

**The relationship between female adiposity and physical attractiveness amongst adults in
Ranaka village, Botswana**

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I am profoundly happy that I have finally completed my MSc programme of study. It was not an easy journey, but through the grace of God I have managed. Nothing could have been possible without the assistance from my supervisors, family and friends.

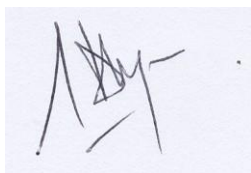
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The article in this study will be submitted to the South African Journal of Clinical Nutrition (SAJCN) for publication. The co-authors therefore grant permission that the manuscript be submitted for the attainment of MSc degree.



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Dr. Z.J Mchiza... ...Date.....3/11/2016

Abstract

Research undertaken in non-western societies associates body adiposity with attractiveness and wealth. However, there is a dearth of data on perceptions of female attractiveness in relation to adiposity in Botswana. The purpose of this study was therefore to assess the relationship between female body adiposity and physical attractiveness among adults aged 18-50 years from the Botswana culture. This cross-sectional study was conducted with a sample of 113 randomly selected adults who were stratified for gender and ward in Ranaka village, Botswana. The instruments used in this study were: (i) a questionnaire comprising of two items to elicit information about participants' socio-demography and their perceptions about female body adiposity; and (ii) 21 soft tissue dual-energy x-ray absorptiometry (DXA) images that covered seven body fat percentage levels. These images had previously been successfully used to study the role of adiposity and perceptions about physical attractiveness by US college students. In addition, participants' weight and height were measured and their body mass index (BMI) was also calculated. Data were analyzed using the computer programme Statistical Package of Social Sciences (SPSS version 23 program). The distribution of data was tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests and was presented as counts, percentages, means/medians, standard deviations/interquartile ranges with p values <0.05 representing significant differences. The results showed that overall, overweight and obesity prevalence were higher in women than in men (i.e. 21.5% and 27.7%, respectively versus 8.3% and 2.2%, respectively). The majority of participants used pit toilets. However, they had relatively good housing conditions based on housing structure and access to safe water. Female body size preferences were not differentiated by the socio-demography and anthropometric characteristics of the participants, except the fact that majority of women thought that image 9 (with low WHR=0.61 and BMI=21kg/m² and a %BF = 32%) was more attractive than their male counterparts (i.e. they gave the image a higher mean score of 6.2 compared to a mean score of 3.8 given by men, $p<0.02$). More importantly, no clear linear association was seen between the scores chosen by men and women to reflect female attractiveness in relation to BMI or waist-to-hip ratio (WHR). The regression line showed a closer agreement between younger and older women's choices, than between younger and older men's choices. These results suggested that Botswana men (to a greater extent, older men) still preferred a bigger body sized woman while Botswana women preferred a thinner body sized woman. Knowledge about this relationship may help in the design and adoption of obesity prevention programmes in Botswana.

OPSOMMING

Navorsing in nie-Westerse populasies dui op 'n assosiasie tussen liggaamsvet en aantreklikheid. Die voller figuur word ook met rykdom geassosieer. Daar is min data oor beeldpersepsies oor vroulike aantreklikheid en vetsug in Botswana. Die doel van hierdie studie was om die verwantskap tussen vroulike liggaamsvet en fisieke aantreklikheid in volwassenes 18-50 jaar oud van die Batswana kultuur te bepaal. Hierdie dwarsdeursnitstudie is in 'n steekproef van 113 ewekansig gekose volwassenes, gestratifiseer vir geslag en woongebied in die Ranaka nedersetting, Botswana gedoen. Die instrumente in hierdie studie was (i) 'n vraelys van items waarmee inligting oor die proefpersone se sosio-demografie en hulle persepsies van vroulike liggaamsvet ingesamel is; sowel as (ii) 21 sagte-weefsel dubbel-energie X-straal absorpsiometrie (DXA) figure wat sewe liggaamsvet-persentasies uitbeeld. Die figure is voorheen suksesvol in 'n studie oor die rol van liggaamsvet in die persepsie van fisieke aantreklikheid in kollege-studente in die VSA gebruik. Die proefpersone se gewig en lengte is gemeet en hulle liggaamsmassa indeks (LMI) is bereken. Data is met die rekenaarprogram "Statistical Package van Social Sciences" (SPSS uitgawe 23) geanaliseer. Die verspreiding van data is met die Kolmogorov-Smirnov en Shapiro-Wilk toetse geanaliseer en is voorgestel as tellings, persentasies, gemiddeldes/mediane, standaardafwykings of interkwartielverspreiding met p waardes <0.05 as betekenisvolle verskille. Die resultate toon dat die oorgewig en vetsug prevalensie hoër in vroue vergeleke met mans was (21.5% en 27.7%, respektiewelik versus 8.3% en 2.2%, respektiewelik). Die meerderheid van proefpersone het pittoilette gebruik, maar tog relatiewe goeie behuising en toegang tot skoon, veilige water gehad. Sosio-demografie en antropometriese kenmerke van die proefpersone was nie verskillend ten opsigte van vroulike liggaamsgrootte voorkeure nie. Die vroue het slegs figuur 9 (met lae middel-heupverhouding $=0.61$ en lae $LMI=21\text{kg/m}^2$ en 'n %liggaamsvet = 32%) meer aantreklik in vergelyking met die mans gevind (gemiddelde telling van 6.2 vergeleke met 'n telling van 3.8 deur mans, $p<0.02$). Geen duidelike reglynige verwantskap tussen die tellings deur mans en vroue, respektiewelik, om vroulike aantreklikheid in verhouding tot LMI of middel-heupverhouding te weerspieël, is gevind nie. Die regressielyne het wel beter ooreenkomste tussen jonger en ouer vroue se keuses weerspieël as tussen jonger en ouer mans se keuses. Die resultate stel voor dat Botswana mans (veral ouer mans) steeds meer liggaamsvet in vroue verkies, terwyl Botswana vroue 'n meer slanke liggaamsvorm vir vroue verkies. Kennis oor hierdie verwantskap mag help in die ontwikkeling van vetsugvoorkomingsprogramme in Botswana.

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Chapter 1: Introduction

Background and rationale

Botswana is a land locked country with a population of about 2 million people. It was positioned as a Southern African country by the United Nations Statistic Division together with its neighbours: Lesotho, Namibia, Swaziland and South Africa (Nnyepi *et al.*, 2015). The country has challenges of a double burden of diseases in that it is affected by both life-style related non-communicable diseases and undernutrition. Although since recently there has been a trend towards healthy eating, Botswana is still faced with a huge challenge of malnutrition, predominately that of overweight and obesity (Letamo, 2011), but also undernutrition. The level of wasting, stunting and underweight among children under three years of age in Botswana is reported to be 5.5 %, 38.7 %, and 15.6 % respectively (Mahgoub *et al.*, 2006). The adoption of a western lifestyle and high dependence on diet with high fat, sugar and salt levels and junk foods are the main causes of overweight and obesity in Botswana (Shaibu *et al.*, 2012). The biggest challenge to date is that only an insignificant proportion of the population appreciates that obesity is associated with considerable adverse health events (Botswana Upenn partnership, 2013). This problem does not affect adults only. It also affects young people especially those from middle and higher socio-economic backgrounds (Letamo, 2011; Shaibu *et al.*, 2012). Given that obesity is a contributing factor to the metabolic syndrome, hypertension, diabetes and other cardiovascular diseases, it exerts pressure on the country's already strained resources as the health system gets overburdened with these preventable diseases (Malete *et al.*, 2013).

Although overweight and obesity affect all the age groups, it is quite evident that it affects adults more. Letamo (2011) states that over-nutrition is particularly prevalent among adult women in Botswana, and that overall, 23% of women are overweight, while only 13% of the men are overweight. Overweight and obesity have been greatly linked to body image dissatisfaction and low self-esteem among adolescents in 24 countries from regions across Europe and North America (Al Sabbah *et al.*, 2014; Malete *et al.*, 2013). The pattern of body image dissatisfaction in the past was mostly common in western cultures. However, recent reports show that the same phenomenon is now affecting developing countries (Malete *et al.*, 2013). This suggests that more studies need to be done in Africa to investigate whether or not obesity is considered to be physically attractive, in order to develop the correct strategies to tackle the overweight problem. A recent study conducted in Botswana showed that boys were more dissatisfied with their muscle tone, muscle strength and general appearance than girls (Malete *et al.*, 2013). In Britain and

Malaysia, Swami *et al.*, (2009) stresses that both black and white men find the small waist to hip ratio (WHR) figure with large breasts in women more attractive.

The relationship between female physical attractiveness and body adiposity was studied in an international study conducted in Kenya, Morocco, Nigeria and Senegal, as well as in European and Asian populations (Wang *et al.*, 2015). In the light of this research, the principal investigator of this study wants to include more data from Africa and invited researchers from Southern African countries to contribute data for further similar research. The current study followed a protocol similar to the study of Wang *et al.* (2015) and its outcomes will eventually become part of a larger study.

1.1 Problem statement

Little has been done in Botswana to address the public health problem of adult overweight and obesity. Most health and nutrition interventions that are in place pay more attention to children and pregnant woman and do not include adults and other older persons (Clausen *et al.*, 2006). There is also a lack of information and intervention strategies on how to prevent obesity and overweight in Botswana. Furthermore, little has been done and reported on body fat distribution, body image dissatisfaction and how it varies according to gender. There is also limited information about perceptions of female attractiveness in relation to adiposity among Botswana. The only published studies included mainly girls (61%) and the mean age of students was 14.9 years (Malete *et al.*, 2013).

This study therefore mainly focused on the relationship between female body adiposity and physical attractiveness preferences of men and women in Botswana. The findings of the study would help to frame the government strategies to address overweight and obesity in Botswana, taking gender- and age-specific perceptions of female adiposity and physical attractiveness into account. It would also potentially help the government of Botswana to develop appropriate strategies to tackle the problem of overweight.

1.2 Research question

1.2.1 Aim

The aim of this study was to assess the relationship between female adiposity and physical attractiveness among men and women between 18-50 years of age from the Botswana culture.

1.2.2 Objectives

Derived from the aim above, this study aimed to achieve the following specific objectives:

- To determine the association between female body adiposity and attractiveness as viewed by a group of men and women in rural Ranaka village in Botswana.
- To determine the differences between the rankings of men and women for the association between female body adiposity and attractiveness in Ranaka village in Botswana.
- To determine the differences between attractiveness rankings of the young (18-34 years) and older persons (35-50) in Ranaka village in Botswana.
- To determine the association between the body mass index of the study participants and their rankings of female attractiveness according to body adiposity.

1.3 Significance of the study

The findings of the study would help the researcher and other nutrition professionals to become knowledgeable about body adiposity, overweight and obesity and their associations with preference in terms of attractiveness in Botswana. Such knowledge would help in the design and adoption of prevention programmes of lifestyle diseases such as obesity, diabetes, and hypertension in Botswana. This might in turn encourage the Botswana government to implement nutrition policies that would teach and encourage healthy eating habits among Botswana and to provide overweight prevention programmes in settings with limited resources. It would also help to educate the population on the dangers of overweight and obesity and to change their perceptions of high body fat being attractive. The data would also contribute to the international body of knowledge about the association between female body adiposity and attractiveness.

1.4 Outline of the mini dissertation

This mini dissertation is presented in the article format of research. The method of reference that was used is according to the requirements of the North-West University.

Chapter 2 presents the literature review. This section gives an overview and understanding of the published literature on the topic. The review covers in detail: the female body fat distribution and attractiveness, body weight dissatisfaction and the desire for shape change, physical attractiveness and partner selection, the association between female attractiveness and body adiposity, the differences between attractiveness rankings of the young and older persons, Africans' perceptions of female attractiveness and body weight dissatisfaction across lifespans.

Chapter 3 focuses on the materials and methods used to collect data for this study. This includes the type of study design which was observational and descriptive. The target population was Batswana residing in Ranaka village in Botswana. The village consists of four wards of which a total sample of 113 people was selected. The study population included only participants who were originally Batswana, full time residents of Ranaka village 18 to 50 years range. The instrument that was used in this study was a questionnaire and 21 figures of soft tissue dual-energy X-ray absorptiometry (DXA) images, which were used previously to study the role of adiposity in the perception of physical attractiveness in participants from African, European and Asian populations (Wang *et al.*, 2015). The interview was administered after study participants were given consent. Data was then entered into an Excel file and the Statistical Package of Social Sciences computer programme (SPSS version 22 program) for data analysis.

Chapter 4 is an article prepared according to the authors' guidelines of the South African journal of clinical nutrition. The article focuses on the discussion of methods and results of the study.

Chapter 5 is a short summary of the main findings, conclusion and recommendations to benefit scientists who would wish to perform further research on the subject matter. The references in this chapter are presented according to the North-West University requirements.

1.5 Research team and role of the student

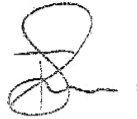
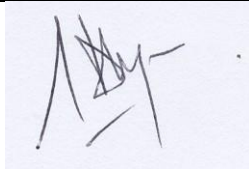
This study was performed by four researchers and the contribution of each is given below in Table 1.1.

In Table 1.2 the authors of the article give permission that the work may be presented as part of this mini-dissertation.

Table 1.1 Research team and roles

Team member	Qualifications and position	Role in the study
Ms T Seru	MSc Nutrition student	Responsible for proposal writing, literature searches, data collection data analysis and discussion.
Prof HS Kruger	PhD, North-West University, South Africa	Study leader: responsible for supervising and assisting with data collection and entering and co-drafting of the text.
Dr ZJ Mchiza	PhD, Human Sciences Research Council, Cape Town	Assistant Supervisor. Assisting in all aspects of the study

Table 1.2 Permission that the work may be presented as part of this mini-dissertation

Authors	Signature
T. Seru	
Dr ZJ Mchiza	
Prof HS Kruger	

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Chapter 2: Literature review

2.1 Introduction

Obesity is a public health problem currently experienced by the contemporary society (Keller *et al.*, 2013). Overweight and obesity is increasing in both economically developed and developing regions of the world, with 33.0% of the world's adult population (1.3 billion people) being overweight or obese in 2005 (Kelly *et al.*, 2008). Moreover the problems of overweight and obesity seems to be more prevalent in economically developed countries than in economically developing countries with 35.2 vs. 19.6% and 20.3 vs. 6.7%, respectively, in 2005 (Kelly *et al.*, 2008). This pandemic is reported to be mostly prevalent among men and woman aged between 60 to 69 years in economically developed regions and in even younger age in developing regions. It is projected that if the current problem of overweight and obesity continues by 2030, up to 57.8% of the world's adult population (3.3 billion people) would be either over- weight or obese (Kelly *et al.*, 2008). Although in Africa there is still a public health problem of underweight, overweight and obesity are also prevalent (NCD Risk Factor Collaboration, 2016). In Southern Africa the prevalence of overweight (23%) and obesity (20%) has been escalating from 1975 to 2010 to 2014 with cases of extreme obesity (BMI > 40 kg/m²) also emerging, particularly among women (Collaboration NRF, 2016).

Obesity in most cases result in psychological problems and body image distress (Schwartz & Brownell, 2004). Poor diet and excess weight can affect mood through changes in neurotransmitters, which in turn might affect body image. This sometimes leads to obese people having a highly stigmatized condition (Schwartz & Brownell, 2004). Obese people have a challenge of being stigmatized in education, employment, and health care settings. This consequently leads to increased body dissatisfaction in obese individuals (Neumark-Sztainer & Haines, 2004).

Both males and females look for different characteristics when identifying a partner for a relationship. This resonates with the adage that "Beauty is bought by judgment of the eye" (Bovet *et al.*, 2016). Naturally men get attracted to female counterparts by looking at certain features which interest them. The same applies to women. Men are said to be mostly attracted to female faces and bodies (Furnham *et al.*, 2006; Rhodes, 2006). Nevertheless, attractiveness in females for masculine features in males are said to be different and complicated (Price *et al.*, 2013). Females are said to be attracted to masculinity and good looking male faces (Brooks *et al.*, 2011). Research study results dictated that attractiveness varies across menstrual cycle, according to

temporal context, female partnership status and according to the national level of socio-economic inequality (Brooks *et al.*, 2011). On the other hand, these masculine traits are said to be more preferred on short-term (Price *et al.*, 2013). An example of this would be that in short term relationship, a woman may tend to be attracted to men with high social dominance and masculine facial and body shape, whereas in long-term courting contexts they put more emphasis on willingness to invest in offspring (Waynforth *et al.*, 2005).

Research shows that there are many factors that influence physical attractiveness in romantic partner selection, including breast size (Zelazniewicz & Pawlowski (2011), body mass index (BMI) Sigh & Randall (2007), and among others also height (Salska *et al.*, 2008). Complexion also plays a role when it comes to choice and attractiveness of woman because pale skinned women are considered more attractive than darker skinned women in a wide range of cultures, including in the African-American population (Maddox, 2004).

2.2 Secondary sexual traits and romantic partner selection

Features such as overall body fat, body fat distribution, breast size and waist-to hip-ratio (WHR) have been identified as contributing factors to female attractiveness in a number of studies (Furnham *et al.*, 2006; Price *et al.*, 2013; Swami & Tovee, 2007). In fact, while Furnham *et al.* (2006) and Price *et al.* (2013) believe that body fat distribution as measured by WHR, breast size and hip width enhance female body attractiveness. Swami and Tovee (2007) on the other hand suggest that WHR does not have any influence in female attractiveness but rather either the slender figures or bigger figures (Swami & Tovee, 2007).

Body fat estimated by BMI and body fat distribution estimated by WHR has a huge role to play when it comes to attractiveness ratings (George *et al.*, 2011; Bovet *et al.*, 2016). Waist to hip ratio can be defined as the ratio of the circumference of the waist to the circumference of the hips (Swami & Tovee, 2005). Moreover, WHR can be used to measure health risks in relation to the distribution of fat mass between men and women's upper and lower body and also relative to the amount of intra- versus extra abdominal fat (Fan *et al.*, 2005).

Body size dissatisfaction and the desire to lose weight are trends reported among both males and females (Field *et al.*, 2005). Girls start experiencing body dissatisfaction as early as from the age of 5 years, while boys experience it a bit later at the age of 11 years (Viren, 2006). Similar observations were reported that preschool children between the ages of 4 and 6 years had negative perceptions about overweight individuals (Holub, 2008).

2.3 Body weight dissatisfaction across the lifespan

As humans grow, their bodies change from childhood to adulthood. Several authors report that the desire for thinness begins in many children who are as young as 7 and 8 years old. Surprisingly, they are concerned about becoming overweight and are even engaged in weight-loss behaviours such as eating less and exercising to lose weight (Ricciardelli & McCabe, 2001). In another study children of average sizes reported that they were not happy with the way they looked indicating that they wished they were thinner (Smolak, 2004). Obesity and overweight are generally stigmatised in most western cultures, and are regarded as socially undesirable (Grogan, 2006).

Body dissatisfaction issues seem to be even more common among adolescence and adulthood (Presnell *et al.*, 2004; Neighbors & Sobal, 2007). During adolescence, there are changes that occur which include among others the changes in weight, height, body shape, body composition, as well as primary and secondary sex characteristics (Voelker *et al.*, 2015). These physical changes tend to also be challenged by the heightened exposure and subsequent comparisons to cultural ideals of beauty (Voelker *et al.*, 2015). For girls, the ideal body frame is thin with large breasts as seen in print media, television, and online (Voelker *et al.*, 2015). As a result, changes associated with puberty, such as increases in adiposity and widening of the hips, may be perceived negatively and seen as unattractive (Voelker *et al.*, 2015).

Body size changes can also be influenced by diet, because dietary transition according to Faber and Kruger (2005), greatly contributes to female obesity among black women in South Africa. Moreover, exercise and beauty trends displayed in reality television programmes and magazines also contribute to unhealthy adolescent body image perceptions (Voelker *et al.*, 2015). Time spent on other social media such as Facebook encourages unrealistic and so-called ideal images to adolescents (Tiggemann & Slater, 2013). Media is not the only factor influencing the slim figure idea among teenagers. The immediate environment such as family, peers, and romantic partners also play a role (Voelker *et al.*, 2015). Another worrisome and contributing factor is the use of weight-related teasing by parents and siblings which also leads to body dissatisfaction among girls and drive for muscularity among boys in the adolescent stage (Schaefer & Salafia, 2014).

There are serious risk factors of body weight dissatisfaction and fear of gaining weight among early adolescence which might lead to disordered eating (Barker & Galambos, 2003). This is more common among girls than boys because about 60% of girls are reported to want to change their shapes and size compared to 30 % of boys (Ricciardelli & McCabe, 2001). Females are said to be more interested in losing weight while males desire mostly to gain weight (Bearman *et al.*, 2006;

Voelker *et al.*, 2015). Due to pressure from both adolescent boys and girls, girls in particular resort to using certain products to improve appearance, muscle mass, or strength. This is most common among girls and boys who think frequently about wanting more defined muscles and to gain weight (Field *et al.*, 2005).

Early maturity in some girls leads to greater puberty-related weight gain. As a result, they develop a stronger desire to be thin and a stronger preference for a slender figure at an early age than their later maturing counterparts (Lee *et al.*, 2007). In South Africa, female adolescents had a very negative body image and strong desire to be thin (Szabo & Allwood, 2007). However, boys on the other hand are reported not to be very particular on body image concerns during adolescent development. Rather, their major concern lies on increases in height and muscle mass associated with puberty (Voelker *et al.*, 2015). Nevertheless, the boys who mature at a later stage have greater body dissatisfaction than their early maturing counterparts (Headley, 2005).

Similar to the adolescence stage, when young adults age further, their bodies at time change to become less attractive as every year is likely to take people further away from the thin or muscular and youthful body ideal (Tiggemann, 2004). People normally gain about 4.6 kg of weight per decade of life until their 50s, change shape, lose skin elasticity and develop wrinkles, and get hair grey (Tiggemann, 2004). This is a challenge to some people especially women who normally want to remain younger (Tiggemann, 2004). Body weight concern seems to be prevalent across the entire life span in women (Forrester-Knauss & Stutz, 2012). For example, in one of the old surveys in 1982, the readership of *Psychology Today*, reported that 38% of women were dissatisfied with their appearance and only 34% of men had problems with their appearance (Tiggemann, 2004). However, just a small number of studies have found that older men are more likely to experience a decrease in their self-esteem and feelings of attractiveness as they age (Paxton & Phythian, 1999; Baker & Gringart, 2009). The mismatch between body shape dissatisfaction is an outcome of normal weight people not being able to maintain their current body shapes, and overweight or obese people not wanting to have a slimmer body shape (Cheung *et al.*, 2011). This body weight mismatch does in one way or the other negatively affects weight control, which can as a result lead to negative outcomes, such as, inadequate nutritional intake, eating disorders, and further weight problems (Lee, 2012; Marshall *et al.*, 2012).

2.4 Differences between the rankings of men and women for the association between female body fat distribution and attractiveness.

Female beauty is nowadays associated with thinness, which is also linked to low body weight. It is defined as a central attribute and key evaluative dimension of physical attractiveness (Stice & Whitenton, 2002). This is captured in a number of sources, such as parents, peers, dating partners, and the media (Stice & Whitenton, 2002). However, the secondary sexual traits that human beings use to select their future wives and husbands are different from what they use to choose their platonic friends. Documented features that contribute to sexual attractiveness for mate selection in men and women are presented in the following section.

2.4.1 Physical attractiveness and mate selection

Height especially among men is reported to be the main factor that contributes to attractiveness among females. Women are found to be more attracted to taller men because they (taller men) are said to be able to provide direct benefits to their mates. Such benefits include; the ability to intimidate rivals and provide resources (Salska *et al.*, 2008). Another study reveals that women also perceive masculine men with hair on the trunk (chest and abdomen) as more attractive (Dixson *et al.*, 2003). Anecdotal evidence from Africa suggests that women in the past were regarded as housewives whose job was to bear children and baby sit them until they are old enough, while men had to look for jobs and provide for their families. Consequently, women chose the men who appear to would be able to provide for them and be able to protect them against enemies (Fisher & Voracek, 2006).

Facial cues that influence sexual attractiveness has also been widely studied (Perrete *et al.*, 2008). Romantic attractiveness can be at first sight at different locations either at a bus stop or a cinema and they always say beauty is in the eyes of the beholder. Grogan (2007) thinks that men are attracted to almost the whole body of a woman starting from face to legs and feet (Grogan, 2007). However, they mostly pay attention to the upper body, including the face, breasts, and midriff than to the thighs, pubic area, and legs (Dixson *et al.*, 2007a). Actually Black women complain that media has a great influence over how these constrained media representations influence Black men's preferences and attitudes which in turn may detract from their own sense of physical appeal (Capodilupo & Kim, 2014). Black women such as Jennifer Hudson and Kerry Washington featured in rap music videos and magazines also increase the slim body preference among the Black population (Thompson-Brenner *et al.*, 2011; Capodilupo & Kim, 2014).

The limited inclusion of weight-diverse models in magazines traditionally marketed to Black women magnifies the problem (Thompson-Brenner *et al.*, 2011; Capodilupo & Kim, 2014).

Figures with a low WHR were rated more attractive than figures with high WHR. However, the normal weight figure with low WHR (0.7) had the highest attractiveness rating when compared to the underweight figure which was perceived to be unhealthy and less attractive (Singh, 2002). In British populations, the overweight and underweight individuals of both sexes were also perceived as less attractive than their normal weight counterparts (Coetzee *et al.*, 2012).

2.4.2 Breast size and attractiveness

Unlike other female species, human females naturally have body parts that in one way or the other can attract male attention. Female breasts are one of the secondary sexual traits that grasp male attention and influences male's perception of attractiveness (Zelazniewicz & Pawlowski, 2011). It is noted that breasts size contributes to attractiveness even more than the buttocks size do. Breast size is one of the most influential features that contribute to attractiveness (Dixon *et al.*, 2007b). However, factors such as areola size and pigmentation can affect the breast attractiveness (Dixon *et al.*, 2007b). Signs that show men and woman's age are breast shape, areola size, and colour (Dixon *et al.*, 2011). On the other hand, breast size increases with age up to adulthood and corresponds with oestrogen level and may be related to both the age and fecundity (Zelazniewicz & Pawlowski, 2011). Breast size is one of the most visible and most attractive features in women especially in cultures where clothing disguises breast shape (Lynn, 2009).

Different studies have uncovered a number of different findings on breast size and attractiveness across cultures. Some studies suggest that men prefer large to moderate sized breasts (Lynn, 2009), while other studies show that greater preference of attractiveness ratings are associated with smaller sized breast (Furnham *et al.*, 2006). All these discrepancies between breast size ratings among men are because judgments of potential mate value can vary with ecological conditions (Swami & Tovee, 2005).

The degree of breasts asymmetry is believed to be a very important factor that cannot be ignored in female attractiveness. The evaluation of female attractiveness has been investigated in studies done by Singh and colleagues (2010) on a large scale and they have proved that men judge women with bigger breasts in lined clothed drawings as more attractive than those with small breasts. It has recently been reported that women and men with greater body symmetry have more sexual

partners than those with less symmetry (Singh *et al.*, 2010). It is also reported that breast size, body weight and BMI together influence attractiveness, health, and reproductive capacity and that in order to comprehend the contribution of the variety of different breast sizes to the perception of female attractiveness, the shape of the body and size has to be taken into consideration.

2.4.3 Differences between attractiveness rankings of the young and older persons

It is quite evident that body dissatisfaction among girls increases through middle adolescence (Lawler & Nixon, 2011). A study conducted by Paxton *et al.*, (2006) proves that body dissatisfaction increased among participants, although there were some differences noted across age transitions as well as gender. The study further reports that body image dissatisfaction is mostly noticeable among younger males as they change from early to middle adolescence (Paxton *et al.*, 2006). However, still on the same study, body dissatisfaction by older adolescent females shows a decline (Paxton *et al.*, 2006). Contrary to this study, another study shows that dissatisfaction with body weight is more common amongst adolescent girls while remaining constant among boys (Currie *et al.*, 2010). This conversely seems to be different with regions and locations because boys and girls in Western and Central Europe are more likely to report that they are “too fat” than boys and girls in Eastern Europe (Currie *et al.*, 2010). Nevertheless, in a longitudinal study diverse male and female participants became progressively more dissatisfied with their bodies over their 10-year study period (Bucchianeri *et al.*, 2013).

As women grow older they go through a variety of developmental stages that may accelerate the transition of body weight or shape further away from the thin-ideal body (Becker *et al.*, 2013). This is the outcome of more people believing that the thin-ideal is also a young-ideal. This is evidenced by many women especially in the first world countries who use anti-ageing cosmetic products, pharmaceuticals and surgical procedures (Becker *et al.*, 2013).

The way people talk about adiposity also contributes to girls and women’s body dissatisfaction, especially ‘fat talk’ (Becker *et al.*, 2013). ‘Fat talk’ also increases the likelihood of body dissatisfaction; drive for thinness and; internalization of the thin ideal (Warren *et al.*, 2012). This “fat talk” is most common especially among women living in the United States, Australia, and Western Europe (Ousley *et al.*, 2007). It consequently turns into disparaging comments about one’s current or future weight (Ousley *et al.*, 2007). While examining the frequency of conversations involving “fat talk” in a sample of undergraduate men and women, Ousley *et al.* (2007) reports that participants who were diagnosed with an eating disorder engaged more frequently in “fat talk” than those not diagnosed with eating disorder. Moreover, Becker *et al.*

(2013) have shown that the frequency of “fat talk” is reported to be higher among the overweight group than the normal weight group. It is, however, important to remember that body image ideal varies across cultures. Some studies indicate that body dissatisfaction is slightly lower in women over 60 years of age (Gagne *et al.*, 2012). Another study of Black women proved that they generally have lower levels of body dissatisfaction (Franko & Roehrig, 2011).

2.5 African perceptions of female attractiveness

The majority of studies on human behaviour have paid more attention to populations in Western societies (Henrich *et al.*, 2010). The results of these studies generalise the human behaviour, and do not consider the fact that Western populations may be particularly unrepresentative of the human species as a whole (Henrich *et al.*, 2010). The relative importance of the different dimensions like shape of the face, shape of the body, leg length and role of symmetry (Wang *et al.*, 2015) as well as skin colour (Henrich *et al.*, 2010) for physical attractiveness may vary between the sexes and across cultures. Moreover, culture can influence the relationship between BMI and body size dissatisfaction among ethnic and gender groups (Padgett & Biro, 2003). For example, a number of studies shows that Caucasian women experience body dissatisfaction at lower BMI level than Black women, and Black women perceive themselves as normal weight when they are actually overweight (Padgett & Biro, 2003). The African population also rate body fat distribution differently from the Western population and this is evidenced by studies conducted in South Africa which show that South African Black women have a higher prevalence of bigger body size and even regard it as sign of wealth and an indication that someone is not HIV-positive compared to women in the UK (Mvo, 1999; Puoane *et al.*, 2005; Venter *et al.*, 2009; Mchiza *et al.*, 2011; Coetzee *et al.*, 2012).

However, there are a few recent studies in Africa which portray a different picture than the ones mentioned above. Their results are in agreement with the Western and developed countries’ perception of body image and attractiveness. In one urban area in South Africa, female college students were found to have greater body size dissatisfaction than those from rural areas (Senekal *et al.*, 2001). Similar observations are experienced in Botswana where urban and higher socio-economic status adolescent students perceive their proportions and body weight dissatisfying than students with optimal weight (Malete *et al.*, 2013). This desire for the slender body size is said to be attributed to increased urbanisation in developing countries (Malete *et al.*, 2013). Nevertheless, contrary to this in a recent study in a rural area in Nigeria it has been found out that about 35% of both males and females were overweight or obese, but more than half of

the participants perceived themselves as normal weight with high numbers of women perceiving themselves as more obese than men in both verbal and visual perception (Akinpelu *et al.*, 2015). Again in most African cultures skin colour is regarded as one of the contributing factors to attractiveness ratings because a pale skinned woman is considered more attractive than the darker skinned one (Said & Todorov, 2011). This is however also common among the African-American population (Maddox, 2004).

2.6 Values, religion and attractiveness

The relationship between religion and weight, as well as religion and body image is well documented (Kim, 2007). Religion may influence weight perception and weight control behaviour in several ways because some religions promote body image acceptance (Kim, 2007). Again being a religious person encourages and helps in supporting others. It could also give other church participants a sense of self-worth (Ellison, 1993). This makes the more religious persons to be less likely to overestimate or underestimate their body weight than those who are less religious (Kim, 2007). There are theological teachings in different religions that teach that the human body is made in the image of deity and that the human body is a place where God dwells. This helps religious adherents to be more satisfied with their bodies (Asad & Coakley, 1997).

A handful of studies have investigated the relationship between religion and body image as well as dieting in adults (Kim, 2006). One of these studies found that religion may be related to decreased weight control behaviour through offerings and fasting (Winner, 2002; Kim, 2007). Another study indicates that orthodox religions such as Islam at times experience less body dissatisfaction than secular women and prescribe guide-lines related to modest dress or covering the body (Odoms-Young, 2008). More-over, Islamic religion makes it difficult for a woman to be judged on the basis of physical attractiveness alone (Ruby, 2003). Actually women who wear the *hijab* have been rated as significantly lower on attractiveness and intelligence than women who do not wear the *hijab* (Mahmud & Swami, 2010). Internal traits are sometimes preferred more than the external traits. For example, preferred attributes include: humour, friendliness, and exciting personality which include socially appealing traits such as warmth, kindness and honesty (Regan *et al.*, 2000). In addition, individuals do not only pay attention to their partner's personal qualities, but rather, they consider if they are also compatible with individual's various dimensions (Regan *et al.*, 2000). The degree to which people are dissatisfied with their bodies has serious implications on their general self-perceptions, self-esteem and social behaviour (Furnham & Calnan, 1998).

2.7 Media influence on body weight and attractiveness in females

Current media images consider an ideal female beauty as a thin one and exposure to this kind of a thin figure to media may make a bigger figured female to perceive her own weight as not acceptable (Viren, 2006). This body type has been identified as a possible factor that leads to the development of anorexia nervosa (Viren, 2006). The current media is complicated and very confusing. It is portraying mixed messages about women and the entire population about what is sexy. This makes it difficult to choose a role model (Derenne & Beresin, 2006). With the increased technology and availability of plastic surgery, today's women are faced with similarly unrealistic expectations (Derenne & Beresin, 2006).

The idealized media images have been found to greatly contribute to the development of body dissatisfaction (Neumark-Sztainer *et al.*, 2006). In South Africa, media is found to be contributing to increasing influence of Western media and values, because a large number of South African women have fallen into a trap of media portrayed images of "thinness equals beauty" (Szabo & Allwood, 2007). On the other hand, still in a South African study where both Black and White girls participated, White girls and their mothers are more likely to consider themselves fat than Black girls and their mothers (Mchiza *et al.*, 2005). However, it has been suggested that not only were the participants pretty much satisfied with their body shape, but they did not even believe that being thinner would enrich their lives (Mwaba & Roman, 2009). It has been further reported that about 50% of girls and undergraduate women were reported to be dissatisfied with their bodies (Bearman *et al.*, 2006).

Television commercials that feature mostly the thin-ideal image as opposed to average-weight women greatly increase women's body dissatisfaction (Hargreaves & Tiggemann, 2004). This consequently leads to many girls and women dieting in order to manipulate their body figures (Hargreaves & Tiggemann, 2004). Women are not the only ones bombarded with the thin ideals; men also have fallen into the same trap, because pictures of thin, muscular, "metrosexual" models appear in men's magazines (Derenne & Beresin, 2006).

2.8 Body weight satisfaction amongst gays and lesbians

Body weight dissatisfaction has a capability of destroying sexual confidence and enjoyment (Peplau *et al.*, 2009). It has been found that heterosexual women experience more body dissatisfaction than heterosexual men (Frederick *et al.*, 2007). As they grow into adults, both lesbian and heterosexual women get exposed to media images of idealized female beauty and are

judged on their appearance leading to lesbian women experiencing the same degree of body dissatisfaction as heterosexual women (Peplau *et al.*, 2009). For gay men, the media mostly portray fit and masculine bodies as attractive (Frederick *et al.*, 2005). This makes gay men to feel the burden of appearing fit and muscular in order to combat stereotypes depicting gay men as feminine (Shernoff, 2002).

2.9 Body image dissatisfaction and eating disorders

Body size dissatisfaction is often seen as a correlation of eating disorder. This is evidenced by the high prevalence of eating disorders in groups in which there is an increased emphasis on maintaining a thin, “ideal” body shape (Furnham *et al.*, 2002). The challenge is when there is an increased concern about the perceived “ideal” discrepancies relating to bodily aspects (e.g. weight); this dissatisfaction often aggravates efforts to close the perceived ideal gap (Furnham *et al.*, 2002). Normally the means used to close this gap in western societies is exercise, dieting in a normative behaviour for young women and the use of supplements (Furnham *et al.*, 2002). Older studies report that dieting is a more common behaviour among women (Davis & Cowles, 1991). This causes women to traditionally display a greater commitment to their beauty than men who would rather be interested in the bodies of the opposites sex (Furnham *et al.*, 2002). Moreover nutrition transition which has led to changed modern diets, exercise, and beauty trends displayed in reality television and social media outlets can contribute to unhealthy body perceptions (Voelker *et al.*, 2015).

2.10 Summary

Overweight and obesity are a public health problem affecting all age groups. It is however reported that women are more concerned about their body image and looks than men. Literature indicates that in most developing countries Black women show less concern about their body images than those in the developed countries. This body image dissatisfaction can be so serious in some societies that it can even lead to the development of bad eating habits and consequently result in eating disorders. The desire to have a thin figure by teenage girls or masculine figure by teenage boys is said to be mostly common at the adolescent stage. Moreover, at the adulthood stage, human bodies change and become less attractive (Tiggemann, 2004). People normally gain weight until they are at their 50s. This leads to changes in body shape, loss of skin elasticity, development of wrinkles and greying and / or thinning of hair (Tiggemann, 2004). This becomes a challenge to some people who normally want to remain younger (Tiggemann, 2004). This due

to the fact that body size concern seems to be prevalent across the entire life span in women (Forrester-Knauss & Stutz, 2012). The current media, including some television shows, magazines and Facebook, are reported to play a significant role in body weight and attractiveness.

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Chapter 3: Methodology

3.1 Introduction

This study used quantitative research methods. These methods emphasize the measurement and analysis of casual relationships between variables within a value free context (Babbie & Mouton, 2001). The quantitative approach focuses on measurable attributes of a phenomenon (Manwa, 2013). In the light of this, attractiveness scores were calculated for each of the 21 images in a set of pictures of the female figure. Differences between the rankings of men vs. women, older vs. younger and underweight/normal weight vs. overweight/obese participants, respectively, for the association between female body adiposity and attractiveness were determined.

3.2 Design

The study design was observational and descriptive. According to Leedy & Ormrod, (2005), descriptive research involves information about one or more groups of people about their characteristics, opinions, attitudes or previous experiences by asking questions and tabulating their answers. The researcher described the association between female body adiposity and attractiveness amongst adult men and women in Botswana.

3.3 Population and study area

The target study population was Batswana residing in Ranaka village in Botswana. Ranaka village is a rural settlement located in the Southern District of Botswana. Ranaka was chosen purposely as a rural study in Botswana where almost all inhabitants were born and raised in Botswana and identified in their identity documents as Motswana. It is 76 km South-West of the capital city, Gaborone. The village is divided in to 4 wards namely Sebubi, Tsogo, Momare and Newlook. The principal requirement for the inclusion of the population in the international study was that the study participants should be part of a homogeneous African population, born and growing up in the country and region of the study site (Wang *et al.*, 2015). The populations in major cities and towns in Botswana are diverse, with black, white, Indian, Chinese and coloured groups. Therefore given that there is a high likelihood of the population in small villages to be more homogeneous, this study was conducted in a rural village in Botswana.

3.4 Inclusion and exclusion criteria

Only participants who were born from Batswana parents, full-time residents of Ranaka village and aged between 18 and 50 years were selected to participate in this study. National Identity cards were used to identify if participants were indeed a Motswana (as indicated under nationality). No one was excluded according to their sexual orientation.

3.5 Sampling and sampling procedure

According to protocol, a total of 100 people from the four wards was selected for the study using a stratified random sampling technique using gender and wards as stratifying criteria. The sample size was decided upon following the protocol of the original international study. Participants from 10 countries were included, with sample sizes ranging from 53 to 260 per country. The results showed that consistent relationships were found between study countries, irrespective of sample size, indicating that the sample size per country was probably large enough for the research question (Wang *et al.*, 2015). For this reason we decided on a final sample size of 100 for this study. The selection from each ward was done in proportion to the number of persons living in that ward, with an equal number of men and women. Furthermore, since the current study was a household-based study, households were selected randomly from the wards based on the map of the village to allow for a 20% non-response. Men and women were selected from each alternative house to recruit a similar number of men and women. Participants were recruited by advertising the study at the local shops. The researcher then selected a community advisory committee and explained the aim, objectives and procedures of the study to them. The committee then advised on community entry and communication, as well as the recruitment process of the participants from each of the wards. The informed consent forms were then explained and issued to the participants by a trained research assistant. They were then given a day before to enable participants to decide whether or not they wanted to take part in the study. From the 120 households, we managed to recruit 115 eligible participants for the current study, of which 2 people did not agree to participate. We then ended up with 113 participants, with similar numbers from each ward. More women (58% vs. 42%) than men agreed to participate.

3.6 Instrument

The instrument that was used in this study was a questionnaire and 21 figures of a female body (Appendix B). The questionnaire comprised two sections. Section A included questions that elicited information on the socio-demographic characteristics of the participants, with a section to record the participants' weights and heights. Section B included questions that elicited information on the card rating from the most to the least attractive. The cards had 21 body images of soft tissue dual-energy x-ray absorptiometry (DXA). These images had been successfully used previously to study the role of adiposity in the perception of physical attractiveness in the United States of America (USA), in European and in Asian college students (Wang *et al.*, 2015) and were selected from a database of over 5000 female images. They were specifically selected to break the link of body fat percentage (BF %) to WHR (Wang *et al.*, 2015). The 21 female body images covered seven levels of BF %: 15%–20%, 21%–25%, 26%–30%, 31%–35%, 36%–40%, 41%–45%, and 46%–50%. The body fat percentages were then grouped into three levels of WHR arranged from low to high levels namely: low (0.60-0.66), medium (0.67-0.75), and high (0.76-0.88) respectively. In addition the BMI level of these images ranged from 19 to 40 kg/m².

3.7 Data collection procedure

The researcher conducted the interview after study participants had given their consent. Socio-demographic data included questions about the participant's age, gender, home language, education level and occupation, and housing conditions. Each participant's weight and height were measured and recorded. Both weight and height were measured at the participant's house and measurements were taken twice for each variable using a digital scale (Seca, Hamburg, Germany) and free-standing stadiometer (Seca, Germany) and mean values were recorded. Body mass index were calculated as weight (kg) divided by height (m) squared.

Participants were given the 21 image cards which were shuffled and placed in front of them in a random order. The images used were culture neutral to the population used with simple shapes which did not reveal the colour of the skin of the images, nor their hair type. They were then asked to reorder the cards from the most attractive on their right to the least attractive on their left. However they were not allowed to give the same ranking for two different images. The sorting task took about 5 minutes to complete so as to not allow time to reshuffle and rethink. The researcher then recorded the order of the images and confirmed with the subject that the order was indeed from least to most attractive and not the reverse.

3.8 Validity and reliability

According to Babbie and Mouton (2001:648), validity is a term describing a measure that accurately reflects the concept it is intended to measure. Reliability on the other hand, is the quality of measurement method that suggests that the same data would have been collected each time in repeated observation of the same phenomenon. Despite the fact that the validity and reliability of the images used in the current study were not validated in the Botswana community; they were previously successfully adjusted and tested in similar African populations such as Kenya, Morocco, Nigeria and Senegal (Wang *et al.*, 2015).

3.9 Data management system

3.9.1 Data entry

Data was entered in an Excel file and analyzed using the Statistical Package of Social Sciences (SPSS version 22 program) computer programme.

3.9.2 Statistical analysis

The distribution of data was tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Descriptive statistics such as means and standard deviation were used to present data with a normal distribution; while medians and interquartile ranges were used to present data with a non-normal distribution and percentages. To determine the association between female body adiposity and attractiveness in a group of men and women, the mean score for each figure were calculated. According to the protocol of the main study the rankings were converted to standardized scores in the range of 1 to 9 using the following equation: $\text{Score} = 1 + (\text{ranking} - 1) * 0.4$, with original rankings ranging from 1 to 21. The known level of BF% of each figure (X-axis) was plotted against the median attractiveness score for the total group and the sub-groups, separately. Regression lines were fitted and the R square of the regression equation was presented. The p-value to define significance was $p < 0.05$.

To determine differences between the scores of men and women, the median ratings of all individual images by both men and women were recorded and analysed using the non-parametric Mann Whitney test since data was not normally distributed. The Mann Whitney test was also used to determine the differences between median scores of the young (18-34 years) and older

persons (35-50 years). The association between the measured BMI category of the respondent and attractiveness scores were assessed by comparing the median scores of the respondents in the combined normal weight and underweight group with median scores allocated by respondents in the combined overweight and obese group.

3.10 Data archiving

All hard copies of the questionnaire were stored in the office of the principal investigator, Prof. H.S. Kruger and the electronic data was archived on a password protected computer and backed up on an external hard drive. Data was recorded and saved by subject number only to ensure confidentiality. All hard copies of the questionnaire would be stored for at least 7 years and would then be destroyed by shredding.

3.11 Quality control – at all stages of study (collection, analysis, capturing, storage)

Data was collected and analyzed by the researcher. All the instruments that were used such as the measuring scale and the stadiometer were checked and calibrated to ensure quality. Captured data was checked and cleaned to ensure accuracy. It was stored in the Excel file and the Statistical Package of Social Sciences (SPSS version 22 program) computer programme.

3.12 Ethical Considerations

The experimental protocol complied with the ethical rules for human experimentation in the Declaration of Helsinki. The protocol was presented to the Human Ethics Review council of the North-West University and it received approval (Ethics number NWU-00029-16-A1). After approval the researcher scheduled a meeting with the Ranaka village chief. The researcher then explained the aim and methods of the study and waited for the chief's approval. The researcher also formed an advisory committee to whom she also explained the study and discussed recruitment, measurements and an appropriate token of appreciation for participation with them.

Recruitment of participants was done by a research assistant through a door-to-door visit of selected households, following the advertisement of the study at local shops and taxi ranks. The

informed consent forms were then explained and issued to the participants by a trained research assistant. They were then given a day to decide whether they wanted to take part or not. Thereafter signed informed consent forms were collected. Respondent's privacy was guaranteed by using codes. Respondents were given an opportunity to ask questions and were allowed to withdraw from the study without providing any reasons if they so wished.

Measurement of height and weight were done in privacy at each participant's house to prevent embarrassment of the participants. Participants were fully dressed during measurements, with only shoes and hat, and heavy coats or jerseys taken off. No-one was asked to leave the house without head dress.

All results from the study of each participant were treated strictly confidential. The data collected would be kept in storage for a minimum of seven years. However, there were no direct benefits to the study participants but they were given a small food parcel as a token of appreciation. An appropriate token was discussed with the community advisory committee. Potential indirect benefits included: i) notifying the study participants about their body size (BMI) status after being weighed and measured, and helping them to understand the health risks associated with being underweight, overweight and obese, ii) the benefits of adopting a normal body size status, as well as iii) the knowledge that would be gained by the nutrition professionals about the importance of considering body image in the strategies that they would design to reduce body adiposity, overweight and obesity in Botswana. The risks involved for participants were minimal and did not require interventions.

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Chapter 4: Article

Title:

The relationship between female adiposity and physical attractiveness amongst adults in Ranaka village, Botswana

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Abstract

Objective: To assess the relationship between female adiposity and physical attractiveness among men and women between 18-50 years old in Botswana culture.

Methods: This was a cross-sectional study of randomly selected adults (n= 113, 48 men and 65 women), stratified by gender and ward within Ranaka village, Botswana. A questionnaire and 21 images of the female body, previously validated in similar African populations to study the role of adiposity in the perception of physical attractiveness were used. The questionnaire comprised of section A for recording socio-demographic data, and weights and heights. Section B for recording the participants' rating of the images from the most to the least attractive.

Results: Overall, the perceptions of an attractive woman in Botswana population were similar in men and women regardless of some differences in socio-demographic characteristics and anthropometry, except only for image 9 ($p=0.02$). Men gave a lower score for this image (waist to hip ratio (WHR) =0.61 and body mass index (BMI) =21kg/m² and a % body fat (%BF) =32%), while women gave a higher score (3.8 vs. 6.2/9). Moreover, perceptions regarding an attractive female body size seemed not to be influenced by BMI or the education level. although males of all age groups seemed to favour a bigger body sized image compared to their female counterparts.

Conclusions: Despite differences in socio-demographic characteristics and anthropometry, perceptions of an attractive woman in Botswana population are similar in men and women. There was no general relationship between the participant's BMI, education level and attractiveness score.

Introduction

Despite the growing evidence on the development of effective strategies directed at normalizing energy balance (that is; promoting healthy eating and physical activity) to reduce the prevalence of obesity prevalence globally (1) the obesity problem still persist in a number of countries (2). Botswana as a developing country is not spared from this growing obesity pandemic (3, 4). Reports show that overweight and obesity are more common in women than in men (5). There is strong evidence that suggests that body image mediates body size to a greater extent in women than in men (6, 7). In fact, studies suggest that some African populations have a higher tolerance for overweight and obesity since they regard these as attractive and signs of beauty (8-13). There is a dearth of data on body image in Botswana. The only study we could access (14) suggests that overweight and obesity among adolescent students in Botswana are associated with body image dissatisfaction. This study included mainly girls (61%) and the mean age of students was 14.9 years. As such, more studies need to be done to investigate whether or not obesity is considered to be physically attractive, especially in the adult population of Botswana in order to develop targeted interventions to tackle the growing overweight and obesity problems in the country. Furthermore, information on whether gender differentiates body image dissatisfaction, physical attractiveness preference and perceptions regarding body fat distribution in the country is mandatory.

Thus, the purpose of this study was to fill the body image research gap in Botswana by focusing on the relationship between female body adiposity and physical attractiveness preferences among men and women. The findings of this study would help to highlight the importance of educating Batswana about the risks associated with overweight and obesity and thereby dispel the perceptual myths regarding the attractiveness of a bigger body size and body fat distribution. It would also help nutrition specialists and the government of Botswana to develop targeted interventions to manage overweight and obesity problems.

Methods

Sample size selection

In line with the purpose for investigating whether or not obesity is considered to be physically attractive among the adult population of Botswana, the sample for the current study was selected from people living in Ranaka village, where only indigenous Batswana reside. The study required a homogeneous population of a rural area in Botswana. Thus Ranaka village was identified

because it was likely that almost all inhabitants in the village were born and raised in the village. Participants were identified through their national identity documents. The study was introduced to participants by advertising it on posters displayed at the local shops, taxi rank, council office and clinic. The sample size selection was stratified by gender and ward. This sample size was based on the protocol of the original international study (15) which included participants from 10 countries, with sample sizes ranging from 53 to 260 per country. From this international study, the results showed consistent relationships between study countries, irrespective of sample size indicating that the sample size per country was large enough for the research question. Ranaka village has four wards and a trained fieldworker visited 25 to 30 houses from each ward in an effort to recruit 120 study participants. Recruitment of men and women was done alternatively from one house to another in an effort to recruit a similar number of men and women. A total sample of 115 people was recruited. However, two of the recruited persons withdrew their participation in the study. There were eventually a total of 113 participants comprising of 48 men and 65 women.

Ethics and informed consent

The protocol was approved by the Human Research Ethics Council of North-West University project number (NWU-00029-16-A1). The following procedures were followed to obtain data from these villagers. Approval was obtained from the village chief to conduct this study. The researcher invited an advisory committee which consisted of people from all the four wards and its role was to give advice on the study. Participant's recruitment, measurements and an appropriate token of appreciation were also discussed with this committee. Participants were given plain language consent forms and were given enough time to decide on whether or not they wanted to participate in the study. Respondents were given an opportunity to ask questions and they were allowed to withdraw from the study without providing any reasons. Only participants who were indigenous Batswana from Ranaka village and who were aged between 18 and 50 years were eligible for the study. Participants were not excluded according to their sexual orientations.

Procedures and measurements

Data collection was done in June 2016 and the instrument used to collect data was a questionnaire and 21 image cards of the female body. A series of 21 soft tissue dual-energy X-ray absorptiometry (DXA) images was used. The female body images used had been developed previously by an international team and were used to study the role of adiposity in the perception

of physical attractiveness in United States (US) college students (15). The questionnaire used comprised two sections. Section A had questions that elicited information on the socio-demographic characteristics of the participants, and their weight and height. Section B included instructions on the rating of the 21 body image cards from the least to the most attractive. The 21 female body images covered seven levels of body fat percentage (BF %) namely, 15%–20%, 21%–25%, 26%–30%, 31%–35%, 36%–40%, 41%–45%, and 46%–50%. At each level of BF% there were three levels of waist to hip ratio (WHR) namely, low (0.60-0.66), medium (0.67-0.75), and high (0.76-0.88) respectively. The body mass index (BMI) of these images ranged from 19 to 40 kg·m⁻². These images were selected from a database of over 5000 female images and were specifically selected to break the link of BF% to WHR (15).

A highly experienced and trained fieldworker obtained the informed consent in the village. Thereafter the researcher collected data from participants by conducting interviews using a structured questionnaire. The socio-demographic data included questions on the participant's age, gender, home language, education level, water source, type of toilet, fuel used for cooking and housing conditions to assess the participants' living conditions. Participants' weight and height were taken and recorded at the participants' houses. Measurements were taken twice for each variable and the means were calculated. Participants' weight was measured with a digital scale (Seca, Hamburg, Germany) and height with a free-standing stadiometer (Seca, Hamburg Germany). Body mass index was calculated as weight (kg) divided by height (m) squared.

The 21 image cards were shuffled and placed in front of participants in a random order. The images used consisted of simple shapes which did not reveal the colour of skin of the images, nor their hair type or face. Participants were then asked to reorder the cards from the least attractive to the most attractive. The researcher then recorded the order of the images and confirmed with the subject that the order was indeed from least to most attractive and not the reverse. The images used were developed and used previously by an international team (15).

Statistical analysis

Data was analyzed using the Statistical Package of Social Sciences (SPSS version 23 program). Data distribution was tested for normal distribution using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Descriptive statistics such as means and standards deviation were used to present data with a normal distribution, while medians and interquartile range were used to present data with a non-normal distribution. Percentages were used to present categorical data of the socio-demographic and anthropometric results. The median score for each female body image was first calculated in order to determine the association between female body adiposity and

attractiveness in the men and women. Following the protocol of the main study, the rankings were then converted to scores in the range of 1 to 9 using the following equation:

Score = $1 + (\text{ranking} - 1) \times 0.4$, with rankings ranging from 1 to 21. The known level of BF% of each figure (X-axis) was plotted against the median attractiveness score for the total group and the subgroups, separately. Regression and locally weighted scatterplot smoothing (LOWESS) fit lines were fitted and the R square of the regression equation was presented. The p-value to define significance was $p < 0.05$.

The Mann Whitney test was used to determine the differences between scores of men and women and also differences between the median scores of the young (18-34 years) and older persons (35-50 years). The attractiveness scores according to the education level (no school education to primary school versus high school to tertiary education) were also determined.

Results

A total number of 115 participants consented to take part in the study, but only 113, (48 men and 65 women) participated. The age range of participants was 18-50 years. The number of study participants across the four wards was evenly distributed with ward one consisting of 28 participants, ward two 29, ward three 27 and ward four 29 participants. Participants from wards were of a similar gender distribution. Overall, overweight and obesity prevalence were higher in women (21.5% and 27.7%, respectively) than in men (8.3% and 2.2%). There were no significant gender differences between the numbers of people living in the same household. Moreover, the housing conditions of the participants were relatively good, because 85% of the participants stayed in houses made of bricks and 77% of the participants had access to clean safe water on their premises. However, a high prevalence of the participants (72.9%) cooked with wood in open fire places. The characteristics of the participants are presented in Table 1.

Relationship between adiposity and attractiveness

Scatter plots with regression and the locally weighted scatterplot smoothing (LOWESS) fit lines of female attractiveness scores for each of the images in relation to known %BF was generated in order to assess if there was a link between adiposity of the images and attractiveness scores given by the participants. Men and women were then considered separately to determine the differences between their scores of female attractiveness according to body adiposity. Figure 1 and Table 2 show the difference in scores between the two gender groups, and the differences between the scores of younger men and women. In general, there was a huge individual variation

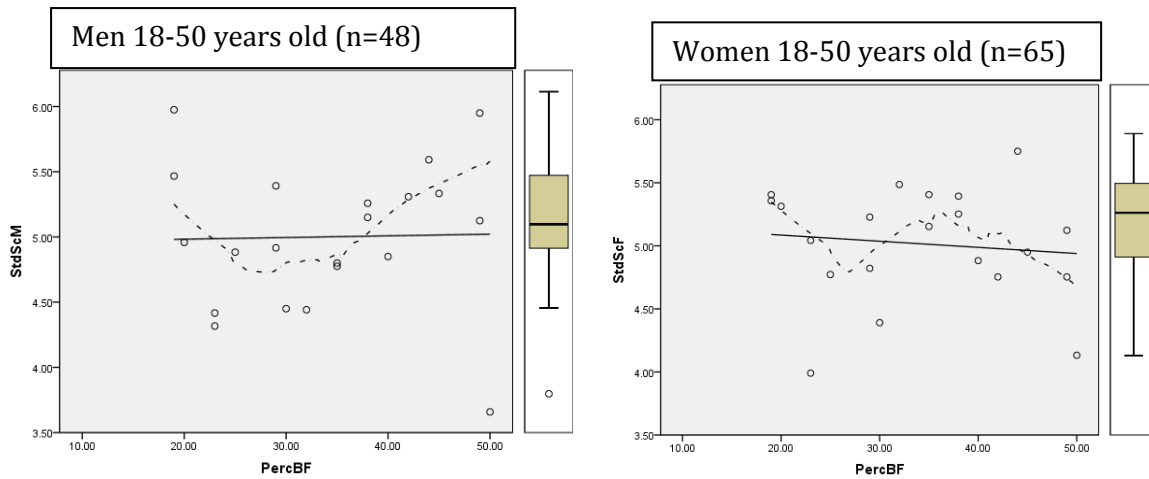
in scores for each image, as shown by the small range of median scores (3.6 to 6.6) and the fact that many images received the same score (Table 2).

Table 1: The socio-demographic and anthropometric characteristics of the participants

Variable	Mean (standard deviation)/Median (interquartile range)/N (%)		
	Men (n=48)	Women (n=65)	P [#]
Age (years) *	30.1 (9.2)	34.1 (8.2)	0.02
Weight (kg) °	55.8 (51.8,64.3)	68 (54.35,79.50)	<0.001
Height (m) *	1.73 (0.06)	1.60 (0.07)	<0.001
Body mass index (kg/m ²) °	18.9 (17.7,21.6)	24.8 (21.8, 30.9)	<0.001
School education *			
No school	3 (6.3)	1 (1.5)	
Primary school only	10 (20.8)	19 (29.2)	
Junior secondary school	23 (47.9)	27 (41.5)	
Senior secondary school	7 (14.6)	10 (15.4)	0.58
Tertiary education	5 (10.4)	8 (12.3)	
Toilet [‡]			
Pit toilet	42 (87.5)	57 (87.7)	
Flush toilet	6 (12.5)	7 (10.8)	
No toilet, use veld		1 (1.5)	0.67
Number of persons per household [‡]	5 (3, 6)	5 (4, 7)	0.47
Number of persons per room [‡]	1.00 (1.2)	2.00 (1.3)	0.07

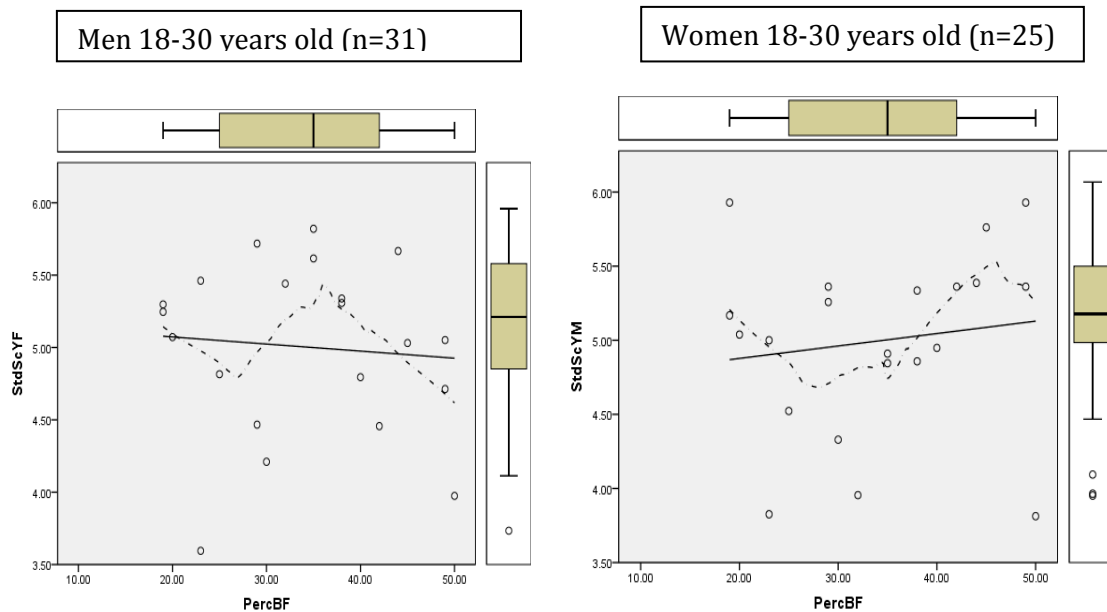
*Mean (standard deviation); °median (interquartile range); [‡]N (%)

[#] Significance of differences between men and women, t-test/Mann-Whitney U-test/chi-square test



$$y = 31.8 + 0.02x, R^2 = 0.001, \text{---- LOWESS fit line}$$

$$y = 46.7 - 0.11x, R^2 = 0.01, \text{___ Regression line}$$



$$y = 22.5 + 0.14x, R^2 = 0.019, \text{--- LOWESS fit line}, \quad y = 41.2 - 0.08x, R^2 = 0.007, \text{__Regression line}$$

PerBF= Percentage Body Fat, **StdScM**=Standard score men, **StdScF**=Standard score women, **StdScYM**=Standard score young men, **StdScYF**=Standard score young women

Figure 1: Comparison between the scores of men and women for female physical attractiveness according to adiposity, as well as scores for younger men and women, respectively.

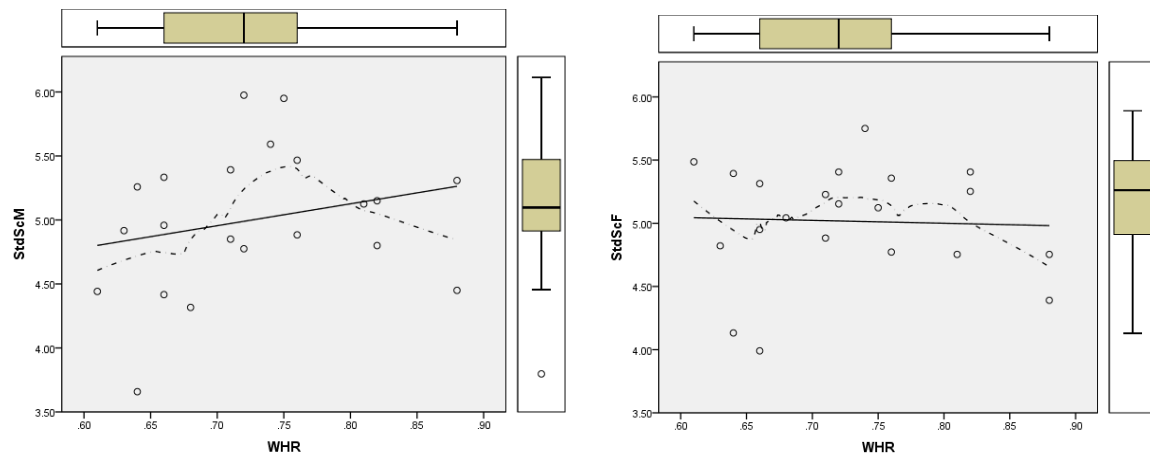
Table 2 shows that there were no significant gender, age and weight status differences between the median scores given by men and women except only for image 9 ($p=0.02$). Men gave a lower score for this image while women gave a higher score (3.8 vs. 6.2). There was an outstanding feature about this image because it had low WHR=0.61 and BMI=21kg/m² and a %BF = 32%.

In addition, a binary variable for the education level was formed (based on lower education level [regarded as no schooling to primary school] = 0 versus high education level [regarded as high school to tertiary education] = 1) to determine the difference between the scores for the 21 image cards by the men and women according to their education status. In this case no significant difference was found between men and women of different education levels.

Figure 1 shows a comparison of scores given by both younger women and men and the overall groups. Regression lines were fitted to show the relation of the scores given for attractiveness by both young female and male raters and the overall group. The shapes of the LOWESS fit lines were similar for women and men of all ages. The only difference observed with the LOWESS fit lines were between the older and younger men's scores, where younger men tended to give lower scores at the highest %BF, (suggesting that they had less preference of a bigger body sized image). However, the overall group of men tended to give higher scores at the highest %BF, (suggesting that they had a higher preference of a bigger body sized image). The scores given by both young and all old men for a bigger body sized image were higher than those of women (indicating that women gave lower scores at the highest %BF). The linear regression lines were different from the LOWESS fit lines for the scatter plots and the R squares for all regression equations were small ($R^2 = 0.001$ to 0.01).

Association between BMI and WHR of the images, respectively, and physical attractiveness score by men and women

Scatter plots of female attractiveness scores in relation to BMI and WHR were also generated and regression analyses were performed. Figure 2 shows the scatterplot of the standard scores of the men and women according to the WHR of the images. No clear relation between the scores and WHR of the images could be detected, as shown by the LOWESS fit lines and small R^2 values. The shape of the LOWESS fit line for men for score against WHR appears to be the opposite of the shape for the relation between attractiveness and %BF, whereas for women the shapes of the lines are more in agreement. However, in this study an image of a WHR of around 0.75 was rated most attractive by both men and women (Figure 2).



$$y = 22.5 + 0.14x, R^2 = 0.019 \text{ LOWESS fit line}$$

$$y = 4.12 - 0.08x, R^2 = 0.007 \text{ Regression line}$$

WHR= Waist to hip ratio, **StdScM**=Standard score men, **StdScF**=Standard score women

Figure 2: Comparison between the scores of men and women for female physical attractiveness according to WHR.

Table 2. Difference in attractiveness scores according to sex, age group, educational status and weight status (median, interquartile range)

Image number	Men (n=48)	Women (n=65)	Age 18-35 years (n=57)	Age 36-50 years (n=56)	Low Education status (n=33)	High Education status (n=80)	Underweight and normal weight (n=76)	Overweight and obese (n=37)
1	6.2 (5.8,6.2)	6.2(6.2,6. 2)	6.2(6.1,6.2)	6.2(6.2,6.2)	6.2(5.4,6.2)	6.2(6.2,6.2)	6.2(5.9,6.2)	6.2(6.2,6.2)
2	3.6(1.1,5.8)	4.6(1.4,6.2)	3.8(1.4,5.8)	4.2(1.4,5.8)	4.6(3.4,5.8)	2.8(1.0,5.8)	4.2(1.4,5.8)	3.4(1.4,5.8)
3	4.6(1.4,7)	4.2(1.4,5.8)	4.6(1.4,6.3)	3.8(1.4,6.6)	4.6(1.8,7.6)	4.6(1.4,5.8)	4.6(2.2,6.2)	4.6,(1.3,6.4)
4	4.6(1.9,6.2)	4.6(2.2,6.2)	4.6(1.7,5.9)	4.6(2.6,7.4)	3.4(1.4,6.0)	4.6(2.2,6.9)	4.6(2.2(6.2)	4.6(1.4,6.4)
5	4.6(2.0,6,7)	5.8(3.4,7.4)	5.8(3.4,7.8)	4.6(2.6,7)	4.6(2.0,7.0)	5.6(3.4,7.4)	5.6(2.7,7.4)	4.6(2.4,7.0)
6	4.2(1.0,4,7)	5.8(2.6,7.6)	4.6(2.1,7)	4.6(2.6,7.8)	4.6(1.6,7.0)	5.0(2.2,7.3)	4.6(2.2,7.0)	5.8(2.0,7.8)
7	5.8(2.8,7.8)	4.6(2.6,7.4)	5.8(3.3,7.8)	4.6(2.2,7)	4.6(2.0,7.4)	5.8(3.1,7.8)	5.8(3.1,7.8)	4.2(2.6,6.4)

Table 2 (continued)

Image number	Men (n=48)	Women (n=65)	Age 18-35 years (n=57)	Age 36-50 years (n=56)	Low Education status (n=33)	High Education status (n=80)	Underweight and normal weight (n=76)	Overweight and obese (n=37)
8	5.0(2.6,7)	5.8(3.4,7.8)	5.6(3.4,7.8)	4.6(2.6,7.4)	3.8(2.6,6.8)	5.8(3.4,7.80)	5.8(3.1,7.4)	5.0(3.0,7.8)
9	3.8(2.3,6.9)*	6.2(3.4,7.8)*	4.6(2.6,7.4)	7.0(2.6,7.4)	5.8(2.4,7.0)	5.0(3.0,7.7)	4.4(2.6,7.4)	6.2(3.2,7.80)
10	6.6(3.8,8.2)	4.6(2.8,7)	5.4(3.0,7.9)	5.4(3.4,7.4)	5.4(3.4,8.0)	5.4(3.1,7.8)	5.4(3.4,7.8)	5.4(2.8,7.8)
11	5.0 (2.6,6.9)	5.0(3.4,7.8)	5.0(2.6,7.1)	5.0(3.8,7.8)	5.0(2.4,7.6)	5.0(3.1,7.4)	5.0(2.7,7.4)	5.0(4.3,7.4)
12	5.8(2.6,7.7)	5.4(2.8,7.8)	5.6(2.6,7.9)	4.2(3.0,7.0)	5.4(4.0,7.2)	4.8(2.6,7.8)	6.0(2.6,7.8)	4.2(2.8,7.6)
13	5.4(3.1,7.4)	4.2(2.4,7)	4.6(2.5,7.4)	5.4(3.0,7.4)	5.4(1.8,7.4)	4.8(3.0,7.3)	5.9(2.7,7.3)	4.2(2.6,7.4)
14	5.2(3.6,9)	3.8(2.2,6.8)	5.0(3.0,7.0)	5.0(2.2,6.6)	5.4(2.6,8.2)	4.0(2.6,6.6)	4.6(2.6,6.6)	5.0(3.0,8.6)

Table 2 (continued)

Image number	Men (n=48)	Women (n=65)	Age 18-35 years (n=57)	Age 36-50 years (n=56)	Low Education status (n=33)	High Education status (n=80)	Underweight and normal weight (n=76)	Overweight and obese (n=37)
15	5.6(3.8,8.6)	5.4(3.4,7.4)	5.4(3.3,7.9)	5.4(3.8,8.2)	5.4(3.8,7.4)	5.4(3.5,8.5)	5.4(3.4,8.1)	5.4(4.2,7.8)
16	5.0 (3.0,7.7)	5.0 (3.8,7.4)	5.0(3.4,7.1)	5.0(3.0,8.2)	5.0(3.2,8.2)	5.0(3.1,7.3)	5.0(3.1,7.4)	5.0(3.4,7.4)
17	5.4(3.1,7.4)	5.0 (3.8,7.4)	5.2(3.4,6.8)	5.4(3.8,7.8)	5.8(4.0,7.6)	5.0(3.5,7.4)	5.4(3.8,7.8)	4.2(3.4,6.6)
18	5.0(3.4,6.6)	5.0(3.0,7.2)	5.0(3.3,7.4)	5.0(3.0,7.0)	5.0(4.2,6.8)	5.0(3.0,7.4)	5.0(3.1,7.0)	5.4(4.3,7.2)
19	4.2(3.0,6.6)	5.0(3.6,6.6)	5.0(3.0,6.6)	4.2(3.0,6.6)	3.8(3.0,5.4)	5.0(3.0,7.2)	4.2(3.0,,6.6)	4.2(3.0,7.0)
20	4.2(3.0,6.6)	4.2(2.6,6.6)	4.2(3.0,6.6)	5.4(3.0,7.4)	6.6(2.6,7.4)	4.2(3.0,6.6)	4.2(2.7,6.6)	5.4(3.0,7.2)
21	5.0(3.0,6.6)	5.0(3.0,6.6)	4.8(3.0,6.6)	5.0(3.0,6.6)	4.2(2.8,7.0)	5.0(3.0,6.6)	5.0(3.0,6.6)	4.2(2.6,6.6)

* p<0.05: Significant difference between men and women

Discussion

There is a dearth of data regarding the perceptions of female attractiveness in relation to adiposity in Botswana. This cross-sectional study therefore sought to fill this research gap and assess the perceptions about female attractiveness and the preference regarding female body size adiposity in 18-50 year old Botswana people. The key findings of this study therefore are that: i) like in most countries where attractiveness rating was studied (15; 16), this study included more female participants (58%) than male participants (42%). Apparently most studies on obesity and body image included more female participants than men (16). ii) There was a general agreement in scores for attractiveness given to different body sized images between Botswana men and women participating in this research. iii) Moreover, the perceptions of an attractive woman in this group of Botswana are generally similar in men and women, regardless of the differences in their socio-demographic characteristics and anthropometry. iv) Furthermore, the results of the current study show that, while the perceptions regarding an attractive female body size in the Botswana population were not influenced by their own BMI and levels of education, males of all age groups seemed to favour a bigger body sized woman than their female counterparts. V) Finally, younger males participating in this research tended to show less preference of a bigger body size than their older male counterparts.

These results are consistent with previous studies where males and females in a given population did not differ significantly in their ratings of female attractiveness (17-20). For example, in South Asia it was also revealed that the younger males ranked a bigger body size as less attractive compared to older men (23). In fact, in many traditional, non-Western settings, high body weight is regarded as sign of wealth and prosperity (21). These results however do not resonate with the results of previous studies conducted in Westernized settings, where slender figures were consistently favoured over heavier ones by male participants and the female participants' preference was not so definite (22).

To fully comprehend the preference for a bigger body sized female in the non-westernized populations especially in rural areas of Africa, it is important to know that, people in rural areas in most African countries including Botswana (Ranaka village) have limited resources. In most cases they do not have electricity or significant amounts of household durable goods (24). As such, women are required to do a lot of manual labour including fetching fire wood far from home. This requires physical strength. Therefore among these populations, a bigger female body size is perceived to reflect physical strength, high status and good health (25). Another possible

explanation to the results that older Batswana men prefer a bigger body sized figure than younger men could be that HIV/AIDS has contributed to the rankings of attractiveness given by the older male participants, who might consider thinner women to be infected by this disease.

Culture dependent views

Body image and attractiveness rating perceptions and ideals differ within and between various cultural groups. (26) In a study where multicultural populations were included, the importance of body adiposity and waist-hip-ratio (WHR) was culture dependent (15). Cultures with limited food supplies usually associate a larger body size with health, wealth, beauty, fertility, and food security (27, 28), while most developed and third world countries idealize female thinness and male muscularity (29, 30). Weight and body images are important elements in the conception of physical attractiveness for many cultures, but each differs in their preferences (31). In most cases American women regard a bigger body size as unattractive and even tend to overestimate their body size (32). Although the concept of African preference of bigger body size image is common across most African cultures, it differs between males and females in different countries. In this study, it is mostly the older men who found the bigger sized images more attractive while in South Africa it is the Black women who are reported to have a higher preference of a bigger body size than their white counterparts (8, 10-13). Similarly in Ghana, (33) it was women who were more likely to rate bigger body sizes as ideal compared to US students. However, in Uganda Furnham and Buguma (34) compared British and Ugandan ratings of both male and female figures and they found out that Ugandans rated obese female figures as more attractive than did the British. The African population in general is reported to have a different preference of body adiposity from the Western population. This is demonstrated by studies conducted in South Africa which proved that South African Black women had a higher prevalence of bigger body size (8-11, 13).

Dissatisfaction with own body size

Although this study did not investigate rates of dissatisfaction with own body size, some studies where both men and women participants were included showed that there is a higher body dissatisfaction in overweight women than men (35). Americans seem to be more obsessed with thinness and own body dissatisfaction. This has been evidenced by high prevalence of about 7 million (predominantly white) females with eating disorders (32, 36). Moreover, the Chinese and Afro-Caribbean are also reported to have low self-esteem than Africans (37). Again in China (38) and Japan (39) women are said to have lower self-esteem than men about their own body images.

A lower level of satisfaction with the body, among Chinese-Australian women, is also common (40). In Africa, in an urban area in South Africa, female college students were found to have greater body size dissatisfaction compared to those from the rural areas (41). Similarly in Botswana, a recent study confirms that urban and higher socio-economic status adolescent students perceive their proportions and body weight dissatisfying than to students with optimal weight (14).

Physiological differences between race/ethnic groups

A human body has a certain amount of fat. The main function of that fat is to store energy (42). This physiological amount of body fat differs according to gender and age (42). This evidence is supported by Womersley and Durnin who found out that there is a relationship between body mass index (BMI) and percentage body fat (%BF) in males and females in different age categories (43). Also, the relationship between BMI and %BF is said to differ according to different ethnic groups (44). Asians who stay in the New York area have a lower BMI but a higher %BF than their age-matched Caucasians (45). This BMI/%BF ratio seems to have a significant role in attractiveness rating in different ethnic groups.

Compared to Americans and Asians, Africans seem to prefer a bigger sized body (46). For example, the Whites in United States regard excess weight as unattractive and they associate it with lack of discipline while African Americans show a greater satisfaction with their current weight (32). Results of this study indicate that it is older men in particular who prefer bigger sized bodies. Studies in other African countries such as in Uganda (34), South Africa (8), Nigeria (15) have also revealed that Africans particularly Blacks, rated bigger sized bodies as more attractive compared to British and (34) Americans (32).

Waist to hip ratio (WHR) has been widely studied in most populations (17, 47-50). Although there is no clear link between the scores and WHR of the images in this study, an image of a WHR of around 0.75 was rated most attractive, and it closely corroborates findings that showed that a WHR of 0.7 was perceived as most attractive (19, 22, 47, 48, 51, 52). These studies have found that both men and women found a female WHR of 0.7 as maximally physically attractive (17, 47, 48, 52-55). Women in most cases are more likely to consider themselves overweight more than men and even engage in surgical enhancements affecting WHR to increase their physical ratings (56). In two studies, Singh has positively established that female attractiveness ratings were significantly correlated with WHR (47, 48), but in those experiments, the images used were line

drawings of female figures, not photographic images. Line drawings may have the potential to alter the true original appearance of a human body and therefore influence people's perceptions about attractiveness preferences.

Finally, the lack of a clear significant relationship between WHR and attractiveness corroborates the results of Swami and Tovee (57) who posit that WHR does not have any influence in female attractiveness or the general slender figure or bigger figure (57). However, the results suggest that the ratings differ between males and females (that is, males giving the lower score to an image with WHR=0.61 and BMI=21kg/m² and a %BF = 32% while females give this image a higher score) is almost similar to a study done in Uganda where females rated the figures with a smaller WHR of 0.5 and 0.7 as more attractive than their male counterparts (58). A possible explanation to this could be that females often perceive the figures as fashion models while males regard them as potential mates (59).

Limitations of the current research

During data collection there were a number of shortcomings that the researcher identified. One of them was the higher number of female participants in this research. This could be attributed to the fact that this study was conducted at household level and in a rural area. The majority of men in rural areas work on the farms, while women stay at home to take care of children. Most people in the villages go out in the morning to perform different chores on the fields and care for livestock. This led to instances where male participants would be difficult to recruit. Even though the study procedures were thoroughly explained to the participants, two participants were not willing to have their weight and height measured.

Conclusion

The purpose of this study was to fill the body image research gap in Botswana by focusing on the relationship between female body adiposity and physical attractiveness preferences by men and women between 18-50 years of age. The key finding of this study therefore shows a profound individual variation in scores for each image. But there is a general agreement in scores for attractiveness given to different body sized images by Botswana men and women who participated in this research. It was also found that perceptions regarding an attractive female body size in the Botswana population are not significantly influenced by age, BMI or level of education of the participants. Nevertheless, older men in particular tended to favour a bigger body sized woman than their female counterparts. Also, this has confirmed that perceptions of an

attractive woman in Botswana population are similar in men and women, and are not influenced by differences in socio-demographic characteristics and anthropometry.

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Chapter 5: Conclusion and Recommendations

5.1 Introduction

The main aim of this investigation was to assess the relationship between female adiposity and physical attractiveness among men and women between 18-50 years of age from Botswana culture. Although there was no association between the scores chosen by both men and women, no significant agreement was expected since it was assumed that African men prefer a bigger body size than women do. It seemed like every participant had individual opinions about each image displayed although there were indications that older men preferred bigger sized bodies.

5.2 Summary of the results

All participants in this study were Batswana men and women aged between 18-50 years (Table 1). The villagers still relied mostly in agriculture and this made our data collection difficult because in the early mornings, the elders especially men, went to the cattle post to look after their goats and cattle while women went to the field to care for the field crops. The second objective which sought to determine the differences between the rankings of men and women for the association between female body adiposity and attractiveness bore similar results to other studies previously done on the same subject.

Generally, men and women rated attractiveness in a similar way except on an image of a WHR of around 0.75 which was rated most attractive by both men and women. The only finding that that seems to come close to the published results is where older men tended to rate the bigger sized bodies higher than the younger ones. This is very common especially in African cultures where males regard bigger sized bodies as healthy and free from diseases such as HIV/AIDS (Mvo, 1999). Another possible explanation to this could be that the younger generation prefer a slender figured body because they believe that a bigger body is not sexy while the older generation believe that a bigger figured body reflects a good status and wealth.

There were no significant difference between the median scores of groups based on sex, age, educational status or weight, except only for image 9 ($p=0.02$). Men gave a lower score for this image than women. Waist-Hip-Ratio (WHR) was identified in most studies as a key feature that influences body shape and physical attractiveness. However, there was still no significant relationship observed between WHR of the images and attractiveness in this study.

Every individual had a specific preference among the 21 DXA images provided. It can therefore be argued that the study participants' preferences differ in a number of aspects, and it is by no means obvious which aspects are most relevant. It is very difficult to determine the relevant parameters of people's perceptions about female attractiveness (Henss, 2000).

Occasionally, combining a weight category and waist size can result in a lower WHR. Therefore a lower WHR may reflect larger hips or a smaller waist. Consequently larger hips give an impression of a heavier figure especially to women, even though they are preferred by most men (Singh & Young, 1995). The role played by hip size in attractiveness ranking has been noted in many societies (Singh & Young, 1995).

5.3 Conclusions

It can therefore be concluded that perception of female body attractiveness is not influenced by age, BMI, or education level of the study participant in the Botswana setting, although men in general seem to prefer a bigger body size than women.

5.4 Recommendations

In future, a similar study could be done in other settings in Botswana, where there are facilities which attract youth and where the source of living is not only agriculture. This could help in recruiting more youth and using after work hours to recruit more working persons. Future research could also avoid using line drawings of images and focus on using only photographic pictures as in the present study. Line drawings do not give a clear picture of the original images, therefore the type of images used in this study are recommended. A larger sample size will also be important for future researchers to increase power to detect differences between groups. More studies need to be done in Africa and perhaps even comparing rural perceptions of attractiveness to urban dwellers' perception. More studies in future could also focus on perceptions of own body image dissatisfaction and attractiveness. Incorporating an objective on media could also help in future to see if the current media has effect in attractiveness ratings of observers.

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Appendices

Appendix A: Informed consent forms

Appendix B: Socio-demographic and data collection form

Appendix C: Author guidelines

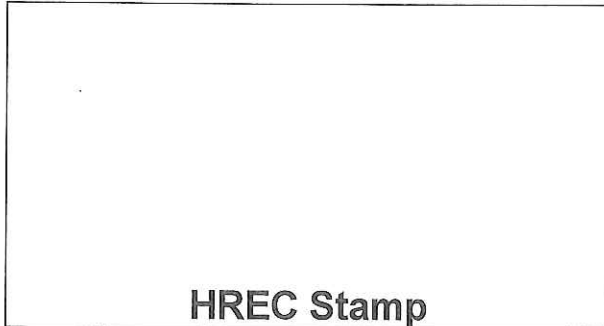
Appendix D: Study team contact information

Appendix E: Ethics certificate

Name of Partner	Team member name	Contact information
North-West University	Prof HS Kruger	0027 727372235
Human Sciences Research Council	Dr ZJ Mchiza	ZMchiza@hsrc.ac.za
North-West University	Ms T Seru	00267 76022785



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PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM FOR PARTICIPANTS BETWEEN AGES OF 18-50 years

TITLE OF THE RESEARCH PROJECT: The relationship between female adiposity and physical attractiveness amongst adults in Ranaka village, Botswana

REFERENCE NUMBERS:

PRINCIPAL INVESTIGATOR: Prof HS Kruger

ADDRESS: E-mail address: salome.kruger@nwu.ac.za, Fax: 0182992464

CONTACT NUMBER: Phone: 018 229 2482, Mobile: 0727372235

You are being invited to take part in a research project that forms part of my M Sc research project. Please take some time to read the information presented here, which will explain how this project will be done. Please ask the researcher any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University NWU (.....)** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki and the ethical guidelines of the National Health Research Ethics Council. It might be necessary for the research ethics committee members or relevant authorities to inspect the research records.

What is this research study all about?

- This study will be conducted in Ranaka, Botswana. An experienced and trained health researcher will ask questions and measure your weight and height. A total number of 100 participants will be asked to participate in this study.
- The objectives of this research are:
 - To determine how a group of men and women in Ranaka village sort 21 pictures of fat and thin women from the least to the most attractive.
 - To determine differences between the rankings of female attractiveness according to body fatness of men and women in Ranaka village in Botswana.
 - To determine the differences between attractiveness rankings of the young (18-30 years) and older persons (31-50) in Ranaka village in Botswana.
 - To determine the association between the body fatness of the participants themselves and their rankings of female attractiveness according to body fatness.
 - You will not participate if your age range is outside 18-50 years, not resident of Ranaka and not an original Motswana by birth. You shall not be excluded because of your sexual orientation.

What will your responsibilities be?

- You will be expected to be ready between 8 o'clock in the morning and 4 o'clock of the afternoon as we will visit you at your house to take your

body measurements and interview you in your house. The visit will only last around less than one hour.

- Please have your Identity document ready so that we can see how old you are and if indeed you are a Motswana as indicated under nationality on your identity document.
- Your height and weight measurements will be done in a closed room in your house.
- You will be requested to take off your shoes and hat and all heavy clothes like a jacket or blanket when weighing and measuring. You do not have to leave your house without head dress.
- We will weigh you on a scale and measure your height with a height meter in your house.
- In your house you will be asked to answer questions honestly from a questionnaire which someone will ask you, about your age, language, your house, school grade, work, occupation and housing conditions. You do not have to write anything yourself.
- You will be shown pictures which will be 21 picture cards which will be shuffled and placed on a table in front of you. You will then be asked to reorder the cards from the most attractive on your right to the least attractive on your left. However you will not be allowed to place two cards together with the same attractiveness. The sorting task will take about 5 minutes to complete.
- To complete the measurements and the questionnaire will take about 40 minutes. All measurements and the questionnaire will be done during one morning or afternoon visit to your house.

Will you benefit from taking part in this research?

- There will be no direct benefits for you as a participant in the study. You will receive a small token of appreciation for taking part in the study.
- The indirect benefit will be helping the adults in Botswana and nutrition professionals to learn about body fatness, overweight and obesity and its influence on preference in terms of attractiveness in Botswana. Such

knowledge will help in the design and adoption of prevention programmes of lifestyle diseases such as obesity, diabetes, and hypertension in Batswana.

Are there risks involved in your taking part in this research?

There will not be any risks in this study because a fieldworker will ask the questions from the questionnaire in a private room.

The height and weight will be done by a female researcher in another private, closed room. You must take your shoes and hat and heavy jersey off for the measurements. You will never have to take off all your clothes for measurements, or go outside your house without your hat or head dress.

Measurements may cause some participants to feel uncomfortable. In order to minimize any discomfort the areas for those measurements will be inside private homes and only the researcher and assistant will be present.

No names will be written on your questionnaire and forms, only a study number. All numbers from measurements will be typed in a password protected computer, but no names. Your information will be kept locked in an office and protected in a computer with only the researchers who can see it. None of your information will be given to any other person. When your information is reported in research papers or at a congress, only the information of the group will be shown, but no names.

What will happen in the unlikely event of some form of discomfort occurring as a direct result of your taking part in this research study?

- Should you have the need for further discussions after our visit to your house, an opportunity will be arranged for you to ask any questions to any member of the research team. You are also welcome to call the team leader, Professor Salome Kruger, at telephone number 0026718 299 2482. If you have any further questions concerning your consent, you can contact Mrs Carolien van Zyl at the Ethics office of the university at telephone number 0026718 299 2094.

Who will have access to the data?

- All hard copies of questionnaires will be stored in the office of the principal investigator, Prof. H.S. Kruger and electronic data will be archived on a password protected computer and backed up on an external hard drive. Data will be recorded and saved by subject number only to ensure confidentiality. All hard

copies of questionnaires will be stored for 7 years at least and then destroyed by shredding.

What will happen with the data/samples?

- This is a once off collection and data will be entered in an Excel file and the computer programme Statistical Package of Social Sciences (SPSS version 22 program). All the analysis will be done by the researcher here in Botswana and at the North-West University, Potchefstroom, South Africa. The information will then also be sent to a professor in Scotland as part of a worldwide study. The worldwide study is done to compare how persons from different countries sort 21 pictures of fat and thin women from the least to the most attractive. No names or photos of participants will be shown to identify participants of the study in any country.

Will you be paid to take part in this study and are there any costs involved?

No, you will not be paid to take part in the study and the researcher will be visiting you in your house so you will not be expected to travel for data collection. You will receive a token of appreciation for your participation. There will thus be no costs involved for you, if you do take part.

Is there anything else that you should know or do?

- You can contact Prof HS Kruger at 00267 018 229 2482 or Tumelo Seru at 002776022785 if you have any further queries or encounter any problems.
- You can contact the Health Research Ethics Committee via Mrs Carolien van Zyl at 00267 018 299 2089; carolien.vanzyl@nwu.ac.za if you have any concerns or complaints that have not been adequately addressed by the researcher.
- You will receive a copy of this information and consent form for your own records.

How will you know about the findings?

- We will tell you the findings of your height and weight after measurements. Your name will never be mentioned in any of the reports and no photos of you will be shown.

- We will tell you about the findings in a meeting at Ranaka village after the study is completed.

Declaration by participant

By signing below, I agree to take part in a research study, **The relationship between female adiposity and physical attractiveness amongst adults in Ranaka village, Botswana.**

I declare that:

- I have read or listened to this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions to both the person obtaining consent, as well as the researcher and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) on (date)
20....

.....
Signature of participant

.....
Signature of witness

Although I agree to participate in this study, **I do not want my information to be sent to the professor in Scotland** as part of a worldwide study to compare how persons from different countries sort the 21 pictures women.

.....
Signature of participant

.....
Signature of witness

Declaration by person obtaining consent

I, declare that:

- I explained the information in this document to the participant.
- I encouraged him/her to ask questions and took adequate time to answer them.

- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did not use an interpreter.

Signed at (place) On (date)
20....

.....
Signature of person obtaining consent

.....
Signature of witness

Declaration by researcher

I Tumelo Seru declare that:

- I trained to explain the information in this document to the participant.
- The person obtaining consent encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did not use an interpreter.

Signed at (place) on (date)
.....20....

.....
Signature of researcher

.....
Signature of witness



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**BUKANA YA BA TSAA KAROLO LE FOROMO YA PATLO
MAIKUTLO YA BATSAAKAROLO MAGARENG GA
DINGWAGA TSE LESOME LE BOHERABOBEDI LE
MASOME A MATLHANO**

SETLHOGO SA DIPATLISISO: Botsalano magareng ga bokete jwa mafura le bontle jwa ditebego tsa bo mme mo bagolong ba motsana wa Ranaka mo Botswana

NOMORO YA REFERENCE:

MOGOKGO WA DIPATLISISO: Prof HS Kruger

ATERESE: E-mail address: salome.kruger@nwu.ac.za, Fax: 0182992464

DINOMORO: 018 229 2482, Mobile: 0727372235

O lalediwa gotsaa karolo mo dipatlisisong tsa dithuto tsa digarata tse di dikgolwane. Ka tswetswe tsaa nako go bala se se kwadilweng mo bukaneng e, se se tla tlhalosang ka botlalo kafa ditshekatsheko tse di tlaa dirwang ka teng. Ka tswetswe botsa mosekasiki dipotso ka ga eng kapa se o sa se tlhaloganyeng ka dipatlisiso tse. Go botlhokwa thata gore o kgotsofale ebile o tlhaloganye se dipatlisiso tse se di batlang le gore o tlaabo o tlhokega eng. Gape, ga o apatelediwe go tsenelela dipatlisiso tse ebile o ka kgona go ikogela morago nako ngwe le ngwe. Fa o sa kgone go tsaa karolo, se ga sena go go kgoreletsa ka gope. Gape o ka kgona go okogela morago ka nako ngwe le ngwe le fa one o dumalane go tsaa karolo.

Ditshekatsheko tse di letleletswe ke ba **Komiti ya tsa Ditshekatsheko tsa Botsogo le Maitsholo ya lekalana la maranyane a botsogo ko Unibesity ya Bokone Bophirima ko Africa Borwa(....) (Health Research Committee of the Faculty of the North West University)** ebile e tlaa sala morago melawana le ditsamaiso tsotlhe tsa maitsholo tsa Declaration ya Helsinki le ditsamaiso tsa maistsholo tsa National Health Research Ethics Council. Go botlhokwa ebile go maleba gore maloko a komiti tsa dishekatsho tsa maitsholo le boitseanape ba ba mmaleba ba sekaseke maduo a dipatlisiso tse.

Dipatlisiso tse ke tsa eng?

- Dipatlisiso tse di tlaa bo di dirwa mo Ranaka, Botswana. Moitseanape wa tsa botsogo o tlaa bo a botsa dipotso le go go tsaya bokete jwa mmele ga mmogo le boleele. Dipatlisiso di tlaa nna le batsaakarolo bale lekgolo.
- **Maikaelelo a dipatlisiso tse ke go:**
 - Go leka go itemogela gore boree le bomme ba Ranaka ba tlaa farologanya jang ditshwantsho tse di masome a mabedie le bongwe tsa bomme baba mmele o motona le o monnye go tswa fela ko o oseng montle thata go ya go ko go o montle thata.
 - Go itemogela pharologanyo magareng ga mmele wa bo mme o montle thata go lebeletswe bokete jwa bone jwa mmele magareng ga bomme le borre mo Ranaka.
 - Go itemogela gore a gona le pharologanyo kafa banana ba ba digwaga di lesome le boherabobedi go ya ko go tse masome a mararo le bongwe (18-31) le bagolo ba bagareng ga masome a maroro le bongwe le masome a matlhano (31-50) ba bonanang bontle jo ka teneng.
 - Go itemogela gore a gona le tomagano magareng ga bontle jwa ditshwantsho tsa bo mme le bokete jwa batsaya karolo ga

mmogo le ka fa baa tlaabong ba tlhomaganya ditshontsho kateng.

- Ga ona go letlelelwa go tsaa karolo fa digwaga tsa gago dile ko tlase ga magareng ga lesome le bofera bobedi le masome a matlhano (18-50) kana fa o se monni wa motse wa Ranaka ebile ose Motswana ka matsalo. Gape ga ona go kgaphelwa ntle ka bong jwa gago.

Go tlaa tlhokega gore o dire eng?

- Go solofelwa fa o tlaa abo o ipaakantse ka nako ya boferabobedi mo mosong le ya bone mo maitseboeng ka re tlaa go etela go go tsaa bokete jwa mmele ga mmogo le bolelee. Re tlaa tsaa nako e e sa feteng selekanya sa oura fela re go etetse.
- Ka tswe tswe o bo ona le omang wa gago ka gore o tlaa re thusa go netefatsa gore a Motswana tota le go netefatsa dingwaga tsa gago.
- Bolelele le bokete jwa mmele tsotlhe di tlaa bo di tseelwa mo phapusing go tswetswe ga go ope yo o tlaa di boning ntle le mosakasiski.
- O tlaabo o kupiwa go rola ditlhako le hutshe le sepe fela se se ka tswang se le bokete fa o tsewa bokete jwa mmele jaaka baki kgotsa kobo. Fa o fetsa o tlaa di rwala pele ga o tswa mo phapusing.
- Go tlaa dirisiwa sekale go go tsaa bokete jwa mmele le mmethara wa bolelee go go tsaa bolelee.
- E ntse ele teng ko lapeng, o tlaabo gape o budiwa dipotso tse o tla kupiwang gore o di arabe ka bonnete jotlhe jwa gago mabapi le dingwaga tsa gago, puo e o e buang, ntlo e o nnang mo go yone, gore o dirile bokae ko sekolong le gore o bereka kae o dira eng. Mme o tlaabo o sa tlhoke go kwale sepe.

- Marago o tlaa supediwa dikarata tsa ditshwantsho dile masome a mabedi le bongwe (21). Ditshwantsho tse, di tlaabo di tlhakatlhakantswe mo tafoleng o bo o kupa go di tlhomaganya go ya ka fa o ratang bontle jwa teng thata ka teng go tswa mo letsogong la moja go ya ko go tse o sa di rateng thata mo letsogo la molema. Mme o tlaabo osa letlelelwe go baa dirata tse pedi tse di tshwanang ka bontle nako ele ngwe. Go dira jalo go tla go tsaya metsotso ele metlhano fela.
- Dipotso tse le go go kala ga mmogo le go go tsaya bolelee go tlaa tsaya metsotso e masome a mane fela. Tse tsotlhe go tswa fela gore re go fitlhetse nako manang e kanna mo mososong kana gone mo maitsoeng.

A mme o tlaa bo o boelwa ke sengwe?

- O tlaa lebogiwa ka mophuthelonyana gore o tsere seabe mme fela ditshekatsheko tsone ga dina go nna le dipelo tse di kalo mo go wena ntle le gore di ka nna tsa solegela lefatshe molemo.
- Se se mosola fela ke gore se se tlaa thusa batho bogolo jang bagolo mo Botswana le bomaitseanape go ithuta ka bokete jwa mmele le mmele o bokima jo bo feteletseng le gore tse di amana jang le ka fa batho ba atlholang bontle jwa mmele ka teng. Jalo he, thuto e e tlaa thusa lefatshe la Botswana go leka go batla ditharabololo ka malwetsi a tshwanang le bolwetsi jwa sukiri, madi a matona, kankere le a mangwe.

A go tsenelela dipatlisiso tse go ka ntsenya mo diphatseng dingwe?

Ga gona go nna le diphatsa dipe mo dipatlisisong tse ka gore dipotso tsotlhe di tlaa bolediwa mo sephiring ke mmatlisisi.

Go tsaya bolelee le bokete jwa mmele go tlabo go dirwa ke moitseanape wa mme mo sephiring. O kopiwa gore obo o rola ditlhako le hutshe ga mmogo le sepe fela se se bokete mo mmeleng. Mme ga ona go apola diaparo tsotlhe mo mmeleng wa gago.

Fa go dirwa ditshekatsheko tse, ga gona go kwalwa leina la gago mo pampiring, go tla bo dirisiwa dinomoro fela. Dinomoro tse tsotlhe di tlaa bo di kwalwa mo kompeteng di bo di lotlelewa mo go yone. Ga go ope o o tlaa letlelelwang go bona se fa maduo a dipatlisiso tse a tsenngwa mo dipampiring, se se tlaa bonalang fela e tlaa nna maduo a ditlhotshwana eseng maina a batho.

Go tlaa diragala eng fa o ka tlhoka go phuthuloga sentle ka ntlha ya go tsaa karolo mo dipatlisisong tse?

- Fa o ka tlhoka go tlhalosediswa kana go lolamisediswa sengwe mabapi le dipatlisiso tse, re tlaa go fa monyetla wa go go etela gape gore o botse dipotso go mongwe fela o o mo dipatlisisong tse. O letlelewa go leletsa moeteledipele wa dipatlisiso tse ebong Professor Salome Kruger, ko mogaleng wa 0026718 299 2482. Fa o na le dipotso dingwe mabapi le botsaakarolo jwa gaga o ka leletsa Mrs Carolien van Zyl ko phaposisng ya Ethics ko universithing ko mogaleng wa 0026718 299 2094.

Ke mang yoo o tlaabong a letlelelwa go bona maduo?

- Dipamapiri tsotlhe tsa dipotso di tlaa bewa mo offising ya mogokgo wa dipatlisiso tse, Prof. H.S. Kruger gape tse di mo komputereng di tlaa bo di lotleletswe dibo di bo di bewa gape mo polokelong ya tsa maranyanae a mangwe. Maduo a a tlaabo a kwadilwe ebile a bewa ka dinomoro go di somarela sentle. Maduo a a tlaabo a bewa sentle ka dinomoro go a somarela. Dipampiri tsa dipotso di tlaa bewa selekanyo sa dingwaga tse supa mme morago di tlaa kgagolwa.

Go tlile go diragala eng ka disampole?

- Disampole di a tlaa dirwa gagwe fela mme di tlaabo di tsengwa mo kompeteng ya lenaneo la Statistical Package of Social Sciences (SPSS version 22 program). Ditharabololo tsotlhe di tlaabo di dirwa ke mosekaseki mo Botswana le ko Afrika Borwa ko Unibesity ya Bokone Bophirima ko Potchefstroom. Ditharabololo tse jaanong di tlaabo di romelwa ko moitseanapeng yo mongwe ko Scotland di bo di tlhakangwa le tse dingwe tsa mafatshefatshe. Dipatlisiso tse tsa mafatshefatshe di tlaabo di dirwa go farologanya gore tota batho go tswa lefatshe ka bophara ba farologanya ditshwantsho tsa boleng teng jwa mafura le bontle jwa ditebego tsa ga mme jang.. Ka jalo he, ga gona go kwala maina kgotsa go dirisa ditshwantsho/dinepe tsa batsaakarolo gope mo lefatsheleng lepe.

A o tlaabo o duelwa go tsaa seabe mo dipatlisisong tse kana o tlaa bo o tlhokega gore wena o duele sengwe?

Nnya o tlaabo o sa duelelwe go tsaa karolo, mosekasiki o tlaabo a go latela ko lapeng ka jalo ga ona go tlhokega gore o tsameele gope kgakala gore o budiwe dipotso kgotsa go go tsaya bolele le bokete jwa mmele. Mme le fa go ntse jalo o tlaa lebogiwa ka mphonyana ya mophuthelwana. Jaanong o tshwanetse go itemogela gore ga ona go duela sepe gore o tsenelele dipatlisiso tse.

A gona le sengwe gape se o tshwanelang go se itse?

- O ka itshwaraganya le Prof HS Kruger at 00267 018 229 2482 kana Tumelo Seru ko 002776022785 fa ona le dikakgelo dingwe kana fa o itemogela mathata mangwe.
- Gape o ka itshwaraganya le ba Komiti ya tsa Ditshekatsheko tsa Botsogo le Maitsholo ya lekalana la maranyane (Health Research Ethics Committee) ko go Mrs Carolien van Zyl at 00267 018 299 2089; carolien.vanzyl@nwu.ac.za fa ona ledingongora dingwe tse di sa kgonegang go rarabolowa ke mosekasiki.
- O tlaa fiwa bukana e ya maikutlo gore o e ipee.

O tlile go itse jang ka maduo a dipatlisiso tse?

- Re tlaa go bolelela ka ga maduo a bokete jwa mmele wa gago le ka boleleele jwa gago. Leina la gago ga le ditshwantsho/dinepe tsa gago ga di kitla di dirisiwa gope.
- Re tlaa dira bokopano mo motseng wa lona wa Ranaka go le lekudisa ka maduo a lona morago ga dipatlisiso di sena go felela.

Declaration by participant

Ka go baa monwana fa ke dumalana le go tsa karolo mo dipatlisisong tse, tsa **Botsalano magareng ga bokete jwa mafura le bontle jwa ditebego tsa bo mme mo bagolong ba motsana wa Ranaka mo Botswana.**

Ke ikana gore:

- Ke badile / ke utwile molaetsa wa foromo ya patlo maikutlo e, ebile e kwadilwe ka puo e ke e itseng ebile ke e itse bobe.

- Ke nnile le monyetla wa go botsa dipotso mo go mme yo oneng a re botsa ka ga maikutlo a rona ga mmogo le mosekasiki ebile dipotso tsame tsotlhe di arabilwe ka botlalo.
- Ke tlhaloganya gore go tsaa karolo mo ditshekatshekong tse ke ka gobo ke ithaupile fela mme ebile ga ke a patelediwa ke ope.
- Ke ka nna ka tlhoba go ikgogela morago nako ngwe le nngwe mme kebo ke sa atilholwe go bo ke tsere tshwetso eo.
- Ke ka nna gape ka kopiwa go ikgogela morago pele ga ditshekatsheko di wela fa ele gore mosekaseki o lemoga gore ga ke sale melawana mengwe morago.

Monwana ko (lefelo) ka (letsatsi)
 20

.....
Monwana wa motsaakarolo

.....
Monwanana wa mosupi

Seikano sa yo o tseisang maikutlo

Nna,ke ikana gore:

- Ke tlhaloseditse motsaakarolo molaetsa otlhe o o mo bukaneng e.
- Ke mo rotloeditse go botsa dipotso ebile ke mo file nako e e maleba go mo araba.
- Ke kgotsofaletse gore mme/rre o tlhalogantse ditshetlana tsotlhe tsa dipatlisiso tse jaaka di tlhalositswe
- Ga ke a dirisa moranodi

Monwana ko (lefelo) ka (letsatsi)
 20....

.....
Monwanana wa mo motho yo o tsaayang maikutlo

.....
Monwana wa mosupi

Maikano a mosekasiki

Nna Tumelo Seru ke ikana gore:

- Ke katisitse ... go tlhalosa mafoko a a mo bukaneng e ka botlalo go motsaakarolo.

- Motho yo o tsayana maikutlo mo go ba tsaya karolo o rotloeditse go tsaya dipotso le go di araba ka botlalo.
- Ke kgotsofala gore o tlahloganay ditshetlana tsotlhe tsa dipatlisiso tse jaaka di ntse.
- Ga ke a dirisa moranodi.

Monwana ko (lefelo) ka (letsatsi)
20....

.....
Monwana wa mmatlisisi

.....
Monwana wa mosupi

SOCIO-DEMOGRAPHIC AND DATA COLLECTION FORM

(All information in this questionnaire is confidential)

1. Interview Date: ____/____/201__

Participant number: _____

Age: _____ years

Ward _____

Gender: _____

language _____

Height (m) _____

weight (kg) _____

2. Information with regards to own completed education

Codes	Education level	code
1	No school education	
2	Primary School	
3	Secondary school (grade 7)	
4	Senior secondary school	
5	Tertiary education	
6	Other: specify	

Code for "Yes" = 1, "No" = 2

3. Housing

Code	1	2	3	4	5	6
Type of dwelling? You can tick more than one block if necessary	Brick, concrete	Traditional mud	Tin	Plank, Wood	Other (Specify)	
Where do you get drinking water from most of the time? (Tick one)	Own tap	Communal tap	River, Dam	Borehole, Well	Other (Specify)	
What type of toilet does this household have? (Tick one)	Flush	Pit	Bucket, Pot	VIP	Other (Specify)	
What fuel is used for cooking most of the time (You can tick more than one)	Electric	Gas	Paraffin	Wood/Coal	Solar/sun	Open fire

Number of people sleeping in the house for at least 4 nights per week						
Number of rooms in the house for sleeping (excluding bathroom, toilet and kitchen if separate)						
Number of people living/sleeping per room (Tick one)	1	2	3	4	5	>5

4. Data collection form: Please look at the 21 image cards on the table. Reorder the cards from the most attractive on the right to the least attractive on the left.

Least attractive	Picture No	
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
Most attractive		

Fieldworker:.....



1



2



3



4



5



6



7



8



9



10



11



12



13



14



17

18

19

20

21

Author Guidelines

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Conflict of interest

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Identifying information should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives informed written consent for publication. Informed consent for this purpose requires that the patient be shown the manuscript to be published. (www.icmje.org)

Ethnic classification

Work that is based on or contains reference to ethnic classification must indicate the rationale for this.

Manuscripts

Short items are more likely to appeal to our readers and therefore to be accepted for publication. Manuscript should not exceed **4000 words** in total all contents inclusive.

Original articles of 4 000 words or less, with **up to 6 tables or illustrations**, should normally report observations or research of relevance to the field of nutrition. **References** should preferably be limited to no more than **25**.

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Editorials, Opinions, Issues in the field of nutrition. should be about 1000 words and are welcome, but unless invited, will be subjected to the SAJCN peer review process.

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Letters to the editor, if intended for the correspondence column, should be marked 'for publication', signed by all authors and presented in triple spacing. Letters should be no longer than 400 words with only one illustration or table.

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Manuscript preparation

- Please submit your manuscript electronically at www.sajcn.co.za
- Research articles should have a structured abstract not exceeding 250 words (50 for short reports) comprising: Objectives, Design, Setting, Subjects, Outcome measures, Results and Conclusions.
- Refer to articles in recent issues for guidance on the presentation of headings and subheadings.
- Abbreviations should be spelt out when first used in the text and thereafter used consistently.
- Scientific measurements should be expressed in SI units except: blood pressure should be given in mmHg and haemoglobin values in g/dl.

If in doubt, refer to www.icmje.org/index.html

Illustrations

1. Figures consist of all material that cannot be set in type, such as photographs and line drawings.
2. Tables and legends for illustrations should appear on separate sheets and should be clearly identified.
3. Line drawings should be arranged to conserve vertical space. Note that reduction to 80 mm for a single column or 170 mm for double columns should not render lettering illegible. Explanations should be included in the legend and not on the figure itself.
4. Figure numbers should be clearly marked on the back of prints and the top of illustrations should be indicated.
5. If any tables or illustrations submitted have been published elsewhere, written consent to republication should be obtained by the author from the copyright holder and the author(s).
6. A limited number of illustrations are free at the discretion of the editor. Colour illustrations are encouraged but are charged to the author.

A quote will be provided on request. Consider sponsorship.

References

References should be inserted in the text as superior numbers and should be listed at the end of the article in numerical and not in alphabetical order.

Authors are responsible for verification of references from the original sources.

References should be set out in the Vancouver style and approved abbreviations of journal titles used; consult the List of Journals in Index Medicus for these details.

Names and initials of all authors should be given unless there are more than six, in which case the first three names should be given followed by et al. First and last page numbers should be given.

Journal references should appear thus:

1. Price NC . Importance of asking about glaucoma. BMJ 1983; 286: 349-350.

Book references should be set out as follows:

1. Jeffcoate N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975: 96-101.
2. Weinstein L, Swartz MN. Pathogenic properties of invading microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974: 457-472.

Manuscripts accepted but not yet published can be included as references followed by (in press).

Unpublished observations and personal communications may be cited in the text, but not in the reference list.

Manuscript revisions

In the event of a manuscript needing revision following the peer review process, all revision changes to the original manuscript should be made using the "track changes" function in Microsoft Word, or in any other such similar format so as to facilitate the speedy completion of the review process. In the event of an "author-reviewer" difference of opinion, the author(s) should state their opinion in writing in the text, which should be bracketed. Revised manuscripts which do not conform to this revision format will be returned to the authors for editing.

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1. The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).
2. The submission file is in Microsoft Word, or RTF file format
3. When available, the URLs to access references online are provided, including those for open access versions of the reference. The URLs are ready to click (e.g., <http://pkp.sfu.ca>).
4. The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
5. The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines, which is found in About the Journal.
6. If submitting to a peer-reviewed section of the journal, the instructions in Ensuring a Blind Review have been followed.
7. The manuscript has an abstract.

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2016/05/26

ETHICS APPROVAL CERTIFICATE OF STUDY

Based on approval by Health Research Ethics Committee (HREC) on 09/06/2016, the North-West University Institutional Research Ethics Regulatory Committee (NWU-IRERC) hereby **approves** your study as indicated below. This implies that the NWU-IRERC grants its permission that provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: The relationship between female adiposity and physical attractiveness amongst adults in Ranaka Village, Botswana.

Study Leader/Supervisor: Prof HS Kruger

Student: T Seru

Ethics number:

N	W	U	-	0	0	0	2	9	-	1	6	-	A	1
Institution				Study Number				Year				Status		

Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation

Application Type: Single Study

Commencement date: 2016-06-09

Risk: Minimal

Continuation of the study is dependent on receipt of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation up to a maximum period of three years.

Special conditions of the approval (if applicable):

- Translation of the informed consent document to the languages applicable to the study participants should be submitted to the HREC (if applicable).
- Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the HREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, please note the following:

- The study leader (principle investigator) must report in the prescribed format to the NWU-IRERC via HREC:
 - annually (or as otherwise requested) on the monitoring of the study, and upon completion of the study
 - without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.
- Annually a number of studies may be randomly selected for an external audit.
- The approval applies strictly to the proposal as stipulated in the application form. Would any changes to the proposal be deemed necessary during the course of the study, the study leader must apply for approval of these amendments at the HREC, prior to implementation. Would there be deviation from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.
- The date of approval indicates the first date that the study may be started.
- In the interest of ethical responsibility the NWU-IRERC and HREC retains the right to:
 - request access to any information or data at any time during the course or after completion of the study;
 - to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.
 - withdraw or postpone approval if:
 - any unethical principles or practices of the study are revealed or suspected,
 - it becomes apparent that any relevant information was withheld from the HREC or that information has been false or misrepresented,
 - the required amendments, annual (or otherwise stipulated) report and reporting of adverse events or incidents was not done in a timely manner and accurately,
 - new institutional rules, national legislation or international conventions deem it necessary.
- HREC can be contacted for further information or any report templates via Ethics-HRECAApply@nwu.ac.za or 018 299 1206.

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the IRERC or HREC for any further enquiries or requests for assistance.

Yours sincerely

Linda du Plessis

Digitally signed by Linda du Plessis
DN: cn=Linda du Plessis, o=NWU,
ou=Vaal Triangle Campus,
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c=ZA
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Prof Linda du Plessis

Chair NWU Institutional Research Ethics Regulatory Committee (IRERC)



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9 June 2016

Prof HS Kruger
Nutrition

Dear Prof Kruger

APPROVAL OF YOUR APPLICATION BY THE HEALTH RESEARCH ETHICS COMMITTEE (HREC) OF THE FACULTY OF HEALTH SCIENCES

Ethics number: NWU-00029-16-S1

Kindly use the ethics reference number provided above in all correspondence or documents submitted to the Health Research Ethics Committee (HREC) secretariat.

Study title: The relationship between female adiposity and physical attractiveness amongst adults in Ranaka Village, Botswana

Study leader/supervisor: Prof HS Kruger

Student: T Seru

Application type: Single study

Risk level: Minimal

You are kindly informed that your application was reviewed at the meeting held on 12/04/2016 of the HREC, Faculty of Health Sciences, and was approved on 09/06/2016.

The commencement date for this study is 09/06/2016 dependent on fulfilling the conditions indicated below. Continuation of the study is dependent on receipt of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation up to a maximum period of three years when extension will be facilitated during the monitoring process.

After ethical review:

Translation of the informed consent document to the languages applicable to the study participants should be submitted to the HREC, Faculty of Health Sciences (if applicable).

The HREC, Faculty of Health Sciences requires immediate reporting of any aspects that warrants a change of ethical approval. Any amendments, extensions or other modifications to the proposal or other associated documentation must be submitted to the HREC, Faculty of Health Sciences prior to implementing these changes. Any adverse/unexpected/unforeseen events or incidents must be reported on either an adverse event report form or incident report form at Ethics-HRECIncident-SAE@nwu.ac.za.

A monitoring report should be submitted within one year of approval of this study (or as otherwise stipulated) and before the year has expired, to ensure timely renewal of the study. A final report must be provided at completion of the study or the HREC, Faculty of Health Sciences must be notified if the study is temporarily suspended or terminated. The monitoring report template is obtainable from the Faculty of Health Sciences Ethics Office for Research, Training and Support at Ethics-Monitoring@nwu.ac.za. Annually a number of studies may be randomly selected for an external audit.

Please note that the HREC, Faculty of Health Sciences has the prerogative and authority to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process.

Please note that for any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the HREC, Faculty of Health Sciences. Ethics approval is required BEFORE approval can be obtained from these authorities.

The HREC, Faculty of Health Sciences complies with the South African National Health Act 61 (2003), the Regulations on Research with Human Participants (2014), the Ethics in Health Research: Principles, Structures and Processes (2015), the Belmont Report and the Declaration of Helsinki (2013).

We wish you the best as you conduct your research. If you have any questions or need further assistance, please contact the Faculty of Health Sciences Ethics Office for Research, Training and Support at Ethics-HRECAppl@nwu.ac.za.

Yours sincerely



Dr Wayne Towers
HREC Chairperson



Prof Minrie Greeff
Ethics Office Head

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