

The relationship between body dissatisfaction and body composition measurements among female university students



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Foreword

You never get a good (wo)man down...

- Mechiel Jakobus de Kock

To list all the things I've learnt throughout this study is an impossible task, but to highlight the important ones will certainly bring me great pleasure. Maybe the most frustrating thing about the writing of this script was never to be able to write my own thoughts – it was compulsory always to refer to another author who already knew better. I realized that life worked the same way. Even though I would have liked to write my own story in the book of my life, it has always been and will forever be the best to refer to the One who already knows better – except, this is not compulsory but an act of free will. Lord, you really are the lover of my soul and there is nothing in this life that I love more than I love you!

Secondly, this project had to be finished irrespective of what could go wrong. No matter how many times I failed, no matter the shortage of finances, no matter the distances I had to drive or how far my loved ones were from me, the project needed to be done. Mom and Dad, thank you for teaching me to press through. It was the two of you who reminded me that everyone who ever did great things failed first. You taught me always to stand up straight, look life in the eye and to give it my best shot. I haven't arrived yet, but I'm getting there. I will never doubt your love for me.

Thirdly, even though no one can do it for you, you can not do it alone. Such is life. The two people who made me a stronger link in their chain of winners were my two dearest

sisters Anéll and Louise de Kock. I learned a lot from the two of you and I'm thankful for every positive word of inspiration that helped me to finish this project. I really could not have done it alone.

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It was quite an experience.

The author
2007





Declaration

The co-authors of the articles which form part of this dissertation, Prof. J. Hans de Ridder (supervisor) and Dr. Alida, W. Nienaber (co-supervisor) hereby give permission to the candidate, Ms Berna de Kock to include the two articles as part of a Masters dissertation. The contribution (advisory and supportive) of these co-authors was kept within reasonable limits, thereby enabling the candidate to submit this dissertation for examination purposes. This dissertation, therefore, serves as partial fulfillment of the requirements for the M.Sc. degree within the School of Biokinetics, Recreation and Sport Science in the Faculty of Health Sciences at the North-West University, Potchefstroom campus.

Prof. J. Hans de Ridder
Supervisor and co-author

Dr. Alida W. Nienaber
Co-supervisor and co-author



Summary

Over the past hundred years, the emphasis of the contemporary ideal body image for women has become a picture of extreme thinness. This thin image inflated the minds of young women to such an extent that it has become a great area of concern for both psychologists and health care providers. The first aim of the study was to identify the anthropometrical trends of first year female students, as well as to determine their body-composition-related health risk. The second aim was to compare their anthropometric profiles to their degree of body image distortion (Body Dissatisfaction and Drive for Thinness). The mean age of the women was 18.9 years. Their mean stature (165.0 cm) compared well with the U.S. norms for stature, whereas their mean body mass (62.4 kg) tested slightly higher than the U.S. norms for body mass for women aged 16 to 20 years. Regarding the waist- and hip girths, the group tested shapely for a medium U.S. trouser size. The majority of subjects fell in the low risk category for the BMI (18.5 – 24.9), whereas their body fat percentages revealed average health risk. The total group was at low health risk regarding their waist-to-hip ratios. The group presented significant body-image distortion in all body-composition health-risk categories i.e. BMI and body-fat percentage as well as the isolated body mass value ($p < 0.01$). No significant relationships was found between the psychological parameters and the waist-to-hip ratio ($p > 0.01$). This is most likely due to the fact that the WHR is a measure of fat distribution mainly around the waist and hips, and not a measure of weight or fatness. Individuals in the “normal-weight” category for BMI presented higher BD and

DT scores than those in the “under-weight” category. The same was true for the “average” and “low” fat-percentage categories. The overweight and obese categories of both the BMI and body-fat percentage parameters were underrepresented by the subjects and were consequently excluded from the conclusions. The BMI proved to be the strongest predictor of body-image distortion, with the isolated body mass value following second in line and the body-fat percentage value being the weakest, yet significant predictor of distorted body image among these subjects. Again, the WHR was of no prediction value for distorted body image among young women. These results greatly supported the literature findings and provided significant ground for the recognition of body-image distortion in young women and the development of intervention programs for this fragile population group.



Opsomming

Gedurende die afgelope honderd jaar, het die klem vir die ideale vroue figuur verander na die van 'n uiterse maer figuur. Hierdie skraal voorkoms het jong dames so gefasineer dat dit 'n groot bron van kommer vir beide sielkundiges en gesondheidsorgpersoneel geword het. Die eerste doel van hierdie studie was om die antropometriese tendense van die eerstejaar-damestudente te identifiseer asook om die gesondheidsrisiko verwant aan hul liggaamsamestellings te bepaal. Die tweede doel was om 'n vergelyking te tref tussen hul antropometriese profile en die mate van liggaamsontevredenheid. Die gemiddelde ouderdom van die dames was 18.9 jaar. Hulle gemiddelde lengte (165.0 cm) vergelyk baie goed met Amerikaanse standaarde, terwyl hulle gemiddelde liggaamsmassa (62.4 kg) ietwat hoër vertoon het as die Amerikaanse norme vir liggaamsmassa vir vroue tussen die ouderdomme 16 en 20 jaar. Die groep se middel- en heupmates pas goed by die mates van die medium grootte Amerikaanse broekgrootte. Die oorgrote meerderheid van die dames het 'n lae gesondheidsrisiko gehad ten opsigte van die LMI, terwyl hul liggaamsvetpersentasie hul gesondheidsrisiko as gemiddeld bepaal het. Die totale groep het 'n lae gesondheidsrisiko gehad ten opsigte van hulle middel-tot-heup-verhoudings. Hierdie groep het 'n betekenisvolle swak liggaamsbeeld verteenwoordig in al die liggaamsamestelling gesondheidsrisiko-kategorieë bv. LMI en liggaamsvetpersentasie asook die geïsoleerde liggaamsmassawaarde ($p < 0.01$). Geen betekenisvolle verhouding is gevind tussen die sielkundige parameters en die middel-tot-heup-

verhouding nie ($p < 0.01$). Dit is heel moontlik te wyte aan die feit dat die middel-tot-heup-verhouding 'n maatstaf is van vetverspreiding, hoofsaaklik rondom die middel en heupe eerder as 'n maatstaf van liggaamsgewig of vetpersentasie. Individue in die normale-gewig kategorie vir LMI het 'n hoër liggaamsontevredenheid en maerheidsdryf getoon as die in die ondergewig kategorie. Dieselfde was waar vir die gemiddelde- en lae-vetpersentasie kategorieë. Die oorgewig en obese kategorieë van beide die LMI en liggaamsvetpersentasie-parameters was baie swak verteenwoordig en is daarom nie in aanmerking geneem in die gevolgtrekkings nie. Aan die hand van die studieresultate blyk die LMI die sterkste voorsteller van liggaamsontevredenheid te wees, met die geïsoleerde liggaamsmassawaarde in die tweede plek en die liggaamsvetpersentasiewaarde as die swakste voorspeller. Hoewel die liggaamsvetpersentasiewaarde die swakste verhouding met liggaamsbeeld getoon het, was die verhouding tog statisties betekenisvol. Weereens het die middel-tot-heup verhouding geen verhouding getoon met enige van die parameters vir liggaamsbeeld in hierdie groep nie. Die resultate het literatuurbevestigings ondersteun en 'n belangrike basis geskep vir die erkenning van 'n verwronge liggaamsbeeld by jong dames. Die ontwikkeling van intervensieprogramme om verwronge liggaamsbeeld in die gesondheidssektor aan te spreek, blyk van kardinale belang te wees.



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List of abbreviations

ACSM	American College of Sports Medicine
BD	Body dissatisfaction
BF	Body Fat
BMI	Body Mass Index
cm	Centimeter
DT	Drive for thinness
EDI	Eating Disorder Inventory
g	Gram
kg	Kilogram
kg/m ²	Kilogram per squared meter
m	Meter
Max	Maximum
Min	Minimum
mm	Millimeter
n	Number of data values in the sample
N	Number of data values in the population
Std. Dev.	Standard Deviation
SD	Standard Deviation
WHR	Waist-to-hip-ratio
%BF	Percentage body fat



Chapter 1

PROBLEM STATEMENT AND AIM OF THE STUDY

- 1.1 Problem Statement
 - 1.2 Objectives
 - 1.3 Hypotheses
 - 1.4 Structure of the dissertation
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-

1.1 Problem Statement

Body image is a complex notion, referring both to what Schilder (1938) called “the picture of our body which we form in our minds” and to our affective response to our appearance (Wardle & Foley, 1989:55). Body image is influenced by numerous factors including the media, social comparison, young adult literature, desires to be partnered, culture, early menarche and also by known objective anthropometric values. Yet, it is unlikely that all young women are affected by these influences to the same degree (Krones *et al.*, 2005:135; Chang *et al.*, 2004:156; Halliwell & Dittmar, 2004:104; Holmstrom, 2004:198; Monro & Huon, 2004:85; Younger, 2003:48).

The abovementioned psychological and social factors which are especially crucial in females, reach a development peak during adolescence – a period which indicates the entry of young individuals into the adult world (Maritz *et al.*,

2000:117). The culmination of these changes already established during adolescence results in body dissatisfaction leading to disordered eating. The prevalence of body dissatisfaction and disordered eating often increases dramatically in the fragile timeframe of adolescent girls becoming first year college students (Vohs *et al.*, 2001:280; Striegel-Moore *et al.*, 1990:700; Fairburn & Beglin, 1990:405; Compas *et al.*, 1986:2) due to numerous factors mentioned by Rosen *et al.* (1993:154). They found that female College students suffer from eating disorders as a result of their high levels of stress, achievement orientation, and role and identity changes. As a consequence of these abovementioned factors, it can be said that young female College students rather wish to think of opportunities as expectations which they cannot accomplish – with the more crucial factor of them all, needing to look good and be thin (Dickerson, 2004:338; Wender, 2004:44; Younger, 2003:45).

Dickerson (2004:338) states that globally women seem to have many more opportunities going for them as an effect of the feminist movement. Belkin (2003:45) adds that “In spite of increasing opportunities, women got what they didn’t expect: problems of infertility, female burnout, eating difficulties, not to mention ‘who is going to take care of the kids’”. Even in the young adult literature of the last three decades, Younger (2003:45) noted that thinner young women are portrayed as powerful and in control of their sexual lives, while larger women are depicted as sexually passive and irresponsible. The idea of thinner women being more successful than their larger counterparts, has taken off so vigorously that young adults, men and women, socially prefer the slim image over and above any other body shape (Chang *et al.*, 2004:153).

Another influential factor regarding body dissatisfaction is the media. Advertisements of almost every beauty product, especially articles of male interest are accompanied by painfully slender figures, leaving the majority of young women feeling they can’t measure up (Krones *et al.*, 2005:134; Stice *et al.*, 2003:110). Young women do not only want to impress their female

counterparts with their body shapes, but also the male population in order to be socially accepted.

Researchers therefore believe that young women will rather overestimate their body weight and body fatness to buffer themselves against disappointment and social rejection (Stice *et al.*, 2003:110). All these feelings of failure or of not measuring up that young women of today experience, have prompted enough interest to have earned itself a title called the "*quarterlife crisis*" (Wender, 2004:44; Vohs *et al.*, 2001:281).

Chang *et al.* (2004:153) found that female medical students in Taiwan with normal BMI (Body Mass Index) values considered themselves overweight. They consequently presented with very negative body images and reported the reason as mainly due to marketing strategies for beauty products and weight reduction. Monro and Huon (2004:85) found the same tendency among female Australian university students. Krones *et al.* (2005:134) proved that female undergraduate students from the University of Texas at Austin fostered body dissatisfaction due to social comparison. In the United States young women with a low level of emotional expression related significantly to greater body dissatisfaction (Hayaki *et al.*, 2002:57).

According to Vohs *et al.* (2001:280) female students of Dartmouth College had poor self-image, dieting behaviors and eating disorder symptoms both before and during college. At the University of Hawaii, black students were more satisfied with their bodies and desired a larger body size on average than white students (Aruguete *et al.*, 2004:393). In South Africa, only a few studies shed light on this specific topic. The best related literature is outdated and also includes men, women of a wider age range and different ethnic groups. Even though no specific topic matched the title of this study, the general outcome of other partially related studies, is that young college women usually present with high levels of stress and depression caused by, or leading to, body dissatisfaction,

which results in disordered eating (Cilliers *et al.*, 2002:36; Boshoff, 1990:75; Senekal & Albertse, 1988:85).

With these facts in mind and a scarcity of South African data available on this topic and population type, a few questions arise. How does the body composition of first-year female South African students, specifically on the Potchefstroom campus of the North-West University, look like? Secondly, what is their body composition-related health risk? Thirdly, is there any significant relationship between body image and body composition in this group of students? And finally, if sorted into the different health risk categories for body composition, what is the degree of body dissatisfaction and drive for thinness of the subjects in the different categories?

1.2 Objectives

The purposes of this study are:

- To establish a general, ethnically independent body composition image of the first-year female students at the North-West University, Potchefstroom campus.
- To determine the body composition-related health risk of this group of first-year female university students.
- To determine whether relationships between body dissatisfaction, drive for thinness and body composition measurements (BMI, WHR, body mass and %BF) exist in this group of students.
- To determine the degree of body dissatisfaction and drive for thinness of the group in the different health risk categories for body composition.

1.2 Hypotheses

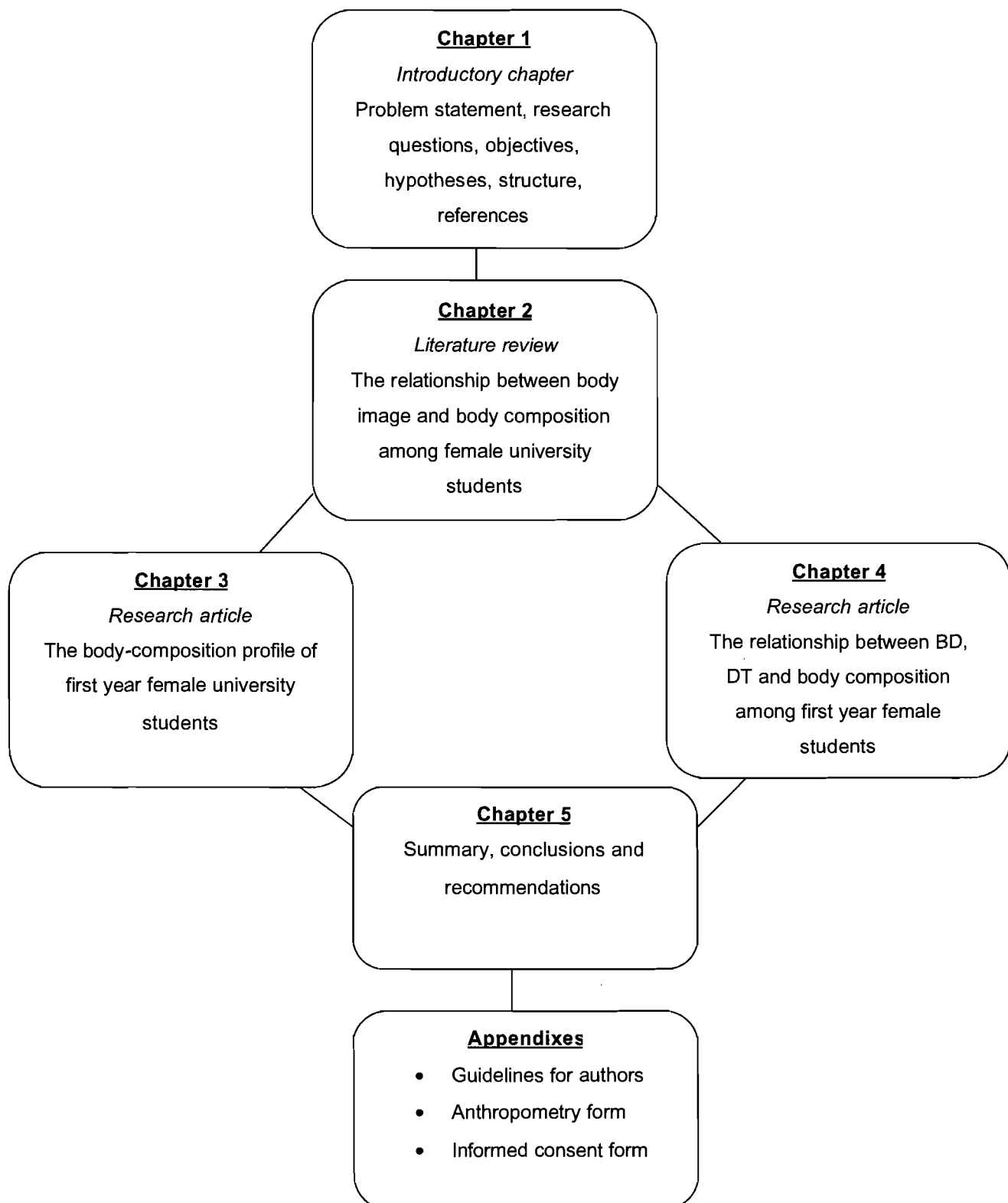
The following hypotheses were formulated and tested:

- The body-composition image of the group will have a tendency toward the Western cultural standards of body composition.
- The group will be at low health risk according to body-composition parameters.
- Significant relationships will exist between body dissatisfaction, drive for thinness and body composition measurements (BMI, WHR, body mass and %BF) in the group of students.
- Subjects with higher body-composition values (BMI, WHR and %BF) will be less satisfied with their body composition and have a higher drive for thinness than the subjects with lower body composition-values.

1.4 Structure of the dissertation

The dissertation is presented in four main chapters (figure 1), namely an introductory chapter (Chapter 1), a literature review (Chapter 2), and two research articles (Chapters 3 and 4). A summary with conclusions and recommendations will follow (Chapter 5). Chapter 1 includes the problem statement and also states the research questions, aims and hypotheses of the study. Chapter 2 contains the relevant literature available on body image and body composition among young women. Chapter 3 will be presented in the form of a research article entitled *“The body composition profile of first year female university students”*. Chapter 4 will also be presented as a research article entitled *“The relationship between body dissatisfaction, drive for thinness and body composition among first-year female university students”*. The final chapter will conclude the study with a summary and recommendations. Chapter 5 will be followed by a list of appendices. Each chapter will include its relevant references. Referencing in chapters 1, 2 and 5 will adhere to the regulations of the Potchefstroom Campus of the North-West University, which uses the Harvard referencing system. In chapters 3 and 4 referencing will follow the specifications of the African Journal of Physical Health Education, Recreation and Dance.

Figure 1: Structure of Dissertation



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Chapter 2

THE RELATIONSHIP BETWEEN BODY-IMAGE AND BODY COMPOSITION AMONG FEMALE UNIVERSITY STUDENTS

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2.1 Introduction

Over the past 100 years, the emphasis of the contemporary ideal body image for women, became a picture of extreme thinness. In and before the 18'th century, plumpness had been the ideal for women, signifying their health and wealth, but that ideal later faded (Brannon, 1996:366). As early as the eighties already, researchers discussed the social class basis for the thin ideal, claiming that when rich women began to prefer thinness, this preference began to spread throughout all social classes (Brannon, 1996:336). Currently, of the many causes of young women hating their bodies, the widest researched factor with the highest impact on the female mind in general, is physical attractiveness (Eating Disorder Referral and Information Centre, 2006; Eisenberg *et al.*, 2005:95; Hayaki *et al.*, 2002:60; Polivy & Herman, 2002:205). Today, being slim is more than a fashion; it is a deeply rooted social prejudice (Wilson *et al.*, 2005:259; Chang *et al.*, 2004:156). Physical attractiveness plays a prime role in interpersonal evaluations. In this regard, Christine Hartline writes, "women are enslaved to a beauty myth, chained to the false belief that our value is based on our appearance alone" (Eating Disorder Referral and Information Center, 2006). The aim of this chapter is to shed light on the topic of body image on university female students, the causes of a distorted body image and measuring methods on body image and body composition.

2.2 Body image and perception of body image

2.2.1 Definition

Body image is a complex notion, referring both to what Schilder (1938:507) called "the picture of our body which we form in our minds" and to our affective response to our appearance (Wardle & Foley, 1989:55). It is also described as a way a person perceives their body and what they think is good or bad, fat, thin, attractive or unattractive, and how they feel in general about their physical

appearance (Disordered Eating, 2007). Body image is not based on facts. It is psychological in nature, ever changing and sensitive to changes in environment, physical experience and mood (Eating Disorder Referral and Information Center, 2006). Researchers agree with these descriptions of body image and believe that the analysis and measurement of body image is not an easy task (Krones *et al.*, 2005:140; Dickerson, 2004:338; Chang *et al.*, 2004:158; Stice *et al.*, 2003:113; Hayaki *et al.*, 2002:61)

2.2.2 The complexity of body image

In the definition it is stated by Schilder (1938:507) that body image presents itself as a very complex notion. According to Hayaki *et al.* (2002:61) body dissatisfaction is a central feature of eating disorders. It can therefore be assumed that young women with distorted body images may end up suffering from some kind of eating disorder. The unavoidable complexity of this condition speaks for itself when its causes are studied. Therefore, it is almost impossible to box all the causes of body dissatisfaction, let alone distinguish between the different causes of body dissatisfaction and eating disorders. What is evidently known from what researchers discovered, is that the origin of the majority of causes for body dissatisfaction already arise in childhood (Goodman *et al.*, 2004:434; Hayaki *et al.*, 2002:57; Vohs *et al.*, 2001:281)

From a young age, individuals, particularly women, are subjected to unrealistically high standards regarding physical appearance (Hayaki *et al.*, 2002:57). Goodman *et al.* (2004:431) found that children express more negative attitudes toward obesity than they do toward a variety of other handicaps, such as facial disfigurements and missing limbs. For numerous reasons outside the scope of this study, children are over-exposed to the media, in particular, television. The media constantly depict extremely thin celebrity women as successful, beautiful and treasurable, making thinness a requirement for success (BBC News, 2007; Holmstrom, 2004:196). With their minds negatively set

toward obesity, children grow up becoming adolescents – a period indicating young individuals' initiation into the adult world (Maritz *et al.*, 2003:116).

Academic pressure and choices, career commitments, group pressure, interpersonal relations and the potential for unplanned pregnancy and parenthood, are but a few of the responsibilities an adolescent needs to face (Maritz, *et al.*, 2003:117). In the majority of cases where adolescent girls do not manage to cope with these responsibilities, their inability to cope results in an overreaction, in their attempting to be in control. According to Barlow and Durand (1999:233), this urge for control is seen in a woman's choice and ability to rule her own body. This view is supported by Vohs *et al.* (2001:280), suggesting that adolescent girls who reveal a variety of psychological and physical risk factors predict later disordered eating. Furthermore, no increase in the severity of disordered eating patterns was found with the transition of adolescent girls to College students (Vohs *et al.*, 2001:287). This proves that firstly, a corrupted body image in most cases has its origin in childhood, secondly, that this distorted image usually results in disordered eating and thirdly, that the same distorted body image that started in childhood, will most likely continue into college life.

Victoria C. Dickerson is a psychiatrist who lectured, learned and wrote about narrative ideas and practices. In her article called "Young Women Struggling for an Identity" she stated that young women in their 20's were experiencing varying degrees of distress (Dickerson, 2004:337). Dickerson (2004:337) is of the opinion that young women appeared to have many more opportunities available to them as an effect of the feminist movement. Now, thirty years later, the movement is long gone and researchers refer to our world today as a 'post feminist' world. Suddenly, women have more responsibilities than they can handle (Dickerson, 2004:337). Researchers reason that the factors causing pressure in the lives of young women mainly include finding a partner, choosing careers, achieving financial independence, creating respectable social lives, having direction in life, "not to mention needing to look good and be thin"

(Eisenberg *et al.*, 2005:100; Wendell *et al.*, 2005:226; Dickerson, 2004:338; Levitt, 2004:109; Polivy & Herman, 2002:191).

Young women experience tremendous pressure trying to accomplish the previously stated challenges. They struggle to meet the needs of these challenges, so they start developing a lack of confidence (Dickerson, 2004:338). Even in the technological world the problem of lack of confidence and low self-esteem surfaced in various areas of study. This tendency gained scientific attention in the 1990's as young women were excluded from technological fields due to their lack of confidence in their own efficacy to handle technical situations adequately (Wender, 2004:44).

College women in particular are at great risk of developing eating disorders due to social isolation, high anxiety, body dissatisfaction, dieting and excessive exercise (Levitt, 2004:109). In this unique population, exercise is often used as a coping strategy. Research (Loumidis & Wells, 2001:416) also recommends exercise as a coping mechanism due to its anxiolytic and antidepressant properties. Sadly, as beneficial as physical exercise can be, it can also develop into a maladaptive behavior, which is a common finding in College women (Loumidis & Wells, 2001:416).

Consequently, ever so often, young women identify themselves as failures – of not doing it right, of not being good enough, of not being heard, of being invisible (Wendell *et al.*, 2005:213; Chang *et al.*, 2004:156). All of these conspire to create self-doubt, which “makes young women believe that something is drastically wrong with them” (Eating Disorder Referral and Information Center, 2006). Robbins and Wilner (2001:121) coined this fragile set of coping inabilities – reaching a peak during the decade of the 20's – as the *Quarter life Crisis*.

In the Oxford Mini School Dictionary (1994:268) 'health' is described as the condition of a person's body or mind and 'behavior' as acting in a particular way

(OMSD, 1994:53). This implies that one would act in whatever way the condition of one's mind demands. Thus, body image is the crucial link between positive health behaviors and improving self-esteem (Nirsa Know, 2006).

2.2.3 Media, peer pressure and self-esteem

The effect of the media on young women's body image is widely researched and sometimes contradictory in its results. In the meta-analysis of Holmstrom (2004:214), it was found that when young women viewed thin images, it had little effect on their body image, but when they viewed overweight images, it increased their body satisfaction. Monro and Huon (2004:85) concluded that participants' body shame increased after exposure to idealized images, irrespective of advertisement type. Wendell *et al.* (2005:227) agrees with Monro and Huon (2005:227), but disagrees with the meta-analysis of Holmstrom (2004:214). Wendell *et al.* (2005:227) found that the exposure of young women to wider sets of silhouettes, rather than the thinner sets, resulted in lower body satisfaction measures for the women.

In peer pressure situations, Krones *et al.* (2005:139) found that young women exposed to social comparative pressure to be thin, promoted an increase in body dissatisfaction. They also confirmed that body dissatisfaction is a risk factor for eating disorders. This view was supported by Craig *et al.* (2006:248) stating that in a 'fat talk' situation of a group of young women, a female individual would respond by self-degrading her body image. Neighbors and Sobal (*in press*) investigated young women in a clinical setup and found that overweight individuals expressed the greatest body dissatisfaction compared to their normal weight and underweight counterparts. They also found that normal weight females desired a body slightly thinner and lighter than themselves and that underweight females expressed little body dissatisfaction, idealizing a body weight maintaining their BMI classification.

Many researchers studied the prevalence of shape- and weight-based self-esteem in college undergraduates. The general result of their studies indicated that young women who placed a high personal value on body shape usually presented with either body dissatisfaction or eating disorders (Jakatdar *et al.*, 2006:331; Melnyk *et al.*, 2004:232; Geller *et al.*, 1997:20; Cohen-Toveé, 1993:226). Research has also shown a positive relationship between low levels of fruit and vegetable consumption and high levels of body image dissatisfaction and binge eating (Anton *et al.*, 2000:159). Springer *et al.* (1998:17) nevertheless found that a formal eating disorder prevention program modeled on an educational format can result in the reduction of both attitudinal and behavioral eating disorder risk factors.

In North Carolina in the USA, the five most common weight loss behaviors in female college students were exercising (80%), eating or drinking low fat or fat free versions of foods or drinks (59%), consciously eating less than they desired (51%), eating or drinking sugar-free versions of foods or drinks (43%), and counting calories (40%). In the United States 86% of people report the onset of their eating disorder by the age of 20 (Disordered Eating, 2007). Approximately 72% of alcoholic women below 30 years of age have an eating disorder. The Alliance for Eating Disorders Awareness claims that at least fifty thousand individuals will die annually as a direct result of their eating disorder. The Substance Abuse and Mental Health Services Administration states that more than 90% of those who have eating disorders are women between the ages of 12 and 25. The National Association of Anorexia Nervosa and Associated Disorders found that only 50% of people report being cured (National Statistics Online, 2007).

2.2.4 Body dissatisfaction and sexual behaviors

In the world of young adult literature, Younger (2003) analyzed relevant literature written over a period of 24 years (1975-1999) on the topic of body image and

sexuality in young women. The article explains the main topics and ideas found in these scripts. The research “reveals an imbedded link between body image, weight, and sexuality”. Thinner young women are depicted as powerful and in control, while larger women are portrayed as sexually passive and irresponsible (Younger, 2003:45). Eisenberg *et al.* (2005:99) supports Younger’s literature review based on research among college students proving that young women with larger body weights and unhealthy eating behaviors were associated with several high-risk sexual practices. Other young females with lower BMI values also engaged in sexual practices, but were a lot more responsible in their precautions (Eisenberg *et al.*, 2005:99).

2.2.5 Causes of a negative body image

The underlying causes of a distorted body image are numerous with a wide range of possible causative combinations – some which are not easily described. As mentioned earlier, the causes of a distorted body image are very closely related to and usually result in disorderd eating. The causes are therefore summarized and not distinguished from one another in the “integrative causal model of eating disorders” found in Barlow and Durand (1999:242). It explains the three major influences on eating restrictions.

Table 2.1 Causes of eating disorders adapted from Barlow and Durand (1999:242)

Psychological influences	Biological influences	Social influences
Anxiety focused on appearance and presentation to others.	Inherited vulnerability (unstable or excessive neurobiological response to stress associated with impulsive eating).	Cultural pressures to be thin
Distorted body image		Family interactions or pressures. Re: social presentation

2.2.6 Measurement of body image: the EDI-III questionnaire

Over 120 citations containing research articles, abstracts, scientific journals and bibliographic data bases (e.g., PsycInfo) clearly indicate the Eating Disorders Inventory (EDI) by Garner *et al.* (1983) as being a widely used instrument in the measurement of certain psychological factors across a variety of populations (River Center Clinic, 2007). These factors include: bulimia nervosa, anorexia nervosa, eating behaviors and attitudes in normal populations, as well as personality traits often associated with disordered eating. The EDI-3 was developed to provide a standardized clinical evaluation of symptomatology associated with eating disorders (Garner, 2005). The questionnaire is administered to an individual or a group within an age range of 13-52 years and takes about 20 minutes to complete. It was designed in particular for clinical settings, but is also successfully used in non-clinical settings (Garner, 2005).

The subscales of particular importance in this study were the DT (drive for thinness) and BD (body dissatisfaction) subscales. The EDI and its subscales have received support as reliable and valid measures by Joiner and Heatherton (1996:189). Thiel and Paul (2006:567) supported the reliability of Joiner and Heatherton's (1996:189) research on the EDI-2 questionnaire. Thiel and Paul (2006:569) also found the questionnaire a reliable test-retest instrument for female inpatients who may be at risk for developing eating disorders.

The EDI test materials include an EDI-3 booklet, answer sheet and profile sheet. The first page of the booklet contains demographic information and physical characteristics. The answer sheet is used by the examinee to record item responses. The Scoring Sheet and the Score Summary Sheet are used by the examiner to obtain validity scale scores and to calculate scale raw scores, T scores and percentiles (Garner, 2005).

2.3 Anthropometry and body composition

2.3.1 The definition and development of anthropometry

The word 'anthropometry' is derived from the Greek words *anthropos* meaning 'man' and *metrein* meaning 'to measure', thus literally meaning "measurement of humans" (De Ridder, 2002:1). In physical anthropology, anthropometry refers to the measurement of living human individuals for the purposes of understanding physical variation (Wikipedia, 2007).

The French savant, Alphonse Bertillon found that by measuring certain bony structures in an individual, each person could be perfectly distinguished from one another. "Bertillonage" as it was called was soon adapted by police to fix a person's identity and link it with that person's criminal record. The Bertillon protocol included 11 measurements: height, stretch, bust, length of head, width of head, length of right ear, length of left foot, length of left middle finger, length

of left cubit, width of cheeks and length of left little finger. It also became particularly famous in France in 1883. This method was replaced by the finger print method in 1894 by Francis Galton (Wikipedia, 2007).

Anthropometry was first used in the 19th and 20th century in criminalistics, measuring facial characteristics in order to identify criminals. Francis Galton again was a key contributor to this system. In the 20th century only, anthropometrics was used to differentiate between races of man, but was soon discarded for political reasons (Wikipedia, 2007). In 1940 William Sheldon believed that criminality could be predicted according to body type. It is, however, the Belgian mathematician Baronne L.A.J. Quetelet (1796-1874) who is believed by some researchers to be the father of anthropometry (Trevor, 1950:458).

Today, however, anthropometry is a method extensively used by scientists to identify and train athletes and to understand sports performance, growth, exercise, and nutrition (De Ridder, 2002:2). It is also a handy tool to guide populations in terms of their health and to classify and treat individuals with illness or disease (Wikipedia, 2007). Anthropometry mainly includes measurements of height and body mass, as well as girths, skinfolds, breadths, lengths and heights (Marfell-Jones *et al.*, 2006:iii). According to Heyward and Wagner (2004:3), the major goal of researchers working in the field of applied body composition assessment is to develop valid field methods that practitioners and clinicians can use to accurately estimate the body fat of their clients and identify those at risk for diseases.

2.3.2 Body-composition measurements and health

“Maintaining a healthy body weight and level of body fatness is key to a healthier and longer life” (Heyward & Wagner, 2004:3). Persons allowing their bodies to reach the extreme upper and lower levels of the body-fat continuum expose themselves to the possibility of serious health problems that could reduce their

life expectancy and inhibit their quality of life (Heyward & Wagner, 2004:3). Overweight or obese individuals are at higher risk for premature death, the development of heart disease, diabetes, different kinds of cancer, breathing problems, arthritis, reproductive complications and other health consequences (HHS, 2007). On the other hand, underweight individuals having too low body-fat levels usually suffer from malnourishment causing fluid-electrolyte imbalances. They also present with renal and reproductive disorders, osteopenia or osteoporosis, and muscle wasting (Heyward & Wagner, 2004:3). The clustering of three distinct factors in females: too low body weight (energy insufficiency), osteopenia or osteoporosis (bone-mineral deficit) and amenorrhea (loss of or irregularities in the menstrual cycle) is known as the female triad (Dowshen, 2006).

2.3.2.1 The Body Mass Index (BMI)

The body-mass index (BMI) is presently the most common large-scale epidemiological equation used to categorize individuals as underweight, normal weight, overweight or obese (Ode *et al.*, 2007:403; Heyward & Wagner, 2004:3). The BMI is calculated by weight in kilograms divided by the square of height in meters. This equation was first described by Quetelet and is also referred to as the Quetelet index (Daniels *et al.*, 1997:804).

One limitation of the BMI is its great measure of considerable variability in body composition for any given value, because the BMI does not take into account the individual's body composition (Ode *et al.*, 2007:403). For example, two thirty-year-old males with the same BMI, may have either excessive body fat or a large amount of muscle mass, still not taking into account their specific posture and bone structure (Heyward & Wagner, 2004:4). It is therefore clear that the BMI cannot be used in isolation to estimate health risk in any given individual. In this regard, Daniels *et al.* (1997:804) states that in the event of using the BMI for evaluating fat percentage in children and adolescents, it is of great importance to

account for their maturation stage, race, gender and distribution of fat. For college non-athletes, research supports the need for different BMI classifications of overweight (Ode *et al.*, 2007:403).

**Table 2.2 Classification of disease risk based on Body Mass Index (BMI).
(ACSM, 2006:59)**

Classification	BMI (kg/m ²)
Underweight	< 18.5
Normal	18.5 – 24.9
Overweight	25.0 – 29.9
Obesity, class I	30.0 – 34.9
Obesity, class II	35.0 – 39.9
Obesity, class III	= 40.0

Research has shown that young adult women with high BMI values correlated positively with high-risk sexual behaviors (Eisenberg *et al.*, 2005). A high BMI value also correlated positively with cognitive distortions concerning body image (Jakatdar *et al.*, 2006). In Western women, the BMI plays a greater role in perceptions of female physical attractiveness than the waist-to-hip ratio, consistent with sociocultural theories of attractiveness in Western culture (Wilson *et al.*, 2005). Available statistics show that in England in 2004, women aged 16 years and older were categorized as underweight (6%), desirable weight (37%), overweight (34%) and obese (23%). These values were established by means of the BMI equation (National Statistics Online, 2007).

2.3.2.2 The Waist-to-hip-ratio (WHR)

The waist-to-hip ratio is concerned with the pattern of body-fat distribution (ACSM, 2006:59). Individuals with more fat distributed around their abdominal area (android fat distribution pattern), are at increased risk of hypertension, type 2 diabetes, hyperlipidemia, coronary artery disease, and premature death

compared with individuals whose fat percentage is equally high, but distributed mainly around their hips (gynoid fat distribution pattern), (ACSM, 2006:59; Van Anders & Hampson, 2005:248; Montague, 2003:57). The android fat distribution pattern is especially common in men because of a positive relationship between a higher WHR and the male hormone testosterone. Females with higher testosterone levels also tend to have an android fat distribution pattern (Van Anders & Hampson, 2005:248).

It is recommended that girths be measured with an unstretchable steel measuring tape with a length of at least 150cm, a breadth no wider than 7mm and a stub (blank) area of 4 cm before the zero line to avoid reading error at cross point. Waist girths are measured at the narrowest part of the torso, between the lower costal (10th rib) border and the top of the iliac crest (ACSM, 2006:59; Marfell-Jones *et al.*, 2006:87). The hip girths are measured at the greatest posterior protuberance, perpendicular to the long axis of the trunk (ACSM, 2006:59; Marfell-Jones *et al.*, 2006:88). The anthropometrist should be at eye level with the measuring point to exclude the possibility of a parallax error (Marfell-Jones *et al.*, 2006:79).

Table 2.3 Risk stratification of the Waist-to-hip ratio (WHR) (Heyward & Wagner, 2004:78)

Age	Low	Moderate	High	Very high
20-29	<0.71	0.71 – 0.77	0.78 – 0.82	>0.82
30-39	<0.72	0.72 – 0.78	0.79 – 0.84	>0.84
40-49	<0.72	0.73 – 0.79	0.80 – 0.87	>0.87
50-59	<0.74	0.74 – 0.81	0.82 – 0.88	>0.88
60-69	<0.76	0.76 – 0.83	0.84 – 0.90	>0.90

This measurement can be used as a field method for those without access to a laboratory. It can effectively be used in large groups and does not require expensive equipment, it is a valid, reliable and accurate measurement if

procedures are correctly followed and are relatively simple and easy to use. The waist-to-hip ratio does, however, appear to be sensitive to training and to have greater error in the measurement of females compared to measurements of males. In obese populations, change in waist-to-hip ratio occurs as a result of preferential loss of subcutaneous abdominal fat (De Ridder, 2002:104).

2.3.2.3 Methods used in this study to calculate percentage body fat

a) Skinfolds

The skinfold method is an indirect measuring method of the thickness of subcutaneous adipose tissue. It involves the grasping of fat beneath the skin at different sites on the body (De Ridder, 2002:23). Heyward and Wagner (2004:50) states that certain basic relationships are assumed when using the skinfold (SKF) method to estimate total body density (D_b). These assumptions include that the SKF is a good measure of subcutaneous fat, that the distribution of fat subcutaneously and internally is similar for all individuals within each gender, that the sum of several SKF's can be used to estimate total body fat because there is a relationship between subcutaneous fat and total body fat, that there is a relationship between the sum of SKF's and D_b , and that age is an independent predictor of D_b for both men and women.

Skinfolds are measured with a skinfold caliper. Various types of skinfold calipers are available in the market in plastic or steel, but the preferred caliper should possess a constant pressure of 10 g/mm^2 and be able to measure in increments of at least 0.2mm (Marfell-Jones *et al.*, 2006:12). The skinfold caliper widely used by Marfell-Jones *et al.* (2006:12) is the Harpenden skinfold caliper.

The skinfold method does not require expensive equipment. It is a valid, reliable and accurate measurement if correct measurement procedures are followed and are successfully used in the measurement of large groups and by those with no

access to a laboratory. It incorporates a low technology method and is relatively simple and easy to use. The sum of the skinfolds is inversely related to total body density and directly related to percentage body fat (De Ridder, 2002:104). The disadvantages of the skinfold method include the required skill and experience to attain reliable results. Poor site location and incorrect lifting of skinfolds contribute to measurement error. With obese people it is difficult to lift the skinfold and in the case of extremely obese individuals, the skinfold thickness may exceed the width of the caliper's jaw. The validity and reliability has also to be checked regularly (De Ridder, 2002:104).

In this study the 3-skinfold equation for non-obese females aged 18-55 was used. The equation had been developed by Jackson *et al.* (1980:180).

Table 2.4 Equations for body density and percentage body fat used in this study (Jackson *et al.*, 1980:180)

Age	Equations for body density and % body fat
Females: 18 - 55	$BD = 1.099421 - 0.0009929 (\Sigma 3SKF) + 0.0000023 (\Sigma 3SKF)^2 - 0.0001392(\text{age})$ $\%Fat = [(5.01 / BD) - 4.57] \times 100$

If each test is performed correctly according to the recommended guidelines, there is a $\pm 3\%$ error. Its validity compared to underwater weighing has an r value of 0.89.

b) Bod Pod

The Bod Pod (figure 2.1) is one of the newest forms of body composition testing developed by Life Measurements Instruments, Concord, CA (Georgia State University, 2007). The apparatus consists of a large, egg-shaped fiberglass

chamber that uses air displacement and pressure-volume relationships to derive body volume (BV) (Heyward & Wagner, 2004:33). The Bod Pod consists of a front and rear chamber (the rear chamber being the reference chamber) with a diaphragm in between (Life Measurement, Inc., 2007). The diaphragm oscillates during measurement creating pressure fluctuations which are used to solve for the volume in the front chamber (Poisson's law). The body volume (BV) is simply calculated as the difference between the chamber volume when it is empty and when the client is seated inside of the chamber (Life Measurement, Inc., 2007; Heyward & Wagner, 2004:33).



Figure 2.1 The Bod Pod air displacement plethysmograph adapted from Life Measurement, Inc. (2007)

As an air displacement plethysmograph, the Bod Pod centers on Boyle's law of the relationship between pressure and volume. It also attempts to serve as a control for changes in temperature and gas pressure that occur when a human is placed in an enclosed chamber (Life Measurement, Inc., 2007; Heyward & Wagner, 2004:33). To minimize the isothermal effects of clothing and hair, individuals are tested wearing minimal clothing and a swim cap to compress the hair. An estimate of body surface area, calculated from the height and weight of the client (BMI), is used to correct for the isothermal effects at the body's surface.

The volume of air in the lungs and thorax, is either directly measured or estimated by the Bod Pod to account for the isothermal conditions in the lungs (Life Measurement, Inc., 2007). After measuring the body volume (BV), the value is corrected for both Thoracic Gas Volume (TGV) and body-surface area (Heyward & Wagner, 2004:34).

This apparatus has drawn a lot of attention since 2002. In a study launched by Fields *et al.* (2002:464), the Bod Pod was ranked at or near the top in categories such as cost, time, maintenance, ability to accommodate people with limitations, and ease of use. Collins *et al.* (2003:80) agree with Fields *et al.* (2002:464) concerning the Bod Pod's precision, along with its speed and ease of measurement. The Bod Pod system correlates nicely with hydrostatic weighing (Georgia State University, 2007) and could be used in preference to hydrostatic weighing. It makes a valuable contribution in the long term to the field of body composition (Collins *et al.*, 2003:89).

Advantages of the Bod Pod include easy operation, short measurement time, its independence of water and excellent accommodation of special populations. It is, however, a very expensive piece of equipment and rare among body composition laboratories (Georgia State University, 2007; Life Measurement, Inc., 2007). Several factors can influence the accuracy of the Bod Pod measurements. These include hydration status and increases in muscle temperature. Also, it is imperative to breathe normally and remain still, since even slight movement may affect results (Georgia State University, 2007; Life Measurement, Inc., 2007). It displays possible error in cases where the individual possesses a lot of body hair and when the individual is either a small person or extremely obese (Heyward & Wagner, 2004:36). The Bod Pod is, however, recommended as the preferable instrument used when assessing individuals on a longitudinal basis (Collins *et al.*, 2003:80).

**Table 2.5 Predicted body fat percentage based on Body Mass Index (BMI)
for African-American and white adults (ACSM, 2006:59)**

BMI (kg/m²)	Health Risk	20 – 29 year old females
< 18.5	Elevated (too low)	< 21%
18.6 – 24.9	Average	21% – 32%
25.0 – 29.9	Elevated	34% – 39%
> 30	High	= 39%

2.4 The BMI, WHR and %BF as predictors of health risk

The prediction strength of the BMI, percentage body fat and waist-to-hip ratio to health and disease risk, is presented in a figure developed by Norton and Olds (1996:367). This study's aim is to shed light on the health risk of psychologically induced body-composition errors.

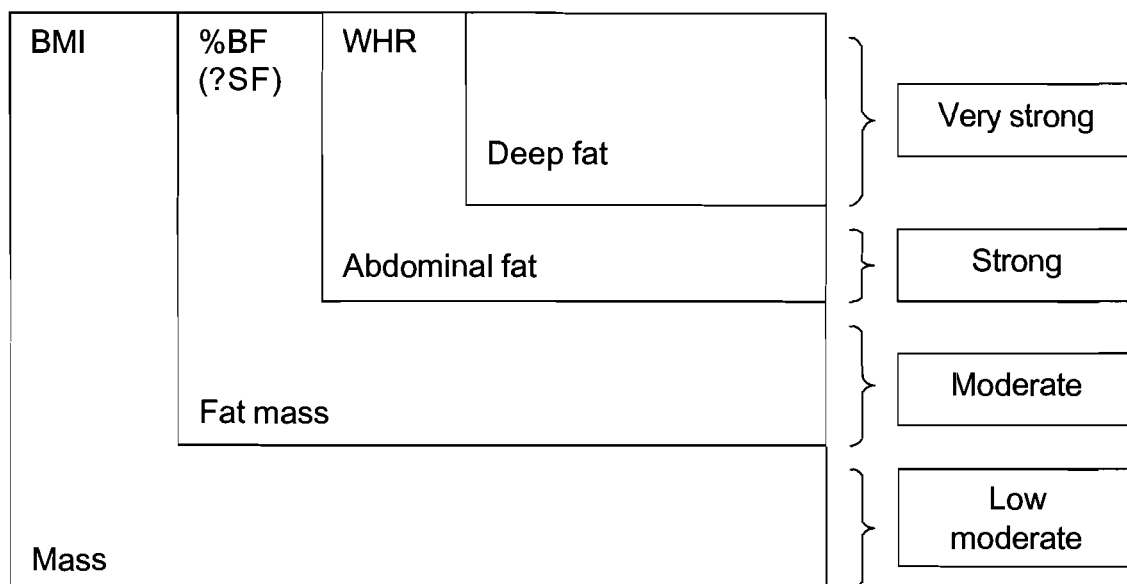


Figure 2.2 Relationship of anthropometric measures to risk factors for major pathologies adapted from Norton and Olds (1996:367).

Figure 2.2 illustrates a low moderate prediction of health risk by the BMI value which is calculated by means of body mass and stature values. Percentage body fat is a moderate predictor of health risk and a bit stronger than the BMI. It takes into account the subcutaneous part of body fat which is measured by means of skinfolds. The Waist-to-hip ratio is the strongest predictor of health risk among these three indirect body-fat measurements and include the waist and hip girths. Deep fat is a direct measurement of fat around internal organs and can only be performed on cadavers. However impossible to measure on living creatures, deep fat has the strongest relationship with major pathologies among all measurements of body fat.

2.5 Research on body image and body composition of young women

Table 2.6 provides a summary of research on body image and body composition over the past 15 years. Researchers, study titles, subjects, measurements and main findings are included in the table. No two studies examined the same

parameters, yet a few had common characteristics. The list aims to give a thorough overview of the different aspects of body image that have already been researched and to identify what the tendencies among young women have been. No significant change in the body-image perceptions of white young women is noted over the past 15 years. Women of other cultures have, in some studies, changed in their body-image perceptions over the last decade. Some studies also include men as subjects. Findings on men have not been included due to their irrelevance to this study.

Table 2.6 Research on Body Image

Author(s)	Year	Title of study and study design	Subjects	Measurements	Findings
Cohen-Tovée	1993	- Depressed mood and concern with weight and shape in normal young women. - Experimental study	48 female Cambridge University undergraduates	- Demographic information (weight, height and frame size) - Concern with body shape measured by the SCQ (Self Concept Questionnaire) & BSQ (Body Shape Questionnaire)	- Change in concern with body shape after induction of depressed mood was higher in high-concern group than in lower concern group. - Among those who place a high personal value on body shape, depressed mood can accentuate concerns with shape.
Geller <i>et al.</i>	1997	- The role of shape and weight in self-concept: The shape and weight based self-esteem inventory - Experimental study	110 females - Undergraduates 18-45 years	- Shape and Weight Based Self-esteem inventory (SWBS) - Eating Disorders Inventory (EDI) - Beck Depression Inventory (BDI) - General Information Sheet - Stroop Task - Word Recognition Task - Short Marlowe-	- Shape- and weight-based self-esteem may be associated with a shape and weight schema. - Shape- and weight-based self-esteem is a central cognitive feature of the eating disorders.

Table 2.6 (continues)

				Crowne Social desirability Scale • Rosenberg Self-Esteem Scale • Health Information Question- naire	
Springer <i>et al.</i>	1998	- Effects of a body image curriculum for college students on improved body image - Experimental	24 females - Undergraduates	- Body image - Disordered eating	A formal academic course can result in the reduction of both attitudinal and behavioral eating disorder risk factors.
Anton <i>et al.</i>	2000	Discrepancy between actual and ideal body images: Impact on eating and exercise behaviors.	115 college-age women	- BDS (body discrepancy scale) - Leisure time physical activity questionnaire - Measures of maladaptive eating attitudes and behaviors.	- Scores on BDS were associated with low levels of physical activity, with low levels of fruit and vegetable consumption and with high levels of body image dissatisfaction and binge eating. - Discrepancies between actual and ideal body images are associated with maladaptive eating and exercise patterns.
Loumidis & Wells	2001	Exercise for the wrong reasons: Relationship among eating disorder beliefs, dysfunctional exercise beliefs and coping	100 subjects attending a university sports center 52 female	- Exercise Beliefs Questionnaire - Eating Disorder Belief Questionnaire - Coping Inventory for Stressful Situations - COPE	- Exercise beliefs were associated with avoidance coping (distraction). - If not correlated for dysfunctional exercise beliefs, eating disorder beliefs and maladaptive coping, they might be paradoxically encouraging exercise for the wrong reasons.
Vohs <i>et al.</i>	2001	- Disordered eating and the transition to college: a prospective study. - Experimental study	342 females - Dartmouth College students.	- Changes in body self perception - Eating-related attitudes - Disordered eating - BMI	Disordered eating symptoms and attitudes are established before college.
Hayaki <i>et al.</i>	2002	Emotional expression and body dissatisfac-	141 females - College undergraduates	- EDI: Eating attitudes and behavior - BDI:	A lower level of emotional expression is related significantly

Table 2.6 (continues)

		- tion - Experimental study		- Depressed mood - IIP-C: Maladaptive interpersonal behavioral styles - Self-reported BMI measures	to greater body dissatisfaction.
Stice <i>et al.</i>	2003	- Adverse effects of social pressure to be thin on young women: an experimental investigation of the effects of "fat talk". - Experimental study	120 females - Undergraduate students from a large public university.	- Body dissatisfaction - Negative effect - Thin-ideal internalization - Social support	Exposure to peer pressure to be thin resulted in significant increases in body dissatisfaction relative to the control condition.
Aruguete <i>et al.</i>	2004	- Acculturation, body image and eating attitudes among black and white college students - Experimental	25 white university students 50 black university students	- Demographic information - Symptoms of eating disorders - Body mass silhouettes - Body image	- Blacks tended to desire the body size they considered healthy. - Whites desired a smaller body size than what they considered healthy.
Chang <i>et al.</i>	2004	- Unbearable weight: young adult women's experiences of being overweight - Experimental study	5 females - aged 20-23yrs - self-designated as overweight - Taiwan	Life experiences of young adult women who considered themselves overweight, but whose body weight was still within normal range.	Young women evaluate their body image in terms of attractiveness.
Halliwel & Dittmar	2004	Does size matter? The impact of model's body size on women's body-focused anxiety and advertising effectiveness	202 non-student women in the UK. - Median age was 28 years	- Images and advertisements - Rating of attractiveness of models - SATAQ (The sociocultural attitudes toward appearance questionnaire) - PASTAS (The Physical appearance state and trait anxiety scale)	- Exposure to thin models resulted in greater body-focused anxiety among women who internalize the thin ideal than exposure to average-size models or no models. - Advertisements were equally effective, regardless of the model's size.

Table 2.6 (continues)

Holmstrom	2004	- The effects of the media on body image: a meta-analysis - Meta-analysis	34 independent studies in which some measure of media exposure was independent variable and some measure of participants' weight-based body image, balanced feelings about thinness, or eating pathology was the dependent variable	Body dissatisfaction due to media exposure	- Thin images have little effect on participants' body image - Overweight images increase participants' body satisfaction - Literature examination revealed cloudy results
Melnik et al.	2004	Body Image Ups and Downs: Prediction of Intra-individual Level and Variability of Women's Daily Body Image Experiences.	108 women from Old Dominion University - Mean age = 22.4 years.	- BASS (Body dissatisfaction Scale) - ASI-R (Appearance Schemas Inventory-Revised) - SIBID-S (Situational Inventory of Body Image Dysphoria-Short Form) - BICSI (Body Image Coping Strategies Inventory) - EAT-26 (Eating Attitudes Test) - BISS (Body Image Sates Scale)	- Less favorable body image state levels were associated with: - Lower trait body image satisfaction - More body image dysphoria - More dysfunctional investment in appearance - More disturbed eating attitudes - Use of more maladaptive body image coping strategies. - Body image variability was predicted by: - Psychological investment in one's appearance - Disturbed eating attitudes and - Appearance-fixing coping strategies.
Rubin et al.	2004	- Exploring Feminist Women's Body Consciousness - Qualitative investigation	25 feminist women - Graduate and undergraduate	Group discussion about body consciousness and feminist resistance	- Participants described themselves as constantly aware of and attending to their bodies. - They worked hard to resist internalizing cultural messages about women's bodies.
Monro & Huon	2004	- Media-portrayed idealized images, body shame, and appearance anxiety - Experimental study	39 females - University students	- Pre-exposure and post exposure body shame - Appearance anxiety measures	- Appearance anxiety increased after viewing advertisements featuring idealized images. - Participants' body shame increased after exposure to

Table 2.6 (continues)

					idealized images, irrespective of advertisement type.
Eisenberg <i>et al.</i>	2005	- Weight-related issues and high-risk sexual behaviors among college students - Experimental	1168 college students - Males and females	- BMI - Sexual behaviors - Body satisfaction	Individuals with high body mass index, negative body image and unhealthy weight control behaviors may be more likely to engage in high-risk sexual behaviors than others.
Krones <i>et al.</i>	2005	- In vivo social comparison to a thin-ideal peer promotes body dissatisfaction: a randomized experiment - Experimental study	119 females - Undergraduates from the University of Texas, Austin. - Aged 17-22years	- Body dissatisfaction - Negative affect - Thin-ideal internalization - Perceived sociocultural pressure - Self-esteem	- Exposure to social comparative pressure to be thin promotes an increase in body dissatisfaction, which is a risk factor for eating pathology. - No increase in negative affect.
Wendell <i>et al.</i>	2005	The thick and the thin of it: Contextual effects in body perception.	120 undergraduates 41 men 78 women	Silhouettes of 12 different types of bodies	- Even a brief exposure to a set of body images can quickly change the standards by which people judge those images. - Exposure to wider sets of silhouettes rather than the thinner sets resulted in lower body satisfaction measures for the women - Women with poor body images consistently used thin ideals to judge the silhouettes and were not sensitive to the contextual manipulation.
Wilson <i>et al.</i>	2005	The relative contributions of waist-to-hip ratio and body mass index to judgments of attractiveness	180 males and females 17-51 years of age	9 photographs of body type	BMI plays a greater role in perceptions of female physical attractiveness than WHR, consistent with sociocultural theories of attractiveness in Western culture.
Craig <i>et al.</i>	2006	Peer pressure to "Fat talk": Does audience type influence	100 female college undergraduates	- BES (body esteem scale) - BWFA (body weight figure assessment)	In a fat-talk situation a target female would respond by self-degrading her body image.

Table 2.6 (continues)

		how women portray their body image?			
Jakatdar <i>et al.</i>	2006	Body image thought processes: The development and initial validation of the assessment of body-image cognitive distortions.	263 females - Aged 18-75 years	- ABCD (Assessment of body-image cognitive distortions) - SIBID-S (Situational inventory of body-image dysphoria-short form) - ASI-R (Appearance schemas inventory-Revised) - BISS (Contextual assessment with the body-image states scale) - BIQLI (Body-image quality of life inventory) - EAT-26 (Eating attitudes test) - PDS (Paulhus deception scales) - IM (impression management)	- More negative evaluation of and dissatisfaction with one's appearance was correlated with greater body-image cognitive distortions. - Cognitive distortions were related to more preoccupation with being or becoming overweight. - Greater psychological investment in one's appearance was related to higher levels of cognitive distortions. - Confirms a modest but significant relationship between cognitive distortions and a heavier BMI.
Neighbors & Sobal	2007	Prevalence and magnitude of body weight and shape dissatisfaction among university students	310 undergraduate students	- BMI - BWD (Body Weight Dissatisfaction) - BSD (Body Shape Dissatisfaction) - Body weight/size importance - Weight loss attempts	- Overweight individuals expressed the greatest BWD and BSD. - Normal weight females desired a slightly thinner, lighter body - Underweight females expressed little BWD and BSD, idealizing a body weight maintaining their BMI classification. - Results may suggest prevalent overweight females expressing less BD and few normal weight individuals idealizing a the thin.

2.6 Summary

Body dissatisfaction is a complex entity with numerous causes that goes hand-in-hand with eating disorders. The prevalence of body dissatisfaction is highest among female adolescents and young adult women, and in most cases already develops in childhood. It seems that the media have become the greatest contributor to the prevalence of body dissatisfaction and associated eating disorders among the entire spectrum of females. First year female students are especially prone to developing distorted body images due to, mainly, the media, social isolation, body dissatisfaction and dieting. Several questionnaires are used in research to identify and diagnose females with distorted body images and possible eating disorders. In this review the EDI-3 questionnaire with subscales for DT (drive for thinness) and BD (body dissatisfaction) is discussed.

Anthropometrical measurements including stature, mass, skinfolds and girths served as entities to provide information regarding BMI and WHR. The BOD POD air displacement plethysmograph is one of the newest and most accurate measurement tools for %BF and was used to determine the body fat percentages of the subjects. The WHR (body fat distribution) is recognized as the best predictor of health risk in body composition among these three. BMI (weight only) is the weakest predictor of health risk and percentage body fat (fat mass alone), a moderate predictor of health risk in all populations. The WHR is, however the weakest predictor of distorted body image, whereas BMI is the strongest. The prediction value of %BF regarding body image is not well documented.

In the literature a clear link exists between body image and anthropometry. The identification of certain anthropometric values with the strongest correlation with body image may supply beneficial information regarding the status of body dissatisfactory attitudes among young undergraduate women. It may also help in the selection of a single anthropometric measurement with the highest prediction

value for distorted body image among this population. With such a finding, health care providers could assist in the identification and treatment of young women with distorted body images.

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Chapter 3

THE BODY-COMPOSITION PROFILE OF FIRST-YEAR FEMALE UNIVERSITY STUDENTS

DIE LIGGAAMSAMESTELLINGSPROFIEL VAN EERSTEJAAR VROULIKE UNIVERSITEITSTUDENTE

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The body composition profile of first year female university students

ABSTRACT

Objective: To determine the general anthropometric profile (body mass, stature, skinfolds, girths, lean body weight and fat weight) and health risk classification according to body composition parameters (BMI, WHR and %BF) of first year female students of the North-West University, Potchefstroom campus. **Research Methods:** A cross-sectional study was performed on a multi-cultural sample of 116 university first year female students (mean (SD) age 18.9 (0.46) years). The procedure comprised (1) anthropometric measurements including stature, body mass, waist- and hip girths, triceps-, iliac crest- and thigh skinfolds as well as lean weight and fat weight measured with the Bod Pod; (2) health risk stratification according to the BMI, WHR (calculated from anthropometric measurements) and %BF (measured by the Bod-Pod). **Results:** Mean values for the sample (mean $\pm$ SD): stature, 165.0 $\pm$ 0.06 cm; body mass, 62.4 $\pm$ 10.1 kg; lean weight, 44.6 $\pm$ 6.98 kg; fat weight, 18.27 $\pm$ 9.24 kg, waist girth, 71.2 $\pm$ 7.2 cm; hip girth, 99.2 $\pm$ 7.1 cm; triceps skinfold, 21.6 $\pm$ 21.57 mm; iliac crest skinfold, 23.6 $\pm$ 23.59 mm; thigh skinfold, 36.4 $\pm$ 36.39 mm and %BF, 26.77 $\pm$ 6.27%. The majority of subjects presented with normal BMI values (18.5 – 24.9 kg/m²), n=82; moderate WHR's (0.71 – 0.77) n=63; and average levels of %BF (21.0 – 32.9%) n=74. **Discussion:** The waist and hip girths of the sample fitted a medium U.S. trouser size. Their stature was in line with U.S. values for women aged 16 to 20 years, whereas their body mass tested heavier. The majority of subjects presented with a gynoid fat distribution pattern and was at average health risk regarding all measured body composition parameters. No other comparable sets of anthropometric data were available for the drawing of further conclusions. Limitations include the lack of a detailed anthropometric profiles and/or insufficient health risk prediction due to the measurement of body composition

health-risk parameters only. By comparing different ethnic groups, conclusions may be more valid.

Introduction

Anthropometric measurements are commonly used by health professionals to calculate body composition parameters such as the body mass index (BMI), waist-to-hip ratio (WHR), body-fat percentage (%BF) as well as other health indicators to guide populations in terms of their health and to classify and treat individuals with illness or disease (Wikipedia, 2007; ACSM, 2006).

The BMI is presently the most common large-scale epidemiological equation used to categorize individuals as underweight, normal weight, overweight or obese (Ode, Pivarnik, Reeves & Knous, 2007; Heyward & Wagner, 2004). A shortcoming of the BMI is its great measure of considerable variability in body composition for any given value, because the BMI does not take into account the individual's body composition and does not differentiate between the non-fat and fat masses (Ode *et al.*, 2007). BMI is therefore best viewed as a measure of heaviness.

The WHR is concerned with the pattern of body-fat distribution (ACSM, 2006). Individuals with more fat distributed around their abdominal area (android fat distribution pattern), are at increased risk of hypertension, type 2 diabetes, hyperlipidemia, coronary artery disease, and premature death compared with individuals whose fat percentage is equally high, but distributed mainly around their hips (gynoid fat distribution pattern), (ACSM, 2006; Van Anders & Hampson, 2005; Montague, 2003).

The measurement of percentage body fat has become a favourable parameter for health risk stratification over the past 2 decades. Overweight or obese individuals with high percentage body-fat levels are at greater risk for premature death, the development of heart disease, diabetes, different kinds of cancer, breathing problems, arthritis, reproductive complications and other health consequences (Health and Human Services, 2007). On the contrary,

underweight individuals having too low body fat levels usually suffer from malnourishment causing fluid-electrolyte imbalances. They also present with renal and reproductive disorders, osteopenia or osteoporosis, and muscle wasting (Heyward & Wagner, 2004).

Anthropometric profiles differ extensively between races, genders and age groups. This is especially true when considering the numerous equations used by researchers to determine the fat percentage body fat of different races, populations and age groups (Heyward & Wagner, 2004). Other anthropometric health indicators (BMI and WHR) have fixed equations but differ in their health-risk categories for genders and age groups (Heyward & Wagner, 2004; ACSM, 2006).

In the matter of ethnicity, research shows that black university students tend to desire a body size they consider healthy while the white students desire a smaller body size than what they consider healthy (Arguete, Nickleberry & Yates, 2004). In South Africa 32% of wealthy black adult women are categorized as obese even though 15% of them believe they are underweight. According to Wittenberg (2005) these tendencies may be due to HIV negativity, material wealth, status, influence and power. Twenty eight percent of wealthy white adult women fall in the overweight or obese categories and more than 50% of them believe they are overweight (Wittenberg, 2005). On the contrary, in very low income groups, white women tend to be more overweight than black women.

Female undergraduate students desire lighter body weights whereas male undergraduates have either mixed opinions or have a desire to gain weight (Neighbors & Sobal, 2007). Female undergraduates in particular, are at great risk for developing eating disorders due to social isolation, high anxiety, body dissatisfaction, dieting and excessive exercise (Levitt, 2004). Specific anthropometric guidelines and standards are therefore especially important in this population group.

There is considerable variability among different countries and sources regarding the age of adulthood in females. Maturity is recognized by a combination of mainly three parameters as a function of age; cessation of skeletal growth (16 – 17 years of age), reaching peak stature (16 years of age) or reaching peak body weight (14 years of age), (Gallahue & Ozmun, 2000; Daniels, Khoury & Morrison, 1997). Adult health statistics start at the age of 16 years in the United States and vary between 16 and 18 years among other countries (Ellis-Christensen, 2007; Wikipedia, 2007). In South Africa the age of sexual consent is 16 years whereas adult mortality statistics include 15 year olds. First-year female students (age range 17 -20 years) are therefore categorized as adults. Yet anthropometric health indicators for adult women only range between ages 20 to 79 years (ACSM, 2006; World Health Organization, 2000). This leaves a 4 year age gap with no female body composition health indicator values. The mean age for first year female students (young adults) is about 18 years (Gallahue & Ozmun, 2000), placing them in this target research area.

The aim of this study was to set up a general body-composition profile for a multi-cultural group of young women and to evaluate their health risk according to selected body composition parameters. To our knowledge, such a study has not yet been performed on a multi-cultural female university group in the North-West province.

Methods

This study was a cross-sectional design that has been approved by the Ethics Committee of the North-West University (project number 06M10). The study was set on the Potchefstroom Campus of the North-West University, South Africa. All authorities were fully informed by written consent about the objectives and procedures of the study prior to any recruitment of subjects. The authorities included the Potchefstroom Campus Rector (Prof. A. Combrink), authorities of

campus student matters (Prof. Hendre Reyneke – Dean of Students) and all the house committees and house parents of female hostels.

Subjects

One hundred and sixteen female subjects from the North-West University, Potchefstroom Campus were selected in randomized fashion. All subjects were residents in female campus hostels and in their first year of study. Subjects varied between the ages of 17 and 20 years and were from various fields of study. No selection restrictions were set on ethnicity, so the selected group represented the views of more than one cultural group. Subjects were selected in random fashion and the only selection criteria for participation was to be an academic first year female resident on the Potchefstroom Campus. One of the twelve campus hostels refused participation, therefore the number of candidates selected from that hostel was recruited pro rata from the remaining hostels to meet the desired total of subjects needed for the study. If a recruited subject refused participation, another volunteer was selected in her place. All subjects were personally informed about the details of the study at routine meetings of the hostels. After selection, each student received an information page stating all procedures, dates and details of testing. The day before testing each participant was reminded of the testing times, location and duration of testing via text message. Subjects were free to query procedures or quit participation at any time before or during testing.

Testing procedures

Testing was conducted in November 2006. Subjects were accommodated in groups of six. On arrival at the anthropometry laboratory, all participants were formally welcomed, requested to sign an informed consent form and to complete a document containing their demographic information. To ensure privacy they were asked to attend the anthropometric station one at a time where their stature, skinfolds and girths were measured.

Stature was measured using a stadiometer whilst body mass was measured with the BOD-POD electronic weighing scale. The waist girth, hip girth and skinfolds (triceps, iliac crest and thigh) were taken by two qualified Level 1 anthropometrists (supervised by a level 2 and level 4 anthropometrist) according to standardized methods as described by Marfell-Jones, Stewart and Carter (2006). Girths were measured with a Lufkin (Cooper Tools, Apex, NC) unstretchable metal measuring tape to the nearest 0.1 cm. A Harpenden (British Indicators, UK) skinfold caliper with a constant pressure of 10 g/mm² was used for the measurements of the skinfolds to the nearest 0.2 mm.

On completion of the anthropometric measurements, all subjects were required to attend the BOD-POD station. Before measurement, subjects were asked to fully urinate, take off all jewelry and dress in tight fitting sportswear so as to minimize measurement error due to excess air caught up in clothing. Each subject also wore a swimming cap to suppress air captured by hair. Their body mass was measured electronically with the BOD-POD weighing scale to the nearest 100g. Fat percentage, lean body weight and fat weight were all calculated with the BOD-POD electronic body composition measurement system.

The ACSM (2006) classification for BMI, WHR and %BF was used to sort the subjects into the different health risk categories.

Two weeks after testing, each subject received a report containing their personal anthropometric measurements, category of health risk and recommendations.

Data Analysis

This study reports an anthropometric profile and therefore contains no correlation values, statistical significance or practical significance. The discussion is based on descriptive statistics of the anthropometric values and the body composition parameters where maximum, minimum and mean values were interpreted. Standard Deviation values are also reported. The data was analyzed using the software program Excel of Microsoft Office 2000. Two subjects were excluded due to incomplete anthropometric proformas.

Results

The descriptive statistics of the group of first year female students (n=114) are presented in Table 1. The table includes anthropometric measurements as well as body-composition variables and their associated health risk categories derived from the anthropometric measurements.

Table I: Descriptive statistics of the anthropometric and body composition variables of first-year female students (n=114)

Variable	Classification	Category range	Mean	Std. Dev.	Minimum	Maximum
Age (years)	NA	NA	18.9	0.46	18.0	21.0
Stature (cm)	NA	NA	165.0	6.0	142.0	181.0
Body Mass (kg)	NA	NA	62.4	10.13	41.8	104.3
Waist girth (cm)	NA	NA	71.2	7.23	57.5	98.0
Hip girth (cm)	NA	NA	62.4	7.13	83.5	125.3
Lean body weight (kg)	NA	NA	44.63	6.98	20.9	60.4
Fat weight (kg)	NA	NA	18.3	9.24	6.6	65.4
Skinfolds (mm)	NA	NA				
• Triceps			21.6	21.57	10.1	44.4
• Iliac crest			23.6	23.59	9.0	57.0
• Thigh			35.0	36.39	14.3	62.0
BMI (kg/m ²) #	Total group (n=114)		22.64	3.32	16.7	37.0
	Underweight (n=6)	<18.5	17.5	0.7	16.7	18.2
	Normal (n=82)	18.5 – 24.9	21.4	1.5	18.6	24.8
	Overweight (n=23)	25.0 – 29.9	26.4	1.0	25.2	29.0
	Obese (n=3)	≥30	34.0	2.8	31.4	37.0

Table I (continues)

Variable	Classification	Range	Mean	Std. Dev.	Minimum	Maximum
WHR *	Total group (n=114)		0.71	0.04	0.63	0.85
	Low (n=42)	<0.71	0.68	0.02	0.63	0.70
	Moderate (n=63)	0.71 – 0.77	0.73	0.02	0.71	0.77
	High (n=6)	0.78 – 0.82	0.79	0.02	0.78	0.82
	Very high (n=3)	>0.82	0.84	0.01	0.83	0.85
% Body Fat **	Total group (n=114)		26.8	6.27	14.4	44.9
	Low (n=24)	<21.0	18.7	1.82	18.4	20.7
	Average (n=74)	21.0 – 32.9	27.6	3.05	21.0	32.5
	High (n=12)	33.0 – 38.9	35.0	1.74	33.5	38.6
	Very high (n=5)	=39.0	42.64	1.5	40.7	44.9

NA

Not applicable

#

Body Mass Index

*

Waist-to-hip-ratio

**

Percentage body fat

Std. Dev.

Standard Deviation

According to Table 1, the subjects had an average age of 18.9 ± 0.46 years. They had an average stature of 165.0 ± 6.0 cm with the tallest subject being 181.0 cm tall and the shortest subject 142.0 cm. The heaviest subject weighed 104.3 kg and the lightest subject 41.8 kg. The average body mass of the subjects was 62.4 ± 10.13 kg.

The subjects had an average waist girth of 71.2 ± 7.23 cm with the largest waist girth 98.0 cm and the smallest waist girth 57.4 cm. The average hip girth of the subjects was 99.2 ± 7.13 cm with the largest hip girth 125.3 cm and the smallest hip girth 83.5 cm. The average lean body weight of the subjects was 44.63 ± 6.98 kg. The minimum lean body weight value was 20.9 kg and the maximum value was 60.4 kg. The mean fat weight value of the subjects was 18.27 ± 9.24 kg with a maximum value of 65.4 kg and a minimum value of 6.6 kg.

Regarding the three skinfolds, the subjects portrayed an average triceps skinfold of 21.6 ± 21.57 mm. The largest triceps skinfold value of the subjects was 44.4 mm and the smallest, 10.1 mm. The mean value of the skinfold of the iliac crest was 23.6 ± 23.59 mm with the largest value, 57.0 mm and the smallest, 9.0 mm. The largest thigh skinfold among the subjects was 62.0 mm and the smallest was 14.3 mm. The mean skinfold thickness on the thigh was 35.0 ± 32.6 mm.

Figures 1, 2 and 3 are graphic representations of the body composition variables (BMI, WHR and %BF) as listed in Table 1.

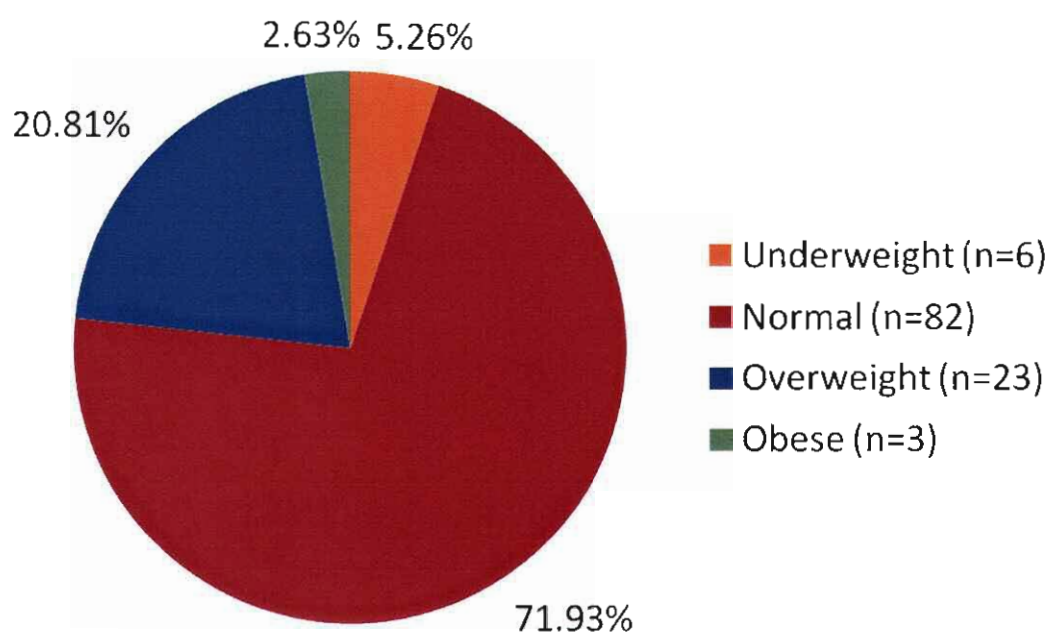


Figure: 1 Representation of subjects in the different categories for BMI

The subjects were divided into four health-risk categories for the BMI. Six subjects (5.26%) belonged to the underweight category ($<18.5 \text{ kg/m}^2$) with an average BMI of $17.5 \pm 0.7 \text{ kg/m}^2$. Eighty-two subjects (71.93%) belonged to the normal category ($18.5 - 24.9 \text{ kg/m}^2$) with a mean value of $21.4 \pm 1.5 \text{ kg/m}^2$ and twenty-three subjects (20.18%) represented the overweight category ($25.0 - 29.9 \text{ kg/m}^2$) with a mean value of $26.4 \pm 1.0 \text{ kg/m}^2$. Three subjects (2.63%) belonged to the obese category ($\geq 30 \text{ kg/m}^2$) with the lowest value of the obese group at 31.4 kg/m^2 and a highest value of 37.0 kg/m^2 . The mean BMI value of the total group ($n=114$) was $22.6 \pm 3.32 \text{ kg/m}^2$ with the lowest value at 16.7 kg/m^2 and the highest value for the total group at 37.0 kg/m^2 (Also see Table 1).

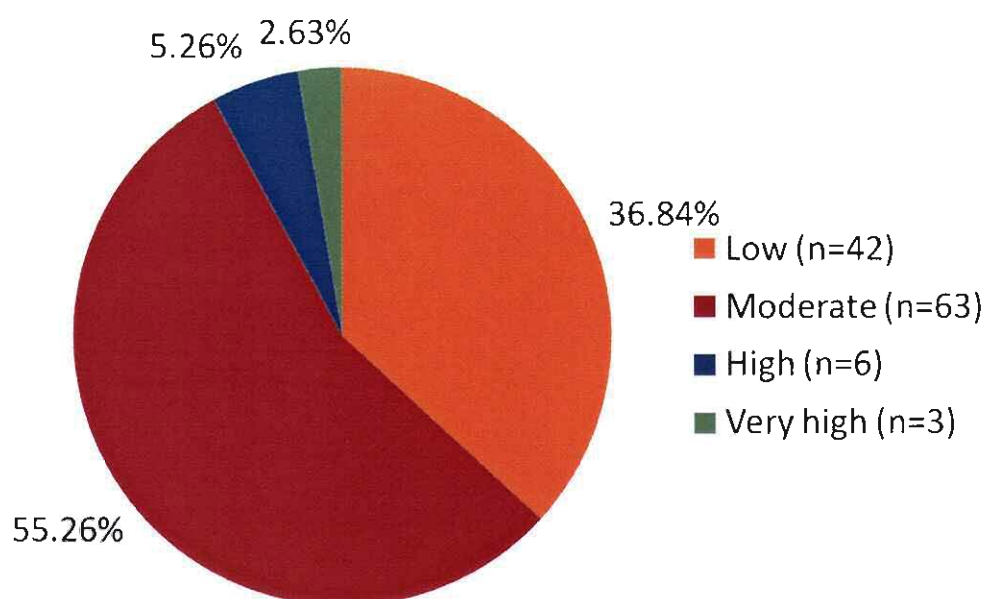


Figure: 2 Representation of subjects in the different categories for WHR

The subjects were also divided into four health-risk categories for the WHR value. Forty-two subjects (36.84%) were at low risk (<0.71). In the low risk category, the lowest value was 0.62 and the highest, 0.70 with the mean 0.68 ± 0.02 . Sixty-three subjects (55.26%) had a moderate health risk ($0.71 - 0.77$) with the mean value 0.73 ± 0.02 , the smallest value 0.71 and the highest value 0.77. Six subjects (2.63%) were at high risk ($0.78 - 0.82$) with the smallest value in this category 0.78, the largest 0.82 and the mean value 0.79 ± 0.02 . Only three subjects (2.63%) were at very high health risk (>0.82). In the very high risk category, the lowest value was 0.83, the highest, 0.85 and the mean value 0.84 ± 0.01 . The average WHR value of the total group was 0.71 ± 0.04 . The highest value of the total group was 0.85 and the lowest value was 0.62. (Also see Table 1).

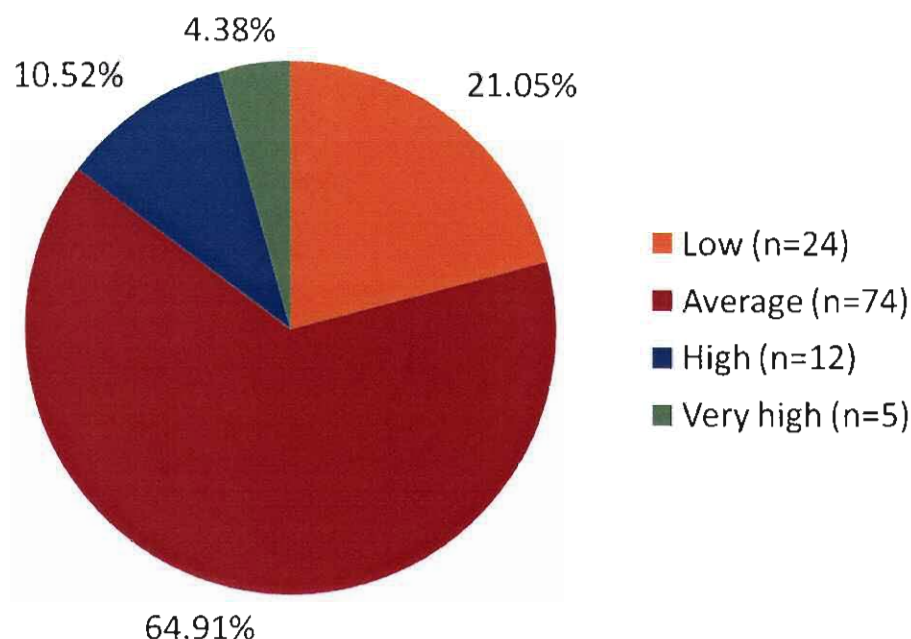


Figure: 3 Representation of subjects in the different categories for %BF

The body-fat percentages of the subjects were calculated by means of the Bod-Pod air-displacement plethysmograph. The average BF% of the subjects was $26.8 \pm 6.27\%$. The subject with the highest fat percentage had a value of 44.9% whilst the subject with the lowest fat percentage showed a value of 14.4%. Again the subjects were sorted according to health risk. Twenty-four subjects (21.05%) belonged to the low risk category ($<21\%$) with the lowest value being 18.4%, the highest value 20.7% and the mean $18.7 \pm 1.82\%$. Seventy-four subjects (64.91%) had an average body fat percentage (21 -32%) with a mean of 27.6 ± 3.05 and twelve subjects (10.52%) were at a high health risk (33 -38%) with a mean of $35.0 \pm 1.74\%$. Five subjects (4.39%) were at very high health risk ($\geq 39\%$) with a minimum value of 40.7%, a maximum value of 44.9% and a mean value of $42.62 \pm 1.5\%$. (Also see Table 1).

The majority of subjects were of normal weight for their stature (71.93%), had average body fat percentages (64.91%) and were at moderate health risk regarding their WHR (55.26%). Five percent of subjects were underweight

whereas 21.05% of subjects were under fat. Just over a third of the subjects were at low health risk regarding their WHR (36.84%). An estimated 23% of subjects were overweight or obese whereas only 14.9% of the subjects had high or very high levels of body fat. Only 7.89% of subjects were at high or very high health risk regarding their WHR.

Discussion

According to Statistics South Africa (2007) and Gallahue and Ozmun (2000), the onset of adulthood for females is 16 years of age. However, criteria for disease-risk classification used in South Africa only starts at twenty years of age (ACSM, 2006; World Health Organization, 2000). As a result, there is a lack of health statistics for females aged 16 to 20 years. This tendency is probably due to the shortage of anthropometric data in health studies of South Africa for women aged 16-20 years. The multi-cultural diversity in the country also cripples a definite general profile for body composition in females aged 16-20 years. The anthropometric measurements and health risk parameters measured in this study are consequently truly unique.

The mean stature value (165.0 ± 6.0 cm) of the group compared well with the 50th percentile of the U.S. female stature-for-age chart. On the chart, women aged 16 average 163.0 cm whilst women aged 20 average a value of 165.0 cm. The group's average body mass (62.4 ± 10.13 kg) presented much higher than the mean values for women 16 years (54.0 kg) and 20 years (57.0 kg) on the same chart (Gallahue & Ozmun, 2000).

A combination of the average waist girth (71.2 ± 7.23 cm) and hip girth (99.2 ± 7.13 cm) categorized the group shapely for a medium U.S. trouser size range (waist: 68.58 cm – 72.1 cm; hip: 95.0 cm – 101.8 cm), (Nellis, 2007). No comparable data is available on the values for lean body weight and fat weight, or fat distribution regarding the triceps, iliac crest and thigh skinfolds.

The mean BMI-value of the total group of students (22.6 ± 3.32 kg/m²) tested slightly lower than the national average median BMI for women aged 20-29 years (24.4 kg/m²) (Halls, 2003). Seventy-two percent of the students belonged to the healthy weight category whereas only 36.1% of women over the age of 20 years in the U.S. are considered having a healthy weight for their stature. A total of 23.44% of students tested overweight or obese in comparison to the 36.1%

overweight and obese individuals in the U.S. female population (U.S. Department of Health and Human Services, 2006).

The group of students tended to rather be under fat than over fat with the majority of subjects having normal body-fat percentages. This is according to the body fat percentage categories of the ACSM (2006) for white and Hispanic women aged 20-29 year. Other available literature is inconsistent regarding norms for body-fat percentage among different ages, genders and ethnic groups. It is thus difficult to compare the data of this multi-ethnic group to other sets of available data regarding body-fat percentage.

The majority of subjects presented a typical gynoid fat distribution pattern and was at low risk for chronic diseases related to high WHR values (ACSM, 2006). Again, the lack of research data regarding the WHR cripples the significant comparison of this data set to others.

Values of the body composition variables best fitted the Western body composition tendencies. This could possibly be the result of a larger representation of white subjects in the selected group, or the change of non-western subjects' cultural beliefs regarding body composition to the Western cultural beliefs throughout the group.

Limitations of the study include the small number of subjects hampering the generalization of findings to the total population. The representation of the different ethnic groups have not been recorded and conclusions arrived at may be one sided. The limited anthropometric proforma was insufficient to establish a full anthropometric profile for women aged 16-20 years.

Recommendations for future research

The different contributions of ethnic groups to the anthropometric profile of young women might be of value in the multi-cultural composition of the South African population. Future research might assist in assessing the possible cultural shift among young non-western women regarding body composition. In order to predict health risk accurately, more health-risk parameters need to be tested as isolated body composition values are insufficient predictors of health risk. Conduction of such research at the beginning as well as the end of the year could assist in understanding the effect of a unique University atmosphere on the body composition of first year female students.

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Chapter 4

THE RELATIONSHIP BETWEEN BODY DISSATISFACTION, DRIVE FOR THINNESS AND BODY COMPOSITION AMONG FIRST-YEAR FEMALE UNIVERSITY STUDENTS

DIE VERBAND TUSSEN LIGGAAMSONTEVREDENDHEID, MAERHEIDSDRYF EN LIGGAAMSAMESTELLING BY EERSTEJAAR UNIVERSITEITSDAMESTUDENTE

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The relationship between body dissatisfaction, drive for thinness and body composition among first-year female university students

ABSTRACT

Objective: To determine whether relationships between body composition variables (BMI, WHR, fat % and body mass) and psychological parameters (Drive for thinness and Body Dissatisfaction) exist among first year female students of the North-West University, Potchefstroom campus. Also, to determine the degree of BD and DT in the different health risk categories of the body composition variables. **Methods:** A cross-sectional study of 116 university first year female students was conducted. Body-composition measurements included stature, body mass, waist- and hip circumferences and body-fat percentages measured by means of Bod-Pod air-displacement plethysmograph. Health-risk parameters were calculated (BMI and WHR) and measured (%BF). Body Dissatisfaction and Drive for Thinness were measured with subscales of the EDI-III questionnaire. **Results:** The sample showed statistically significant positive relationships of certain body composition variables (body mass, BMI and body fat percentage) with both Body Dissatisfaction and Drive for Thinness. The waist-to-hip ratio did not in any way correlate with BD or DT. The underweight (BMI) and under normal (fat percentage) categories scored lower DT and BD scores than the normal categories, but did yield statistical significance ($p < 0.01$) as well as practical significance. No results for the overweight and obesity categories are available due to insufficient representation by the subjects. **Discussion:** The present study found that young women were dissatisfied with their bodies and had a significant drive for thinness irrespective of their body weight, BMI or percentage body fat. This tendency, however, was not true of the WHR. The higher their body composition values were, the higher was their BD and DT. Those subjects in the normal BMI and average BF% categories scored higher on the BD and DT scales than those in the underweight (BMI and %BF) categories. More research is needed to prove the validity of these findings and to test this tendency among obese subjects of the same population. Also to identify possible influential risk factors unique to first-year female students' environment for concern to

health care providers. The contribution of different ethnic groups to the conclusions could also shed light on the validity of the findings.

Introduction

Body image is a complex notion, referring both to what Schilder (1938) called “the picture of our body which we form in our minds” and to our affective response to our appearance (Wardle & Foley, 1989). Body dissatisfaction is a central feature of eating disorders (Hayaki, Friedman & Brownell, 2002) and the origin of the majority of causes for body dissatisfaction already arises in childhood (Goodman, Dornbusch, Richardson & Hastorf, 2004; Hayaki *et al.*, 2002; Vohs, Heatherton & Herrin, 2001). Children in our time are overexposed to the media which constantly depict extremely thin celebrity women as successful, beautiful and treasurable, portraying thinness as a requirement for success (BBC News, 2007; Holmstrom, 2004).

Children grow up becoming adolescents, a period indicating the entry of young individuals into the adult world (Maritz, De Ridder, Nienaber, Coetzee & Underhay, 2003). From adolescent to young individual, the severity of disordered eating patterns does not change significantly (Vohs *et al.*, 2001). The pressure in this population does, however, increase as its responsibilities increase. Researchers reason that the factors causing pressure in the lives of young women mainly include finding a partner, choosing a career, achieving financial independence, creating a respectable social life, having direction in life, “not to mention needing to look good and be thin” (Eisenberg, Neumark-Stainer & Lust, 2005; Wendell, Santoyo & Pettibone, 2005; Dickerson, 2004; Levitt, 2004; Polivy & Herman, 2002). According to Barlow and Durand (1999) the urge for control is seen in a woman’s choice and ability to rule her own body.

College women in particular are at great risk for developing eating disorders due to social isolation, high anxiety, body dissatisfaction, dieting and in some cases even excessive exercise (Levitt, 2004). Even in the technological world the problem of lack of confidence and low self-esteem surfaced in various areas of study. This tendency gained scientific attention in the 1990’s as young women were excluded from technological fields due to their lack of confidence in their own efficacy to handle technical situations adequately (Wender, 2004).

Consequently, ever so often, young women identify themselves as failures – as not doing it right, as not being good enough, as not being heard, as being invisible (Wendell *et al.*, 2005; Chang, Liou, Sheu & Chen, 2004). Robbins and Wilner (2001) coined this fragile set of coping inabilities – reaching a peak during the decade of the 20's – as the *Quarter life Crisis*.

The aim of this study was to determine whether relationships between psychological parameters such as drive for thinness and body dissatisfaction, and body composition measurements such as BMI, WHR, body mass and %BF exist in this group of students. Also, to determine the degree of body dissatisfaction and drive for thinness of the group in the different health risk categories for body composition.

Methods

This study was a cross-sectional design that has been approved by the Ethics Committee of the North-West University (project number 06M10). The study was set on the Potchefstroom Campus of the North-West University, South Africa. All authorities were fully informed by written consent about the objectives and procedures of the study prior to any recruitment of subjects. The authorities included the Potchefstroom Campus Rector (Prof. A. Combrink), authorities of campus student matters (Prof. Hendré Reyneke – Dean of Students) and all the house committees and house parents of female hostels.

Subjects

One hundred and sixteen female subjects from the North-West University, Potchefstroom Campus were selected in randomized fashion. All subjects were residents in female campus hostels and in their first year of study. Subjects varied between the ages of 17 and 20 years and were from various fields of study. No selection restrictions were set on ethnicity, so the selected group represented the views of more than one cultural group. Subjects were selected in random fashion and the only

selection criteria for participation was to be an academic first year female resident on the Potchefstroom Campus. One of the twelve campus hostels refused participation, therefore the number of candidates selected from that hostel was recruited pro rata from the remaining hostels to meet the desired total of subjects needed for the study. If a recruited subject refused participation, another volunteer was selected in her place. All subjects were personally informed about the details of the study at routine meetings of the hostels. After selection, each student received an information page stating all procedures, dates and details of testing. The day before testing each participant was reminded of the testing times, location and duration of testing via text message. Subjects were free to query procedures or quit participation at any time before or during testing.

Testing procedures

Testing was conducted in November 2006. Subjects were accommodated in groups of six. On arrival at the anthropometry laboratory, all participants were formally welcomed, requested to sign an informed consent form and to complete a document containing their demographic information. To ensure privacy they were asked to attend the anthropometric station one at a time where their stature, skinfolds and girths were measured.

Stature was measured using a stadiometer whilst body mass was measured with the BOD-POD electronic weighing scale. The waist girth, hip girth and skinfolds (triceps, iliac crest and thigh) were taken by two qualified Level 1 anthropometrists (supervised by a level 2 and level 4 anthropometrist) according to standardized methods as described by Marfell-Jones, Stewart and Carter (2006). Girths were measured with a Lufkin (Cooper Tools, Apex, NC) unstretchable metal measuring tape to the nearest 0.1 cm. A Harpenden (British Indicators, UK) skinfold caliper with a constant pressure of 10 g/mm² was used for the measurements of the skinfolds to the nearest 0.2 mm.

On completion of the anthropometric measurements, all subjects were required to attend the BOD-POD station. Before measurement, subjects were asked to fully urinate, take off all jewelry and dress in tight fitting sportswear as to minimize measurement error due to excess air caught up in clothing. Each subject also wore a swimming cap to suppress air captured by hair (Life Measurement, Inc., 2007). Their body mass were measured electronically with the BOD-POD weighing scale to the nearest 100g. Fat percentage, lean body weight and fat weight were all calculated with the BOD-POD electronic body composition measurement system.

The ACSM (2006) classification for BMI, WHR and %BF was used to sort the subjects into the different health risk categories.

EDI-III (Eating Disorder Inventory III)

The ED-III is a self-report questionnaire consisting of 91 questions disproportionately divided into 12 subscales. It is a measurement tool widely used by psychologists in the field of eating-related disorders. The two subscales of particular importance in this study were the DT (drive for thinness) and BD (body dissatisfaction) subscales which correlated highly with the Eating Disorder Risk scales at $r=0.96$ and $r=0.97$ respectively (Garner, Olmstead & Polivy, 1983).

Two weeks after testing, each subject received a report containing their personal anthropometric measurements, category of health risk and recommendations.

Data analysis

All data was analyzed by means of the software program StatSoft (2006) which is available on the computer network of the North-West University. A Pearson product-correlation coefficient was used to establish whether any significant relationships existed between the anthropometric measurements (BMI, WHR and %BF) and the

psychological parameters (DT and BD). Where significant relationships were noted, the psychological parameters were compared to the different anthropometric health-risk categories as set by the ACSM (2006). The practical significance of the found relationships were then determined (Cohen, 1988). A Tukey's honestly significant difference test was used to determine the level of significance of the findings. In this study the level of significance was set at $p < 0.01$.

Results

All subjects completed the study ($n=116$). Anthropometric data of 3 subjects were excluded due to incomplete anthropometric data. General anthropometric and psychological characteristics of the population are shown in Table 1.

Table 1: Descriptive statistics of the anthropometric and psychological parameters of the first-year female students ($n=116$)

Variable	Mean	Std. Dev.	Minimum	Maximum
Stature (cm)	165.0	6.0	142.0	181.0
Body mass (kg)	62.40	10.12	41.82	104.28
BMI (kg/m ²)	22.65	3.32	16.73	36.95
WHR	0.72	0.04	0.63	0.85
%BF	26.77	6.27	14.4	44.9
DT	11.39	7.4	0	27.0
BD	20.28	9.7	0	40.0

BMI = Body mass index

WHR = Waist-to-hip ratio

%BF = Percentage body fat

DT = Drive for thinness

BD = Body dissatisfaction

SD = Standard Deviation

According to Table I, the average stature of the subjects was 165.0 ± 6.0 cm with the tallest subject, 181.0 cm tall and the shortest subject 142.0 cm tall. The heaviest subject weighed 104.3 kg and the lightest subject 41.8 kg. The average body mass of the subjects was 62.4 ± 10.13 kg.

They were also characterized by a mean BMI of 22.65 ± 3.32 kg/m² which falls in the normal BMI category ($18.5 - 24.9$ kg/m²), (ACSM, 2006); a mean waist-to-hip ratio of 0.72 ± 0.04 which falls in the moderate health risk category ($0.71 - 0.77$) (Heyward & Wagner, 2004), and a mean fat percentage of $26.77 \pm 6.27\%$ which falls in the average risk category ($21.0 - 32.9\%$) for women aged 20 to 39 years (ACSM, 2006).

A raw DT-score of equal to or less than 16.0 is considered of low clinical range (Garner *et al.*, 1983). The mean raw DT-score of 11.39 ± 7.4 is lower than 16.0 and falls between the first and 24th percentile of U.S. adult females. A raw BD-score of equal to or less than 21.0 is considered of low clinical range. The mean raw BD-score of 20.28 ± 9.7 is, therefore, also considered of low clinical range and falls between the first and twenty fourth percentile of the U.S. Adult Combined Clinical sample.

The relationship between the body composition parameters and psychological subscales are presented in scatter-graph format in Figures 1 through 4.

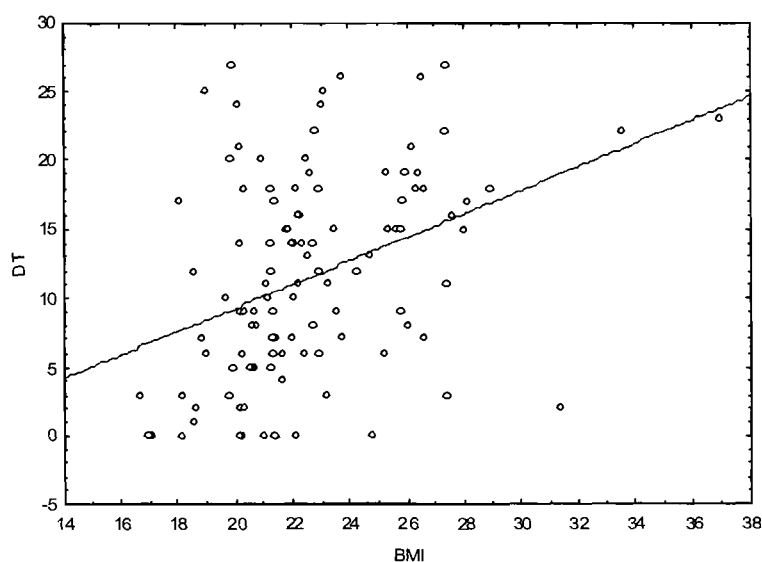


Figure 1: The relationship between the BMI (Body Mass Index) and Drive for thinness among first-year female students

The BMI-values of the group of students demonstrated a weak, but significant positive correlation with the psychological parameter DT presenting a correlation value of $r=0.38$. This suggests that the higher the BMI-values of the group were, the stronger their desire to be thinner and the greater their preoccupation with weight loss. The data set was statistical significant ($p<0.01$).

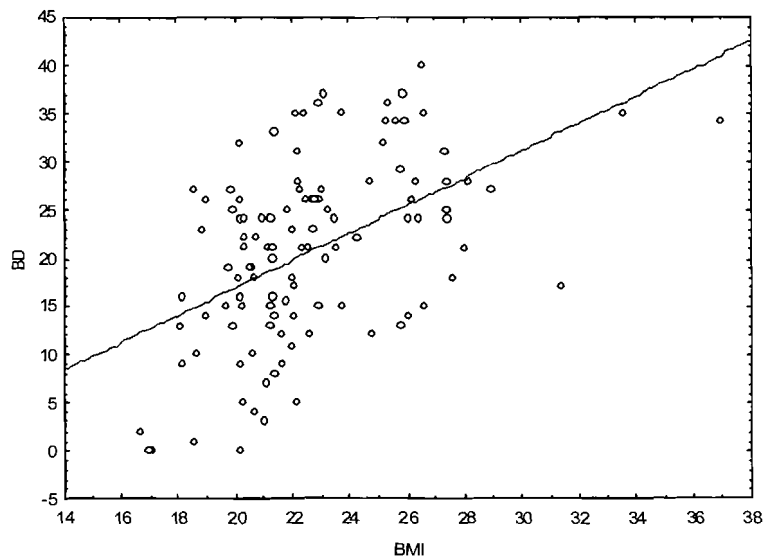


Figure 2: The relationship between BMI (Body Mass Index) and Body Dissatisfaction among first-year female students

A positive correlation was formed between the BMI-values of the group and the psychological parameter BD. A correlation value of $r=0.5$ was found, which is evident of a moderately strong relationship. This relationship suggests that the higher the BMI-values of the group of students were, the more dissatisfied they became with their bodies. This is especially true regarding their belly, buttock, hip and thigh areas as is suggested by Garner *et al.* (1983). The correlation also proved to be statistically significant ($p<0.01$). Body dissatisfaction presented a stronger relationship with the BMI-value than Drive for thinness.

The isolated body mass value revealed the same tendency as the BMI with both psychological parameters: DT ($r=0.4$, $p<0.01$) and BD ($r=0.46$, $p<0.01$). This is probably due to the fact that body mass value is an integral part of the equation for body mass index.

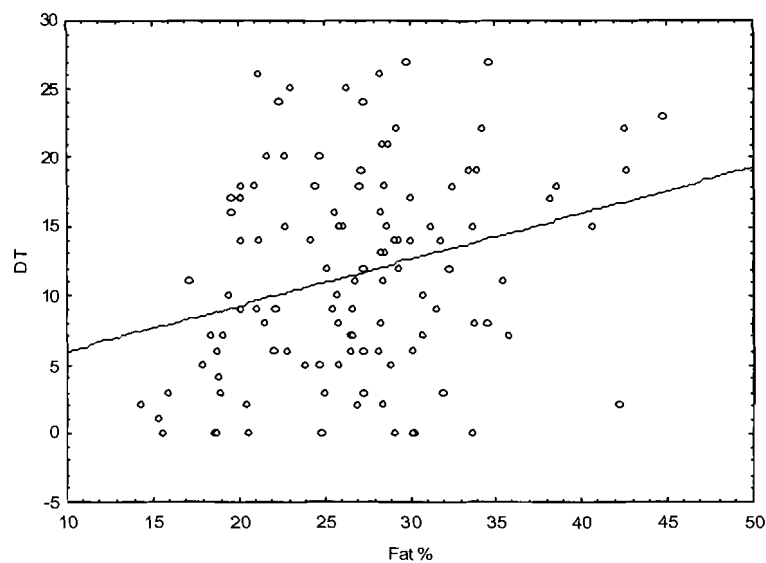


Figure 3: The relationship between Fat Percentage and Drive for Thinness among first-year female students

A weak positive correlation ($r=0.28$) existed between the values for body fat percentage and DT. This suggests that the higher the body fat percentages of the group, the stronger they desired to be thin and the more they were preoccupied with weight loss. Body fat percentage seems to be a weaker predictor of DT than the BMI in this group of female students. The data set proved to be statistically significant ($p<0.01$).

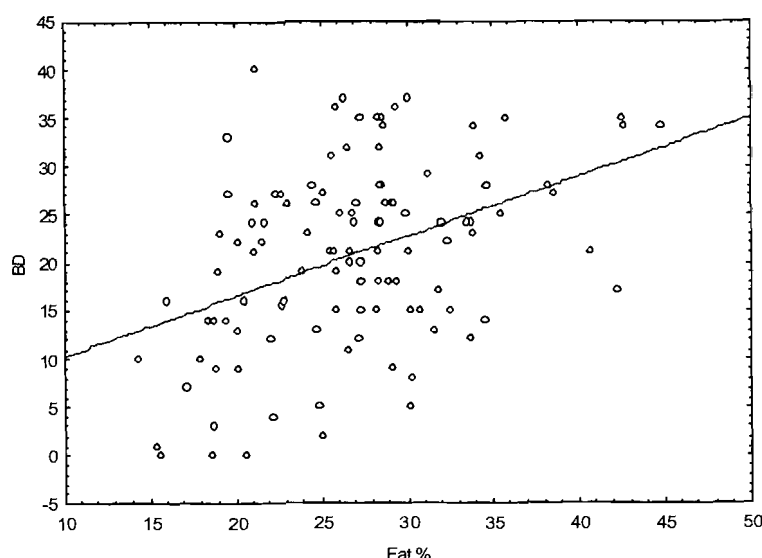


Figure 4: The relationship between Fat Percentage and Body Dissatisfaction among first-year female students

The fat-percentage values also correlated positively with BD ($r=0.41$) and showed statistical significance of $p<0.01$.

A moderately strong positive correlation ($r=0.41$) existed between the values for body fat percentage and BD. This suggests that the higher the body fat percentages of the group, the less satisfied they became with their bodies. This is especially true regarding their belly, buttock, hip and thigh areas as the questions on body dissatisfaction revolve around these body areas (Garner *et al.*, 1983). Body fat percentage seems to be a slightly weaker predictor of BD than the BMI in this group of female students. The data set again proved statistical significance ($p<0.01$).

The WHR correlations with DT ($r=0.08$) and BD ($r=0.01$) were very low and non-significant. This is probably due to the fact that the WHR is no measure of body mass or body fatness, but rather fat distribution regarding the waist and hip are. The data set was consequently not statistically significant for either of the psychological parameters (DT or BD).

The descriptive statistics of the psychological variables compared to the Body-mass Index (BMI) categories are shown in Table 2.

Table 2: Descriptive statistics of the psychological parameters compared to the Body-mass Index (BMI) categories

BMI	DT Means	DT Max	DT n	DT Std. Dev.	BD Means	BD Max	BD n	BD Std. Dev.
Underweight ($<18.5 \text{ kg/m}^2$)	3.83	27.0	6	6.61	6.67	40.0	6	6.98
Normal ($18.5\text{--}24.9 \text{ kg/m}^2$)	12.02	27.0	106	7.23	21.55	40.0	106	8.92
All groups	11.58	27.0	112	7.41	20.75	40.0	112	9.42

The underweight category ($<18.5 \text{ kg/m}^2$) recorded a DT score of 3.83 ± 6.61 out of a maximum of 27.0. This raw score is of low clinical value and falls within the 1st and 24th percentile of the U.S. Adult Combined Clinical sample (Garner *et al.*, 1983). The BD score of 6.67 ± 6.98 out of a maximum of 40.0 is also of low clinical significance compared with the U.S. Adult Combined Clinical sample. This value falls within the first and twenty fourth percentile of that same U.S. sample. The normal BMI category ($18.5\text{--}24.9 \text{ kg/m}^2$) calculated a score of 12.02 ± 7.23 for DT, which is also of low clinical value, but indicates a stronger tendency toward DT than the underweight category. The mean BD raw score of the group in the normal BMI category was 21.55 ± 8.92 . This value is also of low clinical value, but indicates that the students in this category were much more dissatisfied with their bodies than those in the underweight categories. The overweight and obese categories were collectively represented by only 3 subjects and were consequently excluded from the discussion.

Figure 5 and 6 are graphic representations of the DT and BD tendencies of the group in the different categories for BMI.

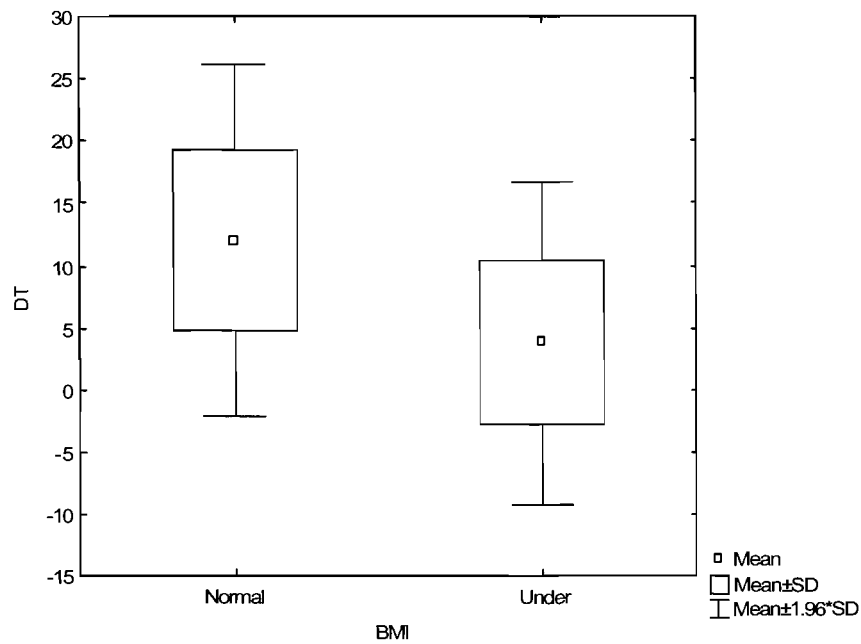


Figure 5: Drive for Thinness values for subjects in the normal- and underweight categories of the Body Mass Index (BMI)

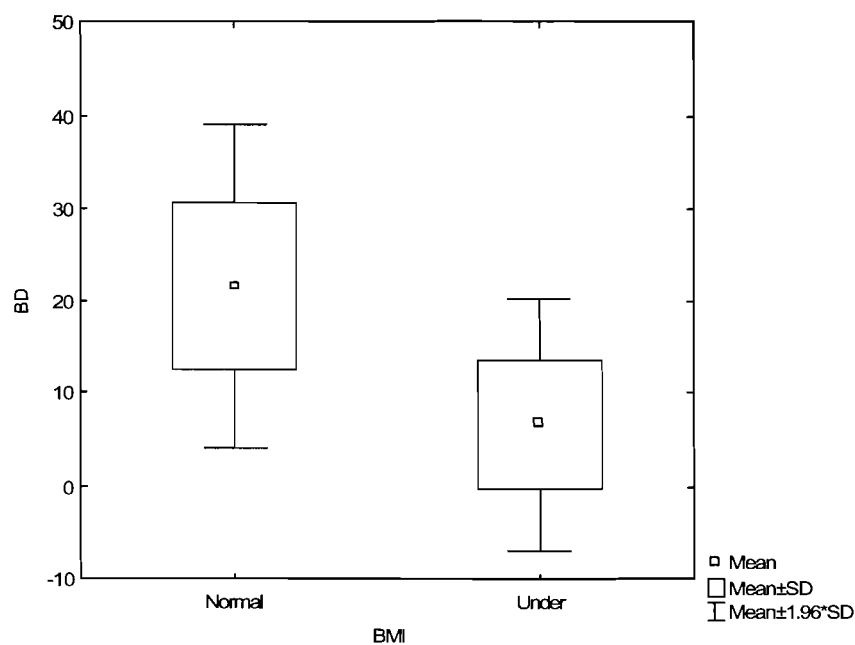


Figure 6: Body Dissatisfaction values for subjects in the normal- and underweight categories of the Body Mass Index (BMI)

The Drive for Thinness and Body Dissatisfaction parameters in the two BMI categories were both practically significant with large effect size values of $d=1.14$ for DT and $d=1.67$ for BD respectively. In both BMI-categories, subjects were dissatisfied with their bodies and desired smaller or thinner body shapes. Subjects in the normal weight category, however, were more dissatisfied with their bodies and desired thinner body shapes than those subjects in the underweight category. The BMI appears to be a good predictor of distorted body image in first year female students, especially those with normal body weights for their stature.

The descriptive statistics of the psychological variables compared to fat-percentage categories are shown in Table 3.

Table 3: Descriptive statistics of the psychological parameters compared to the Fat-percentage categories

Fat %	DT Means	DT Max	DT N	DT Std. Dev.	BD Means	BD Max	BD N	BD Std. Dev
Under normal/ low (<21.0%)	6.91	27.0	22	6.20	12.4	40.0	22	8.90
Normal/ Average (21.0 – 32.9%)	12.72	27.0	90	7.26	22.80	40.0	90	8.40
All groups	11.58	27.0	112	20.75	20.75	40.0	112	9.42

The under normal (elevated risk) category (<21.0%) recorded a DT score of 6.91 ± 6.20 out of a maximum of 27.0. This value is considered of low clinical value and falls within the first and 24th percentile of the U.S. Adult Combined Clinical sample (Garner *et al.*, 1983). In the under normal body fat percentage category, the mean BD score of the subjects was 12.4 ± 8.90 out of a maximum of 40.0. This value is also considered of low clinical value on the same U.S. sample. The normal/average body fat-percentage category (21.0 – 32.9%) recorded a score of 12.72 ± 7.26 for DT which, again, is considered of low clinical value compared to the U.S. Clinical Combined Adult sample. The mean BD-value in this category, however, scored 22.80 ± 8.40 . This score is of typical clinical value and lies within the 25th and 66th percentile for the U.S. Adult Combined Clinical sample. Body fat percentage seems to prove itself to be a good predictor of distorted body image, especially for those first year students with normal body fat percentages. The overweight and obese categories were collectively represented by 3 subjects. These categories were consequently excluded from the discussion.

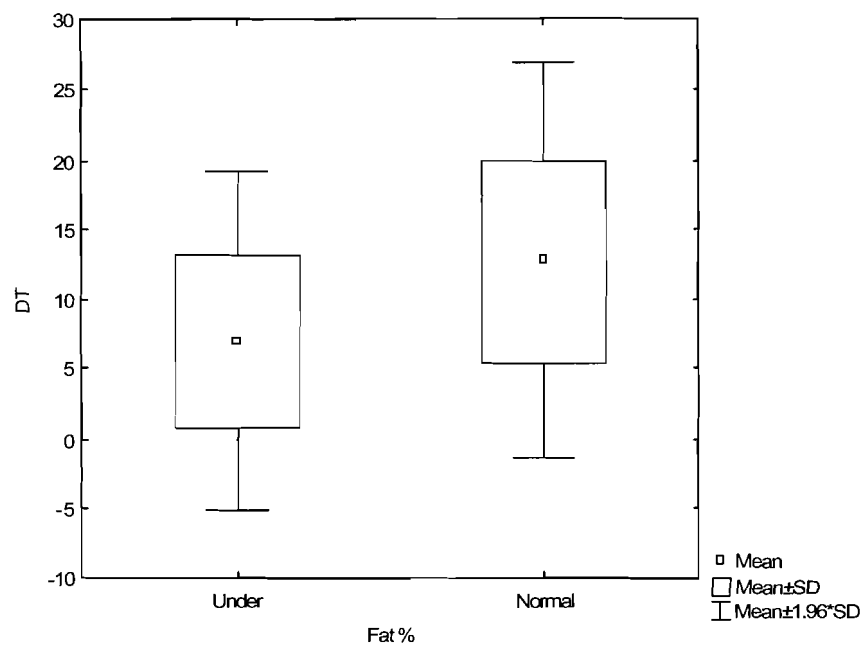


Figure 7: Drive for Thinness values for subjects in the under-normal and normal categories for Fat Percentage

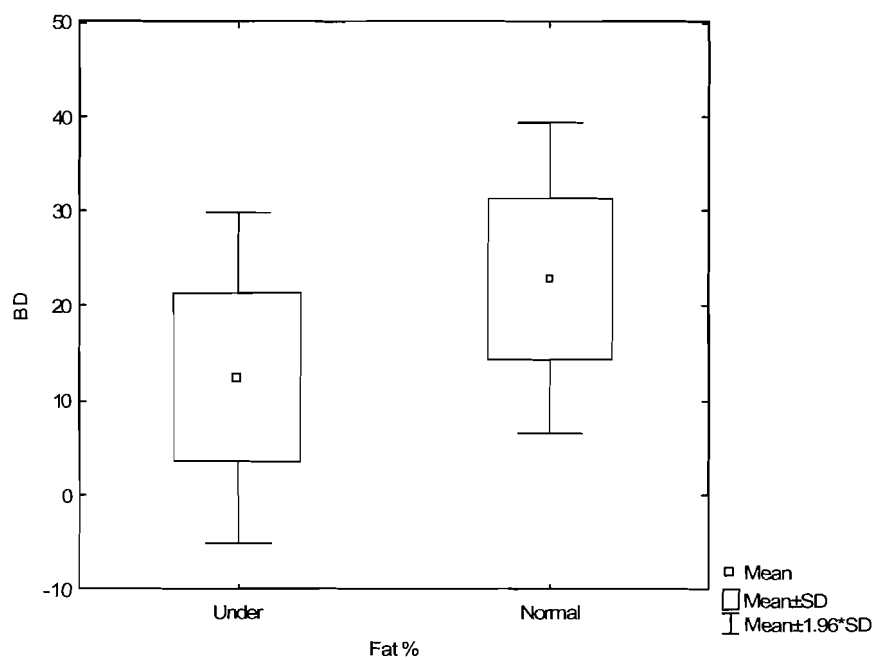


Figure 8: Body Dissatisfaction values for subjects in the under-normal and normal categories for Fat Percentage

The Drive for Thinness and Body Dissatisfaction parameters in the two fat-percentage categories were practically significant with a medium-effect size of $d=0.79$ for DT and a large-effect size for BD $d=1.16$ respectively. In both categories subjects were dissatisfied with their bodies and desired smaller or thinner body shapes. Subjects who portrayed normal fat-percentage levels were much more dissatisfied with their bodies and driven to lose weight than those in the underweight category. Body fat percentage seems to be a good predictor of distorted body image in first year female students, especially in those subjects with normal body fat percentages.

Discussion

The main finding of the present study was that young women in general were dissatisfied with their bodies and had a strong drive for thinness irrespective of their body weight, BMI or percentage body fat. This tendency, however, was not supported by the WHR value, most likely due to the fact that it is not a measure of weight or fatness, but of fat distribution regarding the waist and hips.

The BMI demonstrated a strong positive relationship with both drive for thinness and body dissatisfaction. Even though the underweight category scored lower on the psychological variables, its subjects also portrayed dissatisfaction toward their body compositions and presented with a significant Drive for Thinness. Similar results were found by Neighbors and Sobal (2007) who reported lower body-weight satisfaction for higher BMI values, but on the contrary suggested that underweight females idealized a body weight maintaining their BMI classification. Too few subjects represented the overweight and obesity categories; therefore no conclusions could be made on the body dissatisfaction status of those subjects. Isolated body-mass values presented with the same tendency as the BMI. This was, however, expected due to its presence in the equation of the BMI.

The fat-percentage values also portrayed significant positive relationships with both body dissatisfaction and drive for thinness. Even though the DT and BD scores were lower in the under-normal body-fat category than in the normal/average category, both psychological parameters portrayed practical significance. Too few subjects represented the high-risk body-fat categories, therefore no conclusions could be drawn on the body dissatisfaction status of those subjects. To our knowledge, no previous studies on body image and body composition included fat percentage as a body composition parameter and predictor of distorted body image.

This research found no relationship whatsoever between the waist-to-hip ratio and the psychological parameters on body image (DT and BD). This finding is in agreement with Wilson, Tripp and Boland (2005), who stated that the BMI plays a greater role in perceptions of female attractiveness than the waist-to-hip ratio.

It seems that young women place a high personal value on body shape and therefore present with either body dissatisfaction or a drive for thinness, or both. This tendency is consistent with the work of several researchers (Jakatdar, Cash & Engle, 2006; Melnyk, Cash & Janda, 2004, Geller, Johnston & Madson, 1997). The hypothesis that first-year female students would be dissatisfied with their bodies and driven to be thinner is therefore accepted. It is possible that the unique new university atmosphere of a first-year female student could play an important influential role on their body image perception (Senekal & Albertse, 1988).

The tendency of this multi-cultural group is inconsistent with research by Wittenberg (2005) that women (especially black women) desire heavier body masses due to HIV negativity, material wealth, status, influence or power. The group rather seemed consistent with socio-cultural theories of attractiveness in the Western culture. This finding is in agreement with Garner *et al.* (1983) who stated that Western origin is a very high risk factor for distorted body image resulting in eating disorders. This suggests

either overwhelming representation of white individuals in the sample, or the adaptation of Western culture by other ethnic groups.

Limitations of the study include the small number of subjects hampering the generalization of findings to the whole population. Also, the representation of the different ethnic groups has not been recorded and conclusions arrived at may be skewed.

Recommendations for future research

The contribution of different ethnic groups to holistic conclusions might be of value regarding the cultural direction of the multi-cultural composition of the South African population. Future research might assist in assessing the possible cultural shift among young non-western women. Also, the different influential factors exclusive to a first-year female student's environment should be brought into account in order to shed light on the tendency toward body dissatisfaction among these women. Possible intervention or prevention programs could result from this research.

Through identification of the tendency as well as the risk factors for body dissatisfaction in the milieu of a university, health-care providers could assist in intervention programs. Biokineticists are trained health-care providers in this field who work one-on-one with patients on a daily basis. They could effectively assist in leading these individuals into a healthy lifestyle or preventing any such psychological distortions from developing.

Acknowledgements

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Chapter 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

- 5.1 Summary**
 - 5.2 Conclusions**
 - 5.3 Recommendations**
 - 5.4 Further Research**
 - 5.5 References**
-

5.1 Summary

The aim of this study was firstly to set up anthropometric and body composition profiles of first-year female students on the Potchefstroom Campus of the North-West University. The anthropometric profile consisted of stature, body mass, skinfolds (triceps, iliac crest and thigh) and girths (waist and hip). The body composition-related health risk of the group was determined by means of body composition health indicators such as the BMI (body mass index), WHR (waist-to-hip-ratio) and %BF (percentage body fat). The BMI and WHR were derived from the anthropometric measurements, whereas %BF was measured with the BOD POD. The third aim was to investigate whether significant relationships between body dissatisfaction, drive for thinness and body composition measurements (BMI, WHR, %BF and body mass) existed in this group. The fourth and final aim was to determine the degree of body dissatisfaction and drive for thinness of the group in the different health risk categories for body composition.

Chapter 1 provided a brief introduction and outline of the problem statement that underlies the research questions, aims and hypotheses that form the basis of this study.

This dissertation is submitted in article format, as approved by the Senate of the North-West University (Potchefstroom Campus) and, therefore, includes a literature review (Chapter 2) and two research articles (Chapter 3 and 4 respectively) which will be presented to appropriate and accredited journals.

Chapter 2, the literature review, focuses on the relationship between body image perceptions and anthropometry among female university students. The chapter introduced the reader to the literature by means of an introduction. The introduction is followed by two main sections. The first describes the complexity of body image and distorted perceptions of body image which is well described in the available literature. The causes of a negative body image, the influence of the media on distorted body composition perceptions, and measurement methods are also outlined. The second section contained the definition and history of anthropometry as well as information regarding the three main body composition health parameters (BMI, WHR and %BF). A table containing recent research on this topic concluded the chapter.

The first research article entitled “The body composition profile of first year female university students” will be presented to the African Journal for Physical, Health Education, Recreation and Dance (AJPHERD) and is included in chapter 3. The aim of this chapter was to set up an anthropometric profile for a group of first year female students and to determine their health risk according to body composition. The group tested in line with the Western tendencies for body composition, but presented with an overall higher body mass. The group presented average regarding their body composition-related health risk.

The second article entitled “The relationship between body dissatisfaction, drive for thinness and body composition among first year female university students”, will be

presented to the African Journal for Physical, Health Education, Recreation and Dance (AJPHERD) and is included as chapter 4. The first aim of this article was to determine whether significant relationships existed between body dissatisfaction, drive for thinness and certain anthropometric measurements. Significant relationships did exist and they are practically significant. The degree of BD and DT in the different health risk categories was also determined. Subjects in all health risk categories presented significant values for BD and DT, yet the subjects with higher anthropometric values had a stronger desire to be thin and were more dissatisfied with their bodies compared to individuals in the lower risk categories.

All of the above mentioned articles have been written according to the guidelines of the specific journals and consisted of an introduction, problem statement and the resulting research questions and purposes of the study. The research methods (subjects, testing procedures and data analysis) were described after which the results were presented and discussed. Each article concluded with research conclusions and implications.

5.2 Conclusions

The conclusions that are drawn from this research are presented in accordance with the hypotheses set in Chapter 1.

Hypothesis 1 states that the body composition image of the group will have a tendency toward the Western cultural standards of body composition.

A few of the anthropometric measurements that were tested in this study (skinfold thickness of the triceps, iliac crest and thigh skinfolds, and lean body weight) could not be compared to other sets of data, due to the lack of available anthropometric data for young women between the ages of 16 and 20 years. The mean stature of the group compared with the 50th percentile of the U.S. chart for women aged 16-20 years (Gallahue & Ozmon, 2000). The mean body mass value of the group was, however, higher than was expected on the same U.S. chart. The average waist- and hip girths of the group fitted the measurements for a medium U.S. trouser size. The body mass

value is the only measurement outside the Western frame of body composition values for young women. Hypothesis 1 is thus partially accepted.

Hypothesis 2 states that the group would be at low health risk according to body composition parameters.

The mean BMI values of the group clustered in the normal category, which put the group at average health risk regarding the isolated BMI value. The majority of subjects presented with a gynoid fat distribution pattern, lowering their health risk regarding the waist-to-hip-ratio. They also had normal fat percentages tending rather to be under fat than over fat. Again, they were at average health risk for chronic diseases. The group in general, tested either normal or at low risk for chronic diseases according to Western data (ACSM, 2006). According to these research findings, the second hypothesis is indeed accepted.

Hypothesis 3 states that significant relationships will exist between body dissatisfaction, drive for thinness and body composition measurements (BMI, WHR, %BF and body mass) in the group of students.

The third hypothesis is partially accepted based on the research findings that statistically significant relationships were found between some of the body composition variables and psychological parameters for body image ($p < 0.01$). Drive for thinness correlated statistically significant with %BF, but correlated stronger with the isolated body mass value and strongest with the BMI-value. DT presented practical significance with both body-mass and the BMI. Body dissatisfaction correlated practically significant with all three body composition parameters (body mass, BMI and %BF). The strongest correlation was with the BMI. A slightly weaker correlation existed between BD and the isolated body mass value whereas the weakest correlation of BD was with %BF. No comparison whatsoever was found between the psychological parameters and the waist-to-hip-ratio. All three body composition variables proved to be good predictors of distorted body image perceptions, with the BMI as the strongest predictor.

Hypothesis 4 states that subjects with higher body composition values will be less satisfied with their body composition and have a higher drive for thinness than the subjects with lower body composition values.

The WHR did not in any way correlate with body dissatisfaction or drive for thinness either in isolation or in any health risk category. The overweight and obese categories for the BMI and %BF were underrepresented and were of no statistical significance. The categories, in which significant differences were found, were the normal and under-normal categories of both the BMI and %BF. Subjects in the normal category of the BMI, presented with higher body dissatisfaction and drive for thinness values than those subjects in the underweight category. Regarding %BF, the subjects in the average fat-percentage category also had higher body dissatisfaction and drive for thinness values than those in the under-fat category. The findings were of practical significance. Again, the hypothesis is partially accepted.

5.3 Recommendations

Despite the differences in anthropometry and body image perceptions throughout different age- and ethnic groups, this multi-cultural group compared well to the Western standards for health and beauty. The majority of women were categorized as either normal or underweight. The normal weight and underweight women (BMI and %BF) both desired thinner bodies than they currently had. Subjects in the normal categories, however, demonstrated higher values for body dissatisfaction and drive for thinness than those in the underweight categories. It is recommended that first year female students by default be treated cautiously regarding the influence of their body composition on their psychological profile. Also, to suspect abnormal behavior regarding body image in young women with either under-normal or normal BMI- or %BF-levels.

5.4 Further research

The study demonstrated several limitations on various areas, which could be overcome in future research. The limitations include the following:

- The study was of cross-sectional design. The subjects have been recruited randomly using residence as strata. Consequently some health risk categories were underrepresented. Using body composition categories as strata (eg. BMI) would perhaps have been a more suitable approach.
- The study's population sample consisted of 116 women who were all recruited from the same institution and province, therefore, the results cannot be generalized to the larger population of first year university women in the country, as certain discrepancies may occur.
- The representation of different ethnic groups in this sample was not recorded. This may cause misinterpretation of results and consequently result in invalid conclusions.

5.5 References

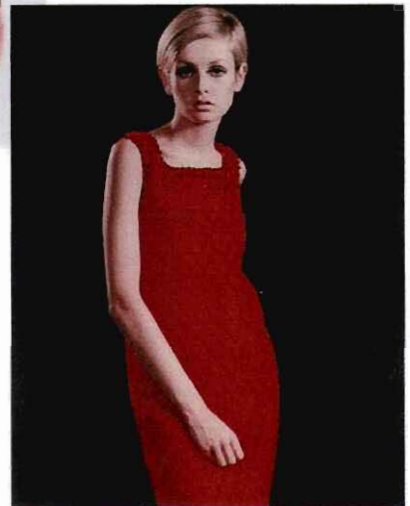
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Appendices

- Guidelines to authors
- Anthropometry form
- Informed consent form



GUIDELINES FOR AUTHORS

The African Journal for Physical, Health Education, Recreation and Dance (AJPHERD) is a peer-reviewed journal established to:

- i. Provide a forum for physical educators, health educators, specialists in human movement studies and dance, as well as other sport-related professionals in Africa, the opportunity to report their research findings based on African settings and experiences, and also to exchange ideas among themselves,
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Abstract

An abstract of 200-250 words is required with up to a maximum of 5 words provided below the abstract. Abstract must be typed on a separate page using single line spacing, with the purpose of the study, methods, major results and conclusions concisely presented. Abbreviations should either be defined or excluded.

Text

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The introduction should start on a new page and in addition to comprehensively giving the background of the study, clearly state the problem with concise but informative and critical literature review is required.

Materials and Methods

This section should provide sufficient and relevant information regarding study participants, instrumentation, research design, validity and reliability estimates, data collection procedures, statistical methods and data analysis techniques used. Qualitative research techniques are also acceptable.

Results

Findings should be presented precisely and clearly. Tables and figures must be presented separately or at the end of the manuscript and their appropriate locations in the text indicated. The results section should not contain materials that are appropriate for presentation under the discussion section. Formulas, units and quantities should be expressed in the *system international (SI)* units. Color printing of figures and tables is expensive and could be done upon request at author's expense.

Discussion

The discussion section should reflect only important aspects of the study and its major conclusions. Information presented in the results section should not be repeated under the discussion. Relevant references should be cited in order to justify findings of the study. Overall, the discussion should be critical and tactfully written.

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For two authors: Johnson, A. G., & O'Kefee, L. M. (2003). Analysis of performance factors in provincial table tennis players. *Journal of Sport Performance*, 2(3), 12-31.

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For chapter references in a book: Adams, L. L., & Neveling, I. A. (2004). Body fat characteristics of sumo wrestlers. In J. K. Manny and F. O. Boyd (Eds.), *Advances in Kinanthropometry* (pp. 21-29). Johannesburg, South Africa: The Publishers Company Ltd.

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Perception vs Facts

Anthropometrical Data

Name & initials: _____

Surname: _____

Student number: _____

Date of birth (age): _____

Hostel: _____

Field of study: _____

Length: _____ cm Body mass: _____ kg

Waist girth: _____ cm Hip girth: _____ cm

SKINFOLDS

Triceps: _____ mm Iliac Crest: _____ mm Thigh: _____ mm

BOD POD

Fat weight: _____ kg

Lean weight: _____ kg

Fat percentage: _____ %

Comments: _____

Geagte eerstejaardame

NAVORSINGSPROJEK – LIGGAAMSAMESTELLING: PERSEPSIES vs FEITE

Liggaamsamestelling en voorkoms is 'n teer en gewoonlik emosionele saak by jong dames wat 'n Universiteit vir die eerste keer betree. In meeste van hierdie dames se oë is voorkoms gelyk aan aanvaarding en hul persepsies aangaande hul liggaamsamestelling word dan hiervolgens bepaal, selfs ten koste van die waarheid. Die doel van hierdie studie is om die persepsie van eerstejaardames op die PUK-kampus van die NWU aangaande hul voorkoms, liggaamsvorm en liggaamsamestelling te vergelyk met hul werklike liggaamsamestelling. Moontlike wanpersepsies sal dus geïdentifiseer en aangespreek word ten bate van die dames se fisiese en emosionele welstand. Hierdie navorsingsprojek word gedoen onder die vaandel van die Skool vir Biokinetika, Rekreasie en Sportwetenskap (BRS) aan die Noordwes-Universiteit (Potchefstroom-kampus). Hiermee vra ons dan u toestemming tot deelname aan hierdie projek.

Inligting rakende die studie

Vir enige navrae kontak Berna de
Kock by Tel. 018 - 299 1824

1. Die doel van die navorsingstudie sal wees om eerstejaardames van die PUK-kampus, NWU se persepsies oor hul liggaamsamestelling te vergelyk met hul werklike liggaamsamestelling.
2. Die deelnemers sal geweeg word en hul lengtes, massas sowel as twee omtrekke sal gemeet word. Daarna sal hul ook met die BOD-POD sisteem geëvalueer word. Elke dame se metings word afsonderlik gedoen. Die drag waarin die dames gemeet word, is oefenklere. Slegs damespersoneel is tydens die metingsproses teenwoordig en die privaatheid van elke proefpersoon sal ten alle tye in ag geneem word. Professionele biokinetici sal die metings doen en so te werk gaan dat geen dame in verleentheid gestel sal word nie.
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5. U samewerking in dié verband word hoog op prys gestel.

Vriendelike groete en byvoorbaat dankie

Berna de Kock
(Biokinetika intern en Magistersgraad student)

Professor Hans de Ridder
(Programleier Navorsing: Skool vir BRS, NWU)

Professor Dawie Malan
(Direkteur: Skool vir BRS, NWU)

**I_____ (name and
surname) hereby voluntarily participate in the project: body
composition – perception versus facts.**

Signature _____ Date_____

.....

**Ek_____ (naam en van)
neem vrywilliglik deel aan die navorsingsprojek liggaamsamestelling:
persepsie versus feite.**

Handtekening_____ Datum_____