their perception of their weight and their weight goals. They were most inclined and the underweight students least inclined to have attempted weight reduction during the two years preceding the study. Underweight, normal-weight and overweight students seemed to be equally successful in achieving weight loss. However, the students who were unable to maintain the weight loss had a higher mean BMI than those who did maintain the weight loss.

Psychological health

The mean BSQ score fell in the low BSQ score category (Table 3) and only 11.9% were classified as high scorers. The mean BMI of the low scorers was significantly lower than that of the medium or high scorers. Furthermore, overweight students were significantly more inclined to have a high score than underweight students. Students were mostly dissatisfied with the shape and size of their stomach, buttocks and thighs, while just less than half were also dissatisfied with their middle and hips (Table 4). Students who were dissatisfied with a particular body part had a significantly higher mean BMI than those who were satisfied with all body parts except for the calves. This is also reflected in the significant differences in dissatisfaction with body parts between the three BMI categories, with underweight students being the least dissatisfied with their different body parts and overweight students the most.

The mean score of the ASCS fell into the medium self-concept category (Table 3). Students with a low self-concept had a significantly higher mean BMI than students with a high self-concept. The mean EAT-26 score fell within the normal EAT-26 score category. The few high scorers had a significantly higher mean BMI than students

with normal EAT-26 scores. Significant correlations indicate that a higher BMI is associated with a higher BSQ score, a lower ASCS score and a higher EAT-26 score (Table 3).

Physical activity

Students with a normal BMI had a significantly higher score for the sport index, indicating more regular participation in physical activity, than underweight or overweight students (Table 5). At the time of the study, just more than a quarter of the students (27.2%) did not participate in any physical activity which forms part of the sport index (data not presented in the table).

Discussion

The sociodemographic and health indicators characterise the study population as a healthy group of young females with a low self-reported prevalence of CDL and a low use of chronic medication. The actual blood pressure and WC data support the self-reported data. Despite these general indicators of good health, half of the students indicated that they used vitamin or mineral supplements. Similar figures have been reported by others for university student populations^{45,46}. Education on the use of supplements, specifically when the use of supplements may be necessary, should be addressed. Smoking prevalence (13.1%) was lower than what has been reported for other female student populations^{2,47,48}. The students who indicated that they did smoke before entering university but were not currently smoking had higher mean BMI. This supports the findings of Janzon *et al.* that, in comparison with non-smokers and smokers, quitters gained more weight over a period of 9 years⁴⁹. Besides the known negative health outcomes of smoking, in young women it has also been associated with concerns about gaining weight^{50–52}, dieting behaviours⁵¹ including

Table 3 Mean \pm SD BSQ, ASCS and EAT-26 scores of FYFS, classification according to diagnostic categories, mean \pm SD BMI for diagnostic categories, association with BMI categories and correlation with BMI

	Mean \pm SD score	Classification of questionnaire score according to category				Actual BMI (kg m^{-2})		Column % of BMI category by questionnaire categories			Pearson correlation with BMI		
		Categories	<i>n</i>	%	Mean \pm SD	<i>P</i> -value	Underweight (%)	Normal (%)	Overweight (%)	Pearson chi-square <i>P</i> -value	<i>r</i>	<i>P</i> -value	
BSQ	87.7 \pm 32.2	< 112	Low	274	76.1	21.4 \pm 2.5 ^a	<0.001*	92.3	77.3	56.4	0.011	0.413	<0.001
		112–128	Medium	43	11.9	23.1 \pm 2.5 ^b		0	11.5	23.1			
		> 128	High	43	11.9	23.1 \pm 2.8 ^b		7.7	11.2	20.5			
ASCS	72.0 \pm 12.6	< 63	Low	70	19.4	22.4 \pm 3.0 ^a	0.031*	15.4	18.3	30.8	0.273	–0.115	0.029
		63–78	Medium	158	43.9	21.9 \pm 2.6 ^{a,b}		38.5	44.4	43.6			
		> 78	High	132	36.7	21.4 \pm 2.3 ^b		46.2	37.3	25.6			
EAT-26	8.5 \pm 9.0	< 21	Normal	329	91.6	21.7 \pm 2.6	0.025†	88.5	92.5	87.2	0.438	0.255	<0.001
		\geq 21	High	30	8.4	22.8 \pm 2.7		11.5	7.5	12.8			

SD – standard deviation; BSQ – 34-item Body Shape Questionnaire; ASCS – 100-item Adolescent Self-Concept Scale; EAT-26 – 26-item Eating Attitudes Test; FYFS – first-year female students; BMI – body mass index.

* One-way analysis of variance, means with unlike superscript letters differ significantly using Bonferroni *post hoc* test.

† Independent samples *t*-test.

Table 4 Dissatisfaction with the shape and size of specific body parts of FYFS, mean \pm SD BMI for response categories and association with BMI categories

Dissatisfied with		Frequency		BMI (kg m^{-2})		Column % of BMI category by satisfaction with body parts			<i>P</i> -value†
		<i>n</i>	%	Mean \pm SD	<i>P</i> -value*	Underweight (%)	Normal (%)	Overweight (%)	
Arms	Yes	120	33.8	23.0 \pm 2.7	<0.001	15.4	31.4	64.1	<0.001
	No	235	66.2	21.2 \pm 2.4		84.6	69.6	35.9	
Stomach	Yes	214	60.5	22.3 \pm 2.7	<0.001	26.9	60.0	86.8	<0.001
	No	140	39.5	20.9 \pm 2.2		73.1	40.0	13.2	
Middle	Yes	149	42.0	22.7 \pm 2.7	<0.001	15.4	41.4	64.1	<0.001
	No	206	58.0	21.2 \pm 2.3		84.6	58.6	35.9	
Hips	Yes	166	46.8	22.6 \pm 2.6	<0.001	15.4	45.9	74.4	<0.001
	No	189	53.2	21.1 \pm 2.4		84.6	54.1	25.6	
Buttocks	Yes	227	63.9	22.1 \pm 2.5	0.004	38.5	65.5	69.2	0.017
	No	128	36.1	21.3 \pm 2.8		61.5	34.5	30.8	
Thighs	Yes	250	70.8	22.3 \pm 2.4	<0.001	15.4	74.3	82.1	<0.001
	No	103	29.2	20.5 \pm 2.6		84.6	25.7	17.9	
Calves	Yes	96	27.1	22.1 \pm 2.8	0.116	15.4	26.6	39.5	0.910
	No	258	72.9	21.7 \pm 2.5		84.6	73.4	60.5	

FYFS – first-year female students; SD – standard deviation; BMI – body mass index.

* Independent samples *t*-test.

† Pearson's chi-square test.

recurrent intentional weight-loss episodes⁵³, disordered eating symptoms⁵¹ and perceptions of themselves as being overweight^{54,55}. Adolescents and young women also consciously start smoking as a means of controlling their weight⁵¹. Therefore, former smokers and current smokers might need attention in weight management programmes to address these issues.

The mean BMI (21.8 kg m^{-2}) of the students was in line with the values reported for South African FYFS at the same university 15 years ago (BMI = 21.5 kg m^{-2})⁹, for white female students at another South African university (BMI = 21.3 kg m^{-2})⁵⁶, for European university students (BMI = 20.5 kg m^{-2})⁵⁷ and white American college students (mean BMI (kg m^{-2}): 21.5⁵⁸, 21.4⁸, 21.6⁵⁹, 21.7³⁵ and 22.3⁶⁰). Based on these premises it can be speculated that although not a random sample, the comparability of the mean BMI of the current sample with that of similar groups refutes the presence of a strong bias in the results. The prevalence of overweight among FYFS enrolled at this university has increased over the past 15 years from 6.7%⁹

to 10.0%, while the prevalence of obesity has remained nearly constant (0.95%⁹ vs. 0.8%). These prevalences are, however, lower than those found for young females (aged 15–24 years) who participated in the South African Demographic and Health Survey (20.0% overweight, 9.6% obese⁶¹), but in line with figures reported for a European student population (8% overweight, 1% obese⁵⁷).

As was expected from previous research^{9,54,62–64}, the results indicate that female students do not have a realistic perception of their weight, with perceived weight being higher than actual weight. This is illustrated by the fact that the mean BMI of students who perceived themselves as overweight was in the normal range (BMI = 23.6 kg m^{-2}), although significantly higher than the mean BMI of students who perceived their weight as normal (BMI = 20.8 kg m^{-2}). A similar situation was described by Sciacca *et al.*⁶³, who found that the mean BMI of American students who perceived themselves as overweight was 23.2 kg m^{-2} while that of students who perceived their weight as normal was 20.4 kg m^{-2} .

Table 5 Mean \pm SD scores of the three different components of the three physical activity indices for the total group and the three BMI categories of FYFS

Physical activity questionnaire index	<i>n</i> *	Mean \pm SD index score	Mean \pm SD index score by BMI category			<i>P</i> -value†
			Underweight	Normal	Overweight	
Work index	353	2.5 \pm 0.4	2.4 \pm 0.5	2.5 \pm 0.4	2.5 \pm 0.5	0.156
Sport index	346	2.4 \pm 0.7	2.2 \pm 0.7	2.4 \pm 0.6	2.2 \pm 0.5	0.038
Leisure-time index	357	3.3 \pm 0.5	3.3 \pm 0.6	3.3 \pm 0.5	3.3 \pm 0.6	0.926

SD – standard deviation; BMI – body mass index; FYFS – first-year female students.

* *n* varies due to missing values.

† One-way analysis of variance; although significant differences for sport index, Bonferroni *post hoc* test did not find a significant difference for mean \pm SD score between categories.

The lower mean BMI for students who perceive their weight as normal could be explained by the fact that almost all underweight students perceived their weight as normal. These results imply that underweight students may not want to gain weight but would prefer to remain underweight, which can result in negative health outcomes. Furthermore, normal-weight students may engage in unnecessary weight-reduction practices to 'normalise' their weight.

The results clearly indicate that most students (84.2%), especially normal- and overweight students, were not satisfied with their weight, as was also reported for British female students (62.7%)⁵ and American undergraduates (54.3%)⁶⁵. Despite the fact that the students who wished to lose weight had a significantly higher mean BMI than those who were satisfied with their weight, their mean BMI was still within the normal ranges. A similar situation was reported for British undergraduates⁵. Our results indicate that overweight students were justified in being dissatisfied with their weight and in setting weight-loss goals. However, it is important that weight goals are realistic and that acceptable weight-loss methods be used to prevent weight cycling and possible further weight gain. What is of concern is that very few of the normal-weight students were actually satisfied with their weight and the majority still wanted to lose weight, while a quarter of the underweight students also wanted to lose weight.

The 55% of our study population who attempted weight reduction in the two years preceding the study is in line with the 45.9% reported for students from the same university in 1988⁹ and the 43.5–64.5% reported for female students from other countries^{5,7,8}. Students with a higher mean BMI (whether actually overweight or not) were more inclined to diet at the time of the survey and more inclined to have attempted to lose weight in the two years preceding the study. Although all students were equally successful in achieving weight loss, those who were not able to maintain this weight loss had a higher initial BMI. When compared with normal or underweight students, overweight students were actually the most likely to have engaged in weight-loss practices previously, but were the least successful in maintaining the weight losses achieved. These students could therefore be a high-risk group for weight cycling.

The mean BSQ score of our study population (87.4) and the scores for other female students (ranging from 85.0 to 96.3)^{35,59,66} suggest that, on average, students do not seem to be inclined to have body-shape concerns. However, in subgroups this might not be true. Our results indicate that the higher the BMI, the more likely it is that a student would have concerns with their body shape in general (BSQ) and more specifically with their stomach, buttocks, thighs, middle and hips. Overweight students were most inclined to be dissatisfied, but this was also prevalent among the normal- and underweight groups. The results

concerning perceived weight, body-shape satisfaction and weight-reduction attempts point to the need to focus on the formulation and acceptance of reasonable individualised weight goals in weight management interventions aimed at female students.

The mean EAT-26 score (8.5), which is well within the normal range, is lower than the scores reported for other female students, which range from 10.6 to 15.4^{10,16,36,64,67}. Our prevalence of high scorers (8.4%) was also lower than figures reported for female students from other university samples, ranging from 17 to 21.9%^{16,17,64,67}. These results indicate that disordered eating is possibly not such a prominent concern during a student's first year. However, the university environment may serve as the place where an eating disorder may develop⁶⁸ and the disordered eating attitudes and behaviours that develop may become lifelong habits⁶⁹. Hesse-Biber maintains that the majority of female students experience chronic eating problems throughout their tertiary careers⁷⁰, which is supported by the findings of Senekal⁷¹. Ensuring the maintenance of 'normal' eating attitudes and behaviours should therefore be a focus in any weight management intervention aimed at students.

The mean ASCS score of our study population (72.0) was indicative of a medium self-concept, with a fifth scoring in the low self-concept range and just more than a third in the high self-concept range. It has been found that the transition from high school to college is associated with a decrease in the self-concept of female students and that they do not appear to make positive changes during college⁴. Hesse-Biber and Marino also reported that female students whose eating patterns became or remained abnormal during college are inclined to experience a decrease in self-concept over time compared with students whose eating patterns remained good or improved⁴. In our sample a lower self-concept was significantly associated with a higher BMI. This supports the fact that a high self-concept is an important component of effective weight management⁷² and that a weight management programme for students should address self-concept.

Students with a normal BMI do more exercise than those who are underweight or overweight. This trend was also highlighted in a review by Hendricks and Herbold, which indicated that increases in inactivity are associated with a higher BMI¹. In the long run the low levels of physical activity may also contribute to an increase in mortality⁷³. More than a quarter of our study population did not participate in any physical activity that is performed for the purpose of conditioning the body, improving or maintaining health, and improving or maintaining physical fitness. This is higher than the 22%²⁰ or 12.3%⁷⁴ of American college women who reportedly did not engage in any physical activity. Senekal reported that the physical activity levels of FYFS (both recreational and participation in competitive sport) decreased significantly from the

Table 6 Summary of the weight management-related characteristics of underweight, normal-weight and overweight FYFS (n = 360)

Characteristic	Underweight students (n = 26)	Normal-weight students (n = 295)	Overweight students (n = 39)
	Perception of weight	Unrealistic: most perceive weight as normal	Realistic: two-thirds Unrealistic: third perceive weight as overweight
Satisfaction with weight	Most satisfied	Most dissatisfied	Most dissatisfied
Weight-loss goals	Quarter want to lose 1–3 kg	Half want to lose 1–3 kg Third want to lose ≥ 4 kg	Most want to lose ≈ 4 kg
Previous weight loss	A fifth tried	More than half tried	Most tried
Successful with weight-loss attempts	Yes	Yes	Yes
Maintain weight loss	Half did	Less than half did	Most did not
Satisfied with most/all body parts	Yes	No	No, most dissatisfied
Body parts most dissatisfied with	Buttocks	Stomach, buttocks and thighs	Stomach, thighs, hips, buttocks and middle
Self-concept (ASCS)	Medium to high	Medium to high	Low to medium
Body shape (BSQ)	Satisfied: most low scorers	Dissatisfied: a fifth medium or high scorers	Dissatisfied: almost half high scorers
Eating attitudes and behaviours (EAT-26)	Normal	Normal	Normal
Physical activity	Less active	More active than the others	Less active

FYFS – first-year female students; ASCS – 100-item Adolescent Self-Concept Scale; 34-item Body Shape Questionnaire; 26-item Eating Attitudes Test.

period before they come to university to their first 3 months at university⁹. During a 4-year follow-up of these students it was found that the physical activity levels of those students who continued to gain weight over the 4-year period continued to decrease, while those students whose weight remained constant seemed to maintain the highest level of physical activity⁷¹. These studies clearly indicate that physical activity is an important component of a weight management programme for female students.

In conclusion, FYFS in the different weight categories (underweight, normal-weight, overweight) are characterised by a number of weight management-related issues (Table 6). It is also evident that very little improvement in this situation has occurred at the university in question since 1987, emphasising the need for preventive intervention. If large populations (such as university students) could learn healthful behaviours early in life, this would not only have a positive effect on the health of a particular student and her possible family later in life, but it could also decrease the economic burden to health services. The results of this research therefore support the recommendation by Prouty *et al.* that universities must provide interdisciplinary teams specialising in eating disorders and students' education focusing on body image, healthful eating, exercise, and the types of mental health and medical services available¹⁷. Because many normal- and underweight students in our study experienced weight-related problems, interventions aimed at correcting these behaviours and problems should target all students, regardless of their BMI. The specific need of FYFS identified in this study should be borne in mind when developing and implementing weight management programmes for university students: information about supplement use, smoking, realistic weight goals, safe and sound weight-loss methods, weight cycling, body-shape perceptions, eating attitudes and behaviours, self-concept and physical activity.

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