Biokineticist and Physiotherapist attitudes in Gauteng towards overweight and obese individuals.

Research Report

Centre for Exercise Science and Sports Medicine, Faculty of Health Sciences, University of the Witwatersrand, as partial fulfilment for the

MSc (Med) in the field of Biokinetics

Darrin Jordaan

(Student Number 750886)

Dedication

For my Mom

Declaration

I, Darrin Jordaan declare that this research report is my own work. It is being submitted for the degree of MSc (Med) in the field of Biokinetics in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

_____12/01/2017

Darrin Jordaan

Acknowledgments

Thank you Estelle Watson for your patience and professionalism

List of Abbreviations

1) FPS- Fat phobia Scale
2) ATOP- Attitudes Towards Obese Persons scale
3) BMI- Body Mass Index

Definitions

1) Bias- Bias is defined as “inclination or prejudice for or against one person or group, especially in a way considered to be unfair” (7).

Table of Contents.

List of Tables and Figures

Abstract.

Introduction.

Obesity levels have doubled since the 1980s and health professionals have been documented to show weight bias and stigma towards these overweight individuals. Research in South Africa on weight bias has not as yet been conducted. This study aimed to examine bias and prejudice toward overweight and obese individuals in Biokineticists and Physiotherapists

Methods.

The Fat Phobia Scale (FPS) and The Attitudes Towards Obese Persons (ATOP) questionnaire were used to access bias and prejudice attitudes in the sample of Biokineticists and Physiotherapists. The FPS is a 14-item scale consisting of a five-point semantic differential scale. The ATOP is a 20 point questionnaire that requires a rating of a statement from -3 to +3.

Results.

A total of 223 Biokineticists and Physiotherapists in the study. Biokineticists were significantly more bias towards overweight and obese patients on both the FPS ($p=0.04$) and ATOP ($p<0.01$). Females were also shown to be more prejudice than men ($p=0.01$), and there was an inverse relationship between the BMI of the healthcare worker, and the fat phobia scale ($p=0.02$). Lastly, the amount of overweight/obese patients ($p=0.56$), the age of the healthcare professional ($p=0.74$) and years of practice did not appear to affect bias and prejudice in this study ($p=0.13$).

Conclusion.

These results provide a platform for future research into bias and prejudice for South African health professionals. Future research should include implicit bias and prejudice measures as this study only looked at explicit bias and prejudice.

Chapter 1.

Introduction.

The obesity prevalence worldwide has more than doubled since 1980. It was estimated in 2014 around 1.9 billion people worldwide were overweight while 600 million were estimated to be obese. Furthermore, around 2.8 million of these adults die each year as a result of being overweight or obese (1). In South Africa, females in the 45-54, 55-64 as well as over 65 years old age groups had a body mass index of 31.5, 31.6 and 30.0 and for the males, it was found to be 25.8, 25.0 and 25.4 respectively. This indicating a tendency towards being classified as overweight for females in South Africa (2). A body mass index (BMI) of between 18.5 and 24.99 indicates normal weight. A BMI of 25 to 29.99 is classified as overweight. A BMI of 30 to 34.99 classifies severe obesity, and 35 to 39.99 classifies the individual into morbid obesity. Higher than 40 is classified as superobese (3).

One impact of excess weight has been described as metabolic syndrome which is a cluster of health problems such as high blood pressure, raised blood sugar, elevated cholesterol levels and Type II diabetes mellitus (4). Other issues associated with excess weight include cancer, cardiovascular disease, dementia, infertility, depression and painful joints (4).

Upon recommended guidelines, overweight and obese individuals will seek out professionals to help facilitate appropriate treatment often involving exercise and nutrition (5). Biokineticists and physiotherapists administer the exercise component with obese individuals. Unfortunately, with healthcare providers there are documented

prejudicial attitudes or anti-fat bias towards overweight and obese individuals in the form of the Implicit Association Test which looks at associating obese people and thin people with good vs. bad (6).

A*nti-fat bias* is overweight or obese prejudice which highlights the particular individual in a negative character concerning being lazy, lacking self-discipline, being incompetent, lacking willpower, lack of attention and being over indulgent. Implications of bias and prejudice may result in avoidance and reduction in quality of care for these overweight and obese individuals (8).

The study assessed bias and prejudice towards overweight and obese in South Africa as has been done in other countries such as the USA (9), Germany (10), Australia (11) and Ireland (12). The study will also provide a starting point for future research for intervention and improvement in the treatment of overweight and obese individuals in South Africa.

Aim.

The aim of this study is to determine attitudes of Biokineticists and Physiotherapists towards obese and overweight individuals.

Objectives.

1. To describe the attitudes of Biokineticists and Physiotherapists towards overweight and obese persons.
2. To compare the attitudes of Biokineticists and Physiotherapists towards overweight and obese persons.
3. To determine the factors related to bias in Biokineticists and Physiotherapists

Chapter 2.
Literature Review.

2.1 Overview of overweight and obesity.

A) The overweight and obesity pandemic.

The prevalence of overweight and obesity has become a pandemic that has spread from modern industrialized countries to that of low-to-middle income countries (13). This problem is particularly prevalent in America whereby 68% of American adults being overweight and 34% being obese (14). There are no states that have obesity levels lower than 20%, and there were more than twelve states that have more than 30% of the population as obese. By 2030, it is predicted that the US will have 65 million more obese people (14). In Europe, the picture is not any better, with projections that 80% of adults in Spain, the Czech Republic and Poland being overweight, while 90% of adults in Ireland is sharing the same fate by 2030 (15). In South Africa, metabolic syndrome symptoms associated with being overweight and obese such as hypertension is projected rise by 75 million people affected in 2008 to 126 million by 2025. While diabetes is expected to affect 49.7 million people by 2030 in sub-Saharan Africa (16). Further, obesity levels in South Africa have increased from 56% in 2002 to 65% in 2012 (107).

The spread of obesity to low-to-middle income countries has been reportedly in part due to traditional healthy diets being replaced with energy dense, less nutritionally sound, Western-style eating causing weight gain. Indeed, China has been exposed only in the last twenty years to the typical western diet resulting in around 350 million overweight

and 60 million obese individuals in that country (17). South Africa has been described as one of the most obese nations and currently rank third behind the United States and Mexico. The increase in middle-class disposable income in South Africa is seen as one of the possible that more individuals have increased consumption of food (18). Increased food consumption, especially with sugar intake in South Africa, showed that after adjustment, those subjects that consumed more added sugars (>10% energy intake) compared with those who consumed less added sugar had higher waist circumferences as well as higher body mass index (101).

B) Obesity Theories.

Human beings do not need the deposition of fat or excessive fat stores as they are not exposed to cold in the same way other mammals are, and various theories have been proposed to explain the pattern of fat deposition (19). These theories include aquatic ape theory, sweating theory, big brain theory, thrifty gene theory and nutritional transition theory.

Aquatic Ape Theory, talks about the competition that existed between humans and animals on land and that our ancestors used the oceans to then hunt for food to avoid clashing with animals. This competition resulted in our adapting to the wet environment by becoming hairless and storing more subcutaneous fat to allow exposure to cold water (19).

Sweating theory talks about how fur would result in a higher ability to perspire especially on the plains of the savannah and that as an adaptation, humans have become more

hairless. With a loss of fur and therefore to combat cold temperatures, humans have adapted the ability to store subcutaneous fat (19).

The Brain theory describes how the brain is around 1000 grams larger than is expected for body size and weight resulting in energy cost that is four times greater than a mammal. Fuelling this energy cost comes from a reduction in the size of the digestive tract, which is around 60% smaller than expected (20). Bigger brains allowed for greater social intelligence and forming social groups which would have the advantage of being able to have shared power of ideas and thoughts, all of which are important for survival. The ability of humans to have a flexible diet from plant or/and either animal tissue allowed there is be sufficient energy to maintain expensive brain tissue (21, 22).

Thrifty Gene or the Barker hypothesis argues that there is an inverse relationship between birth weight and obesity as well as obesity-related disorders such as coronary heart disease, stroke, hypertension and diabetes (23, 24). Insulin is responsible for energy storage in the body and controls fetus growth in relation to glucose availability. If there is a lack of energy availability, then there is a survival gene that will allow the body to sacrifice muscle growth of the baby as it is not as important. The situation now allows more glucose to be present in the blood, which is then stored in the muscle of the developing baby. Once born, if these children find themselves with more than adequate nutrition availability, their bodies are not able to produce enough insulin or/and their tissues do not respond as it should. Results are that glucose begins to accumulate in the bloodstream and is eventually stored as fat and weight gain (23, 24, 25).

Lastly, the nutritional transition is a theory proposed by Barry Popkin. In this work, reference is made to demographic transition that is when a country has improved socioeconomic development which can be in the form of mass media growth, urbanization, economic growth, technological changes for work and leisure as well food processing (26). Accompanying the demographic transition is the epidemiological transition that sees a shift from infectious disease to that of chronic degenerative disease (26). The nutritional transition accompanies the demographic and epidemiologic transitions and results in increased incidence of diabetes, cardiovascular disease, certain cancers and osteoporosis or also known as non-communicable diseases (NCDs) (26). The increased non-communicable disease is as a result of increased fat, increased processed food intake, increased intake of caloric beverages which is typical of a western diet (102). In South Africa, this pattern can be seen with fat intakes have increased from 16.4% to 26% of total energy, with carbohydrate decreasing from 69.3% to 61.7% of total energy which is typical of a western diet that has an increased fat intake with decreases in carbohydrate and fiber (102). Further, increased urbanization in comparison with rural areas shows that body mass index (BMI) concerning overweight and obese individuals was highest in the urban areas with BMI and waist-hip ratio increasing with age compared with those in the rural areas (103). As a result, diseases such as Type II Diabetes Mellitus is estimated to be present in around 2 million people in South Africa and projections are that by 2030, 49.7 million people will be affected in sub-Saharan Africa (16).

C) Hormonal secretions of adipocytes and obesity.

Adipose tissue consists of white adipose is found in various locations in the body depending on sex and age. Woman tend to store fat around the legs, hips and buttocks and men mainly around the waist. As a result, a woman tends to be gynoid (pear shaped) and men, android (apple shaped). Brown adipose has a rich mitochondrial content and can consume energy and produce heat (104).

The greatest risk of increased adipose tissue storage especially around the abdomen is for developing metabolic syndrome which is a cluster of symptoms including expanded waist, high triglyceride count, low HDL, high blood sugar and high fasting blood sugar (27). Adipose also can release hormones or adipokines. Research is considering how metabolic syndrome is associated with dysfunction in adipokine secretion as they play an important role in balancing the body's energy needs as well as controlling the cells sensitivity to insulin. Included in these adipokines are resistin, adiponectin and leptin (28).

Resistin or "resistance to insulin" as the name suggests is involved in the development of diabetes and resistin levels in the blood are correlated with the amount of visceral abdominal fat an individual has present (28).

Adiponectin is seen as a starvation signal and helps to increase glucose uptake by the muscles and prevents fat accumulation in the liver. Obesity is associated with decreased concentrations of adiponectin in the blood (29).

Leptin has been called the starvation hormone and has the function of controlling energy balance in the body and is secreted by fat cells and travels to the brain where it

tells the hypothalamus that the fat cells have enough energy stored (30). The brain has a threshold as to what the levels of leptin in the blood should be for it to shut on or off hunger signals. Resistance to these signals is believed to be a state where the brain can no longer sense higher levels in the blood such as those associated with an obese individual (31). Insulin resistance and leptin resistance occur both in obese individuals and is associated with more internal body fat (visceral) around the organs (32), with excess fructose intake (33) as well as desensitization of the hypothalamus to the effects of leptin due to down-regulation of leptin receptors (34). Ghrelin is the hormone that is secreted by the stomach which happens when the stomach is empty and in doing this, ghrelin travels the same path as leptin to the brain to signal hunger (35). Intestinal flora plays an important part in ghrelin secretion.

D) Intestinal flora and obesity.

H. pylori or Helicobacter pylori is a type of bacteria found in the stomach, and it has been linked with helping to modulate concentrations of ghrelin secretion. However, with the advent of increased antibiotic use, it has been linked with decreasing amounts of H. pylori bacteria in the stomach resulting in an inability to regulate eating (36). Research in mice has shown that different levels of different bacteria in the gut can have an influence on metabolism either by keeping them lean or becoming obese. A possible reason is that certain bacteria can break down indigestible starches and sugars as this allows the obese mouse to absorb more energy. More energy absorption in the body would be seen as a possible reason for an increase in body and fat mass in obese mice (37).

E) The brain and obesity.

The hypothalamus is a deep brain structure that is located just above the brainstem, and its function is to, amongst other things, control hunger. Early investigations into obesity brought about the belief that a set point was in place concerning the individual's metabolism and this would determine eating patterns (38). One study showed how accurate the hypothalamus is in maintaining body weight with the average adult gaining 0.5kg or consuming only 3500 kcal excess out of 900,000 kcal per year. This works out to be 0.5% difference, therefore showing how accurate the control of energy intake is (39). However, obesity is increasing and by implication shows the homeostatic balance that keeps energy balance in control is being overwritten. A possible cause is found in the deeper brain structures that are concerned with pleasure and reward as well as the release of dopamine (40, 41). Upon eating food that is perceived as highly rewarding certain areas in the brain release dopamine and is important for learning and memory especially in a case where large amounts of dopamine are released, there is a likelihood that the individual will repeat the activity (42). It has also been shown that individuals with obesity have fewer dopamine receptors than leaner individuals mainly because of down regulation of the receptors because of the large dopamine release on a regular basis. Over time obese individuals need to overeat to get the same effect of dopamine and may explain overeating as a behavior that is rooted in brain chemistry (42).

2.2 Bias and Prejudice towards Obesity.

An individual's weight can attract negative attention in various forms such as being made fun of in a public setting, being part of stigmatizing jokes that form part of popular culture and media, to being subject to receiving below average marks in school, not being considered for jobs and promotions, with not last on the list, not being considered for adopting children (43, 44).

A) Weight bias and prejudice in place of work.

In a survey of 2290 individuals, it was found that younger individuals who had a higher BMI were at high risk of weight discrimination and this was regardless of race, education and weight status. Also, women with a BMI of between 30-35kg/m^2 were at a greater risk for weight discrimination compared with men and three times more likely to report weight discrimination compared to male peers with a similar weight (45). Another study found that out of those reporting weight discrimination, 60% reported being mistreated at least four times because of weight stigma compared to their non-overweight peers (46). A study involving salary and remuneration of 12,686, obese male employees showed that these individuals received on average between 0.7 to 3.4% less than their less overweight colleagues, while for obese females, it was between 2.3 to 6.1% less than their non-overweight colleagues (47)

B) Weight bias and prejudice in the educational setting.

Educational settings have shown to be another area where research shows bias and stigmatization of obese individuals. A cohort study done in Sweden showed found a correlation between adolescent (16-18 years old) obesity and not attaining a college degree when compared with normal weight peers (48). Weight bias and stigmatizing behavior has been documented among teachers who believed that obese students were more emotional, untidy, had more family problems and less likely to succeed at work (49). Teachers have also been documented to have lower expectations of obese students in comparison to thinner students across a wide range of abilities (50). Lastly, children who were victimized at school because of their weight were more likely to be vulnerable to depression, low self-esteem, inferior body image as well as suicidal thoughts (51).

C) Weight bias and prejudice in interpersonal relationships.

In a study looking at dating in undergraduate college students, an overweight woman was less likely to be dating than that of their normal weight peers. Weight was also negatively correlated with relationship satisfaction for these overweight woman (52). Another study looked at sexual relationships and considered six hypothetical sexual partners. These partners consisted of a healthy partner, obese partner and partners that had disabilities in different forms (missing arm, in a wheelchair, mental illness and having a sexually transmitted disease). Men and woman all ranked the obese person the least desirable and between both men and woman, men rated the obese person least desirable than the woman, meaning that obese woman does face a greater weight

bias than men do (53). In a study documenting family and friends of 2,449 overweight and obese women, it was reported that 72% felt they received the most weight bias and stigma from family members with mothers being involved the most at 53% compared with fathers at 44% (54).

D) Weight bias and prejudice in the media.

In an analysis of movie scenes, it was found that male characters portrayed weight stigma and humor more so than female characters. These movies with weight stigma are popular at showing social acceptance of weight bias and prejudice (55).

Children are exposed to weight bias from an early age by mainstream media. One study looked at third-grade children and found that the amount of television viewing predicted a tendency among males to stereotype and bias overweight females (56). Television was also found to increase male children to associate overweight females as greedy while learning to associate thin females as smart and clean (57).

A study involving weight loss infomercials had researchers show participants "before" and "after," only "before" or only "after" pictures. The results showed that participants who looked at the “before" and "after" pictures had a stronger anti-fat bias towards obese individuals than the other individuals only shown “after” or “before” (58).

The media provides a platform that frames obesity as a lack of personal responsibility in forms of eating to excess and not exercising enough that creates weight bias and stigma in a suspecting society not receiving the full information about being overweight (59). In 2008, an article was published in *Newsweek* that spoke about Obesity as a “tragic addiction” and that obese individuals should pay a surcharge on airplane tickets for being overweight. Articles such as this further emphasize negative attitudes towards the obese (60). Further, magazines have also contributed toward creating stigmatizing attitudes towards obese individuals by placing emphasis on thinness through main front page pictures of models, articles on weight loss and being a “new you” by losing weight (61).

E) Weight bias and prejudice effect on psychological and physical health.

A study looking into obesity stigma and coping mechanisms as well as the relationship with psychological distress showed that frequent exposure to weight stigma was positively correlated with greater psychological stress, more coping mechanisms and severe obesity. Obese participants that were exposed to stigmatization on a regular basis commonly used coping mechanisms such as avoidance, negative self-talk and crying (62).

A study considering obese individuals exposed to weight stigma showed a significant correlation with ratings of impaired mood (63). Another study showed that weight stigma was found to contribute the most to a depressive mood in obese individuals, after controlling for BMI, gender, the age of onset of obesity, physical disability and binge eating status (64).

Physical activity is seen as an important intervention tool in treating obesity. In one study researchers looked at three categories of weight stigma, exercise behavior and exercise motivation where they showed a high correlation with stigma and exercise avoidance (65). In children and adolescents from grade 5 to grade 8, it has been demonstrated that weight stigma was more prevalent for females and heavier children regardless of gender which resulted in a decreased participation in mild-intensity exercise and sports enjoyment (66).

In a study involving weight bias and eating patterns, it was shown that obese adult woman who had internalized negative weight-based stereotypes (for example eating junk food while watching TV) had more reported binge eating episodes than those who did not internalize the negative stereotypes (67). Another study showed that weight bias and stigmatizing events could predict binge eating behavior as well as the overall psychological distress in obese adults (68). In contrast, one study showed obese individuals that had a recorded history of weight-stigmatizing events; a higher BMI, lower body dissatisfaction and greater fear of fat had experienced greater weight loss with obesity treatment program. Also found in the study was that obese adults with a

higher BMI and who had experienced more weight-stigmatizing events achieved a better weight maintenance six months after the treatment had finished (69).

F) Weight bias and prejudice in health professionals.

Research has been done into different professions and groups regarding weight bias and prejudice. These professions include doctors, nurses, fitness professionals, dieticians and medical students.

For example, a study examining 620 doctors reported that more than 50% found overweight and obese patients to be awkward, unattractive, ugly and noncompliant. These doctors saw obesity as a problem caused by inactivity and overeating (70). Another study conducted in Britain showed that these health professionals also believed that physical inactivity and overeating were causes of being overweight and obese (71). A study looking at patient motivation levels and the doctor's perception of their motivation levels found that overweight and obese participants reported a higher motivation level than what the doctor had perceived. They found that 31% of overweight and obese females and 21% of overweight and obese males rated themselves as completely motivated or "10", while physicians rated this only 2.5% and 3.1% respectively (72).

In a study addressing attitudes of a group of 398 nurses, 69% believed that it was choices about physical activity and food that explained why certain individuals would become overweight or obese and only 8.2% believed that individuals who are obese are motivated for a lifestyle change to improve their condition (73).

Medical students may be expected to provide different attitudes towards the overweight and obese individuals because they have not been in practice. However, in one study students did not believe that derogatory humor toward overweight and obese individuals was unfounded and that they did not like obese individuals as it would mean the students had extra work to manage these patients (74). Half the dental students (n=420) in one study reported no obesity education before professional dental education, and a

large percentage of these students (+-30%) felt that obese individuals were lazier than non-obese patients (75).

In fitness professionals, it was found that most believed that sedentary lifestyles, poor food choices, excess calories and psychological issues as the main reasons for individuals becoming overweight and obese (76). While in exercise science students, a study found that being a Caucasian female and growing up in a less populated area was associated with a tendency to have weight bias and stigmatization toward overweight and obese clients (77). One study done with dieticians found that these professionals rate obese individuals more critically than overweight individuals and also felt that obese individuals were more responsible for their excess weight than overweight individuals (78).

H) Problem Statement

There is currently no research in South Africa looking into weight bias and stigma toward overweight and obese individuals in healthcare professionals. South Africa has a high prevalence of obesity, and health care professionals need to be able to provide objective treatment for better outcomes in this population group. The implications of such research are that on a physiological level being overweight or obese has many possible causes. Some of these causes are socio-environmental, such as the nutritional transition of low to middle-income countries, and physiological such as hormonal secretions of adipose tissue, gut microbiome, brain function as well as psychological, such as weight bias in various settings including importantly those in healthcare. Healthcare practitioners may not be providing the best treatment if they unaware of these implications.

Chapter 3
Methods

3.1 Study Design

This was a cross-sectional descriptive survey.

3.2 Study Population

Qualified allied healthcare professionals (Biokineticist or Physiotherapist) registered with the Health Professions Council of South Africa (HPCSA) were invited to participate in the study. Inclusion criteria were that they had been practicing for a minimum of one year in South Africa. Exclusion criteria were those not qualified and registered with the HPCSA, those that were of other professions and those not practicing their profession in any capacity. To increase the sample size for the study, all nine provinces in South Africa were considered as well as those allied healthcare professionals (Biokineticist and Physiotherapist) in Namibia.

3.3 Sample size

The Health Professions Council of South Africa (HPCSA) was contacted to obtain an approximate number of both Biokineticists and Physiotherapists in South Africa. (Appendix B). From a population of 2 747 appropriate health professionals, a sample size was calculated using Epi Info Version 7. A sample size of 338 was calculated with a confidence level of 95% (Appendix B). However, all provinces were considered due to the low response rate obtained from Gauteng region. Allied healthcare professionals (Biokineticist and Physiotherapist) in Namibia were also considered.

3.4 Measurement Tools

The tools that were used were the Fat Phobia Scale (FPS) and the Attitudes Toward Obese Persons Scale (ATOP) (Appendix A). The demographic profile of the participants was also obtained (Appendix A). The FPS was a 14-item scale that consisted of a five-

point semantic differential scale which used pairs of adjectives to describe fat people and has a reliability of 0.87-0.91 (21). Higher scores indicate a greater weight bias. The design of the scale means that a score of 2.5 would indicate a neutral attitude, a score less than 2.5 would indicate a positive weight bias and a score greater than 2.5 would indicate a negative weight bias (106).

The ATOP is a 20 point questionnaire that required a rating of a statement from -3 (I strongly disagree) to +3 (I strongly agree) and has a reliability of 0.72 (105). Obtaining lower scores on the ATOP was indicative of a high level of fat phobia and negative attitudes toward overweight and obese individuals.

3.5 Data collection

The channel that was used to obtain information was the online survey platform called Survey Monkey. The platform allowed for the generation of a uniform resource locator (URL) which allowed the survey to be sent out by email or via the web as a link to the online survey. The Biokinetics Association of South Africa and Physiotherapy Society were contacted, and they displayed the link on all their social media platforms. The survey link was sent out once a month on both the Biokinetics and Physiotherapist Facebook member groups for each of the professions respectively. This totaled the link being sent out 52 times with 26 times on Biokinetics Association Facebook group and 26 times on the Physiotherapy Society Facebook group. Once the recipient had completed the survey, the platform automatically collected the data.

The collection of data started on the 7th of June 2014 and was ended on the 6th of August 2016. Due to logistical and time constraints, a manual collection was abandoned as a method for data collection.

3.6 Data Analysis

For objective 1: Categorical data was described as number and %. Numerical data was displayed as mean and standard deviation

For objective 2: For differences between the Biokineticists and Physiotherapists characteristics, Fisher's exact test was used for categorical data (two groups), and a Chi-squared test was used (more than two groups). For numerical data, an unpaired t test was used with significance set at $p<0.05$ for all statistical tests.

For objective 3: A Pearson correlation coefficient was calculated to look at the relationship between phobia and ATOP scores. r- value obtained of between 0-0.3, indicated weak correlation; r-value between 0.3-0.6, indicated moderate correlation and r-value of between 0.7-1 indicated good correlation. For comparisons between two groups (numerical data) an unpaired t-test was done, and between multiple groups, an ANOVA was done. Significance was set at $p<0.05$.

3.7 Ethical considerations

Data collection was confidential and anonymous as the survey did not record the name or any other identifying information of the participant. The data was coded from the answers of the participants into different categories based on age, the area of practice, height and weight for body mass index calculation. Ethical approval was obtained from the University of the Witwatersrand human research ethics committee (medical) with clearance certificate of no. M130901. (Appendix C).

Chapter 4.
Results.

In total 223 Biokineticist and Physiotherapist practitioners completed the survey consisting of the Fat Phobia Scale (FPS) and Attitudes Toward Obese Individuals (ATOP) scale. The response rate was recorded to be 3.8% for the Physiotherapists and 1.8% for the Biokineticists.

4.1) Description of Biokineticist and Physiotherapist on all factors including demographics.

Of the total, 223 Biokineticists and Physiotherapists that answered the survey 164 were Physiotherapists and 66 were Biokineticists, with 87.4% being female and 22.6% male.

Average BMI for the Physiotherapists was 24.2kg/m^2, while for the Biokineticists it was 23.9kg/m^2. It was found that for Physiotherapists, 58 (35%) were classified as overweight, while for Biokineticists, 21 (31%) were classified as overweight (25-29.9 BMI).

Table 1: Description of all factors including demographics

	Physiotherapists N (%) Mean ±SD	Biokineticists N (%) Mean ±SD	p-Value
Gender			***0.01***
Female	150 (91%)	51 (77%)	
Male	14 (9%)	15 (23%)	
BMI (kg/m2)	24.2 (±4.4)	23.9 (±4.6)	0.73
Overweight (>24.9kg/m2)	58 (35%)	21 (32%)	0.65

Years in practice <5	124 (76%)	51 (77%)	0.86
>50% practice obese patients	32 (20%)	20 (30%)	0.08
Age groups 20-30 years	62 (38%)	41 (62%)	***<0.01***
30-40 years	64 (39%)	20 (30%)	
40-50 years	21 (13%)	3 (5%)	
50-60 years	17 (10%)	0	

4.1.1) Age Distribution.

The majority of the surveyed participants were between the ages of 26 to 35.

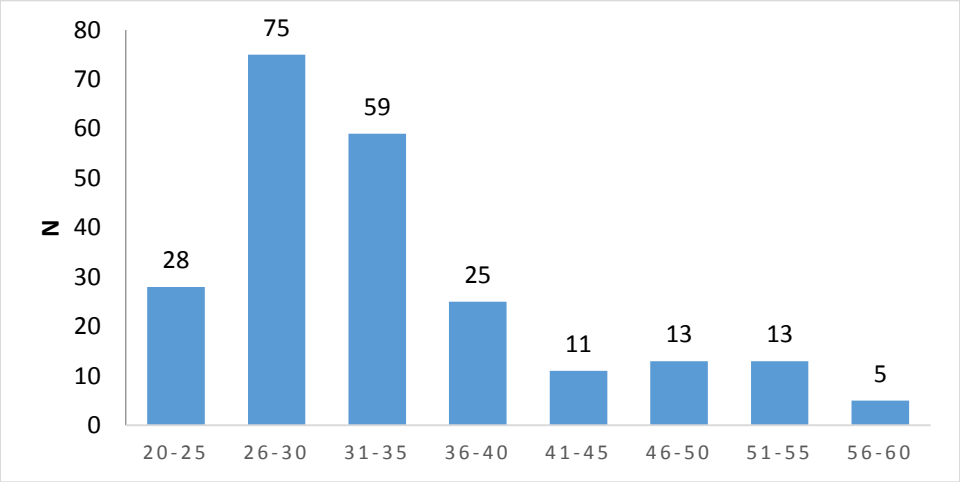

Figure 1: Age distribution of surveyed participants (N=229)

4.1.2) BMI.

The majority of surveyed participants fall within the “normal” body mass index range which was seen as between 18.5kg/m^2 and 24.9kg/m^2.

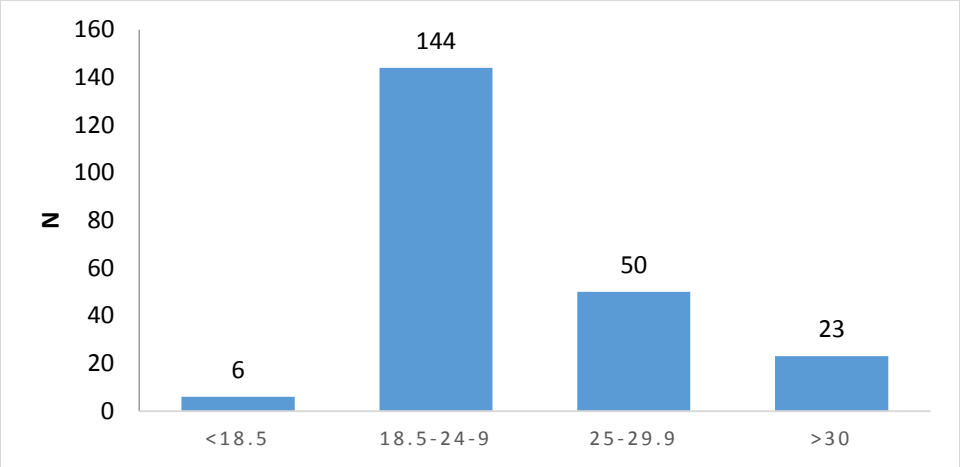

Figure 2: Body Mass Index of surveyed participants (N=223)

4.1.3) Ethnicity.

The majority of the participants were of Caucasian decent with around 82% of the surveyed participants.

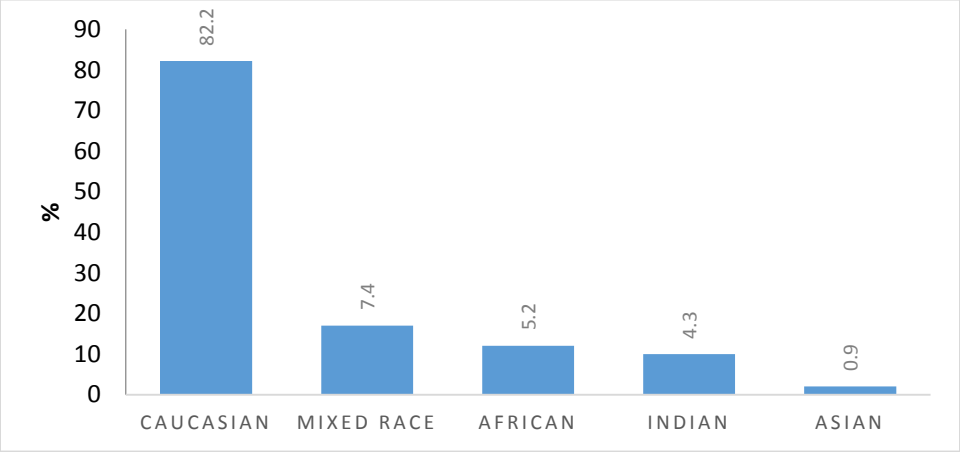

Figure 3: Ethnicity totals (%) per racial group for surveyed participants

4.1.4) Years in Practice.

The majority of participants had more than a decade of experience working as either Biokineticists or Physiotherapists.

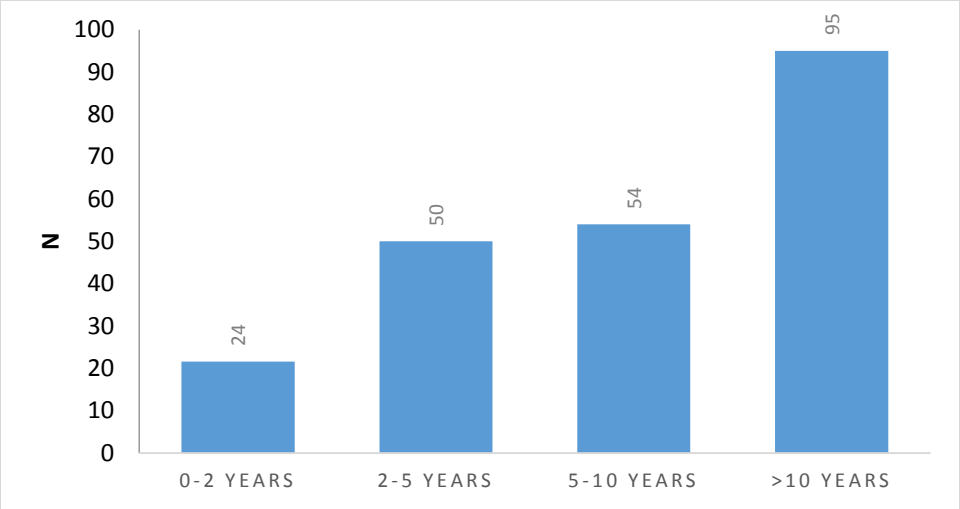

Figure 4: Years of practice totals per specified years of surveyed participants

4.1.5) Place of Practice.

The majority of surveyed participants were practicing professionals in the Gauteng region of South Africa.

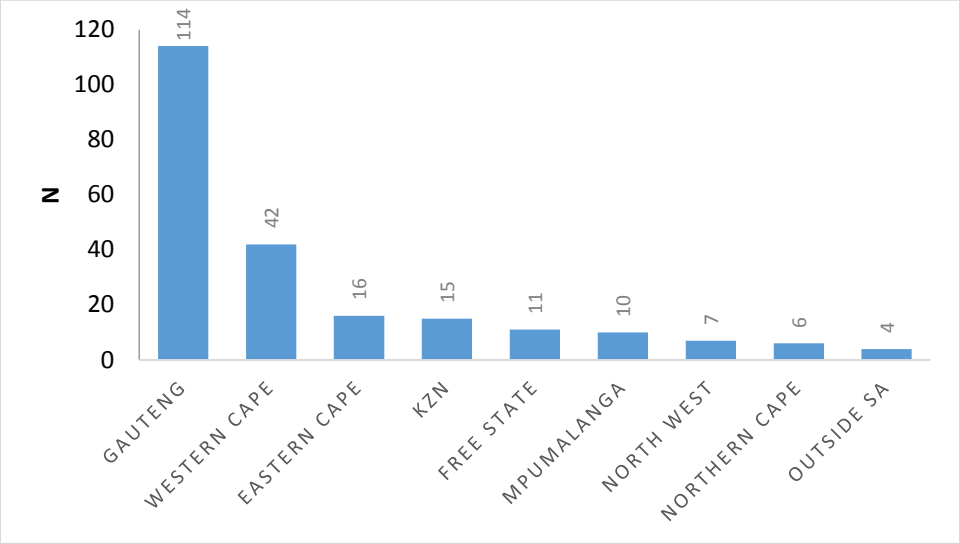

Figure 5: Place of practice according to surveyed participants

4.1.6) Percentage and the number of obese clients in private practice.

The majority of the biokineticists and physiotherapists surveyed had around 30-50% of their practice as overweight or obese clients.

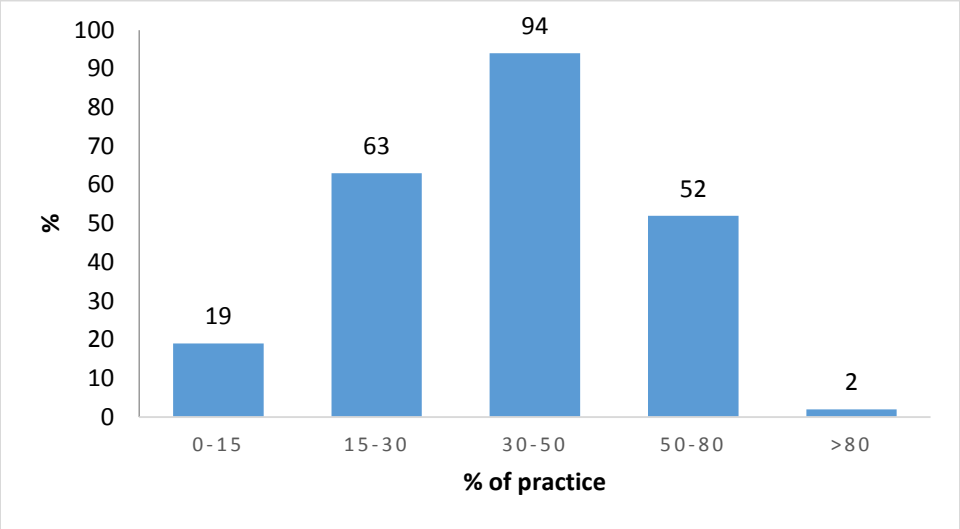

Figure 6:% of patients who are obese per practice

4.2) Description and differences between Biokineticists and Physiotherapist attitudes towards overweight and obese

The average fat phobia scale (FPS) score for the Physiotherapists was 2.87, and for the Biokineticists, it was 2.94 which indicated that there was mild weight bias toward overweight and obese individuals in both groups. FPS scores below 2.49 are seen as neutral or positive regarding bias and scores above 2.50 are seen as showing negative regarding bias. Therefore, both were seen as being slightly bias with Biokineticists being statistically significantly more bias than Physiotherapists in this population.

The average ATOP score for the Physiotherapists was 67.9, and for the Biokineticists, it was 55.7. Biokineticists were seen to be significantly more weight bias according to the ATOP scale. Scores range from 0-120 and higher scores are seen as representing a more positive attitude toward overweight or obese individuals.

Table 2: Differences between healthcare provider's FPS and ATOP scores

	Physiotherapists Mean ±SD	Biokineticists Mean ±SD	P value
FPS score	2.87 (±0.23)	2.94 (±0.34)	***0.04***
ATOP score	67.9 (±17.8)	55.7 (±17.8)	***≤ 0.01***

4.3) Factors relating to FPS and ATOP scores

4.3.1) Comparison of genders based on Fat Phobia Scale and ATOP scores.

Table 3 shows the mean and standard deviation scores for the FPS and ATOP score with a difference between females and males. For the FPS, there was a significant difference in score between male and females with females scoring significantly higher indicating negative weight bias. Females did score higher on the ATOP questionnaire, and this was not statistically significant.

Table 3: Mean Phobia/ATOP score correlation between female and male

	Females N=202 (87%) Mean ±SD	Males N=29 (13%) Mean ±SD	P-Value
FPS Mean(SD)	2.9 (±0.26)	2.8 (±0.29)	***0.01***
ATOP score mean(SD)	65.5 (±18.3)	58.9 (±17.2)	0.08

4.3.2) Relationship between BMI and FPS/ATOP score

A significant negative correlation was found between BMI, fat phobia scale (FPS) score and attitudes toward obese individuals (ATOP) score went down. Although the strength of both relationships (r value) was low, it was still statistically significant.

Table 4: FPS, ATOP and BMI correlations and significance levels

	p-Value	r-Value
BMI to FPS	0.02	***0.02***
BMI to ATOP	0.70	***≤ 0.01***

4.3.2) Comparison of prevalence of obesity with scores – split between <50% patients within the practice who are obese and >50% patients within the practice who are obese.

The prevalence or amount of obese patients being seen in practice did not have an effect on the FPS and ATOP scores, with no differences seen between those practices that saw less than 50% of obese patients and those that saw >50% of obese patients.

Table 5: Comparison of prevalence of obesity with scores – split between <50% patients within the practice who are obese and >50% patients within the practice who are obese

	<50% N=54 (23%) Mean ±SD	>50% N=176 (77%) Mean ±SD	p-Value
FPS score	2.87 (±0.23)	2.89 (±0.28)	0.56
ATOP	64.90 (±17.9)	63.7 (±19.5)	0.66

4.3.3) Differences in phobia/ATOP score between age groups.

Table 6 below shows the FPS and ATOP scale scores for each age grouping. Age with age was shown to have no significant impact on phobia or ATOP scores for each of those groupings.

Table 6: Deciles for different age categories compared with FPS and ATOP scores

Age Groups	PFS scores Mean ±SD	ATOP scores Mean ±SD
20-30 years (N=103; 45%)	2.90 (0.26)	65.4 (16.8)
30-40 years (N=84; 37%)	2.85 (0.28)	65.3 (19.6)
40-50 years (N=24; 11%)	2.91 (0.33)	62.6 (15.5)
50-60 years (N=15; 7%)	2.90 (0.10)	62.8 (22.6)
P value	0.74	0.87

4.3.4) Comparison of years in practice and fat phobia scale (FPS)/attitudes toward obese persons (ATOP) scores.

Comparison of years in practice and fat phobia scale (FPS)/attitudes toward obese persons (ATOP) scores. >1 and <5 years showed a higher score on the fat phobia scale than >1 and >5 years. For the attitudes towards obese individuals, scores for >1 and >5 years were shown to be more fat phobic. Both scores were not significant.

Table 7: Comparison of years in practice and the FPS/ATOP

	> 1 and < 5 years Mean ±SD	>1 and > 5 years Mean ±SD	p-Value
FPS	2.93 (0.25)	2.87 (0.28)	0.13
ATOP	64.9 (17.9)	63.7 (19.5)	0.66

Chapter 5
Discussion

The prevalence of obesity has shown to have doubled since 1980. With prevalence rates in 2016 showing that 1.9 billion adults who are 18 and older, are classified as overweight (>24.9 BMI and less than <29.9 BMI), while 600 million of those adults were classified as “obese” (>30 BMI) (79).

Summary of findings

Health professionals play an important part in providing guidance and identifying behaviors that could increase the likelihood of disease which they, in turn, need to modify to prevent or help reverse this pattern (80). However, it has been shown that weight bias and prejudice are present in health professionals (70-78) and that these health professionals often do not find the job of treating obese patients rewarding (81-85). Thus the aim of this study was to assess bias and prejudice attitudes towards overweight and obese patients in selected healthcare professionals. This is the first study of its kind in South Africa and showed that Biokineticists and Physiotherapists have negative attitudes toward overweight and obese individuals with scores of 2.94 and 2.87 respectively on the fat phobia scale (FPS). Further, scores on the attitudes towards obese persons (ATOP) scale of 55.7 and 67.9 showed a bias for Biokineticists and Physiotherapists respectively. Biokineticists were significantly more bias towards overweight and obese patients on both the FPS ($p=0.04$) and ATOP ($p<0.01$). Females were also shown to be more prejudice than men, and there was an inverse relationship between the BMI of the healthcare worker, and the phobia scale. Lastly, the amount of overweight/obese patients, the age of the healthcare professional and years of practice did not appear to affect bias and prejudice in this study.

5.1 Attitudes and comparison of Biokineticists and Physiotherapists toward overweight and obese individuals

The participants surveyed were mostly young, with the majority being in the 26-35 years of age group. The importance of this finding is that when this younger generation gets older, they may have a greater awareness of weight bias and prejudice towards overweight and obese individuals. Being younger is considered an important predictor of having a negative weight bias (7).

Of the healthcare professionals surveyed, 23% were overweight or obese (>24.9 BMI), and this is lower in comparison to the general South African public which was 65% obese in 2012 (107). Implications of this being that health professionals should be advocates of a healthy body but their message could be ineffective towards obese patients as these overweight and obese health professionals are not setting an example to follow. The overweight and obese patients made up nearly 30-50% of surveyed health professionals practice, and implications of this are that it may have created an environment for the manifestation of negative weight bias.

Previous findings using the Fat Phobia Scale have demonstrated bias (86, 87, 88, 89, 90) in Dieticians. Bias using the Fat Phobia Scale was also demonstrated in doctors, nurses, dieticians (90) and with university students (91). To the best of our knowledge, no studies have assessed bias in Biokineticists and Physiotherapists within South Africa. The results from this study also confirm slight bias in Biokineticists and Physiotherapists with a mean score of 2.94 and 2.87 respectively. Higher scores indicate a greater weight bias with a score of 2.5 indicating a neutral attitude, a score less than 2.5 indicating a positive weight bias and a score greater than 2.5 indicating a negative weight bias (106). The general population Fat Phobia Scale mean score is 3.60 (87, 92). The score of this study for the Fat Phobia Scale of 2.89 was lower compared to other studies 3.66 (86), 3.8 (88), 3.7 (89), 3.8 (90) and 3.57 (91). The reason for the difference may be that as bias and prejudice have become a more prevalent idea, individuals have a higher conscious understanding of bias and thus may

reflect lower scores when surveyed. The Fat Phobia Scale is also an explicit test and fails to measure implicit beliefs (93).

Previous research with Attitudes Toward Obese Persons scale has shown that higher scores are associated with a more positive view towards obese individuals. The results from this study showed that Biokineticists scored an average of 55.7 and for the Physiotherapists an average score of 67.9. In previous studies, similar scores have been attained with men: 56.02 and woman: 59.41 (44), and overall: 59.68 (44). For both the FPS ($p=0.04$) and ATOP ($p<0.01$), Biokineticists were found to be significantly more bias and prejudice compared to their Physiotherapist counterparts. Reasons that Biokineticists are more weight bias than Physiotherapists is that the Physiotherapists learn to be more empathetic as they need to deal with obese individuals not only giving out physical activity advice but also dealing with orthopedic issues that require a hands-on approach. However, the sample size of the Biokineticists was not as large as the Physiotherapists, and this may not have given a true reflection of the Biokineticists being more weight bias.

5.2 Factors related to bias in Biokineticists and Physiotherapists.

5.2.1. Gender, BMI and age.

Research involving gender and weight bias have shown through the implicit association test (IAT) that being male and older was associated with levels that were positive concerning attitudes toward weight bias (6). In contrast, this study showed that females scored a significantly higher fat phobia score (FPS) of 2.9 in comparison to males of 2.8 ($p=0.01$). Higher scores on the fat phobia score were associated with negative attitudes weight bias. However, the attitudes toward obese individuals (ATOP) scale, females also scored higher with 65.5 than males with 58.9, and although this was not statistically significant, it shows that in this sample, women appear to have more phobia, but less bias. Previous research has shown that weight bias was more likely amongst females than males (99). In summary, evidence from this studied was conflicting for female

participants as the FPS indicated negative attitudes toward obese individuals while ATOP indicated more positive attitudes when compared to men. Possible reasons for this is that the ATOP scale considers stereotypical attitudes with regards to obese people with questions such as “Obese workers cannot be as successful as other workers” while the FPS that considers fat phobic attitudes with regards to obese people with the use of adjectives such as “overeats” and “smells bad” and this may have been the reason for the difference in that the interpretation of this two different scales resulted in two different scores as well.

In one study investigating BMI and weight bias, it was found that there was a positive correlation between weight bias and increasing BMI (100). In this study, BMI of the Biokineticists and Physiotherapists was found to be inversely associated with fat phobia scale (FPS) and attitudes toward obese individuals scale scores (ATOP). Although the strength of the relationship was low ($R=0.02$; $p=0.02$) a significant inverse relationship was found between BMI and the FPS score meaning that as the BMI of the healthcare professional increased, the FPS score went down. The same has been found in similar research involving the fat phobia scale, where average or underweight respondents more likely to have weight bias attitudes than those who were overweight (99). In summary, it was found that the higher the BMI of either professional group that scores on the fat phobia scale would go down but was weakly correlated.

Further, in another study done on health professionals specializing in obesity, the authors found that with age, the biggest predictor for weight bias was being younger (7).

Similar findings were shown with younger counterparts having more fat phobic scores than older counterparts (>55 years old) (99). In contrast, our study showed no differences between the age groups, for both FPS and ATOP; however, our sample showed that younger health care professionals tended to have slightly higher ATOP scores compared to the older groups ($p=0.87$). In summary, it was found in previous studies that younger professionals were more likely to have negative attitudes toward obese individuals, however, this study showed no significant differences between age groups.

Practicing Biokineticists and Physiotherapists with <50% (less prevalence) of their patients as obese (n=177) had lower weight bias scores for both the FPS score and ATOP scale in comparison to the professionals who had more than >50% (high prevalence) of their practice as obese patients (n=50) and was not significant (p 0.66). A study assessing dieticians with a high prevalence of interactions with overweight and obese patients found the dieticians score an FPS of 3.7 indicating negative weight bias (89). In contrast, a study of non-dietetic students who would be considered to have a low prevalence of exposure to overweight and obese individuals found a similar negative weight bias in both groups when compared with dietetic students (110). In summary, health professionals and non-health professionals can display negative weight bias toward overweight and obese individuals regardless, and more prevalence of obese individuals for a health professional may not be a reason for displaying more negative weight bias and attitudes.

Biokineticists and Physiotherapists in practice for <5 years scored higher on the FPS with 2.93 in comparison to the 2.87 for those who had practiced >5 years, considering that a higher score on the FPS indicates a higher fat phobia and negative weight bias toward overweight and obese individuals, but this was not significant (p 0.13). In contrast, the ATOP saw those in practice <5 years scored higher with 64.9 in comparison to 63.7 for those with >5 years of practice with a lower score being indicative of negative weight bias towards overweight and obese individuals, however, this also was not significant (p 0.66). A study that considered health professionals with more years of experience had found lower scores on the FPS and was also not statistically significant (111).

5.3 Strengths and Limitations

The importance of this study was that it was the first in South Africa to consider bias and prejudice in Biokineticists and Physiotherapists. This study pioneered research into the area of weight bias and stigma in health professionals specifically in South African as well in Africa. This is hoped to help with future research and weight bias with a focus on

intervention to helping health professionals better treat their patients and have greater clinical success.

A sample size of greater than 338 was the goal to achieve a 95% confidence level (Appendix B) at the beginning of the study. However, only 223 participants were surveyed by the decision to end data collection. This sample size for the Biokineticists (66) and the Physiotherapists (164) means that any significant differences between the two groups must be interpreted with caution. Response rates for healthcare professionals are generally low (109), and a low response rate was the same result in this study for both Biokineticists and Physiotherapists (Appendix B).

The results from this study provide views of bias in Biokineticists and Physiotherapists. The scales used (Fat Phobia Scale and Attitudes Towards Obese Persons) are explicit and do not take into consideration implicit testing as this was not done in this study and may reflect and provide even greater insight. However, results do reflect mild weight bias for this group of surveyed participants.

5.4. Recommendations

Implicit and explicit bias reduction has been shown to be effective in health professionals. A study considering three different interventions, controllable conditions (i.e., diet and nutrition), uncontrollable conditions (genes/genetics), and a neutral condition (alcohol use in young people); found that the uncontrollable conditions help reduced both implicit and explicit bias (94, 95). One study found implementing various strategies helped reduced explicit weight bias, and one such strategy involved showing individuals that their colleagues did not have negative weight bias attitudes (96). The legal framework that has been in place to deal with age, sex and race, have been proposed to deal with weight based inequalities (96). Also, surveys have been done that show there is support for policies and legislation to deal with weight discrimination (99).

This study showed that Biokineticists surveyed had negative attitudes toward overweight and obese individuals with a fat phobia scale (FPS) score of 2.87. The

Physiotherapists surveyed also showed negative attitudes toward overweight or obese individuals with a fat phobia score of 2.94.

Attitudes toward obese persons (ATOP) scale showed that Biokineticists had a negative attitude toward overweight and obese individuals as well as the Physiotherapists with scores of 55.70 and 67.90 respectively.

Factors relating to the FPS and gender showed that females had a significantly higher score of 2.9 when compared with males of 2.8 ($p=0.01$).

There was a significant correlation that as BMI increased that the fat phobia scale score decreased, however, the strength correlation strength was weak ($p=0.02$, $r=0.02$).

Implications for practicing Biokineticists and Physiotherapists is the need for weight bias reduction and can include aspects such as changing beliefs about the causes obesity; evoking acceptance (108), empathy and liking toward overweight and obese individuals (108); influencing social norms (108) and changing social consensus (108). More specifically for health professionals can starting with CPD activities that professional organizations such as the Biokinetics Association of South African and the Physiotherapy Society of South Africa can send out as a requirement to complete before Biokineticists and Physiotherapists are allowed to renew their memberships each. Further, education about the weight bias can be included in the University syllabus to help equip Biokineticists and Physiotherapists with awareness, knowledge and tools to provide more objective health care and treatment for obese and overweight individuals.

5.6. Conclusion

This study has shown that bias and prejudice do exist in Biokineticists and Physiotherapists. However, more research needs to be done especially in South Africa as currently no research on this topic has been found, and this research will provide a platform to which additional research can be added. Weight bias and prejudice have been shown to have negative effects on treatment outcomes for overweight and obese

patients, especially from health professionals. A better understanding of the magnitude weight bias can provide intervention and improve weight bias and treatment outcomes. A more objective health care and health professional framework would result allowing better interventional treatment and ultimately improved patient outcomes.

References

1) World Health Organisation Obesity and Overweight world statistics. [updated January 2015, cited April 11 2016], Available from http://www.who.int/mediacentre/factsheets/fs311/en/.
2) Shisana, O., Labadarios, D., Rehle, T., Simbayi, L., Zuma, K., Dhansay, A.,…Faber, M. (2013). South African National Health and Nutrition Examination Survey (SANHANES-1). Cape Town: HSRC Press
3) Peltz, G. et al. (2010). The role of fat mass index in determining obesity. *American Journal of Human Biology,* 22(5):639-47.
4) Ogden, C.L., et al. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *Journal of the American Medical Association*, 307(5):483-90.
5) U.S. Department of Health and Human Services. (2000). Healthy People 2010. Washington, DC:Government Printing Office, (1):28-29.
6) Schwartz, M.B., Chambliss, H.O., Brownell, K.D., Blair, S.N., Billington, C. (2003). Weight bias among health professionals specializing in obesity. *Obesity Research*, 11(9):1033-9.
7) "Bias". Oxforddictionaries.com. Oxford. 2013. [Cited 26 April 2013]. Available form: http://www.oxforddictionaries.com.
8) Puhl, R.M., Moss-Racusin, C.A., Schwartz, M.B. (2007). Internalization of Weight Bias: Implications for Binge Eating and Emotional Well-being. *Obesity*. 15:19-23
9) Pantenburg, B., Sikorski, C., Luppa, M., Schomerus, G., Konig, H.H., Werner, P., Riedel-Heller, S.G. (2012). Medical Students attitudes towards overweight and obesity. 2012. *PLOs One*, 7(11):e48113.
10) Puhl, R., and Brownwell, K. (2001). Bias, discrimination and obesity, Review. *Obesity Research*, 9:788-805.
11) Dimmock, J.A., Hallett, B.E., Grove, J.R. (2009). Attitudes toward overweight individuals among fitness centre employees:an examination of contextual effects. *Research Quarterly for Exercise and Sport*, 80(3):641-7.

12) Roddy, S., Stewart, I., Barnes-Holmes, D. (2010). Anti-fat, pro-slim, or both? Using two reaction-time based measures to assess implicit attitudes to the slim and overweight. *Journal of Health Psychology*, 5(3):416-25.
13) Sassi, F., et al. (2009). The Obesity Epidemic: analysis of past and projected future trends in selected OECD countries. *OECD Health Working Papers*, 45.
14) Flegal, K. M., et al. (2010). Prevalence and trends in obesity among US adults, 1999-2008. *Journal of the American Medical Association*, 303(3):235-241.
15) Webber, L. (2014). The European obese model: the shape of things to come. In:Forum UH.
16) Baleta, A., and Mitchell, F. (2014). Country in Focus: Diabetes and obesity in South Africa. *The Lancet Neurology*, (2).
17) Webber, L., Divajeva, D., Marsh, T., et al. (2014). The future burden of obesity related diseases in the 53 WHO European-Region countries and the impact of effective interventions: a modelling study. *BMJ Open*, 4:e004787.
18) De Villiers, J. (2014). We have an absolute epidemic of obesity. Retrieved from http://www.health24.com/Medical/Hypertension/Lifestyle-changes/We-have-an-absolute-epidemic-of-obesity-in-SA-20141210.
19) Lewis, D., and Leitch, M. (2015). Fat Planet. The obesity trap and how we can escape it (pp. 41-44). London:Random House books.
20) Leonard, W., and Robertson, M. (1994). Evolutionary perspectives on human nutrition: The influence of brain and body size on diet and metabolism. *American Journal of Human Biology*, 6 (1):77-88.
21) Aiello, L. C., and Wheeler, P. (1995). The expensive Tissue Hypothesis: the brain and the digestive system in human and primate evolution. *Current Anthropology*. 36 (2):199-221.
22) Dunbar, R. I. (2009). The social brain hypothesis and its implications for social evolution. *Annals of Human Biology*, 36 (5):652-72.
23) Hales, C.N., and Barker, D.J. (2001). The thrifty phenotype hypothesis. *British Medical Bulletin*, 60:5-20.
24) Swinburn, B. (1995). The thrifty genotype hypothesis: concepts and evidence after 30 years. *Asia Pacific Journal of Clinical Nutrition*, 4:337-8.

25) Eckel, R. (2005). *The metabolic syndrome*. The Lancet, (365)9468:1415-1428

26) Popkin, B.M., Haines, P.S., and Patterson, R. (1992a) Dietary changes among older Americans, 1977-87. *American Journal of Clinical Nutrition,* 55:823-30.

27)Wozniak, S. E., et al. (2009). Adipose tissue: the new endocrine organ? *Digestive Diseases and Sciences*. 54 (9)1847-56

28) McTernan, C.L., et al. (2002). Resistin, central obesity and type 2 diabetes. *The Lancet*. 359 (9300):46-7

29) Qi, Y., et al. (2004). Adiponectin acts in the brain to decrease body weight. *Nature Medicine*. 10(5):524-9

30) Klok, M.D., Jakobsdottir, S., Drent, M.L. (2007). The role of leptin and ghrelin in the regulation of food intake and body weight in humans: a review. *Obesity Review*, 8(1):21-34.

31) Neil, U. (2010). Leaping for Leptin. *The Journal of Clinical Investigation*, 120 (10):3413-18.

32) Woods, S.C,. (2009). The control of food intake: behavioral versus molecular perspectives. *Cell Metabolism*, 9 (6):489-98.

33) Shapiro, A., et al. (2008). Fructose-induced leptin resistance exacerbates weight gain in response to subsequent high-fat feeding. American Journal Physiol. Regul. Integr. Comp. Physiol. 295 (5): R1370–5.

34) Münzberg, H., Flier, J.S., Bjørbaek C. (2004). Region-specific leptin resistance within the hypothalamus of diet-induced obese mice. *Endocrinology*, 145(11):4880-9

35) Inui, A. (2001). Ghrelin: an orexigenic and somatotrophic signal from the stomach. *Nat Rev Neurosci*, 2(8):551-60.

36) Francois, F., et al. (2011). The effect of H. pylir eradication on meal-associated changes in plasma ghrelin and leptin. *BMC Gastroenterology*, (11):37.

37) Turnbaugh, P. J., Ley, R. E., et al. (2006). An obesity-associated gut microbiome with increased capacity for energy harvest. *Nature*, 444 (11):1027-1031

38) Harris, R.B. (1990). Role of set-point theory in regulation of body weight. *FASEB*, 4(15):3310-8.

39) Du, H., et al. (2009). Dietary energy density in relation to subsequent changes of weight and waist circumference in European men and women. *Plos One*, 4 (4):e5339.

40) Pecina, S., Smith, K.S., Berridge, K.C. (2006). Hedonic hot spots in the brain. *Neuroscientist*. 12 (6):500-511.

41) Berridge, K. C., et al. (2010). The tempted brain eats: pleasure and desire circuits in obesity and eating disorders. *Brain Research*. 1350:43-64

42) Wang, G.J., Volkow, N.D., Logan, J., et al. (2001). Brain dopamine and obesity. *Lancet*, 357 (9253):354-357.

43) Andreyeva, T., Puhl, R.M., Brownell, K.D. (2008). Changes in perceived weight discrimination among Americans: 1995–1996 through 2004–2006. *Obesity,* 16:1129–1134.

44) Puhl, R.M., Brownell, K.D. (2006). Confronting and coping with weight stigma: an investigation of overweight and obese adults. *Obesity,* 14:1802–1815.

45) Puhl, R.M., Andreyeva, T., Brownell, K.D. (2008). Perceptions of weight discrimination: prevalence and comparison to race and gender discrimination in America. *Int J Obes*, 32:992–1000.

46) Carr, D., Friedman, M.A. (2005). Is obesity stigmatizing? Body weight, perceived discrimination, and psychological well-being in the United States. *J Health Soc Behav*, 46:244–259.

47) Baum, C.L, Ford, W.F. (2004). The wage effects of obesity: a longitudinal study. *Health Econ*, 13:885–899.

48)Karnehed, N., Rasmussen, F., Hemmingsson, T., Tynelius, P. (2006). Obesity and attained education: cohort study of more than 700,000 Swedish men. *Obesity,* 14:1421–1428.

49) Neumark-Sztainer, D., Story, M., Harris, T. (2011). Beliefs and attitudes about obesity among teachers and school health care providers working with adolescents*. Journal of Nutritional Education*, 31(1):3–9.

50) Price, J.H., Desmond, S.M., Stelzer, C.M. (1987). Elementary school principals' perceptions of childhood obesity. *J Sch Health*, 57(9):367–370.

51) Sargent, J.D., Blanchflower, D.G. (1994). Obesity and stature in adolescence and earnings in young adulthood. Analysis of a British birth cohort. *Arch Pediatr Adolesc Med*.148(7):681–687.
52) Sheets, V., Ajmere, K. (2005). Are romantic partners a source of college students' weight concern? *Eat Behav*. 6:1–9.
53) Chen, E.Y., Brown, M. (2005). Obesity stigma in sexual relationships. *Obesity Research*, 13:1393–1397.
54) Puhl, R.M., Moss-Racusin, C.A., Schwartz, M.B., Brownell, K.D. (2008). Weight stigmatization and bias reduction: perspectives of overweight and obese adults. *Health Educ Res*, 23:347–358.
55) Himes, S.M., Thompson, J.K. (2007). Fat stigmatization in television shows and movies: a content analysis. *Obesity*, 15:712–718.
56) Harrison, K. (2000). Televisions viewing, fat stereotyping, body shape standards, and eating disorder symptomatology in grade school children. *Communic Res,* 27:617–640.
57) Latner, J.D., Rosewall, J.K., Simmonds, M.B. (2007). Childhood obesity stigma: association with television, videogame, and magazine exposure. *Body Image*, 4:147–55.
58) Geier, A.B., Schwartz, M.B., Brownell, K.D. (2003). “Before and After” diet advertisements escalate weight stigma. *Eat Weight Disord*, 8:282–288.
59) Kim, S-H., Willis, L.A. (2007). Talking about obesity: news framing of who is responsible for causing and fixing the problem. *J Health Communic*, 12:359–376.
60) Adler, J. (2008). The obese should have to pay more for airline tickets. Newsweek. 7 July/14 July. 60
61) Malkin, A.R., Wornian, K., Chrisler, J.C. (1999). Women and weight. Gendered messages on magazine covers. *Sex Roles*, 40:647–655.
62) Myers, A., Rosen, J.C. (1999). Obesity stigmatization and coping: relation to mental health symptoms, body image, and self-esteem. *Int J Obes*, 23:221–230.
63) Carr, D., Friedman, M.A., Jaffe, K. (2007). Understanding the relationship between obesity and positive and negative affect: the role of psychosocial mechanisms. *Body Image*, 4:165–177.

64) Chen, E.Y. (2007). Depressed mood in class III obesity predicted by weight-related stigma. *Obes Surg*. 17:669–671.

65) Rosenberger, P.H., Henderson, K.E., Grilo, C.M. (2006). Correlates of body image dissatisfaction in extremely obese female bariatric surgery candidates. *Obesity Surg*, 16:1331–1336.

66) Faith, M.S., Leone, M.A., Ayers, T.S., Moonseong, H., Pietrobelli, A. (2002). Weight criticism during physical activity, coping skills, and reported physical activity in children. *Pediatrics,* 110:e23.

67) Puhl, R.M., Moss-Racusin, C.A., Schwartz, M.B. (2007). Internalization of weight bias: implications for binge eating and emotional well-being*. Obesity,* 15:19–23.

68) Ashmore, J.A., Friedman, K.E., Reichmann, S.K., Musante, G.J. (2008). Weight-based stigmatization, psychological distress, & binge eating behavior among obese treatment-seeking adults. *Eat Behav.*, 9:203–209.

69) Latner, J.D., Wilson, G.T., Jackson, M.L., Stunkard, A.J. (2009). Greater history of weight-related stigmatizing experience is associated with greater weight loss in obesity treatment. *J Health Psychol.,* 14(2):190-9.

70) Foster, G.D., Wadden, T.A., Makris, A.P. et al. (2003). Primary care physicians' attitudes about obesity and its treatment. *Obes Res*., 11:1168–1177.

71) Harvey, E.L., Hill, A.J. (2001). Health professionals' views of overweight people and smokers. *Int J Obes*., 25:1253–1261.

72) Befort, C.A., Greiner, K.A., Hall, S. et al. (2006). Weight-related perceptions among patients and physicians: how well do physicians judge patients' motivation to lose weight*? J Gen Intern Med.,* 21:1086–1090.

73) Brown, I., Stride, C., Psarou, A., Brewins, L., Thompson, J. (2007). Management of obesity in primary care: nurses' practices, beliefs, and attitudes. *J Adv Nurs.*, 59:329–341.

74) Wigton, R.S., McGaghie, W.C. (2001). The effect of obesity on medical students' approach to patients with abdominal pain. *J Gen Intern Med.*, 16:262–265.

75)Magliocca, K.R., Jabero, M.F., Alto, D.L., Magliocca, J.F. (2005). Knowledge, beliefs, and attitudes of dental and dental hygiene students toward obesity. *J Dent Educ.*, 69:1332–1339.

76) Hare, S.W., Price, J.H., Flynn, M.G., King, K.A. (2000). Attitudes and perceptions of fitness professionals regarding obesity. *J Community Health*, 25:5–21.

77) Chambliss, H.O., Finley, C.E., Blair, S.N. (2004). Attitudes toward obese individuals among exercise science students. *Med Sci Sports Exerc*, 36:468–474.

78) Harvey, E.L., Summerbell, C.D., Kirk, S.F.L., Hill, A.J. (2002). Dietitians' views of overweight and obese people and reported management practices. *J Hum Nutr Diet*. 15:331–347.

79) World Health Organisation Obesity and Overweight world statistics. [updated June 2016, cited November 21 2016], available from http://www.who.int/mediacentre/factsheets/fs311/en/

80) Phelan, S.M. et al. (2015). Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. *Obesity Reviews*, 16(4):319-326.

81) Bocquier, A., Verger, P., Basdevant, A., Andreotti, G., Baretge, J., et al. (2005). Overweight and obesity: knowledge, attitudes, and practices of general practitioners in france. *Obes Res,* 13:787–795.

82) Campbell, K., Crawford, D. (2000). Management of obesity: attitudes and practices of Australian dietitians. *Int J ObesRelatMetabDisord*, 24:701–710.

83) Campbell, K., Engel, H., Timperio, A., Cooper, C., Crawford, D. (2000). Obesity management: Australian general practitioners' attitudes and practices. *Obes Res*8:459–466.

84) Loomis, G.A., Connolly, K.P., Clinch, C.R., Djuric, D.A. (2001). Attitudes and practices of military family physicians regarding obesity. *Mil Med,* 166:121–125.

85) Thuan, J-F, Avignon, A. (2005). Obesity management: attitudes and practices of French general practitioners in a region of France*. Int J Obes,* 29:1100–1106.

86) Berryman DE, Dubale GM, Manchester DS, Mittelstaedt R. 2006. Dietetics students possess negative attitudes toward obesity similar to nondietetics students*. J Am Diet Assoc*, 106:1678–1682.

87) Bacon JG, Scheltema KE, Robinson BE. 2001. Fat phobia scale revisited: the short form. *Int J Obes Relat Metab Disord*, 25:252–257.

88) Bacardi-Gascon, M., Jimenez-Cruz, A., Castillo-Ruiz, O., Baezares-Sarmiento, V., Leon-Gonzalez, J.M. (2015). Fat phobia in Mexican nutrition students. *Nutr Hosp*, 36:2956–2957.

89) Puhl, R., Wharton, C., Heuer, C. (2009). Weight bias among dietetics students: implications for treatment practices. *J Am Diet Assoc*, 109:438–444.

90) Swift, J.A., Hanlon, S., El-Redy, L., Puhl, R.M., Glazebrook, C. (2013). Weight bias among UK trainee dietitians, doctors, nurses and nutritionists. *J Hum Nutr Diet*, 26:395–402.

91) Hayran, O,. Akan, H,. Ozkan, A.D., Kocaoqlu, B. (2013) Fat Phobia of University Students: attitudes towards Obesity. *Journal of Allied Health*, 42(3):147-150.

92) Diversi, T.M., Hughes, R. Burke, K.J. (2016). The Prevalance and practice of impact of weight bias amongst Australian dieticians. 2016. *Obesity Science and Practice*, 10:1002

93) Brown, I., Flint, S.W. (2013). Weight bias and the training of health professionals to better manage obesity: what do we know and what should we do? *Curr Obes Rep, 2*:333–340.

94) Friedman, K.E. et al. (2005). Weight Stigmatization and Ideological beliefs: Relation to Psychological Functioning in Obese Adults. *Obesity*, 13(5):907-916.

95) O'Brien, K.S., Puhl, R.M., Latner, J.D., Mir, A.S., Hunter, J.A. (2010). Reducing anti-fat prejudice in preservice health students: a randomized trial. *Obesity*, 18:2138–214.

96) Phelan, S.M., Burgess D.J., Yeazel, M.W., Hellerstedt, W.L., Griffin, J.M., van Ryn, M. (2015). Impact of weight bias and stigma on quality of care and outcomes for patients with obesity. *Obes Rev*, 16:319–326.

97) Pomeranz, J.L. (2008). A historical analysis of public health, the law, and stigmatized social groups: the need for both obesity and weight bias legislation. *Obes Silver Spring*, 16:93-103.

98) Puhl, R.M., Latner, J.D., O'brien, K.S., Luedicke, J., Danielsdottir, S., et al. (2015). Potential Policies and Laws to Prohibit Weight Discrimination: Public Views from Four Countries. *Milbank* Q, 93:691–731.

99) Robinson, B., Bacon, J., O'Reilly, J. (1993). Fat Phobia: Measuring, Understanding and Changing Anti-Fat Attitudes*. International Journal of Eating Disorders*, 14 (4):467-480.

100) Mold, F. 2011. Patients and professionals experiences and perspectives of obesity in health-care settings: a synthesis of current research. *Health Expectations*, 16 (2)119-142.

101) Vorster, H et al. (2014). Added sugar intake in South Africa: findings from the Adult Prospective Urban and Rural Epidemiology cohort study. *The American Journal of Clinical Nutrition*, 99:1479-86.

102) Bourne, L et al. Where does the black population of South Africa stand on the nutrition transition? *Public Health Nutrition*, 5(1A):157-162.

103) Steyn, N., and Mchiza, Z. (2014). Obesity and the nutrition transition in Sub-Saharan Africa. *Annals of the New York Academy of Sciences*. 1311:88-101.

104) Fenzl, A., and Kiefer, FW. (2014). Brown Adipose tissue and thermogenesis. *Hormone molecular biology and clinical investigation*, July 19(1):25-37.

105) Puhl, R. et al. (2010). Attitudes toward obesity in obese persons: A matched comparison of obese women with and without binge eating. *Eating and weight disorders*, 15(3):173-179.

106) Soto, L., et al. (2014). Beliefs, attitudes and phobias among Mexican medical and psychology students towards people with obesity. *Nutri Hosp*., 30 (1):37-41.

107) Okop, K. et al. (2015). Factors Associated with excessive body fat in men and woman: cross sectional data from black South Africans living in rural community and an urban township. *PLOS one*, 10(10):E0140153.

108) Danielsdottir, S., et al. (2010). Anti-fat prejudice reduction: a review of published studies. *Obesity Facts*, 3:47-58.

109) Bock, C., Diehm, C., Schneider, S. (2012). Physical activity promotion in primary health care: Results from a German physician survey. *European Journal of General Practice*, 18(2):86-91

110) Berryman, D., Dubale, G., Manchester, D., Mittelstaedt, R,. (2006). Dietetics students possess negative attitudes toward obesity similar to nondietetic students. *J Am Diet Assoc*., 106:1678-1682.

111) Diversi, T., Hughes, R.,. Burke, K. (2016). The prevalence and practice of weight bias amongst Australian dietitians. *Obesity science and practice*, 2(4):456-465.

Appendix A

- **A little bit about you…**

a. Todays Date……
b. Profession……
c. Height……
d. Weight……
e. Age……..
f. Sex……..
g. Race/ethnicity……
h. Years of Practice……
i. Estimate % portion of your patients who are overweight or obese……

Fat Phobia Scale

Directions: Listed Below are 14 pairs of adjectives sometimes used to describe obese or fat people. For each adjective pair, please place an X on the line closest to the adjective that you feel best describes your feelings and beliefs.

1. **Lazy** 5 4 3 2 1 **Industrious**
2. **No will power** 5 4 3 2 1 **Has will power**
3. **Attractive** 5 4 3 2 1 **Unattractive**
4. **Good self-control** 5 4 3 2 1 **Poor self-control**
5. **Fast** 5 4 3 2 1 **Slow**
6. **Having endurance** 5 4 3 2 1 **Having no endurance**
7. **Active** 5 4 3 2 1 **Inactive**
8. **Weak** 5 4 3 2 1 **Strong**
9. **Self-indulgent** 5 4 3 2 1 **Self-sacrificing**
10. **Dislikes food** 5 4 3 2 1 **Likes Food**
11. **Shapeless** 5 4 3 2 1 **Shapely**

12. **Undereats** 5 4 3 2 1 **Overeats**
13. **Insecure** 5 4 3 2 1 **Secure**
14. **Low self-esteem** 5 4 3 2 1 **High self-esteem**

The Attitudes Toward Obese Persons Scale

Please mark each statement below in the left margin, according to how much you agree

or disagree with it. Please do not leave any blank. Use the numbers on the following scale

to indicate your response. Be sure to place a minus or plus sign (- or +) beside the

number that you choose to show whether you agree or disagree.

-3 I Strongly Disagree / -2 I Moderately Disagree/ -1 I Slightly Disagree/+1 I Slightly Agree/+2 I Moderately Agree/+3 I Strongly Agree

1. _____ Obese people are as happy as non-obese people.
2. _____ Most obese people feel that they are not as good as other people.
3. _____ Most obese people are more self-conscious than other people.
4. _____ Obese workers cannot be as successful as other workers.
5. _____ Most non-obese people would not want to marry anyone who is obese.
6. _____ Severely obese people are usually untidy.
7. _____ Obese people are usually sociable.
8. _____ Most obese people are not dissatisfied with themselves.
9. _____ Obese people are just as self-confident as other people.
10. _____ Most people feel uncomfortable when they associate with obese people.
11. _____ Obese people are often less aggressive than non-obese people.
12. _____ Most obese people have different personalities than non-obese people.
13. _____ Very few obese people are ashamed of their weight.
14. _____ Most obese people resent normal weight people.
15. _____ Obese people are more emotional than non-obese people.

16. _____ Obese people should not expect to lead normal lives.

17. _____ Obese people are just as healthy as non-obese people.

18. _____ Obese people are just as sexually attractive as non-obese people.

19. _____ Obese people tend to have family problems.

20. _____ One of the worst things that could happen to a person would be for him to become obese.

Attitudes Toward Obese Persons scale (atop)

Step 1: Multiply the response to the following items by -1 (i.e., reverse the direction of scoring):

• Item 2 through Item 6, Item 10 through Item 12, Item 14 through Item 16, Item 19 and Item 20

Step 2: Add up the responses to all items.

Step 3: Add 60 to the value obtained in Step 2. This value is the ATOP score.

Higher numbers indicate more positive attitudes.

Appendix B
Sample Size

		REG_CODE		
BRD_CODE	**REGION**	**BK**	**PT**	**Grand Total**
PPB	EASTERN CAPE	93	324	**417**
	FOREIGN	14	102	**116**
	FREE STATE	69	341	**410**
	GAUTENG	489	2,258	**2,747**
	KWAZULU NATAL	135	890	**1,025**
	LIMPOPO	20	236	**256**
	MPUMALANGA	42	260	**302**
	NORTH WEST	52	192	**244**
	NORTHERN CAPE	16	108	**124**
	WESTERN CAPE	285	1,676	**1,961**
PPB Total		**1,215**	**6,388**	**7,603**

Number of registered Biokinecticists and Physiotherapists with the HPCSA per province (Data courtesy of Health Professions council of South Africa).

Population survey or descriptive study
For simple random sampling, leave design effect and clusters equal to 1.

Population size:	2747
Expected frequency:	50 %
Confidence limits:	5 %
Design effect:	1.0
Clusters:	2

Confidence Level	Cluster Size	Total Sample
80%	**78**	**156**
90%	**123**	**246**
95%	**169**	**338**
97%	**201**	**402**
99%	**267**	**534**
99.9%	**389**	**778**
99.99%	**488**	**976**

Sample Size Calculation.

Appendix C
Ethical Clearance

R14/49 Mr Darrin Jordaan

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M130901

NAME: (Principal Investigator)	Mr Darrin Jordaan
DEPARTMENT:	Centre for Exercise Science and Sports Medicine
PROJECT TITLE:	Biokineticist and Physiotherapist Attitudes in Gauteng towards Overweight and Obese Individuals
DATE CONSIDERED:	27/09/2013
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Mrs Estelle Watson
APPROVED BY:	Professor PE Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	18/11/2013

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**.

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix D
Turnitin report