The Effect of a Herbal Complex as an aid in Weight Loss in Females

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DECLARATION

I declare that this research report is my own, unaided work. It is being submitted for the degree of Magister Technologiae: Homoeopathy at the University of Johannesburg, Johannesburg. It has not been submitted before any degree of examination in any other University.

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ABSTRACT

It is estimated that 59% of South African adult women and 29% of South African adult men are overweight (Department of Health, 2004). Significant risks arise from being overweight including: elevated cholesterol and the development of cardiovascular disease which increases with a greater gain in weight (Duyff, 2006). There is a lack of sufficient evidence supporting the safety and efficacy of many of the herbal weight-loss products currently available thus indicating that more research on herbal products and their efficacy in weight-loss is required (Lenz and Hamilton, 2004).

The aim of this study is to determine the efficacy of a herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum)* as an aid in weight loss in females utilising comparative measurements of the participants' weight, Body Mass Index (BMI), body fat percentage and circumferential measurements of their hips, waist, thighs, upper arms and abdomen.

The study was a quantitative, double blind placebo controlled study. The study involved thirty overweight female participants (BMI 25.5 - 30 kg/m²) between the ages of twenty and thirty five. The participants were recruited by means of advertisement posters placed at the University of Johannesburg, Homoeopathy Health Centre. The participants were randomly divided into two groups of fifteen. One group received the herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum)* and the other group received the placebo. Participants from both groups attended an initial interview where they were screened by means of a questionnaire and physical examination, including the measurement of their height and weight, calculation of their Body Mass Index (BMI) and body fat percentage, as well as the circumferential measurement of their hips, waist, thighs, upper arms and abdomen. Each participant was given a weekly diary and instructed to take fifteen drops of the issued medication three times daily, after meals for the duration of the full eight week study. Participants were examined, weighed, and the measurement of their body circumference and fat percentage were recorded every second week for the duration of the eight week study.

Data from each participant was collected and analysed using repeated measures analysis of variance (ANOVA).

From statistical evaluation, it was determined that the herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum)* was ineffective as an aid in weight loss in females.

To God, my Guides, my Mom and my siblings, Family and dearest friends.

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TABLE OF CONTENTS

APPENDICES **56**

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE
INTRODUCTION

1.1 Problem Statement

The impact of health related disorders associated with being overweight is now considered to be one of the major health threats in the developed world (Bouchard, 2000). Whilst a range of herbal products are promoted for weight loss, many of the products lack sufficient evidence to support their claims of efficacy and safety and more research on their use in weight loss is needed (Lenz and Hamilton, 2004).

According to the South African Demographic and Health survey (SADHS) of 2003, 29% of adult men and 59% of adult women in South Africa are overweight and 8% of adult men and 23% of adult women are obese.

Being overweight significantly increases one's risk of heart disease, stroke, diabetes mellitus, certain types of cancers, osteoarthritis and gallbladder disease. Overweight may also cause other harmful effects such as hypertension, sleep apnoea and may have psychological effects on the individual (Zelkovsky, 2006; Summerfield, 2001; Cure research, 2007; Bouchard, 2000).

Bouchard (2000) reported that approximately 75% of the variation in body fat percentage and total fat mass is determined by lifestyle and culture, whereas 25% can be attributed to genetic factors (Goedecke *et al.*, 2005). Physical inactivity as well as dietary intake high in fat is a major contributing factor to the high prevalence of overweight in the South African population, particularly those individuals residing in the urban areas (Hardman and Stensel, 2003; Goedecke *et al.*, 2005).

Weight gain has also been linked to a decline in metabolic rate associated with aging and is further increased in women experiencing diminishing levels of oestrogen (Moskowitz, 2008). Certain types of medication can also lead to weight gain in women (Klimis-Zacas and Wolinsky, 2004; Wong, 2005; Hopkins, 2006). Overweight is also one of the leading symptoms associated with Cushing's syndrome and hypothyroidism (Nieman, 2009; Goldberg *et al.*, 2002). Eating disorders such as binge eating and nocturnal eating as well as individuals suffering from mental disorders such as anxiety disorders and depression may increase the risk of overweight (Summerfield, 2001).

1.2 Aim of the Study

The aim of this study is to determine the effect of the herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum–graecum)* as an aid in weight loss in females utilizing various bodily measurements, Body Mass Index (BMI) and body fat percentage.

1.3 Hypothesis

It is anticipated that the herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum)* will effect a reduction of weight in kilograms, body fat percentage or body circumference measurements in centimeters in females as compared with those provided with a placebo.

1.4 Objective and Expected Outcome

The objective of the study is to determine the effect of a herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum–graecum)* as an aid in weight loss in females. Comparative measurements of the participants' Body Mass Index (BMI), weight, body fat percentage and circumferential measurements of their hips, waist, thighs, upper arms and abdomen will be utilised to evaluate the effects of the herbal complex. The expected outcome is a more rapid weight loss in the experimental group versus the control group. Ultimately it is anticipated that this formulation will assist overweight patients in weight loss, thereby reducing the risk of health disorders associated with being overweight.

CHAPTER TWO
LITERATURE REVIEW

2.1 Overweight

An individual is described as being overweight if he or she is 20% (BMI 25.5 – 30 kg/m²) over their normal weight for their build, height, age and sex (Zelkovsky, 2006). The more overweight a person is, the higher their risk of developing health problems. (Duyff, 2006).

The international prevalence of overweight was researched by the World Health Organisation (WHO) in 2005, with results revealing that approximately 1.6 billion adults were found to be overweight and 400 million were obese. It was estimated that by the year 2015 the global prevalence of overweight will increase to an estimate of 2.3 billion adults and >700 million adults will be classified as obese (WHO, 2006).

2.1.1 Overweight in South Africa

According to the South African Demographic and Health survey (SADHS) of 2003, 29% of adult men and 59% of adult women in South Africa are overweight and 8% of adult men and 23% of adult women are obese. Furthermore, regarding South Africans between the ages of 25 and 34:

- 29.3% of women are overweight and 25.8% are obese and
- 20.7% of men are overweight and 9.6% are obese (Department of Health, 2004).

The Disease Research Unit of the South African Medical Research Council performed a study estimating the burden of disease attributable to excess body weight in South Africa. Using the WHO Comparative Risk Assessment (CRA) methodology, it was shown that excess body weight was estimated to have caused 36,504 deaths or 7% of all deaths in the year 2000. An overall BMI greater or equivalent to 21kg/m² was attributed to or associated with 87% of type 2 diabetes, 68% of hypertensive disease, 61% of endometrial cancer, 45% of ischaemic stroke, 38% of ischaemic heart disease, 31% of kidney cancer, 24% of osteoarthritis and 17% of colon cancer in the South African adult population 30 years of age or older. This study has highlighted the need to implement and evaluate comprehensive interventions to achieve long lasting change in the determinants and impact of excess body weight (Joubert *et al.*, 2007).

2.1.2 Aetiology of Overweight in Females

2.1.2.1 Lifestyle and Culture

Susceptibility to weight gain is increased in people of traditional culture who adopt Western diets and have low activity levels. The method of food preparation and the importance given to food and eating at social, religious or cultural events may have a lasting influence on individuals' eating habits and food choices (Summerfield, 2001).

The socioeconomic status of a family may also influence the body weight of the family members. The prevalence of weight gain increases amongst people of low socioeconomic levels. Due to their limited income these individuals are unable to purchase foods low in fat including fresh fruit and vegetables and are also unable to gain access to health clubs, gyms and after school sports programs (Summerfield, 2001).

2.1.2.2 Genetic factors

Studies using subjects such as families, adoptees, and twins have indicated that as much as 80% of the variance in Body Mass Index (BMI) may be related to genetic factors; however, overweight is rarely due to isolated genetic causes alone but rather due to the interaction of both genetic and environmental factors (McGarry and Tong, 2006).

It has been reported that individuals identified as having a genetic predisposition to being overweight gained more weight when exposed to an increase in dietary fat content in comparison to control groups with no apparent genetic predisposition to being overweight (Walker, n.d).

Studies have indicated that genetics is attributed to the 20 – 70% of weight differences amongst individuals, and more than 60% of weight gain during middle age is attributed to genetic factors. A major genetic component has also been linked to the amount of weight gain that results from over-eating (Waltham, 2007). Weight gain in genetically predisposed individuals may also be attributed to a lower capacity to oxidize lipids (Walker, n.d).

2.1.2.3 Diet

Diet plays a central role in the maintenance of both weight and health (Ogden, 2003). A diet high in fats is one of the leading causes of overweight (Goedecke *et al.*, 2005). However excessive or crash dieting is also seen as a major cause of weight gain.

An individual's energy is stored so efficiently in adipose tissue that someone of normal weight can survive without any food intake for at least two months. Whenever an individual's body is deprived of food (caused by dieting or even famine) the metabolic rate of the individual decreases in order to compensate for fewer calories and therefore ensuring survival (Goldberg *et al.***,** 2002).

There are many adverse effects to dieting such as the decrease in an individual's metabolism, emaciation of muscle cells, enlargement of adipose cells, an accumulation of toxic fats in surrounding tissue and fatigue. Dieting can accelerate weight gain instead of promoting weight loss. Rapid weight loss increases the risk of heart complications due to muscle loss (Goldberg *et al.***,** 2002).

Amongst the several diets recommended, many have been demonstrated to be ineffective. Only one-half to two-thirds of weight loss in individuals that have participated in 'Low calorie' diets can be maintained in the following year (Walker, n.d).

2.1.2.4 Decline in Metabolic Rate Associated with Ageing

On average, adults gain 0.1 kilogram per meter squared per year between the ages of 20 and 63 years as a result of the age-related decline in the metabolic rate (Tierney *et al.*, 1997). The age-related increase of body weight and fat percentage in women is associated with an increased risk of morbidity and premature mortality as well as a markedly increased risk of non-insulin-dependent diabetes mellitus and coronary artery disease (Van Pelt *et al.*, 1997).

Age-related reductions in energy expenditure are often greater than the reductions of energy intake in women and this results in an increase in women's body weight and fat percentage. A female's Resting Metabolic Rate (RMR), accounts for 60-70% of her daily energy expenditure. The RMR decreases with age and is therefore thought to play an important role in the age-associated increase of body weight (Van Pelt *et al.*, 1997).

2.1.2.5 Diminishing levels of Oestrogen in Ageing Women

The oestrogen levels decreases significantly during and after the climacteric phase of women and this is associated with an increase in weight gain (Moskowitz, 2008). The exact reasoning behind the relationship of decreased levels of oestrogen and weight gain is unknown however the effect of a reduction on oestrogen on the weight of a woman has been demonstrated in several studies. One study demonstrated a direct relationship between low oestrogen levels and weight gain in women (Tibaldi, 2006). Another group of researchers studied the effects of an oestrogen-blocker drug on a group of young women who were instructed not to change their diet or exercise plan throughout the trial. The resting energy expenditure of each woman was measured before and after the trial showing a significant decrease of 100 calories per day in their resting energy expenditure (Tibaldi, 2006).

Adipocytes are able to produce oestrogen. Calories are therefore converted by the body into fat to assist in the supplementary increase of oestrogen levels once the ovaries cease functioning during the menopausal stage of a woman's life (Moskowitz, 2008). As women reach the climacteric phase oestrogen levels decrease and this in turn stimulates the function of adipocytes, thus causing weight gain (Meyer, 2000).

2.1.2.6 Medications

Various medications can cause weight gain in women. These medications include antidepressants, corticosteroids (Klimis-Zacas and Wolinsky, 2004), hormone replacement medication (Wong, 2005) and a range of diabetic medications (Hopkins, 2006).

- **Antidepressants**

  Weight gain is a common side effect associated with antidepressants, mood stabilizers and antipsychotics (Schimelpfening, 2006). Most antidepressant therapies appear to produce a 3-4 kg increase in an individuals' weight within the first 6 to 12 months of treatment, which may be managed with the correct diet plan and an exercise program (Masand and Gupta, 2002). Antidepressants can affect weight in several ways (Riley, n.d). They can cause an increase in appetite, a decrease in the metabolic rate and an increase in the body's resistance to insulin (Klimis-Zacas and Wolinsky, 2004) and they may also effect hormonal changes (Riley, n.d).

  Current studies suggest that long-term use of Selective Serotonin Reuptake Inhibitors (SSRI) such as Prozac, Zoloft, and Paxil, are associated with weight gain (Riley, n.d). According to

various medical literatures, Paxil, Zoloft, Remeron and Muvox appear to cause the most increase in weight gain in individuals; however weight gain is still seen in other classes of antidepressant drugs (Kinosian, 2009).

- **Corticosteroids**

Corticosteroids, otherwise known as steroids, are anti-inflammatory drugs. Corticosteroids include drugs such as Prednisone, Methyprednisone, Prednisolone and Hydrocortisone (most of which contain synthetic forms of cortisone).

These drugs are very effective in the treatment of pain relief and inflammation as may occur as a result of arthritis and rheumatic disease. In some cases the use of these drugs may even be life-saving (Fields, 2002).

However corticosteroids, like all drugs, can cause side effects depending on the prescribed dose. Cortisone is involved in regulating the body's water, sodium and electrolyte balances which ultimately promotes fluid retention and weight gain (Fields, 2002). Corticosteroids promote the deposit of adipose tissue in the midsection of the body as well as the face and cervicodorsal areas whereas the arms and legs become thinner. These medications also reduce the body's ability to absorb glucose (Lallanilla, 2009).

- **Hormone Replacement Medication**

The effect of Hormone Replacement Therapy (HRT) on weight and body fat remains controversial. Many clinical studies indicated that HRT prevented or reduced weight gain and body fat gain although other investigators found just the opposite. (Sumino *et al.*, 2003).

Hormone Replacement Therapy (HRT) involves the administration of a combination of oestrogen and progesterone. It is the Progestin (synthetic versions of progesterone) component that is most often associated with bloating and weight gain. Progesterone promotes fat synthesis and storage. It increases appetite and slows down intestinal transit time. Progesterone can also sometimes decrease insulin sensitivity therefore resulting in a degree of insulin resistance and elevated blood glucose levels. Weight gain may also be noted due to the water and sodium retention caused by the progesterone levels in the HRT (Hormone Replacement Therapy & Weight gain, 2009). Hormone replacement medication which contains oestrogen, may cause fluid retention and an increase in appetite, thus leading to weight gain (Wong, 2005).

- **Diabetic Medication**

Diabetic medication may also cause weight gain. This is a special concern for many people with type 2 diabetes who already are overweight or obese (Hopkins, 2006).

Diabetic medication, such as Insulin, Sulfonylureas and Thiazolidinediones cause a significant increase in weight. Insulin and Sulfonylureas may cause hypoglycaemia which stimulates the appetite and Thiazolidinediones stimulate the storage of fatty acids in adipose cells and can cause fluid retention which increases weight gain (Hopkins, 2006).

Metformin, sold under the trade name Glucophage®, is one of the few anti-diabetic drugs that has not been reported to cause weight gain but has instead been shown to assist non-diabetics in weight loss by reducing hunger (Mirkin, 2008)

2.1.2.7 Cushing's Syndrome

Cushing's syndrome has been noted to cause an increase in appetite and weight gain (Talley and O'Connor, 2001). It is a condition brought about by the hypersecretion of glucocorticoids by the cortex of the adrenal gland due to the over production of the Adrenocorticotropic hormone (ACTH) by the Anterior Pituitary gland. This results in an excessive breakdown and relocation of lipid cells and proteins (Martini, 1998).

One of the most common symptoms of Cushing's syndrome is an increased deposition of adipose tissue usually affecting the areas of the face, neck, trunk and abdomen. The limbs therefore often appear to be thin in relation to the rest of the body. As a result, individuals affected by this syndrome develop a rounded, moon-shaped face (Nieman, 2009).

2.1.2.8 Hypothyroidism

Hypothyroidism is the term used to describe an under-active thyroid which causes an inadequate production of thyroid hormones (Martini, 1998). Symptoms of Hypothyroidism include constipation, sensitivity to cold, fatigue, eczema, headaches and a slow metabolism (Trattler and Jones, 2001).

When the metabolic rate of an individual slows down the body will store rather that eliminate excess calories therefore resulting in an accumulation of adipose cells and weight gain (Goldberg *et al*., 2002).

2.1.2.9 Eating Disorders and Psychological Effects

- **Binge-eating**

Binge eating, previously known as compulsive eating, is classified as an eating disorder and consists of a distinctive pattern of overeating during a discrete period of time (Andersen, 2003) followed by intense feelings of guilt, shame and depression. When eating these individuals feel "out of control" (Summerfield, 2001).

The most common binge foods are dairy, wheat and sweet foods; these contain exorphins, which are chemicals that mimic the action of endorphins in the brain (Holford, 2003).

Binge eating occurs slightly more in women than in men (Summerfield, 2001) because women tend to binge when they are lonely and depressed (Anon, 1996).

Binge-eating disorder occurs in 0.7% - 4% of the adult population and almost half of those who are involved in weight control groups are affected (Summerfield, 2001).

- **Nocturnal eating**

The most common form of night-eating disorders is sleep-related eating disorder and nocturnal-eating syndrome.

Sleep-related eating disorder is an eating disorder in which people binge-eat whilst sleep walking. Some individuals may eat more than once per night, most of whom are overweight women (Summerfield, 2001).

Nocturnal eating syndrome is described as recurrent awakenings associated with an inability to return to sleep without eating. Individuals suffering from this disorder may eat more than half of their daily diet intake after dinner. According to research, 15% of overweight or obese women with binge-eating disorder have nocturnal eating syndrome (Summerfield, 2001).

- **Depression**

Depression is one of the most common psychological disorders in the general population (Andersen, 2003).

Depression is described as a feeling of extreme sadness and despair and can sometimes occur before the onset of binge-eating disorder, and over eating results from attempts to feel better through eating (Summerfield, 2001).

- **Anxiety**

Anxiety is described as a sense of uneasiness and apprehension that can arise in response to a specific event. More than half of individuals suffering from binge-eating disorder have some type of anxiety disorder (Summerfield, 2001).

2.1.2.10 Physical Inactivity

There is some evidence that indicates that physical inactivity may be the major cause for the current rise in the prevalence of overweight.

Inactivity is as important as diet in the aetiology of overweight and is the most important cause of weight gain over time (Hardman and Stensel, 2003).

2.1.3 Harmful Effects of Overweight

Significant health risks arise from being overweight (Duyff, 2006).

2.1.3.1 Heart Disease

People of the overweight population are more likely to develop hypertension, which is one of the leading risk factors for heart disease and stroke, than people who are not overweight (Cure Research, 2007).

Other factors that may contribute to heart disease and that are often linked to overweight are high levels of cholesterol and triglycerides.

Angina and sudden death from heart disease or stroke may also be contributed to overweight (Cure Research, 2007).

There is a 3.3-fold increase of coronary artery disease in women with a BMI greater than 29kg/m² compared to those with a BMI less than 21kg/m² (Bouchard, 2000).

Women with a waist size of more than 76.2 cm and a waist to hip ratio greater than 193.04 are at double the risk of developing heart disease than those with a 'pear shaped' body (Norris, 2008). Abdominal or central adiposity is associated with cardiovascular disease (Griffith, 2007).

A reduction of 10% of a person's body weight can decrease their chance of developing heart disease by increasing the improvement of cardiac function, reducing blood pressure and lowering levels of blood cholesterol and triglycerides (Cure Research, 2007).

Individuals who are lean throughout most of their lives have the lowest risk of developing cardiovascular disease (CVD) and the incidence in this group of people is estimated to be reduced by 25%. For women the optimal BMI for the lowest risk of CVD has been identified as 21.1 kg/m^2 (Summerfield, 2001).

2.1.3.2 Stroke

Stroke is defined as an interruption of blood flow to a local part of the brain resulting in loss in brain function. There are two types of stroke:

- Haemorrhagic stroke, caused by a blood vessel rupture in the brain, and
- Ischemic stroke, the most common type of stroke which is caused by the constriction or blockage of an artery in the brain (Dougherty, 2003).

Studies done by the Columbian researchers indicate that individuals presenting with abdominal obesity are at a higher risk of getting a stroke, especially ischemic stroke (Dougherty, 2003).

A Finnish study demonstrated that the risk for total and ischemic stroke increases in both sexes due to adiposity (Griffith, 2007).

If an individual is able to maintain an optimal weight throughout their lives then their risk of having a stroke can be decreased by 35% (Summerfield, 2001).

2.1.3.3 Hypertension

In adults, mild hypertension is indicated by a systolic blood pressure of 140mm/Hg or higher and a diastolic blood pressure of 90mm/Hg or more, either on their own or combined. If left untreated it will increase the risk of kidney damage, stroke and heart disease (Summerfield, 2001).

A great percentage of hypertensive cases are linked to excess weight.

Studies have indicated that excess body fat as well as excess body weight can increase the risk of developing hypertension (Summerfield, 2001).

Lifestyle is often a great risk for developing hypertension (Ursu, 2009).

The combination of hypertension and overweight leads to a thickening of the heart's ventricular wall and an increase in heart volume. This increases the risk of cardiac failure (Bouchard, 2000).

2.1.3.4 Type 2 Diabetes Mellitus

Type 2 or non-insulin-dependent diabetes mellitus (NIDDM) is a high risk factor associated with overweight in both genders and all races (Bouchard, 2000).

The risk of developing NIDDM increases with the degree and duration of overweight and with a more central distribution of body fat (Bouchard, 2000).

Individuals with a Body Mass Index (BMI) below 24kg/m² have a lower risk of developing diabetes (Bouchard, 2000).

The incidence of type 2 diabetes increases at a BMI that is greater than 25 kg/m² (Summerfield, 2001).

There is some evidence that adipose cells are more resistant to insulin than muscle cells, therefore the higher an individual's fat percentage, the greater the risk of insulin becoming less effective overall. This negatively affects the cells ability to take up circulating glucose and use it for energy stores. (Manzella, 2006).

More than 80% of NIDDM cases can be attributed to overweight (Bouchard, 2000).

Studies have found that losing at least 5-7% of body weight can prevent or slow down the progression of the disease and reduce the risk of early mortality (Manzella, 2006; Summerfield, 2001).

2.1.3.5 Gallbladder Disease

Gallbladder disease is more common if an individual is overweight and the risk of developing gallbladder disease increases with weight gain (Cure Research, 2007). Cholelithiasis is the primary pathology in the hepatobiliary system associated with overweight (Bouchard, 2000).

The epidemiological factors involved in the development of gallbladder disease are described with the old clinical adage "fat, female, fertile, and forty" (Bouchard, 2000).

The risk of developing gallstones increases as a result of an individual's Body Mass Index (BMI) increasing to a level of 30kg/m² or more (Bouchard, 2000).

Cholesterol production is related to a person's body fat percentage and therefore increases in overweight people. Excess cholesterol levels are excreted in the bile which increases the precipitation of cholesterol gallstones within the gallbladder (Bouchard, 2000).

The risk of developing gallstones also increases with rapid weight loss due to the increased flow of cholesterol through the biliary system. Thus incorporating a low fat diet will stimulate gallbladder contraction that will in turn excrete the excess cholesterol reducing the risk of gallstones (Bouchard, 2000).

2.1.3.6 Cancer

Several types of cancer are associated with being overweight. Overweight women may be at risk of developing cancer of the uterus, gallbladder, cervix, ovary, breast and colon. However it is not clear whether the risk of developing certain types of cancer, such as breast or colon cancer, is associated with the extra weight or with a high fat and calorie diet (Cure Research, 2007).

Weight gain in women over the age of 60 significantly increases the risk of developing cancer (Minkin, 2001). Adipose tissue takes up hormones, namely androstenedione from the adrenal glands, and converts them to oestrogen. Oestrogen stimulates the uterus and this constant oestrogen stimulation causes the endometrial lining to grow and increases the risk of cancer. The same applies to breast tissue (Minkin, 2001).

The risk of endometrial cancer is greater in women with a BMI above 28kg/m², especially when there is a great gain in weight between the ages of young adulthood and middle age (Summerfield, 2001).

Women with a BMI of 28kg/m² or more may have a slightly increased risk of developing breast cancer, although the risk is higher in post-menopausal females with increased visceral fat (Summerfield, 2001).

2.1.3.7 Osteoarthritis

Osteoarthritis is characterised by the degeneration and inflammation of the cartilage present in joints (Summerfield, 2001).

An increase in body weight may result in strain on the joints of the legs and back (Zelkovsky, 2006). The stress of excess body weight on the joints of the lower body may cause cartilage to break down (Summerfield, 2001).

The effect of increased weight is greater in females than in males (Bouchard, 2000).

Overweight individuals, even those in their early adulthood, are at a greater risk of developing knee or hip osteoarthritis later in life.

Women with a BMI of 25kg/m² or more who lose at least 5kg may reduce their risk of developing knee osteoarthritis by half later in life (Bouchard, 2000).

Weight loss may lower the risk of developing arthritis as well as reduce the symptoms of pain and disability associated with arthritis (Summerfield, 2001).

2.1.3.8 Sleep Apnea

Sleep apnea is potentially a life threatening condition, characterised by episodes of slowed or stopped breathing whilst sleeping. This condition is caused by the narrowing or obstruction of the trachea (Summerfield, 2001).

It is a serious condition that is closely associated to overweight. The risk for sleep apnea increases with higher body weights (Cure Research, 2007). About half the population with sleep apnea has a BMI greater than 28kg/m². A woman with a neck circumference that exceeds 40cm is considered to be at additional risk of developing sleep apnea (Summerfield, 2001).

Approximately 2% of women are thought to have sleep apnea syndrome (Summerfield, 2001).

2.1.3.9 Psychosocial Effects

Overweight is a stigmatised condition and the psychological effects of being overweight is more evident in women than in men.

Overweight individuals are faced with the disapproval of the public and regardless of whether it is seen in education, employment, social situations or at home, it has psychosocial consequences (Bouchard, 2000).

An overweight or obese individual is associated with negative attributes because it is seen as a self-inflicted state, whereas a slender figured individual generates constant positive associations (Ogden, 2003). Overweight and obesity related discrimination and stigmatism affect the individual's self esteem and body image (Andersen, 2003).

2.1.4 Management of Overweight

A multidisciplinary approach to weight loss is considered the most successful method. It involves the use of a hypo-caloric diet as well as behavior modifications (eating behaviour, exercise and social support), and medications. The use of medications however only offers a short-term solution (Tierney *et al*., 1997).

2.1.4.1 Diet

Weight loss occurs when the body expends more calories than are consumed (Anderson, 2003). Weight loss can therefore be induced by reducing the fat content of a diet by 20%-25%, regardless of the caloric intake (Summerfield, 2001), whilst still ensuring sufficient intake of all of the ingredients required to maintain homeostasis (Martini, 1998).

According to a study investigating the effect of a reduced Glycaemic Index (GI) diet on appetite, energy intake, body weight and body composition in overweight/obese female subjects, it was concluded that there was no evidence to support an effect of a reduced GI diet on weight loss (Sumino *et al.*, 2003).

Recommendations of a good diet and the nature of a good diet have changed dramatically over the years. It is currently believed that a healthy diet should consist of foods consumed in differing proportions, low in fat and should include complex carbohydrates, fruit and vegetables (Ogden, 2003).

Food can be considered in terms of its basic constituents such as carbohydrate, protein, fat and alcohol (Ogden, 2003). A few recommendations to healthy eating have been illustrated:

- At least five or more servings of a wide variety of fruit and vegetables should be eaten per day.
- Complex carbohydrates should be eaten with emphasis on those high in fiber (bread, pasta, cereals and potatoes).
- Moderate, low-fat varieties (and alternatives) of meat and fish should be eaten.
- Milk and dairy products must be eaten in moderation, again choosing the low-fat alternatives.
- Fatty foods and foods high in glucose should be consumed infrequently and in small amounts. (Ogden, 2003).

Healthy eating is important as it impacts on health and can be protective against the development of an illness (Ogden, 2003).

2.1.4.2 Physical Activity

Physical activity plays an important role in weight management and assists in improving an individual's health status (Summerfield, 2001 and Ogden, 2003).

Physical activity can take many forms including structured sports such as tennis and incidental exercise such as stair-climbing (Ogden, 2003).

Exercise assists in the metabolism of stored fat, increases lean body mass and helps the body to maintain a normal metabolic rate. Physical activity is thus very important in the long term management of body weight and body fat composition, perhaps even more important than diet (Summerfield, 2001).

Research has indicated that an increase in physical activity and fitness can result in significant reductions in the risk of disease and mortality associated with weight gain (Ogden, 2003).

2.1.4.3 Conventional Treatment

Surgical therapies are available but should be considered only as a last resort for the treatment of overweight and obesity (Tierney *et al.*, 1997). A number of conventional medications are also

purported to assist in weight loss. The effects of these medications on the body range from a purgative effect on the intestines to appetite suppressants and examples include:

- **Reductil®**

Reductil® was initially prescribed as an antidepressant and it is now used for management of weight (Rosenthal, 2004; Egger, 2003; Snyman, 2008). It is a Serotonin, norepinephrine, and dopamine reuptake inhibitor which promotes satiety and increases energy expenditure.

Efficacy is related to dose and simultaneous diet and behavioural intervention (McGarry and Tong, 2006).

Side effects may include symptoms such as chills, cardiovascular and gastrointestinal disturbances.

Withdrawal symptoms include an increase in the resting systolic and diastolic blood pressure and mean pulse rate (Rosenthal, 2004; Egger, 2003; Snyman, 2008).

- **Xenicol®**

Xenicol® is a purgative which blocks the action of pancreatic lipase resulting in blocked fat digestion and absorption (McGarry and Tong, 2006). It also therefore causes diarrhoea when the fat content in a meal exceeds 20% (Rosenthal, 2004; Egger, 2003; Snyman, 2008).

Efficacy is dose related and a diet 30% in fat must be included for significant weight loss to occur (McGarry and Tong, 2006).

Side effects such as headache, irregular menstrual cycle and fatigue may occur as a result of taking this drug (Rosenthal, 2004; Egger, 2003; Snyman, 2008).

- **Leanor®**

Leanor® is an appetite suppressant.

It may cause side effects such as headaches, heart palpitations, restlessness, insomnia and gastrointestinal disturbances (Rosenthal, 2004; Egger, 2003; Snyman, 2008).

- **Obesan-X®**

Obesan-X® is prescribed as an appetite suppressant.

It may cause side effects such as aplastic anaemia, skin rashes and impaired renal function (Rosenthal, 2004; Egger, 2003; Snyman, 2008).

2.1.4.4 Weight Loss Surgery

Surgeries available for weight loss are types of bariatric surgeries such as Gastric bypass and vertical banded gastroplasty (Summerfield, 2001). Both these procedures impose dietary control and therefore remove the need for the individual to restrict their diet (Ogden, 2003). These are primarily for individuals who are obese and need to lose excessive weight quickly.

Liposuction is a type of cosmetic surgery used by those who are overweight to remove unwanted adipose tissue from specific areas (Summerfield, 2001).

Risks associated with weight loss surgery however are those subjected to the dangers of the surgery and the accompanying problems with anesthetics, and therefore patients must be made aware of the possible side effects (Ogden, 2003).

A drastic weight loss procedure, such as surgery, is usually restricted to individuals whose Body Mass Index (BMI) is 40 kg/m² or more. Because surgery is considered to be an extreme measure of weight loss, it is advised that other weight loss techniques such as behavioral programs and drug therapy should be considered prior to surgery (Summerfield, 2001).

2.2 Homoeopathy

Homoeopathy was developed by German physician Samuel Hahnemann in 1796 (Fior, 2005) and the term is derived from the Greek words *homoios* (similar) and *pathos* (suffering or sickness) (Jollyman, 1999). Homoeopathy has been verified experimentally and clinically over the last two hundred years (Harrison, 2003) and aims to cure in accordance with natural laws of healing (Morgan, 1989).

2.2.1 Homoeopathy in South Africa

2.2.1.1 Training of Homeopathic Practitioners

The Homoeopathic Masters Degree – M.Tech Hom in South Africa is a full-time course which consists of a five year medico-scientific course in classical, clinical, modern and conventional Homoeopathy as well as Homoeopharmaceutics; and ending with a master's research dissertation.

The M.Tech Hom is offered at the University of Johannesburg (UJ) and Durban University of Technology (DUT) (Homoeopathic Association of South Africa, 2007).

2.2.1.2 Statutory Registration

Registration of homoeopaths in South Africa provides homoeopathic practitioners with similar privileges as that of medical practitioners and both are recognised as primary contact professions.

Once the homoeopathic internship has been completed, registration with the Allied Health Professions Council of South Africa (AHPCSA) is a statutory requirement in order to practice as a homoeopathic practitioner in South Africa (Homoeopathic Association of South Africa, 2007).

2.2.1.3 Scope of Practice

In terms of Section 38 of the Allied Health Professions Act, 1982 (Act 63 of 1982), the profession of a homoeopath allows for the necessary physical examination of patients to assist in diagnosing any physical defect, illness or deficiency and thus the homoeopathic practitioner is also entitled to treat or prevent the above with the use of remedies, providing dietary advice or prescribing dietary supplementation according and related to homoeopathic principles (Prinsloo, 2005)

2.2.1.4 Use of Herbals

Homoeopathic medicines make use of natural substances of animal, plant or mineral origin (Sawhney, 2001) and homoeopathy may make use of herbal tinctures in order to address abnormal physiological processes by supporting and promoting the body's natural healing process (Cuellar, 2006).

Herbs are used extensively in many professions for many reasons. Herbal tinctures known as Mother tinctures are used to prepare herbal based homeopathic tinctures. Herbal tinctures are prepared by macerating the herb in order to express its juices and then being left to soak in alcohol. The mother tincture is used to prepare homoeopathic remedies via a process of dilution and dynamisation (Hahnemann, 1833).

2.3.1 The Herbal Complex

The Weight loss tincture investigated in this study is a complex herbal preparation which contains equal parts of *Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum*.

2.3.1.1 *Aloe ferox*

Aloe ferox is part of the *Asphodelaceae* family (Castleman, 2001) and it originates from the Cape Region of South Africa (Bailey, 1939).

Grieve (1998) describes *Aloe ferox* as being one of the safest and best stimulating herbal purgatives whose action is exerted mainly on the large intestine.

The main constituent of *Aloe ferox* is anthrone which increases peristalsis and balances the absorption of water and electrolytes (Van Wyk *et al*., 1997).

According to Ferrell *et al.* (2004), a daily dose of ten to forty drops of *Aloe ferox*, administered three times a day is considered to be safe. Its use is contraindicated during pregnancy (Wu, 2005).

2.3.1.2 *Fucus vesiculosis*

Fucus vesiculosis is part of the *Fucaceae* family (Grieve, 1998). *Fucus vesiculosis* originates from France and is a type of seaweed that has been used for the treatment of obesity since the 17th century (Murray and Pizzorno, 1998).

Its pharmacological action is due to the iodine content which stimulates the thyroid gland, promoting weight loss by increasing the metabolic rate, suppressing appetite and increasing energy levels (Grieve, 1998).

It is rarely used alone but is formulated as a support ingredient in various formulations (Talbott and Hughes, 2007).

According to Newall *et al.* (1996), a daily dose of four to eight milliliters of *Fucus vesiculosis*, administered three times a day is considered to be safe. Amounts in excess of the recommended daily allowance may be toxic and may result in symptoms of hyperthyroidism or hypothyroidism (Nat main index, 2007). Its use is contraindicated in people with diabetes, heart problems and hyperthyroidism (Grieve, 1998).

2.3.1.3 *Taraxacum officinale*

Taraxacum officinale is part of the *Compositae* family (Castleman, 2001) and its country of origin is China (NCCAM, 2006).

The pharmacological action is that of both a choleretic and a cholagogue, and it is used to assist in detoxifying the body. It also acts as a digestive aid (helps to reduce stomach upsets such as flatulence and constipation), has mild laxative effects, is a diuretic and supports the liver and gallbladder function (Ferrell *et al*., 2004).

The herb itself is high in potassium and it therefore counteracts potassium loss, which is a common effect of other diuretics (Castleman, 2001). It is contraindicated in people suffering from an inflamed or infected gallbladder and blocked bile ducts (Armstrong, 2002).

According to Fetrow and Avila (2000), a daily dose of five to ten milliliters of *Taraxacum officinale*, administered three times a day is considered to be safe.

Taraxacum officinale is on the FDA's Generally Recognised as Safe (GRAS) list (Hartford hospital, 2009) with only a few reports of stomach upsets and diarrhoea (NCCAM, 2006).

2.3.1.4 *Trigonella foenum-graecum*

Trigonella foenum-graecum is part of the *Fabaceae* family and is native to the Mediterranean coast of Europe (Balch, 2002).

The main constituent of *Trigonella* is mucilage, a soluble fiber that reduces fat absorption by binding to fatty acids. It also reduces the appetite by creating a sensation of fullness, therefore reducing food cravings (Jalali, 2005).

The use of *Trigonella foenum-graecum* helps to ease digestive tract disorders and assists in the control of both blood glucose levels and the levels of Low Density Lipoprotein (LDL) cholesterol (Balch, 2002).

Studies performed on animals have found *Trigonella foenum-graecum* essentially non-toxic, and no serious adverse effects have been seen in 2-year follow-up of human trials (Hartford hospital, 2009).

According to Fetrow and Avila (2000), a daily dose of thirty to sixty drops of *Trigonella foenum-graecum*, administered three times a day is considered to be safe. Signs of over-use include bruising, headaches and symptoms of hypoglycaemia (Fetrow and Avila, 2000).

CHAPTER THREE
METHODOLOGY

3.1 Research Design and Sampling

This research project was a quantitative, double blind, placebo controlled study which ran over a period of eight weeks. This study included thirty overweight female participants (BMI 25.5 - 30 kg/m²) between the ages of 20 and 35. Participants had an initial consultation at the University of Johannesburg, Homoeopathy Health Centre. Participants had to have had a history of being overweight for at least one year prior to this study and must have been deemed otherwise healthy by the researcher with the use of the Participant profile (Appendix B) and the inclusion criteria.

For the purposes of this study overweight was defined as a Body Mass Index (BMI) of between 25.5 kg/m² and 30 kg/m². If any of the following criteria were met then the volunteer was excluded from the trial and referred to a non-experimental treatment program as required.

3.2 Exclusion Criteria:

- Previous or present diagnosis of renal disease, hepatic disease, cardiac problems, gastrointestinal disease, endocrine disease (hyperthyroidism, hypothyroidism, Cushing's syndrome, phaeochromocytoma, diabetes), pulmonary disorders, haematological problems or cancer.
- A history of classifiable eating disorders such as anorexia nervosa, bulimia nervosa, or binge eating.
- Women who are pregnant or who are breastfeeding.
- Persons who have previously or are currently battling with substance abuse.
- Persons receiving chronic medication.
- Recent (3 months) use of appetite suppressing medication.
- Persons with Cholecystitis.
- Participants on homoeopathic or phytotherapeutic weight loss treatment were required to refrain from using those remedies throughout the study and for a period of two weeks before they were entered into the study.

3.3 Research Procedure

Participants were recruited with the use of poster advertisements which were placed at the University of Johannesburg, Homoeopathy Health Centre. All participants willing to enrol in the study read and signed a Participant Information and Consent form (Appendix A). After signing the consent form, all participants completed a Patient Profile questionnaire (Appendix B) which determined whether the participants were eligible to be enrolled into the study. The researcher then conducted an evaluation on all participants who met the inclusion and exclusion criteria.

At the first consultation, the vital signs as well as the height (metres) and weight (kilograms) of the participants were recorded, the BMI was calculated and recorded (Appendix C) and the body fat percentage measured. The researcher also recorded the participants' body circumference (hips, waist, thighs, upper arms and abdomen) using a tape measure. Each participant was then given a weekly diary (Appendix D) to record food intake. Bottles were given to the participant's containing either the placebo or the medication. Participants were instructed not to alter their present exercise programs.

Follow up consultations were conducted every two weeks, starting one week after the participant commenced with the treatment. Participants were given a weekly checklist to record adherence to the treatment, symptoms experienced and any lifestyle changes (Appendix D). Participants were examined, weighed, had their body fat percentage measured and had the circumferential measurements of their hips, waist, thighs, upper arms and abdomen recorded at each follow up consultation (Appendix E) with the researcher.

3.4 Reliability and Validity Measures

The manufacturer marked each placebo bottle with a numerical code and each bottle of medicine with another code. In order to ensure randomisation, each group of participants were randomly allocated a number and received bottles with the corresponding number.

The researcher was not made aware of which number belongs to which group until the final participant had completed the final course of medication.

3.4.1 Electronic Calibrated Scale

The same electronic calibrated scale was used to measure the weight of all participants in kilograms and participants were weighed wearing only their undergarments to ensure accurate readings at each consultation.

3.4.2 Measuring Tape

The same standard tape measure was used on all participants to record circumferential measurements in centimetres of their hips (widest part), waist (narrowest part), thighs (midway of the patella and inguinal fold) upper arms (widest area of the related upper arm) and abdomen (widest part).

3.4.3 Bioelectrical Impedance Analysis (BIA)

The QuadScan 4000 is a device manufactured by Bodystat® which uses Bioelectrical Impedance Analysis (BIA) technology to analyse body composition. It is sold internationally for use by health care professionals as a standard analysis for general preventative health checks.

The same QuadScan 4000 was used on all participants to estimate and record their fat percentage at each follow up consultation throughout the study. All participants were asked to empty their bladder prior to commencement of their fat percentage measurement. All participants were placed in the supine position and the self-adhesive disposable electrodes were placed on the dorsal area of their right hand and right foot. For accurate and reproducible results all participants were asked to fast 4-5 hours prior to the test, to refrain from any physical exercise 12 hours prior to the test and to not consume any form of alcohol or caffeine 24 hours before each consultation.

3.5 Medication Administration

Both groups of participants were required to take a safe but potentially therapeutic regimen of fifteen drops of the medicine three times a day, after meals, for the duration of the full eight weeks of the study.

Both the placebo and Herbal complex were administered in identical 50ml amber glass bottles with a number assigned to each bottle. The placebo consisted of twenty percent alcohol.

3.6 Data Collection and Analysis

Two questionnaires were used for the collection and analysis of data. The Participant Profile (Appendix B) was used to obtain participant information and past medical history. The Follow Up Consultation Form (Appendix E) was used to record changes in measurements. The information was collected throughout the course of the study and analysed to compare the results of the two groups. Comparisons were made between the groups using repeated measures ANOVA (Analysis of Variance) (Hardy, 2008).

3.7 Ethics

This study was approved by the University of Johannesburg's Higher Degrees Committee. The Ethics Clearance Number is AEC40/08 (Appendix G). No names were linked to data in either the control group or the study group. Participant anonymity has thus been ensured.

In order to participate in the study group the participants were requested to sign a Participant Information and Consent Form (Appendix A) once all aspects of the study were explained to the satisfaction of the participant. The completion of the consent form and participation in the study was voluntary. Participants were made aware of their right to stop participation in the study at any time for whatever reason. The supervisor, the researcher and the participants reserved the right to stop the study at any point if it was believed that participation in the study was in any way detrimental to the health of the participants. There were no anticipated side effects of the Herbal tincture. The final results of the study will be made available for any participant to view upon request.

All of the above is in accordance with the Department of Health's Guidelines for Ethics in Health Research (2006).

CHAPTER FOUR
RESULTS

4.1 Introduction to Results

This chapter provides the results of the various analyses conducted in order to describe the effect of the Herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum*) as an aid for weight loss in females, determined by comparative measurements of the participants' Body Mass Index (BMI), weight, body fat percentage and circumferential measurements of their hips, waist, thighs, upper arms and abdomen.

The follow up consultation form (Appendix E) gathered data pertaining to the changes in measurements, which was collected throughout the course of the study and analysed to compare the results between the experimental and control group.

4.2 Initial Description

The following are specific descriptive values used in analysing the research results:

- "n" indicates the number of participants used in each analysis.
- The 'mean' – this is the average taken from the results.
- The 'median' – this marks the midpoint in a series of numbers or figures.
- 'Standard deviation' – a measure of the variability of the data about the mean, it indicates how tightly all the various examples are clustered around the mean in a set of data.
- 'P-value' (sig) – this indicates statistical significance. If a p-value is greater or equal to 0.05 then it indicates that there are no differences between the control and experimental group therefore if the p-value is less than 0.05 there are differences between the control and experimental group.

Comparisons were made between the groups using repeated measures ANOVA (Analysis of Variance) with techniques such as the Friedman Analysis of Variance, Mann-Whitney U test and the Wilcoxon Signed-Rank test.

4.2.1 Group Frequency

Fifteen participants were recruited to participate in the experimental group and fifteen were recruited for the control group. The completion rate for both groups was 100% and 100% of the participants attended all the required consultations (Table 4.0) Participants who took part in the study were chosen according to the inclusion criteria as stipulated in 2.2.

Table 4.0: frequency and percent of groups

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Control	15	50.0	50.0	50.0
	Experiment	15	50.0	50.0	100.0
	Total	30	100.0	100.0	

4.2.2 Age Frequency

Participants between the ages of 20 and 35 were recruited as mentioned in 3.1. The overall mean age of the participants of both groups was 25.67 and the median age was 26 years. Table 4.1 demonstrates that the mean age in the control group was 25.73 and 25.60 in the experimental group. Table 4.1 also illustrates the standard deviation (Std. Deviation) of the mean age, and the number of participants (N) who were present at the consultation in each week.

Table 4.1: Age Statistics

	Group	N	Mean	Std. Deviation	Std. Error Mean
Age	Control	15	25.73	3.240	0.836
	Experiment	15	25.60	4.778	1.234

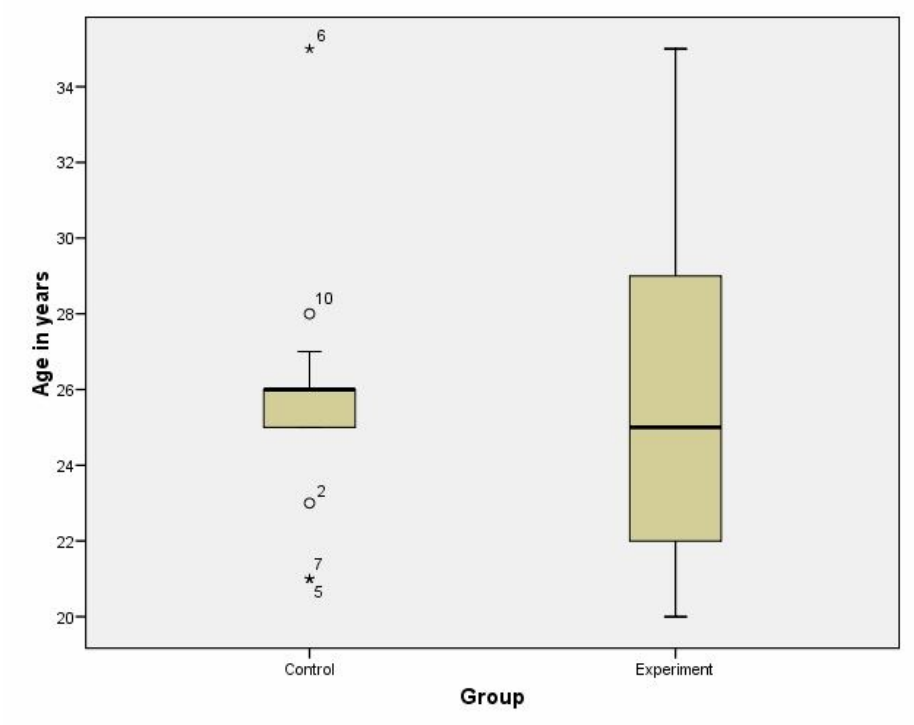

Figure 4.0: Age normality chart

4.2.3 Body Mass Index (BMI) Statistics

The following table illustrates the mean BMI (body mass index) values recorded throughout the eight week trial, of both the control and experimental group. Table 4.2 also illustrates the standard deviation (Std. Deviation) of the mean BMI, and the number of participants (N) who were present at the consultation in each week.

Table 4.2: BMI values over the eight week trial

		N		Mean	Std. Deviation
		Valid	Missing		
BMI - Week 1	control	15	0	26.57	1.651
	experiment	15	0	27.73	1.695
	TOTAL	**30**	**0**	**27.150**	**1.7461**
BMI - Week 2	control	15	0	26.42	1.782
	experiment	15	0	27.50	1.834
	TOTAL	**30**	**0**	**26.9593**	**1.85911**
BMI - Week 4	control	15	0	26.26	1.888
	experiment	15	0	27.39	1.831
	TOTAL	**30**	**0**	**26.8230**	**1.91634**
BMI - Week 6	control	15	0	26.48	1.9780
	experiment	15	0	27.55	1.9090
	TOTAL	**30**	**0**	**27.015**	**1.9871**
BMI - Week 8	control	15	0	26.25	1.796
	experiment	15	0	27.41	1.901
	TOTAL	**30**	**0**	**26.831**	**1.9093**

Table 4.3: BMI measurement test statistics

Control	N	15
	Chi-Square	8.049
	df	4
	Asymp. Sig.	0.09
Experiment	N	15
	Chi-Square	8.239
	df	4
	Asymp. Sig.	0.083

Both groups showed no statistical change in BMI. This is illustrated in Table 4.3 where the p-value (Asymp. Sig) is not less than 0.05 therefore indicating that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) did not have a direct effect on BMI reduction in the experiment group.

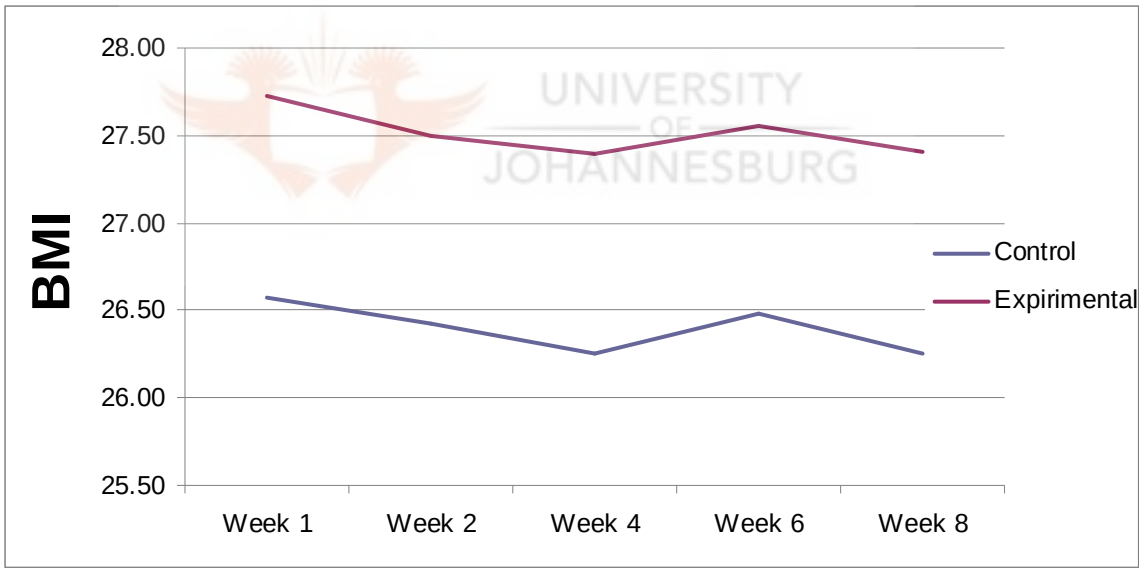

Figure 4.1: BMI readings throughout the eight week trial

4.2.4 Weight Statistics

The following table illustrates the mean weight values (mean (kg)) recorded throughout the eight week trial of both the control and experimental group. Table 4.4 also illustrates the standard deviation (Std. Deviation) of the mean weight, and the number of participants (N) who were present at the consultation in each week.

Table 4.4 Weight over the eight week trial

		N		Mean (kg)	Std. Deviation
		Valid	Missing		
Weight (kg) - Week 1	control	15	0	71.00	9.128
	experiment	15	0	74.90	6.440
	TOTAL	**30**	**0**	**72.95**	**8.011**
Weight (kg) - Week 2	control	15	0	70.570	9.2150
	experiment	15	0	74.310	7.0060
	TOTAL	**30**	**0**	**72.440**	**8.2659**
Weight (kg) - Week 4	control	15	0	70.17	9.554
	experiment	15	0	73.97	6.924
	TOTAL	**30**	**0**	**72.07**	**8.423**
Weight (kg) - Week 6	control	15	0	70.80	9.533
	experiment	15	0	74.38	6.845
	TOTAL	**30**	**0**	**72.59**	**8.255**
Weight (kg) - Week 8	control	15	0	70.13	9.147
	experiment	15	0	74.00	7.013
	TOTAL	**30**	**0**	**72.07**	**8.246**

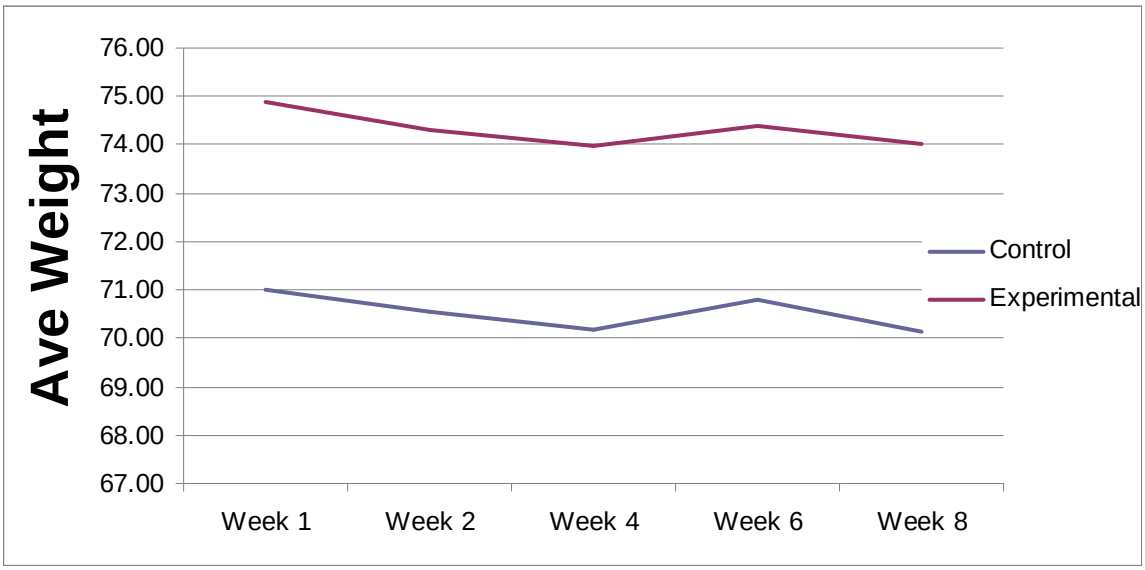

Figure 4.2: Weight readings throughout the eight week trial

4.2.5 Fat Percentage Statistics

The following table illustrates the body fat percentage (Body fat %) values (mean (%)) recorded throughout the eight week trial of both the control and experimental group. Table 4.5 also illustrates the standard deviation (Std. Deviation) of the mean body fat percentage and the number (N) of participants who were present at the consultation in each week.

Table 4.5: Fat percentage values over the eight week trial

		N		Mean (%)	Std. Deviation
		Valid	Missing		
Body fat% - Week1	control	15	0	32.910	4.1930
	experiment	15	0	34.430	5.5830
	TOTAL	**30**	**0**	**33.670**	**4.9134**
Body fat% - Week 2	control	15	0	32.430	3.8900
	experiment	15	0	33.580	5.2960
	TOTAL	**30**	**0**	**33.007**	**4.6027**
Body fat% - Week 4	control	15	0	32.23	4.071
	experiment	15	0	33.23	5.084
	TOTAL	**30**	**0**	**32.73**	**4.554**
Body fat% - Week 6	control	15	0	32.670	4.3510
	experiment	15	0	32.590	4.7770
	TOTAL	**30**	**0**	**32.627**	**4.4898**
Body fat% - Week 8	control	15	0	32.95	4.002
	experiment	15	0	32.07	4.186
	TOTAL	**30**	**0**	**32.51**	**4.049**

Table 4.6: Body fat percentage test statistics

Control	N	15
	Chi-Square	4.176
	df	4
	Asymp. Sig.	0.383
Experiment	N	15
	Chi-Square	18.635
	df	4
	Asymp. Sig.	0.001

The experiment group showed a statistical change, therefore there was a marked improvement in body fat percentage readings indicating that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) did have a direct effect on body fat percentage reduction in the experiment group. This is illustrated in Table 4.6 where the p-value (Asymp. Sig) is less than 0.05.

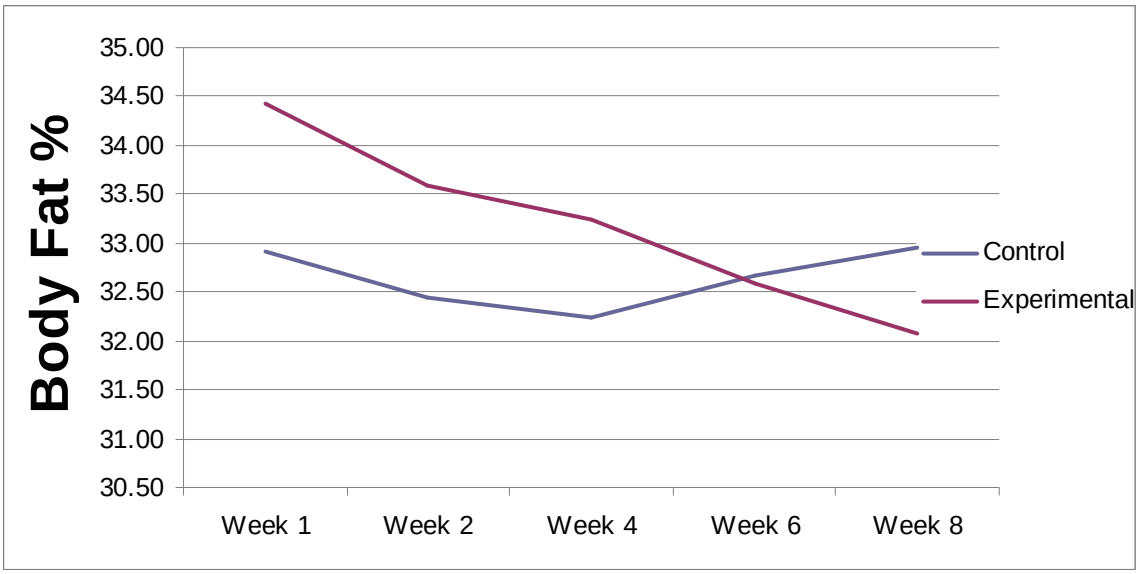

Figure 4.3 Body fat percentage readings throughout the eight week trial

4.2.6 Hip Measurement Statistics

The following table illustrates the mean hip measurement values (cm) recorded throughout the eight week trial, of both the control and experimental group. Table 4.7 also illustrates the standard deviation (Std. Deviation) of the mean hip measurements and the number of participants (N) who were present at the consultation in each week.

Table 4.7: Hip measurements over the eight week trial

		N		Mean (cm)	Std. Deviation
		Valid	Missing		
Hips (cm) - Week 1	control	15	0	107.09	5.992
	experiment	15	0	111.00	7.286
	TOTAL	**30**	**0**	**109.04**	**6.850**
Hips (cm) - Week 2	control	15	0	107.990	5.9480
	experiment	15	0	110.050	6.5580
	TOTAL	**30**	**0**	**109.020**	**6.2408**
Hips (cm) - Week 4	control	15	0	106.61	6.778
	experiment	15	0	109.91	7.496
	TOTAL	**30**	**0**	**108.26**	**7.220**
Hips (cm) - Week 6	control	15	0	106.350	6.5010
	experiment	15	0	109.770	7.7320
	TOTAL	**30**	**0**	**108.057**	**7.2308**
Hips (cm) - Week 8	control	15	0	106.20	6.491
	experiment	15	0	109.59	7.618
	TOTAL	**30**	**0**	**107.90**	**7.165**

Table 4.8: Hip measurement test statistics

Control	N	15
	Chi-Square	8.697
	df	4
	Asymp. Sig.	0.069
Experiment	N	15
	Chi-Square	7.626
	df	4
	Asymp. Sig.	0.106

Both groups showed no statistical change in the Hip measurements. This is illustrated in Table 4.8 where the p-value (Asymp. Sig) is not less than 0.05 therefore indicating that the Herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum*) did not have a direct effect on Hip measurement reduction in the experiment group.

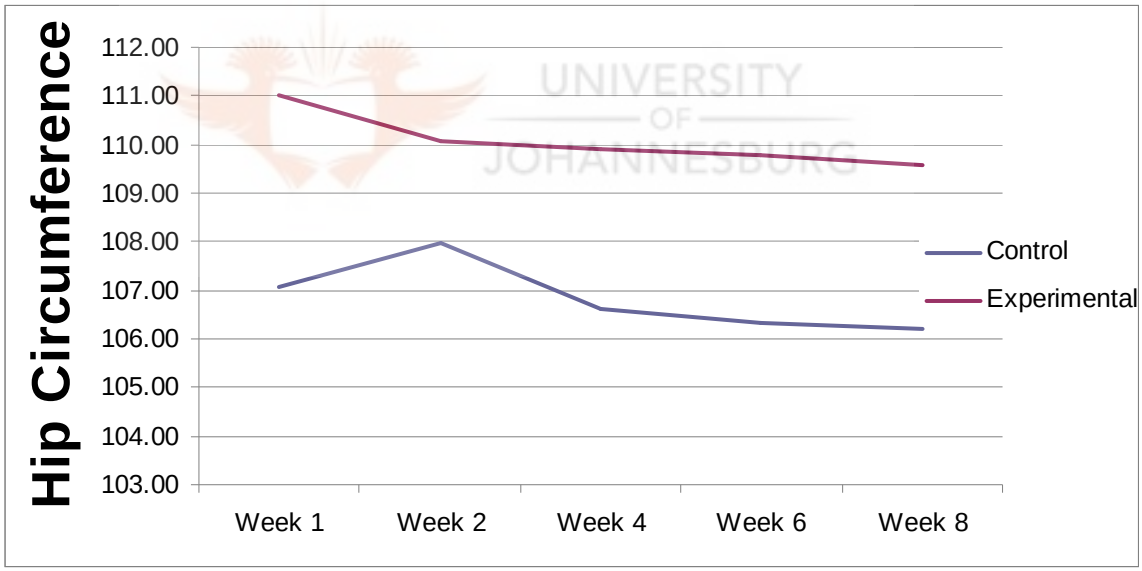

Figure 4.4: Hip measurements throughout the eight week trial

4.2.7 Waist Measurement Statistics

The following table illustrates the mean waist measurements (cm) recorded throughout the eight week trial, of both the control and experimental group. Table 4.9 also illustrates the standard deviation (Std. Deviation) of the mean waist measurements and the number of participants (N) who were present at the consultation in each week.

Table 4.9: Waist measurements over the eight week trial

		N		Mean	Std. Deviation
		Valid	Missing		
Waist (cm) - Week 1	control	15	0	93.42	8.590
	experiment	15	0	97.69	5.263
	TOTAL	**30**	**0**	**95.56**	**7.329**
Waist (cm) - Week 2	control	15	0	93.68	7.830
	experiment	15	0	96.50	5.693
	TOTAL	**30**	**0**	**95.09**	**6.878**
Waist (cm) - Week 4	control	15	0	92.61	7.930
	experiment	15	0	95.67	5.811
	TOTAL	**30**	**0**	**94.14**	**7.007**
Waist (cm) - Week 6	control	15	0	92.660	7.7690
	experiment	15	0	94.680	5.6950
	TOTAL	**30**	**0**	**93.670**	**6.7713**
Waist (cm) - Week 8	control	15	0	92.03	7.575
	experiment	15	0	95.37	5.814
	TOTAL	**30**	**0**	**93.70**	**6.848**

Table 4.10: Waist measurement test statistics

Control	N	15
	Chi-Square	3.189
	df	4
	Asymp. Sig.	0.527
Experiment	N	15
	Chi-Square	9.268
	df	4
	Asymp. Sig.	0.055

Both groups showed no statistical change, therefore indicating that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) did not have a direct effect on mean Waist measurement reduction in the experiment group.

This is illustrated in Table 4.10 where the p-value (Asymp. Sig) is not less than 0.05.

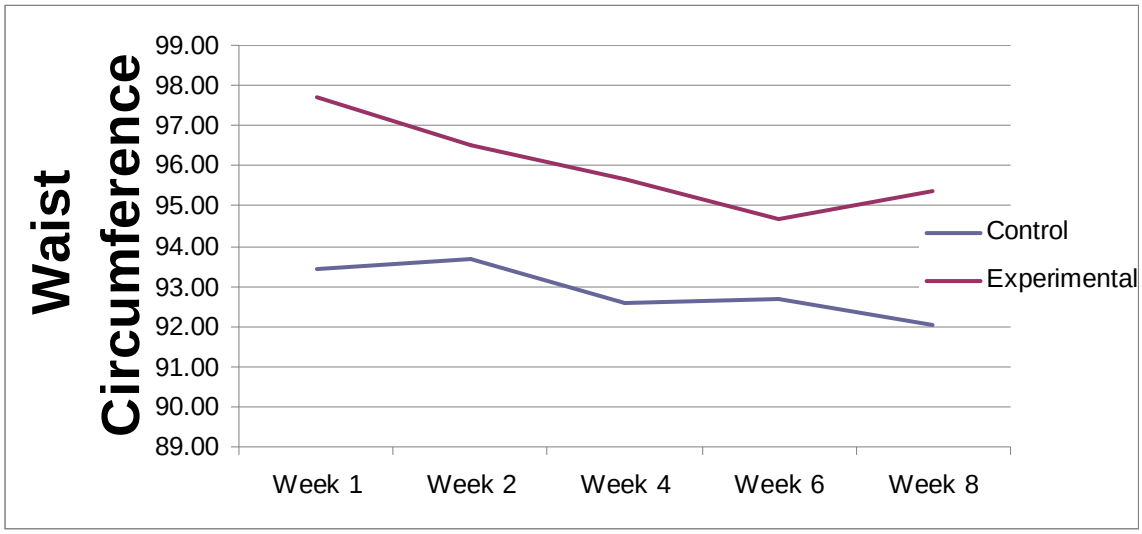

Figure 4.5: Waist measurements throughout the eight week trial

4.2.8 Thigh Measurement Statistics

The following table illustrates the mean thigh measurements (cm) recorded throughout the eight week trial, of both the control and experimental group. Table 4.11 also illustrates the standard deviation (Std. Deviation) of the mean thigh measurements and the number of participants (N) who were present at the consultation in each week.

Table 4.11: Thigh measurements over the eight week trial

		N		Mean (cm)	Std. Deviation
		Valid	Missing		
Mean_Thighs Week 1	control	15	0	63.3200	5.13700
	experiment	15	0	64.5300	3.16100
	Total	**30**	**0**	**63.9250**	**4.23590**
Mean_Thighs Week 2	control	15	0	63.6700	4.73100
	experiment	15	0	64.3200	3.17000
	Total	**30**	**0**	**63.9967**	**3.96184**
Mean_Thighs Week 4	control	15	0	63.2700	4.49300
	experiment	15	0	61.4500	9.01400
	Total	**30**	**0**	**62.3600**	**7.05915**
Mean_Thighs Week 6	control	15	0	62.6000	4.45500
	experiment	15	0	64.3300	3.46700
	Total	**30**	**0**	**63.4633**	**4.01935**
Mean_Thighs Week 8	control	15	0	61.5900	3.84500
	experiment	15	0	63.2100	3.59400
	Total	**30**	**0**	**62.4033**	**3.74835**

Table 4.12: Mean Thigh measurement test statistics

Control	N	15
	Chi-Square	21.436
	df	4
	Asymp. Sig.	0
Experiment	N	15
	Chi-Square	4.455
	df	4
	Asymp. Sig.	0.348

The control group showed a statistical change in Mean thigh measurements as illustrated in Table 4.12 with a p-value (Asymp. Sig) smaller than 0.05 however there was no significant difference in the groups individuality indicating that the Herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum*) did not have a direct effect on Thigh measurement reduction in the experiment group.

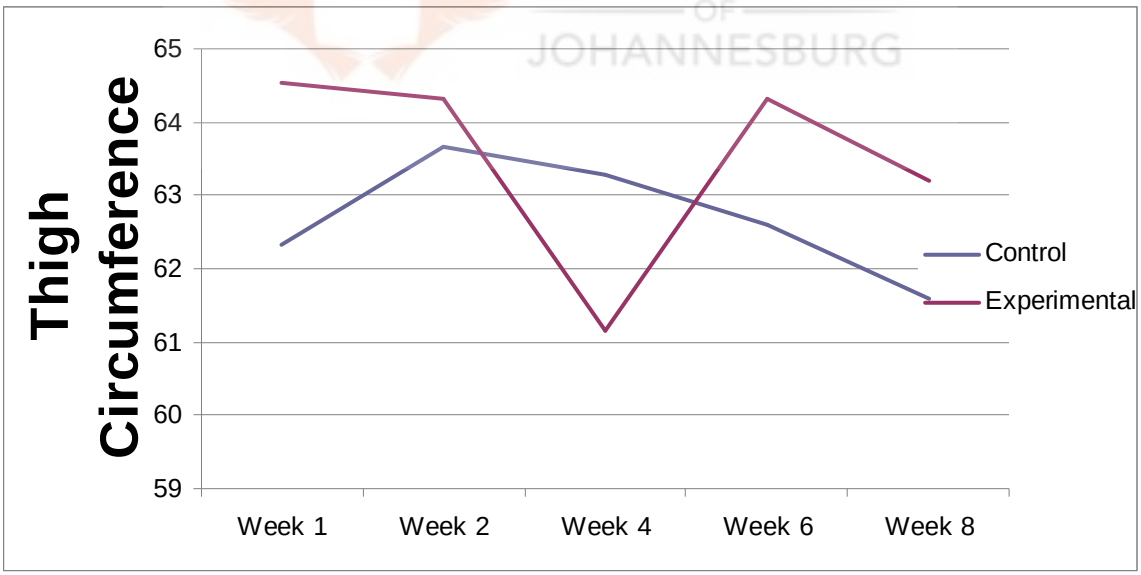

Figure 4.6: Thigh measurements throughout the eight week trial

4.2.9 Upper Arm Measurement Statistics

The following table illustrates the mean upper arm measurement values (cm) recorded throughout the eight week trial, of both the control and experimental group. Table 4.13 also illustrates the standard deviation (Std. Deviation) of the mean upper arm measurements of the number of participants (N) who were present at the consultation in each week.

Table 4.13: Upper arm measurements over the eight week trial

		N		Mean (cm)	Std. Deviation
		Valid	Missing		
Mean_UpperArms Week 1	control	15	0	31.63	2.45900
	experiment	15	0	33.07	2.44000
	TOTAL	**30**	**0**	**30.50**	**2.66243**
Mean_UpperArms Week 2	control	15	0	32.03	2.30800
	experiment	15	0	33.45	2.78600
	TOTAL	**30**	**0**	**31.00**	**2.61483**
Mean_UpperArms Week 4	control	15	0	31.97	1.99700
	experiment	15	0	33.40	2.34600
	TOTAL	**30**	**0**	**29.50**	**2.26114**
Mean_UpperArms Week 6	control	15	0	31.62	1.77100
	experiment	15	0	33.80	2.35000
	TOTAL	**30**	**0**	**31.00**	**2.32759**
Mean_UpperArms Week 8	control	15	0	31.47	1.90600
	experiment	15	0	33.22	2.502
	TOTAL	**30**	**0**	**30.00**	**2.35983**

Table 4.14: Mean Upper arm Measurement test statistics

Control	N	15
	Chi-Square	7.797
	df	4
	Asymp. Sig.	0.099
Experiment	N	15
	Chi-Square	6.068
	df	4
	Asymp. Sig.	0.194

Both groups showed no statistical change in the mean Upper arm measurements, indicating that the Herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum*) did not have a direct effect on Upper arm measurement reduction in the experiment group. This is illustrated in Table 4.14 where the p-value (Asymp. Sig) is not less than 0.05 therefore

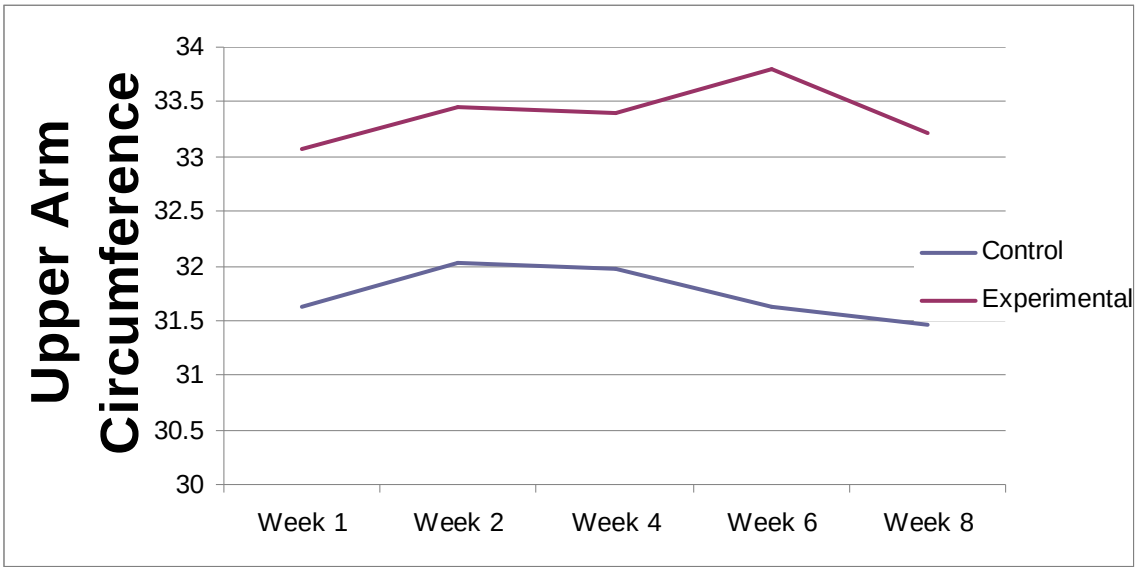

Figure 4.7: Mean Upper arm measurements throughout the eight week trial

4.2.10 Abdomen Measurement Statistics

The following table illustrates the mean abdominal measurement values (cm) recorded throughout the eight week trial, of both the control and experimental group. Table 4.15 also illustrates the standard deviation (Std. Deviation) of mean abdominal measurements and the number of participants (N) who were present at the consultation in each week.

Table 4.15: Abdominal measurements over the eight week trial

		N		Mean (cm)	Std. Deviation
		Valid	Missing		
Abdomen (cm) - Week 1	control	15	0	87.81	6.775
	experiment	15	0	93.68	6.791
	TOTAL	**30**	**0**	**90.74**	**7.304**
Abdomen (cm) - Week 2	control	15	0	88.33	7.375
	experiment	15	0	91.37	6.388
	TOTAL	**30**	**0**	**89.85**	**6.954**
Abdomen (cm) - Week 4	control	15	0	86.37	8.417
	experiment	15	0	91.55	6.930
	TOTAL	**30**	**0**	**88.96**	**8.021**
Abdomen (cm) - Week 6	control	15	0	87.00	8.426
	experiment	15	0	90.93	7.552
	TOTAL	**30**	**0**	**88.97**	**8.112**
Abdomen (cm) - Week 8	control	15	0	87.75	8.262
	experiment	15	0	91.83	7.566
	TOTAL	**30**	**0**	**89.79**	**8.056**

Table 4.16: Abdominal measurement test statistics

Control	N	15
	Chi-Square	7.314
	df	4
	Asymp. Sig.	0.12
Experiment	N	15
	Chi-Square	12.61
	df	4
	Asymp. Sig.	0.013

The experiment group showed a statistical change in abdominal measurements. This is illustrated in Table 4.16 where the p-value (Asymp. Sig) is less than 0.05, indicating that the Herbal complex (*Aloe ferox*, *Fucus vesiculosis*, *Taraxacum officinale* and *Trigonella foenum– graecum*) did have a direct effect on abdominal size reduction in the experiment group.

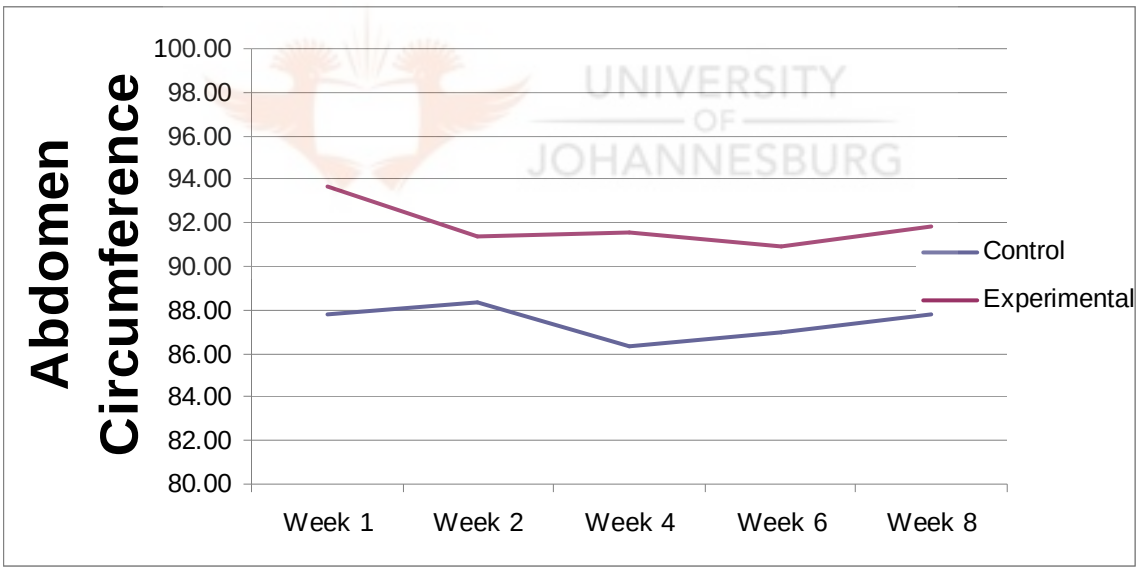

Figure 4.8: Abdominal measurements throughout the eight week trial

4.2.11 Dose Frequency

Participants were requested to take 15 drops (gtt) of the placebo or herbal complex three times a day after meals for the full extent of the eight week trial as discussed in 3.5. Therefore if the recommended daily dose was administered, 315gtt would have been consumed by the end of each week and 2529gtt in total. As shown in Table 4.17, the control group took a mean total of 2287gtt and the experimental group took a mean total of 2262gtt.

Table 4.17: Dose frequency

GROUP	WEEK	Mean Gtt
CONTROL	Week 1	266
	Week 2	307
	Week 3	277
	Week 4	290
	Week 5	290
	Week 6	290
	Week 7	281
	Week 8	286
	TOTAL	**2287**
EXPERIMENT	Week 1	277
	Week 2	291
	Week 3	291
	Week 4	286
	Week 5	264
	Week 6	289
	Week 7	265
	Week 8	299
	TOTAL	**2262**

CHAPTER FIVE
DISCUSSION OF THE RESULTS

5.1 Introduction

Thirty female participants between the ages of 20 and 35 were recruited for the trial and were randomly divided into a control and experimental group. Both the control and experimental group consisted of 15 participants.

The only results that showed a significant change during the eight weeks were the abdominal measurements and the body fat percentage of the experimental group.

All participants were requested not to change their eating plan and exercise routine. The diet regime and exercise programme of the participants was thus not the same across each group.

5.2 Group Frequency

There was a 100% attendance rate amongst all thirty participants throughout the eight week trial as indicated in 4.2.1 which contributes to the reliability of the results.

5.3 Age Frequency

Participants between the ages of 20 and 35 were recruited. The reason for ensuring that all women were between the ages of twenty and thirty five years was to minimise the effects that age has on the metabolism. As discussed in 2.1.2.4, older women are known to have a slower metabolism than younger women. The mean age of both the control and experimental group was 25.67 and the median age was 26 years. The oldest of the participants was 35 years and the youngest participant was 20 years of age, as mentioned in 4.2.2.

5.4 Body Mass Index (BMI) Statistics

Overweight participants with a BMI of 25.5 – 30 kg/m² were recruited as stipulated in 3.1.
Both control and experimental group showed a 0.32 kg/m² decline in BMI from week one to week eight of the trial period (Table 4.2).

This indicates that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) had no statistically significant effect on BMI reduction when compared to the BMI results of the control group.

5.5 Weight Statistics

The weight (kg) of all 30 participants was measured at the initial consultation and at each follow up thereafter for the duration of the trial. The mean weight of the 30 participants at the initial consultation was 72.95 kg. Weight reduction was slight but consistent and the mean weight at the end of week four was 72.07kg. However at the end of week six the mean weight increased to 72.59 kg and then dropped again slightly in week eight to 72.07kg (Table 4.4).

The mean weight measurement results showed no statistical significance in either group. Comparing the measurements of week one and eight the control group showed a mean decrease of 0.87kg and the experimental group showed a mean decrease of 0.9kg in the weight measurements.

This indicates that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) did not have an effect on weight reduction when compared to the placebo group.

5.6 Fat Percentage Statistics

A statistically significant loss in mean body fat percentage was recorded in the experimental group when compared to that of the control group (4.2.5).

When comparing the body fat percentage in week one to the results recorded in week eight the experimental group showed a mean body fat percentage decrease of 2.36% and the control group showed a 0.04% increase of their mean body fat percentage.

This indicates that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) had an effect on reducing body fat percentage when compared to that of the control group.

5.7 Hip Measurement Statistics

While there was a decrease in the mean hip size recorded for the experimental group, it was not statistically significant when compared to a decrease of the hip size measurements of the control group.

There was a 0.89cm decrease in mean hip size in the control group, and the experimental group's loss in mean hip size was 1.41cm (Table 4.7).

This indicates that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) did not have a greater effect on hip size reduction when compared to that of the placebo group.

5.8 Waist Measurement Statistics

There was a decrease in the mean waist size in the experimental group; however it was not statistically significant when compared to the decrease of waist size in the control group.

There was a 1.39cm decrease in mean waist size in the control group, and the experimental group's loss in mean waist size was 2.32cm (Table 4.9).

This indicates that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) had a greater effect on waist size reduction than the placebo.

5.9 Thigh Measurement Statistics

The mean thigh measurement results showed no statistical significance in either group. When comparing the thigh measurements of week one to week eight the control group showed a mean decrease of 1.8cm and the experimental group showed a mean decrease of 1.32cm (Table 4.11).

This indicates that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) did not have an effect on thigh size reduction when compared to that of the control group.

5.10 Upper Arm Measurement Statistics

There was a loss in the mean upper arm measurement recorded in the control group of 0.16cm from the first to the eighth week of the trial , but this holds no significant value when compared with the mean upper arm results of the experimental group which increased by 0.15cm (Table 4.13).

This indicates that the Herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) had no greater effect on upper arm size reduction than the placebo.

5.11 Abdomen Measurement Statistics

These results showed a statistically significant loss in mean abdominal circumferential measurements in the experimental group when compared to that of the control group.

When comparing the mean abdominal size in week one to the measurements recorded in week eight the experimental group showed a mean abdominal size decrease of 1.85cm whilst the control group only showed a loss of 0.06cm (Table 4.15).

5.12 Dose Frequency

Participants were advised to take a recommended daily dose of 15 drops three times a day as illustrated in 3.5. If participants adhered to the recommended daily dose then the total of drops administered at the end of each week is 315 and a grand total of 2529 drops should have been taken at the end of the full eight week trial. As shown in 4.2.11 the control group took a mean total of 2287 drops of their placebo medication and the experimental group took a mean total of 2262 drops of the herbal complex. The control group therefore took 90.43% of their recommended dose throughout the trial and the experimental group completed 89.44% of the recommended dose. This compliance in dose amount in the experimental group can be attributed to the poor taste of the herbal formula and the frequency that it needed to be taken.

5.13 Summary

Even though neither group showed a significant weight reduction during the trial, the decrease in fat percentage could be attributed to the combined loss in centimeters recorded in the experimental group's abdominal, hips, and waist and thigh measurements.

Fat percentage readings using the Quadscan (3.4.3) may have been affected by hydration levels, food intake, skin temperature and other factors affected by the participants non compliance to the protocol that needed to be followed prior to having their body fat percentage measured (3.4.3).

The herbal complex consisted of four different herbal ingredients in equal parts, two of which (*Aloe ferox* and *Taraxicum officinale*) acted solely as a purgative and digestive aid (2.3.1.1; 2.3.1.3) which may have attributed to the significant reduction of abdominal size in the experimental group.

Aloe ferox is a purgative who's action is exerted mainly on the large intestine (2.3.1.1) and *Taraxicum officinale* acts as a digestive aid in reducing constipation and abdominal bloating (2.3.1.3) thus helping to reduce discomfort, and possibly size, in the abdominal area. *Fucus vesiculsis* and *Trigonella foenum-graecum* both had a greater affinity for reducing fat absorption (2.3.1.2; 2.3.1.4), increasing metabolic rate and suppressing appetite.

Dietary alterations and exercise are primary methods of weight loss and medications or supplements should be considered secondary to lifestyle alterations.

Future research may therefore consider an increase in the percentage of *Fucus vesiculsis* and *Trigonella foenum-graecum* in the formula in order to affect the rate of weight loss in participants or further studies may be conducted on the effect of the herbal complex on relieving abdominal symptoms related to the herbal indication including bloating, constipation and abdominal discomfort.

CHAPTER SIX
CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The results of this study indicate that the herbal complex (*Aloe ferox, Fucus vesiculosis, Taraxacum officinale* and *Trigonella foenum– graecum*) is ineffective when utilised for weight loss. Statistically significant results were however noted in the reduction of body fat percentage and with respect to the abdominal circumference of the participants, which may suggest an additional physiological action of the herbal formula which may warrant further investigation.

The insignificant results related to the weight, BMI, hips, waist, thighs and upper arm measurements may be related to a reduced level of compliance, where an inconsistency of the total percentage of the weekly recommended dose taken by the participants was noted. Participants in both groups were asked not to alter their diet or exercise regime. This provided for an accurate picture of the pure physiological functioning of the herbal formula.

6.2 Recommendations for Further Research

Further research on weight loss utilising herbal formulas should consider:

- Improving the taste of the formula or changing the mode of administration of the formula to improve compliance.
- The provision of education and participant awareness surrounding the seriousness of the condition in order to improve overall participant compliance.
- Regulating the exercise in both groups with a prescribed, standard exercise program may help to reduce the variations in results attributed to the different exercise regimes of each participant
- Regulating the diet in both groups with a simple and standard eating plan (2.1.4.1) may also help in reducing the variations in results.
- Extending the trial from an eight week period to a twelve week time frame in order to determine the long-term effects of the formula.

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APPENDIX A

INFORMATION AND CONSENT FORM

Proposal Title: The Effect of a Herbal Complex as an aid in Weight Loss in Females

Participant Consent and Information Form

Dear Participant

My name is Eleftheria Karagiannakis and I am in my final year of studying homoeopathy. One of the requirements for completion of the M-Tech (Homoeopathy) degree at the University of Johannesburg is to complete a research study on a related subject.

If you are overweight and wish to embark on a weight loss programme I would like to invite you to participate in my research study.

You would be under no obligation to participate in this study. The completion of this consent form and participation in the study is voluntary. You have the right to withdrawal from the study at any given time for whatever reason, and you will not in any way be disadvantaged for doing so.

Aim of Research

The research aims to determine the effect of a herbal complex (*Aloe ferox, Fucus vesiculosis, Trigonella foenum – graecum* and *Taraxacum officinale)* in assistance of weight loss for healthy women between the ages of 20 and 35 which will contribute to the prevention of known risks associated with weight gain.

Summary of Study

Firstly you will be asked to complete a Participant Profile form that will be provided.

You will be requested to attend every two weeks for the duration of the study. The following will be recorded and noted: vital signs which include; Blood pressure, pulse rate, breathing rate and body temperature, weight (kg), Body Mass Index (BMI), Fat percentage and tape measurements of your upper arms (triceps), hips, waist, thighs and abdomen.

Measurement of your body fat percentage will be done utilising the QuadScan 4000. The QuadScan 4000 is a device manufactured by Bodystat® which uses Bioelectrical Impedance Analysis (BIA) technology to analyse body composition. An electrical current will be generated by the battery of the instrument, via an electrode placed on your right hand and will pass through your body, received by another electrode which is placed on your right foot. The resistance to the current is measured by the machine and this impedance is used to estimate your body fat percentage.

To ensure accurate and reproducible results you will be asked to fast 4-5 hours prior to the test, to refrain from any physical exercise 12 hours prior to the test and to not consume any form of alcohol or caffeine 24 hours before each consultation.

There will be a consultation every second week for the period of the full eight weeks of the study. Treatment will consist of a dropper bottle of a herbal complex or placebo.

You will be asked to complete a weekly checklist and your present exercise plan will not be interfered with during the duration of the study. The consultations will occur at the University of Johannesburg Health Clinic and treatment will be free of charge. All consultations will be conducted under the supervision of a qualified clinician.

Results of Study

No personal details will be revealed in the thesis, in other words there will be complete confidentiality and anonymity. Results of the study will be made available to you on request.

Declaration by Participant

I, the participant, have been fully informed of the procedure of the study, including the risks and benefits expected. In signing this consent form, I agree with the method of treatment and understand that I am free to withdraw my consent and discontinue with the study at any time. I understand that the researcher will answer any queries that I may have at any time.

I have been informed that I can contact either, the researcher Eleftheria Karagiannakis 072 958 9827, the co-supervisor, Dr L. Strauss 011 454 2167 or the supervisor of the study, Dr Neil Gower at 011 559 6779, should there be any questions relating to the study.

_____ _____

Date Signature

Declaration by Researcher

I, the researcher, Eleftheria Karagiannakis have fully explained the techniques and purpose of treatment used in this research. Any questions that arise from the participants will be answered to the best of my ability.

_____ _____

Date Signature

APPENDIX B

PARTICIPANT PROFILE

This information will not be disclosed

Participant Name : _____ Date : _____

Tel No. (c) : _____ Tel No. (h) : _____

Tel No. (w) : Fax No. : _____

Email : _____

Physical Address : _____

Age : _____

The following questionnaire needs to be completed prior to the commencement of the trial.

1) Please state your age (in complete years): _____

2) How long have you been battling with weight loss? _____ years._____ months.

3) Have you had any recorded noticeable changes in weight over the previous 3 months? If yes, please elaborate:

_____

4) Please specify the type of weight loss techniques you may have tried in the past 12 months (if any) and give a short description of each.

_____

_____

5) State medical history and previous medication that you may have been taking in the past 12 months:_____

_____

6) Are you currently on any of the following medications?

- Antidepressants
- Corticosteroids
- Diabetic medication
- Hormone replacement therapy
- Oral contraceptive pill

7) Please list any other medication that you may be currently taking:

_____

8) Are you currently on any Homeopathic, Naturopathic or Phytotherapeutic medication specifically for the assistance of weight loss? If yes, please state the name of the specific product and the time period of use.

_____

_____

(Please note that any other medication that you currently may be taking for the assistance of weight loss will interfere with the trial therefore discontinuation of such products needs to occur 2 weeks prior to the commencement of the trial)

9) Have you been diagnosed with any of the following conditions below? (If yes then please place at tick next to all of the appropriate conditions)

- Renal disease ☐
- Hepatic disease ☐
- Gastrointestinal disease ☐
- Endocrinological ☐ (*diseases such as hypothyroidism, hyperthyroidism, Cushing's syndrome)*
- Pulmonary disorders ☐
- Hematological problems ☐
- Cancer ☐
- Eating disorders ☐ (*i.e. anorexia nervosa, bulimia nervosa, binge eating)*
- Other. ☐ _____

9) Please state if any of the following apply to you:

- Are you currently pregnant or nursing an infant? _____
- Have you ever suffered from any form of substance abuse? _____

10) Do you follow an exercise plan? If yes then please indicate how many days a week you exercise, the duration and type of exercise plan (e.g. intensity: moderate / high)

_____

_____

(Please note that your present exercise plan will not be interfered with during the duration of this study)

11) Please give a short description of your daily diet intake, including snacks and drinks.

_____

_____

_____

APPENDIX C

INITIAL CONSULTATION FORM

Bottle number: _____

Participant name: _____

Date: _____ Age: _____

RESEARCHERS USE ONLY

Vital signs:-	Physical examination:-
Blood pressure: _____	Abdomen: _____
Pulse rate: _____	_____
Respiratory rate: _____	Respiratory system:_____
Temperature: _____	_____
	Cardio vascular system:_____
	_____
Body measurements:-	Circumference: – Hips (cm): ___
Weight (kg): _____	Waist (cm): ___
Height (m): _____	Thigh's (cm):
BMI: _____	left -_____ right - _____
Total fat%: _____	Upper arms (cm):
	left - _____ right -_____
	Abdomen (cm): _____

APPENDIX D

PARTICIPANT DAILY DIARY

Participant name: _____

Bottle number: _____

Week number:

1	2	3	4	5	6	7	8

Dates: _____ to _____.

Please write the time and number of drops taken under the appropriate day:

	Mon	**Tues**	**Wed**	**Thurs**	**Fri**	**Sat**	**Sun**
Time							
Drop #							
Time							
Drop #							
Time							
Drop #							

Please state any form of exercise and the amount of hours that you may have performed under the appropriate week:

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Exercise								
Total hours								

FOOD DIARY

Please briefly document the foods that you consumed in the past week allocated in the spaces below:

	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Breakfast							
Lunch							
Supper							
Snacks							
Drinks							

Please state if any unusual symptoms were experienced since the beginning of the study. Include duration of the symptoms if any.

_____

APPENDIX E

FOLLOW UP CONSULTATION FORM

Participant name: _____ Bottle number: ___ Date / Week of Visit: _____

Follow Up No.: _____

Please state if any unusual symptoms were experienced since the beginning of the study. Include duration of the symptoms if any.

_____.

RESEARCHERS USE ONLY

Vital signs:-	Physical examination:-
Blood pressure: _____	Abdomen: _____
Pulse rate: _____	_____
Respiratory rate: _____	Respiratory system:_____
Temperature: _____	_____
	Cardio vascular system:_____
	_____
Body measurements:-	Circumference: – Hips (cm): ___
Weight (kg): _____	Waist (cm): ___
Height (m): _____	Thigh's (cm):
BMI: _____	left -_____ right - _____
Total fat%: _____	Upper arms (cm):
	left - _____ right -_____
	Abdomen (cm): _____

APPENDIX F

BODY MASS INDEX

Percentage distribution of women age 15 and above by body mass index (BMI) categories.

Background Characteristic	Underweight (<18.5)	Normal (18.5-24.9)	Overweight (25.0-29.9)	Obese (30.0+)	Total	Number
Age						
15-24	10.6	58.2	20.0	11.2	100.0	1,201
25-34	5.2	39.8	29.3	25.8	100.0	938
Residence						
Urban	5.6	36.3	27.9	31.0	100.0	2,878
Rural	6.8	43.9	28.4	20.9	100.0	1,601
Province						
Western Cape	8.9	34.4	26.1	30.6	100.00	457
Eastern Cape						
Northern Cape	3.2	36.4	28.0	32.4	100.00	526
Population group						
African	5.6	38.2	27.8	28.4	100.00	3,759
Coloured	11.6	35.8	26.0	26.6	100.00	387
Total	6.0	41.3	29.0	23.3	100.0	4,480

(Department of Health, 2004)

APPENDIX G

ETHICS APROVAL

UNIVERSITY OF JOHANNESBURG

FACULTY OF HEALTH SCIENCES

ACADEMIC ETHICS COMMITTEE

ETHICAL CLEARANCE NO: AEC40/08

29 May 2009

TITLE OF RESEARCH PROPOSAL:	**The effect of a Herbal Complex as an aid in weight loss in females**
DEPARTMENT OR PROGRAMME:	**HOMOEOPATHY**
RESEARCHER:	**KARAGIANNAKIS, E STUDENT NO. 802017731**
SUPERVISOR:	**Dr N Gower**
CO-SUPERVISOR:	**Dr L Strauss**

The Faculty Academic Ethics Committee has scrutinised your research proposal and confirm that it complies with the approved ethical standards of the University of Johannesburg.

The attached recommendations were made by the committee which will improve the quality of your proposal.

Please make these changes and corrections to the satisfaction of the supervisor/s.

The AEC would like to extend their good wishes to you in your endeavour of your research project.

Yours sincerely,

Prof. Karien Jooste

Chair: Faculty of Health Sciences: AEC

APPENDIX H

INITIAL DESCRIPTIVES

Appendix H-1: Age Descriptives

Group				Statistic	Std. Error
Age	**Control**	Mean		25.73	0.836
		95% Confidence Interval for Mean	Lower Bound	23.94	
			Upper Bound	27.53	
		5% Trimmed Mean		25.48	
		Median		26.00	
		Variance		10.495	
		Std. Deviation		3.240	
		Minimum		21	
		Maximum		35	
		Range		14	
		Interquartile Range		1	
		Skewness		1.396	0.580
		Kurtosis		4.674	1.121
	Experiment	Mean		25.60	1.234
		95% Confidence Interval for Mean	Lower Bound	22.95	
			Upper Bound	28.25	
		5% Trimmed Mean		25.39	
		Median		25.00	
		Variance		22.829	
		Std. Deviation		4.778	
		Minimum		20	
		Maximum		35	
		Range		15	
		Interquartile Range		9	
		Skewness		0.572	0.580
		Kurtosis		-0.588	1.121

Appendix H-2: Week 1: Body Mass index

Group				Statistic	Std. Error
BMI1	**Control**	Mean		26.57	0.426
		95% Confidence Interval for Mean	Lower Bound	25.66	
			Upper Bound	27.49	
		5% Trimmed Mean		26.47	
		Median		25.90	
		Variance		2.725	
		Std. Deviation		1.651	

		Minimum		25	
		Maximum		30	
		Range		5	
		Interquartile Range		3	
		Skewness		1.302	0.580
		Kurtosis		0.197	1.121
	Experiment	Mean		27.73	0.438
		95% Confidence Interval for Mean	Lower Bound	26.79	
			Upper Bound	28.67	
		5% Trimmed Mean		27.73	
		Median		28.20	
		Variance		2.874	
		Std. Deviation		1.695	
		Minimum		25	
		Maximum		30	
		Range		5	
		Interquartile Range		3	
		Skewness		0.036	0.580
		Kurtosis		-1.757	1.121

Appendix H-3: Week 2: Body Mass index

	Group			Statistic	Std. Error
BMI2	**Control**	Mean		26.42	0.460
		95% Confidence Interval for Mean	Lower Bound	25.43	
			Upper Bound	27.41	
		5% Trimmed Mean		26.29	
		Median		25.70	
		Variance		3.174	
		Std. Deviation		1.782	
		Minimum		25	
		Maximum		30	
		Range		6	
		Interquartile Range		2	
		Skewness		1.378	0.580
		Kurtosis		0.682	1.121
	Experiment	Mean		27.50	0.473
		95% Confidence Interval for Mean	Lower Bound	26.48	
			Upper Bound	28.51	
		5% Trimmed Mean		27.52	
		Median		27.10	
		Variance		3.362	
		Std. Deviation		1.834	
		Minimum		25	
		Maximum		30	
		Range		5	

		Interquartile Range	3	
		Skewness	0.002	0.580
		Kurtosis	-1.364	1.121

Appendix H-4: Week 4: Body Mass index

	Group			Statistic	Std. Error
BMI4	**Control**	Mean		26.26	0.487
		95% Confidence Interval for Mean	Lower Bound	25.21	
			Upper Bound	27.30	
		5% Trimmed Mean		26.19	
		Median		25.60	
		Variance		3.564	
		Std. Deviation		1.888	
		Minimum		23	
		Maximum		30	
		Range		7	
		Interquartile Range		3	
		Skewness		0.975	0.580
		Kurtosis		0.530	1.121
	Experiment	Mean		27.39	0.473
		95% Confidence Interval for Mean	Lower Bound	26.38	
			Upper Bound	28.40	
		5% Trimmed Mean		27.42	
		Median		27.10	
		Variance		3.352	
		Std. Deviation		1.831	
		Minimum		24	
		Maximum		30	
		Range		6	
		Interquartile Range		3	
		Skewness		-0.136	0.580
		Kurtosis		-0.992	1.121

Appendix H-5: Week 6: Body Mass index

	Group			Statistic	Std. Error
BMI6	**Control**	Mean		26.48	0.511
		95% Confidence Interval for Mean	Lower Bound	25.38	
			Upper Bound	27.57	
		5% Trimmed Mean		26.42	
		Median		26.00	
		Variance		3.914	
		Std. Deviation		1.978	

		Minimum		23	
		Maximum		31	
		Range		7	
		Interquartile Range		3	
		Skewness		0.821	0.580
		Kurtosis		0.376	1.121
	Experiment	Mean		27.55	0.493
		95% Confidence Interval for Mean	Lower Bound	26.50	
			Upper Bound	28.61	
		5% Trimmed Mean		27.57	
		Median		27.90	
		Variance		3.644	
		Std. Deviation		1.909	
		Minimum		24	
		Maximum		30	
		Range		6	
		Interquartile Range		3	
		Skewness		0.000	0.580
		Kurtosis		-1.090	1.121

Appendix H-6: Week 8: Body Mass index

	Group			Statistic	Std. Error
BMI8	**Control**	Mean		26.25	0.464
		95% Confidence Interval for Mean	Lower Bound	25.26	
			Upper Bound	27.25	
		5% Trimmed Mean		26.21	
		Median		25.70	
		Variance		3.224	
		Std. Deviation		1.796	
		Minimum		23	
		Maximum		30	
		Range		7	
		Interquartile Range		2	
		Skewness		0.808	0.580
		Kurtosis		0.301	1.121
	Experiment	Mean		27.41	0.491
		95% Confidence Interval for Mean	Lower Bound	26.36	
			Upper Bound	28.46	
		5% Trimmed Mean		27.37	
		Median		26.70	
		Variance		3.613	
		Std. Deviation		1.901	
		Minimum		25	
		Maximum		30	
		Range		5	

		Interquartile Range	3	
		Skewness	0.340	0.580
		Kurtosis	-1.214	1.121

Appendix H-7: Week 1: Weight

	Group			Statistic	Std. Error
Weight1	**Control**	Mean		71.00	2.357
		95% Confidence Interval for Mean	Lower Bound	65.95	
			Upper Bound	76.05	
		5% Trimmed Mean		70.61	
		Median		68.00	
		Variance		83.321	
		Std. Deviation		9.128	
		Minimum		60	
		Maximum		89	
		Range		29	
		Interquartile Range		15	
		Skewness		0.825	0.580
		Kurtosis		-0.499	1.121
	Experiment	Mean		74.90	1.663
		95% Confidence Interval for Mean	Lower Bound	71.33	
			Upper Bound	78.47	
		5% Trimmed Mean		75.00	
		Median		75.50	
		Variance		41.471	
		Std. Deviation		6.440	
		Minimum		63	
		Maximum		85	
		Range		22	
		Interquartile Range		11	
		Skewness		-0.207	0.580
		Kurtosis		-0.668	1.121

Appendix H-8: Week 2: Weight

	Group			Statistic	Std. Error
Weight2	**Control**	Mean		70.57	2.379
		95% Confidence Interval for Mean	Lower Bound	65.46	
			Upper Bound	75.67	
		5% Trimmed Mean		70.13	
		Median		68.00	
		Variance		84.924	
		Std. Deviation		9.215	

		Minimum		59	
		Maximum		90	
		Range		31	
		Interquartile Range		15	
		Skewness		0.868	0.580
		Kurtosis		-0.225	1.121
	Experiment	Mean		74.31	1.809
		95% Confidence Interval for Mean	Lower Bound	70.43	
			Upper Bound	78.19	
		5% Trimmed Mean		74.35	
		Median		75.00	
		Variance		49.087	
		Std. Deviation		7.006	
		Minimum		63	
		Maximum		85	
		Range		22	
		Interquartile Range		12	
		Skewness		-0.224	0.580
		Kurtosis		-0.883	1.121

Appendix H-9: Week 4: Weight

	Group			**Statistic**	**Std. Error**
Weight4	**Control**	Mean		70.17	2.467
		95% Confidence Interval for Mean	Lower Bound	64.88	
			Upper Bound	75.46	
		5% Trimmed Mean		69.71	
		Median		67.00	
		Variance		91.274	
		Std. Deviation		9.554	
		Minimum		59	
		Maximum		90	
		Range		32	
		Interquartile Range		14	
		Skewness		0.846	0.580
		Kurtosis		-0.283	1.121
	Experiment	Mean		73.97	1.788
		95% Confidence Interval for Mean	Lower Bound	70.13	
			Upper Bound	77.80	
		5% Trimmed Mean		74.02	
		Median		74.50	
		Variance		47.945	
		Std. Deviation		6.924	
		Minimum		62	
		Maximum		85	
		Range		23	

		Interquartile Range	13	
		Skewness	-0.219	0.580
		Kurtosis	-0.892	1.121

Appendix H-10: Week 6: Weight

	Group			Statistic	Std. Error
Weight6	**Control**	Mean		70.80	2.462
		95% Confidence Interval for Mean	Lower Bound	65.52	
			Upper Bound	76.08	
		5% Trimmed Mean		70.39	
		Median		68.50	
		Variance		90.886	
		Std. Deviation		9.533	
		Minimum		58	
		Maximum		91	
		Range		33	
		Interquartile Range		14	
		Skewness		0.812	0.580
		Kurtosis		-0.119	1.121
	Experiment	Mean		74.38	1.767
		95% Confidence Interval for Mean	Lower Bound	70.59	
			Upper Bound	78.17	
		5% Trimmed Mean		74.42	
		Median		75.00	
		Variance		46.856	
		Std. Deviation		6.845	
		Minimum		63	
		Maximum		86	
		Range		23	
		Interquartile Range		11	
		Skewness		-0.085	0.580
		Kurtosis		-0.543	1.121

Appendix H-11: Week 8: Weight

	Group			Statistic	Std. Error
Weight8	**Control**	Mean		70.13	2.362
		95% Confidence Interval for Mean	Lower Bound	65.07	
			Upper Bound	75.20	
		5% Trimmed Mean		69.76	
		Median		67.00	
		Variance		83.660	
		Std. Deviation		9.147	

		Minimum		58	
		Maximum		89	
		Range		31	
		Interquartile Range		13	
		Skewness		0.792	0.580
		Kurtosis		-0.304	1.121
	Experiment	Mean		74.00	1.811
		95% Confidence Interval for Mean	Lower Bound	70.12	
			Upper Bound	77.88	
		5% Trimmed Mean		73.89	
		Median		75.00	
		Variance		49.179	
		Std. Deviation		7.013	
		Minimum		64	
		Maximum		86	
		Range		22	
		Interquartile Range		11	
		Skewness		0.160	0.580
		Kurtosis		-0.907	1.121

Appendix H-12: Week 1: Body Fat Percentage

	Group			Statistic	Std. Error
Bodyfat1	**Control**	Mean		32.91	1.083
		95% Confidence Interval for Mean	Lower Bound	30.58	
			Upper Bound	35.23	
		5% Trimmed Mean		32.83	
		Median		33.00	
		Variance		17.584	
		Std. Deviation		4.193	
		Minimum		27	
		Maximum		40	
		Range		13	
		Interquartile Range		7	
		Skewness		0.217	0.580
		Kurtosis		-1.329	1.121
	Experiment	Mean		34.43	1.442
		95% Confidence Interval for Mean	Lower Bound	31.34	
			Upper Bound	37.53	
		5% Trimmed Mean		34.25	
		Median		34.00	
		Variance		31.175	
		Std. Deviation		5.583	
		Minimum		26	
		Maximum		46	
		Range		20	

		Interquartile Range	10	
		Skewness	0.404	0.580
		Kurtosis	-0.440	1.121

Appendix H-13: Week 2: Body Fat Percentage

	Group			Statistic	Std. Error
Bodyfat2	**Control**	Mean		32.43	1.004
		95% Confidence Interval for Mean	Lower Bound	30.28	
			Upper Bound	34.59	
		5% Trimmed Mean		32.45	
		Median		32.60	
		Variance		15.132	
		Std. Deviation		3.890	
		Minimum		27	
		Maximum		38	
		Range		12	
		Interquartile Range		7	
		Skewness		0.020	0.580
		Kurtosis		-1.392	1.121
	Experiment	Mean		33.58	1.367
		95% Confidence Interval for Mean	Lower Bound	30.65	
			Upper Bound	36.51	
		5% Trimmed Mean		33.36	
		Median		33.10	
		Variance		28.046	
		Std. Deviation		5.296	
		Minimum		26	
		Maximum		45	
		Range		19	
		Interquartile Range		9	
		Skewness		0.539	0.580
		Kurtosis		-0.010	1.121

Appendix H-14: Week 4: Body Fat Percentage

	Group			Statistic	Std. Error
Bodyfat4	**Control**	Mean		32.23	1.051
		95% Confidence Interval for Mean	Lower Bound	29.98	
			Upper Bound	34.49	
		5% Trimmed Mean		32.23	
		Median		32.90	
		Variance		16.574	
		Std. Deviation		4.071	

		Minimum		26	
		Maximum		39	
		Range		13	
		Interquartile Range		6	
		Skewness		-0.076	0.580
		Kurtosis		-1.069	1.121
	Experiment	Mean		33.23	1.313
		95% Confidence Interval for Mean	Lower Bound	30.42	
			Upper Bound	36.05	
		5% Trimmed Mean		33.05	
		Median		33.00	
		Variance		25.844	
		Std. Deviation		5.084	
		Minimum		26	
		Maximum		44	
		Range		18	
		Interquartile Range		8	
		Skewness		0.483	0.580
		Kurtosis		-0.427	1.121

Appendix H-15: Week 8: Body Fat Percentage

	Group			Statistic	Std. Error
Bodyfat6	**Control**	Mean		32.67	1.123
		95% Confidence Interval for Mean	Lower Bound	30.26	
			Upper Bound	35.08	
		5% Trimmed Mean		32.98	
		Median		33.00	
		Variance		18.931	
		Std. Deviation		4.351	
		Minimum		22	
		Maximum		38	
		Range		17	
		Interquartile Range		6	
		Skewness		-1.012	0.580
		Kurtosis		1.957	1.121
	Experiment	Mean		32.59	1.233
		95% Confidence Interval for Mean	Lower Bound	29.94	
			Upper Bound	35.23	
		5% Trimmed Mean		32.46	
		Median		31.00	
		Variance		22.821	
		Std. Deviation		4.777	
		Minimum		25	
		Maximum		42	
		Range		17	

		Interquartile Range	7	
		Skewness	0.405	0.580
		Kurtosis	-0.518	1.121

Appendix H-16: Week 1: Hips

	Group			Statistic	Std. Error
Hips1	**Control**	Mean		107.09	1.547
		95% Confidence Interval for Mean	Lower Bound	103.77	
			Upper Bound	110.40	
		5% Trimmed Mean		106.60	
		Median		104.00	
		Variance		35.904	
		Std. Deviation		5.992	
		Minimum		102	
		Maximum		121	
		Range		20	
		Interquartile Range		10	
		Skewness		1.160	0.580
		Kurtosis		0.546	1.121
	Experiment	Mean		111.00	1.881
		95% Confidence Interval for Mean	Lower Bound	106.96	
			Upper Bound	115.04	
		5% Trimmed Mean		110.72	
		Median		112.30	
		Variance		53.091	
		Std. Deviation		7.286	
		Minimum		101	
		Maximum		126	
		Range		25	
		Interquartile Range		13	
		Skewness		0.318	0.580
		Kurtosis		-0.503	1.121

Appendix H-17: Week 2: Hips

	Group			Statistic	Std. Error
Hips2	**Control**	Mean		107.99	1.536
		95% Confidence Interval for Mean	Lower Bound	104.69	
			Upper Bound	111.28	
		5% Trimmed Mean		107.65	
		Median		106.00	
		Variance		35.381	
		Std. Deviation		5.948	

		Minimum		101	
		Maximum		121	
		Range		20	
		Interquartile Range		10	
		Skewness		0.785	0.580
		Kurtosis		-0.128	1.121
	Experiment	Mean		110.05	1.693
		95% Confidence Interval for Mean	Lower Bound	106.42	
			Upper Bound	113.69	
		5% Trimmed Mean		110.09	
		Median		110.20	
		Variance		43.007	
		Std. Deviation		6.558	
		Minimum		99	
		Maximum		121	
		Range		22	
		Interquartile Range		12	
		Skewness		-0.016	0.580
		Kurtosis		-1.092	1.121

Appendix H-18: Week 4: Hips

	Group			Statistic	Std. Error
Hips4	**Control**	Mean		106.61	1.750
		95% Confidence Interval for Mean	Lower Bound	102.85	
			Upper Bound	110.36	
		5% Trimmed Mean		106.62	
		Median		106.00	
		Variance		45.942	
		Std. Deviation		6.778	
		Minimum		94	
		Maximum		119	
		Range		25	
		Interquartile Range		11	
		Skewness		0.202	0.580
		Kurtosis		-0.475	1.121
	Experiment	Mean		109.91	1.935
		95% Confidence Interval for Mean	Lower Bound	105.76	
			Upper Bound	114.06	
		5% Trimmed Mean		109.68	
		Median		110.00	
		Variance		56.191	
		Std. Deviation		7.496	
		Minimum		99	
		Maximum		125	
		Range		26	

		Interquartile Range	12	
		Skewness	0.455	0.580
		Kurtosis	-0.576	1.121

Appendix H-19: Week 6: Hips

	Group			Statistic	Std. Error
Hips6	**Control**	Mean		106.35	1.678
		95% Confidence Interval for Mean	Lower Bound	102.75	
			Upper Bound	109.95	
		5% Trimmed Mean		106.27	
		Median		105.50	
		Variance		42.257	
		Std. Deviation		6.501	
		Minimum		95	
		Maximum		119	
		Range		24	
		Interquartile Range		11	
		Skewness		0.190	0.580
		Kurtosis		-0.457	1.121
	Experiment	Mean		109.77	1.996
		95% Confidence Interval for Mean	Lower Bound	105.48	
			Upper Bound	114.05	
		5% Trimmed Mean		109.63	
		Median		109.00	
		Variance		59.781	
		Std. Deviation		7.732	
		Minimum		97	
		Maximum		125	
		Range		28	
		Interquartile Range		14	
		Skewness		0.282	0.580
		Kurtosis		-0.430	1.121

Appendix H-20: Week 8: Hip

	Group			Statistic	Std. Error
Hips8	**Control**	Mean		106.20	1.676
		95% Confidence Interval for Mean	Lower Bound	102.61	
			Upper Bound	109.79	
		5% Trimmed Mean		106.00	
		Median		104.00	
		Variance		42.136	
		Std. Deviation		6.491	

		Minimum		97	
		Maximum		119	
		Range		22	
		Interquartile Range		10	
		Skewness		0.465	0.580
		Kurtosis		-0.728	1.121
	Experiment	Mean		109.59	1.967
		95% Confidence Interval for Mean	Lower Bound	105.37	
			Upper Bound	113.81	
		5% Trimmed Mean		109.35	
		Median		107.00	
		Variance		58.032	
		Std. Deviation		7.618	
		Minimum		97	
		Maximum		127	
		Range		30	
		Interquartile Range		12	
		Skewness		0.560	0.580
		Kurtosis		0.322	1.121

Appendix H-21: Week 1: Waist

	Group			Statistic	Std. Error
Waist1	**Control**	Mean		93.42	2.218
		95% Confidence Interval for Mean	Lower Bound	88.66	
			Upper Bound	98.18	
		5% Trimmed Mean		93.33	
		Median		94.00	
		Variance		73.796	
		Std. Deviation		8.590	
		Minimum		80	
		Maximum		109	
		Range		29	
		Interquartile Range		14	
		Skewness		0.185	0.580
		Kurtosis		-0.758	1.121
	Experiment	Mean		97.69	1.359
		95% Confidence Interval for Mean	Lower Bound	94.78	
			Upper Bound	100.61	
		5% Trimmed Mean		97.50	
		Median		97.00	
		Variance		27.696	
		Std. Deviation		5.263	
		Minimum		91	
		Maximum		108	
		Range		17	

		Interquartile Range	9	
		Skewness	0.511	0.580
		Kurtosis	-0.740	1.121

Appendix H-22: Week 2: Waist

	Group			Statistic	Std. Error
Waist2	**Control**	Mean		93.68	2.022
		95% Confidence Interval for Mean	Lower Bound	89.34	
			Upper Bound	98.02	
		5% Trimmed Mean		93.67	
		Median		94.00	
		Variance		61.312	
		Std. Deviation		7.830	
		Minimum		81	
		Maximum		107	
		Range		26	
		Interquartile Range		14	
		Skewness		0.101	0.580
		Kurtosis		-0.914	1.121
	Experiment	Mean		96.50	1.470
		95% Confidence Interval for Mean	Lower Bound	93.35	
			Upper Bound	99.65	
		5% Trimmed Mean		96.67	
		Median		95.60	
		Variance		32.410	
		Std. Deviation		5.693	
		Minimum		86	
		Maximum		104	
		Range		18	
		Interquartile Range		10	
		Skewness		-0.118	0.580
		Kurtosis		-1.092	1.121

Appendix H-23: Week 4: Waist

	Group			Statistic	Std. Error
Waist4	**Control**	Mean		92.61	2.048
		95% Confidence Interval for Mean	Lower Bound	88.22	
			Upper Bound	97.00	
		5% Trimmed Mean		92.81	
		Median		93.00	
		Variance		62.889	
		Std. Deviation		7.930	

		Minimum		78	
		Maximum		104	
		Range		27	
		Interquartile Range		11	
		Skewness		-0.286	0.580
		Kurtosis		-0.694	1.121
	Experiment	Mean		95.67	1.500
		95% Confidence Interval for Mean	Lower Bound	92.46	
			Upper Bound	98.89	
		5% Trimmed Mean		95.78	
		Median		96.00	
		Variance		33.772	
		Std. Deviation		5.811	
		Minimum		86	
		Maximum		104	
		Range		19	
		Interquartile Range		10	
		Skewness		-0.408	0.580
		Kurtosis		-0.816	1.121

Appendix H-24: Week 6: Waist

	Group			Statistic	Std. Error
Waist6	**Control**	Mean		92.66	2.006
		95% Confidence Interval for Mean	Lower Bound	88.36	
			Upper Bound	96.96	
		5% Trimmed Mean		92.71	
		Median		94.00	
		Variance		60.355	
		Std. Deviation		7.769	
		Minimum		80	
		Maximum		105	
		Range		25	
		Interquartile Range		12	
		Skewness		-0.011	0.580
		Kurtosis		-1.015	1.121
	Experiment	Mean		94.68	1.471
		95% Confidence Interval for Mean	Lower Bound	91.53	
			Upper Bound	97.83	
		5% Trimmed Mean		94.73	
		Median		94.00	
		Variance		32.436	
		Std. Deviation		5.695	
		Minimum		84	
		Maximum		105	
		Range		21	

		Interquartile Range	9	
		Skewness	0.080	0.580
		Kurtosis	-0.511	1.121

Appendix H-25: Week 8: Waist

	Group			Statistic	Std. Error
Waist8	**Control**	Mean		92.03	1.956
		95% Confidence Interval for Mean	Lower Bound	87.84	
			Upper Bound	96.23	
		5% Trimmed Mean		92.01	
		Median		91.00	
		Variance		57.374	
		Std. Deviation		7.575	
		Minimum		81	
		Maximum		104	
		Range		23	
		Interquartile Range		12	
		Skewness		0.173	0.580
		Kurtosis		-1.130	1.121
	Experiment	Mean		95.37	1.501
		95% Confidence Interval for Mean	Lower Bound	92.15	
			Upper Bound	98.59	
		5% Trimmed Mean		95.44	
		Median		94.00	
		Variance		33.802	
		Std. Deviation		5.814	
		Minimum		85	
		Maximum		105	
		Range		21	
		Interquartile Range		9	
		Skewness		0.111	0.580
		Kurtosis		-0.350	1.121

Appendix H-26: Week 1: Thigh

	Group			Statistic	Std. Error
Mean_Thighs1	**Control**	Mean		63.32	1.326
		95% Confidence Interval for Mean	Lower Bound	60.48	
			Upper Bound	66.16	
		5% Trimmed Mean		63.22	
		Median		61.55	
		Variance		26.391	
		Std. Deviation		5.137	

		Minimum		56	
		Maximum		73	
		Range		18	
		Interquartile Range		9	
		Skewness		0.420	0.580
		Kurtosis		-0.819	1.121
	Experiment	Mean		64.53	0.816
		95% Confidence Interval for Mean	Lower Bound	62.78	
			Upper Bound	66.28	
		5% Trimmed Mean		64.64	
		Median		64.75	
		Variance		9.992	
		Std. Deviation		3.161	
		Minimum		58	
		Maximum		69	
		Range		11	
		Interquartile Range		5	
		Skewness		-0.468	0.580
		Kurtosis		-0.437	1.121

Appendix H-27: Week 2: Thigh

	Group			Statistic	Std. Error
Mean_Thighs2	**Control**	Mean		63.67	1.221
		95% Confidence Interval for Mean	Lower Bound	61.05	
			Upper Bound	66.29	
		5% Trimmed Mean		63.53	
		Median		61.00	
		Variance		22.380	
		Std. Deviation		4.731	
		Minimum		59	
		Maximum		71	
		Range		12	
		Interquartile Range		9	
		Skewness		0.470	0.580
		Kurtosis		-1.564	1.121
	Experiment	Mean		64.32	0.813
		95% Confidence Interval for Mean	Lower Bound	62.58	
			Upper Bound	66.07	
		5% Trimmed Mean		64.48	
		Median		63.95	
		Variance		9.905	
		Std. Deviation		3.147	
		Minimum		57	
		Maximum		69	
		Range		12	

		Interquartile Range	4	
		Skewness	-0.608	0.580
		Kurtosis	0.748	1.121

Appendix H-28: Week 4: Thigh

	Group			Statistic	Std. Error
Mean_Thighs4	**Control**	Mean		63.27	1.160
		95% Confidence Interval for Mean	Lower Bound	60.79	
			Upper Bound	65.76	
		5% Trimmed Mean		63.15	
		Median		62.25	
		Variance		20.189	
		Std. Deviation		4.493	
		Minimum		58	
		Maximum		71	
		Range		14	
		Interquartile Range		8	
		Skewness		0.349	0.580
		Kurtosis		-1.144	1.121
	Experiment	Mean		61.45	2.327
		95% Confidence Interval for Mean	Lower Bound	56.46	
			Upper Bound	66.44	
		5% Trimmed Mean		62.65	
		Median		63.00	
		Variance		81.247	
		Std. Deviation		9.014	
		Minimum		31	
		Maximum		71	
		Range		40	
		Interquartile Range		4	
		Skewness		-3.115	0.580
		Kurtosis		11.173	1.121

Appendix H-29: Week 6: Thigh

	Group			Statistic	Std. Error
Mean_Thighs6	**Control**	Mean		62.60	1.150
		95% Confidence Interval for Mean	Lower Bound	60.13	
			Upper Bound	65.07	
		5% Trimmed Mean		62.54	
		Median		61.00	
		Variance		19.844	
		Std. Deviation		4.455	

		Minimum		57	
		Maximum		70	
		Range		13	
		Interquartile Range		8	
		Skewness		0.268	0.580
		Kurtosis		-1.389	1.121
	Experiment	Mean		64.33	0.895
		95% Confidence Interval for Mean	Lower Bound	62.41	
			Upper Bound	66.25	
		5% Trimmed Mean		64.17	
		Median		64.00	
		Variance		12.024	
		Std. Deviation		3.467	
		Minimum		59	
		Maximum		73	
		Range		14	
		Interquartile Range		4	
		Skewness		0.692	0.580
		Kurtosis		2.002	1.121

Appendix H-30: Week 8: Thigh

	Group			Statistic	Std. Error
Mean_Thighs8	**Control**	Mean		61.59	0.993
		95% Confidence Interval for Mean	Lower Bound	59.46	
			Upper Bound	63.72	
		5% Trimmed Mean		61.49	
		Median		61.00	
		Variance		14.782	
		Std. Deviation		3.845	
		Minimum		56	
		Maximum		69	
		Range		13	
		Interquartile Range		8	
		Skewness		0.374	0.580
		Kurtosis		-0.900	1.121
	Experiment	Mean		63.21	0.928
		95% Confidence Interval for Mean	Lower Bound	61.22	
			Upper Bound	65.20	
		5% Trimmed Mean		62.96	
		Median		64.00	
		Variance		12.916	
		Std. Deviation		3.594	
		Minimum		59	
		Maximum		73	
		Range		14	

		Interquartile Range	6	
		Skewness	1.011	0.580
		Kurtosis	1.959	1.121

Appendix H-31: Week 1: Upper Arm

	Group			Statistic	Std. Error
Mean_UpperArms1	**Control**	Mean		31.63	0.635
		95% Confidence Interval for Mean	Lower Bound	30.27	
			Upper Bound	33.00	
		5% Trimmed Mean		31.67	
		Median		31.25	
		Variance		6.047	
		Std. Deviation		2.459	
		Minimum		27	
		Maximum		36	
		Range		9	
		Interquartile Range		4	
		Skewness		0.028	0.580
		Kurtosis		0.018	1.121
	Experiment	Mean		33.07	0.709
		95% Confidence Interval for Mean	Lower Bound	31.55	
			Upper Bound	34.59	
		5% Trimmed Mean		33.08	
		Median		33.75	
		Variance		7.531	
		Std. Deviation		2.744	
		Minimum		29	
		Maximum		37	
		Range		9	
		Interquartile Range		5	
		Skewness		-0.113	0.580
		Kurtosis		-1.549	1.121

Appendix H-32: Week 2: Upper Arm

	Group			Statistic	Std. Error
Mean_UpperArms2	**Control**	Mean		32.03	0.596
		95% Confidence Interval for Mean	Lower Bound	30.75	
			Upper Bound	33.31	
		5% Trimmed Mean		31.93	
		Median		31.25	
		Variance		5.326	
		Std. Deviation		2.308	

		Minimum		29	
		Maximum		37	
		Range		7	
		Interquartile Range		4	
		Skewness		0.889	0.580
		Kurtosis		-0.144	1.121
	Experiment	Mean		33.45	0.719
		95% Confidence Interval for Mean	Lower Bound	31.90	
			Upper Bound	34.99	
		5% Trimmed Mean		33.54	
		Median		33.50	
		Variance		7.762	
		Std. Deviation		2.786	
		Minimum		28	
		Maximum		37	
		Range		9	
		Interquartile Range		4	
		Skewness		-0.382	0.580
		Kurtosis		-0.820	1.121

Appendix H-33: Week 4: Upper Arm

	Group			Statistic	Std. Error
Mean_UpperArms4	**Control**	Mean		31.97	0.516
		95% Confidence Interval for Mean	Lower Bound	30.86	
			Upper Bound	33.08	
		5% Trimmed Mean		31.94	
		Median		32.25	
		Variance		3.987	
		Std. Deviation		1.997	
		Minimum		29	
		Maximum		36	
		Range		7	
		Interquartile Range		4	
		Skewness		0.066	0.580
		Kurtosis		-0.840	1.121
	Experiment	Mean		33.40	0.606
		95% Confidence Interval for Mean	Lower Bound	32.10	
			Upper Bound	34.70	
		5% Trimmed Mean		33.39	
		Median		33.75	
		Variance		5.503	
		Std. Deviation		2.346	
		Minimum		30	
		Maximum		38	
		Range		8	

		Interquartile Range	3	
		Skewness	0.192	0.580
		Kurtosis	-0.593	1.121

Appendix H-34: Week 6: Upper Arm

	Group			Statistic	Std. Error
Mean_UpperArms6	**Control**	Mean		31.62	0.457
		95% Confidence Interval for Mean	Lower Bound	30.64	
			Upper Bound	32.60	
		5% Trimmed Mean		31.60	
		Median		31.00	
		Variance		3.137	
		Std. Deviation		1.771	
		Minimum		29	
		Maximum		35	
		Range		6	
		Interquartile Range		3	
		Skewness		0.378	0.580
		Kurtosis		-1.166	1.121
	Experiment	Mean		33.80	0.607
		95% Confidence Interval for Mean	Lower Bound	32.50	
			Upper Bound	35.10	
		5% Trimmed Mean		33.72	
		Median		33.95	
		Variance		5.524	
		Std. Deviation		2.350	
		Minimum		31	
		Maximum		38	
		Range		7	
		Interquartile Range		4	
		Skewness		0.372	0.580
		Kurtosis		-0.941	1.121

Appendix H-35: Week 8: Upper Arm

	Group			Statistic	Std. Error
Mean_UpperArms8	**Control**	Mean		31.47	0.492
		95% Confidence Interval for Mean	Lower Bound	30.41	
			Upper Bound	32.52	
		5% Trimmed Mean		31.45	
		Median		31.00	
		Variance		3.634	
		Std. Deviation		1.906	

		Minimum		29	
		Maximum		35	
		Range		6	
		Interquartile Range		3	
		Skewness		0.304	0.580
		Kurtosis		-0.907	1.121
	Experiment	Mean		33.22	0.646
		95% Confidence Interval for Mean	Lower Bound	31.83	
			Upper Bound	34.60	
		5% Trimmed Mean		33.26	
		Median		32.50	
		Variance		6.261	
		Std. Deviation		2.502	
		Minimum		29	
		Maximum		37	
		Range		8	
		Interquartile Range		5	
		Skewness		-0.035	0.580
		Kurtosis		-1.407	1.121

Appendix H-36: Week 1: Abdomen

	Group			Statistic	Std. Error
Abdomen1	**Control**	Mean		87.81	1.749
		95% Confidence Interval for Mean	Lower Bound	84.05	
			Upper Bound	91.56	
		5% Trimmed Mean		87.93	
		Median		89.00	
		Variance		45.899	
		Std. Deviation		6.775	
		Minimum		74	
		Maximum		99	
		Range		25	
		Interquartile Range		10	
		Skewness		-0.408	0.580
		Kurtosis		-0.364	1.121
	Experiment	Mean		93.68	1.753
		95% Confidence Interval for Mean	Lower Bound	89.92	
			Upper Bound	97.44	
		5% Trimmed Mean		93.67	
		Median		94.00	
		Variance		46.115	
		Std. Deviation		6.791	
		Minimum		82	
		Maximum		106	
		Range		24	

		Interquartile Range	10	
		Skewness	-0.041	0.580
		Kurtosis	-0.806	1.121

Appendix H-37: Week 2: Abdomen

	Group			Statistic	Std. Error
Abdomen2	**Control**	Mean		88.33	1.904
		95% Confidence Interval for Mean	Lower Bound	84.24	
			Upper Bound	92.41	
		5% Trimmed Mean		88.28	
		Median		88.00	
		Variance		54.385	
		Std. Deviation		7.375	
		Minimum		75	
		Maximum		103	
		Range		28	
		Interquartile Range		7	
		Skewness		0.150	0.580
		Kurtosis		-0.036	1.121
	Experiment	Mean		91.37	1.649
		95% Confidence Interval for Mean	Lower Bound	87.84	
			Upper Bound	94.91	
		5% Trimmed Mean		91.20	
		Median		91.00	
		Variance		40.806	
		Std. Deviation		6.388	
		Minimum		83	
		Maximum		103	
		Range		20	
		Interquartile Range		12	
		Skewness		0.337	0.580
		Kurtosis		-0.687	1.121

Appendix H-38: Week 4: Abdomen

	Group			Statistic	Std. Error
Abdomen4	**Control**	Mean		86.37	2.173
		95% Confidence Interval for Mean	Lower Bound	81.71	
			Upper Bound	91.03	
		5% Trimmed Mean		86.19	
		Median		87.00	
		Variance		70.838	
		Std. Deviation		8.417	

		Minimum		75	
		Maximum		102	
		Range		27	
		Interquartile Range		15	
		Skewness		0.122	0.580
		Kurtosis		-0.973	1.121
	Experiment	Mean		91.55	1.789
		95% Confidence Interval for Mean	Lower Bound	87.72	
			Upper Bound	95.39	
		5% Trimmed Mean		91.45	
		Median		93.00	
		Variance		48.021	
		Std. Deviation		6.930	
		Minimum		81	
		Maximum		104	
		Range		23	
		Interquartile Range		12	
		Skewness		0.073	0.580
		Kurtosis		-0.970	1.121

Appendix H-39: Week 6: Abdomen

	Group			Statistic	Std. Error
Abdomen6	**Control**	Mean		87.00	2.176
		95% Confidence Interval for Mean	Lower Bound	82.33	
			Upper Bound	91.67	
		5% Trimmed Mean		87.03	
		Median		87.00	
		Variance		71.000	
		Std. Deviation		8.426	
		Minimum		74	
		Maximum		100	
		Range		27	
		Interquartile Range		13	
		Skewness		0.074	0.580
		Kurtosis		-1.058	1.121
	Experiment	Mean		90.93	1.950
		95% Confidence Interval for Mean	Lower Bound	86.75	
			Upper Bound	95.12	
		5% Trimmed Mean		90.59	
		Median		88.40	
		Variance		57.025	
		Std. Deviation		7.552	
		Minimum		81	
		Maximum		108	
		Range		27	

		Interquartile Range	13	
		Skewness	0.702	0.580
		Kurtosis	-0.026	1.121

Appendix H-40: Week 8: Abdomen

	Group			Statistic	Std. Error
Abdomen8	**Control**	Mean		87.75	2.133
		95% Confidence Interval for Mean	Lower Bound	83.18	
			Upper Bound	92.33	
		5% Trimmed Mean		87.73	
		Median		87.30	
		Variance		68.256	
		Std. Deviation		8.262	
		Minimum		75	
		Maximum		101	
		Range		26	
		Interquartile Range		14	
		Skewness		0.171	0.580
		Kurtosis		-1.054	1.121
	Experiment	Mean		91.83	1.954
		95% Confidence Interval for Mean	Lower Bound	87.64	
			Upper Bound	96.02	
		5% Trimmed Mean		91.59	
		Median		90.00	
		Variance		57.251	
		Std. Deviation		7.566	
		Minimum		80	
		Maximum		109	
		Range		29	
		Interquartile Range		10	
		Skewness		0.462	0.580
		Kurtosis		0.402	1.121

APPENDIX I

TESTS OF NORMALITY

		Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Group	Statistic	df	Sig.	Statistic	df	Sig.
Age	Control	0.267	15	0.005	0.814	15	0.006
	Experiment	0.133	15	.200(*)	0.930	15	0.268
Weight1	Control	0.208	15	0.080	0.898	15	0.088
	Experiment	0.111	15	.200(*)	0.972	15	0.892
Height1	Control	0.183	15	0.191	0.928	15	0.256
	Experiment	0.132	15	.200(*)	0.964	15	0.761
BMI1	Control	0.346	15	0.000	0.749	15	0.001
	Experiment	0.200	15	0.108	0.883	15	0.052
Bodyfat1	Control	0.167	15	.200(*)	0.932	15	0.290
	Experiment	0.131	15	.200(*)	0.960	15	0.691
Mean_Thighs1	Control	0.201	15	0.103	0.946	15	0.457
	Experiment	0.113	15	.200(*)	0.958	15	0.651
Hips1	Control	0.239	15	0.021	0.829	15	0.009
	Experiment	0.132	15	.200(*)	0.952	15	0.556
Waist1	Control	0.121	15	.200(*)	0.969	15	0.841
	Experiment	0.128	15	.200(*)	0.943	15	0.422
Abdomen1	Control	0.112	15	.200(*)	0.970	15	0.865
	Experiment	0.128	15	.200(*)	0.978	15	0.955
Mean_UpperArms1	Control	0.122	15	.200(*)	0.974	15	0.915
	Experiment	0.187	15	0.169	0.907	15	0.122
Weight2	Control	0.234	15	0.026	0.907	15	0.122
	Experiment	0.139	15	.200(*)	0.954	15	0.587
BMI2	Control	0.327	15	0.000	0.786	15	0.002
	Experiment	0.127	15	.200(*)	0.934	15	0.313
Bodyfat2	Control	0.130	15	.200(*)	0.938	15	0.359
	Experiment	0.128	15	.200(*)	0.962	15	0.720
Mean_Thighs2	Control	0.247	15	0.014	0.845	15	0.015
	Experiment	0.148	15	.200(*)	0.948	15	0.496
Hips2	Control	0.166	15	.200(*)	0.922	15	0.204
	Experiment	0.146	15	.200(*)	0.965	15	0.782
Waist2	Control	0.101	15	.200(*)	0.970	15	0.853
	Experiment	0.159	15	.200(*)	0.935	15	0.328
Abdomen2	Control	0.151	15	.200(*)	0.974	15	0.918
	Experiment	0.133	15	.200(*)	0.933	15	0.305
Mean_UpperArms2	Control	0.166	15	.200(*)	0.899	15	0.093
	Experiment	0.178	15	.200(*)	0.950	15	0.524
Weight4	Control	0.215	15	0.060	0.905	15	0.115
	Experiment	0.111	15	.200(*)	0.966	15	0.802
BMI4	Control	0.308	15	0.000	0.876	15	0.041
	Experiment	0.117	15	.200(*)	0.952	15	0.560
Bodyfat4	Control	0.135	15	.200(*)	0.957	15	0.634
	Experiment	0.171	15	.200(*)	0.952	15	0.554
Mean_Thighs4	Control	0.164	15	.200(*)	0.925	15	0.231
	Experiment	0.326	15	0.000	0.610	15	0.000
Hips4	Control	0.173	15	.200(*)	0.949	15	0.515
	Experiment	0.144	15	.200(*)	0.961	15	0.705
Waist4	Control	0.095	15	.200(*)	0.971	15	0.871
	Experiment	0.145	15	.200(*)	0.946	15	0.468
Abdomen4	Control	0.143	15	.200(*)	0.952	15	0.562

	Experiment	0.122	15	.200(*)	0.960	15	0.700
Mean_UpperArms4	Control	0.105	15	.200(*)	0.966	15	0.799
	Experiment	0.101	15	.200(*)	0.971	15	0.878
Weight6	Control	0.200	15	0.109	0.928	15	0.258
	Experiment	0.087	15	.200(*)	0.972	15	0.885
BMI6	Control	0.242	15	0.018	0.921	15	0.202
	Experiment	0.139	15	.200(*)	0.960	15	0.700
Bodyfat6	Control	0.145	15	.200(*)	0.918	15	0.177
	Experiment	0.163	15	.200(*)	0.958	15	0.657
Mean_Thighs6	Control	0.174	15	.200(*)	0.917	15	0.175
	Experiment	0.154	15	.200(*)	0.935	15	0.324
Hips6	Control	0.141	15	.200(*)	0.976	15	0.933
	Experiment	0.106	15	.200(*)	0.985	15	0.992
Waist6	Control	0.102	15	.200(*)	0.963	15	0.737
	Experiment	0.200	15	0.108	0.960	15	0.687
Abdomen6	Control	0.106	15	.200(*)	0.957	15	0.633
	Experiment	0.165	15	.200(*)	0.951	15	0.546
Mean_UpperArms6	Control	0.169	15	.200(*)	0.933	15	0.300
	Experiment	0.146	15	.200(*)	0.934	15	0.311
Weight8	Control	0.192	15	0.141	0.919	15	0.189
	Experiment	0.116	15	.200(*)	0.956	15	0.618
BMI8	Control	0.290	15	0.001	0.897	15	0.086
	Experiment	0.179	15	.200(*)	0.920	15	0.193
Bodyfat8	Control	0.158	15	.200(*)	0.928	15	0.258
	Experiment	0.156	15	.200(*)	0.979	15	0.964
Mean_Thighs8	Control	0.130	15	.200(*)	0.950	15	0.523
	Experiment	0.166	15	.200(*)	0.901	15	0.097
Hips8	Control	0.166	15	.200(*)	0.954	15	0.594
	Experiment	0.167	15	.200(*)	0.969	15	0.840
Waist8	Control	0.128	15	.200(*)	0.940	15	0.385
	Experiment	0.159	15	.200(*)	0.961	15	0.713
Abdomen8	Control	0.108	15	.200(*)	0.957	15	0.635
	Experiment	0.144	15	.200(*)	0.962	15	0.727
Mean_UpperArms8	Control	0.138	15	.200(*)	0.953	15	0.565
	Experiment	0.162	15	.200(*)	0.926	15	0.237

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

APPENDIX J

GROUP STATISTICS

	Group	N	Mean	Std. Deviation	Std. Error Mean
Age	Control	15	25.73	3.240	0.836
	Experiment	15	25.60	4.778	1.234
Weight1	Control	15	71.00	9.128	2.357
	Experiment	15	74.90	6.440	1.663
Height1	Control	15	1.63	0.073	0.019
	Experiment	15	1.64	0.051	0.013
BMI1	Control	15	26.57	1.651	0.426
	Experiment	15	27.73	1.695	0.438
Bodyfat1	Control	15	32.91	4.193	1.083
	Experiment	15	34.43	5.583	1.442
Mean_Thighs1	Control	15	63.32	5.137	1.326
	Experiment	15	64.53	3.161	0.816
Hips1	Control	15	107.09	5.992	1.547
	Experiment	15	111.00	7.286	1.881
Waist1	Control	15	93.42	8.590	2.218
	Experiment	15	97.69	5.263	1.359
Abdomen1	Control	15	87.81	6.775	1.749
	Experiment	15	93.68	6.791	1.753
Mean_UpperArms1	Control	15	31.63	2.459	0.635
	Experiment	15	33.07	2.744	0.709
Weight2	Control	15	70.57	9.215	2.379
	Experiment	15	74.31	7.006	1.809
BMI2	Control	15	26.42	1.782	0.460
	Experiment	15	27.50	1.834	0.473
Bodyfat2	Control	15	32.43	3.890	1.004
	Experiment	15	33.58	5.296	1.367
Mean_Thighs2	Control	15	63.67	4.731	1.221
	Experiment	15	64.32	3.147	0.813
Hips2	Control	15	107.99	5.948	1.536
	Experiment	15	110.05	6.558	1.693
Waist2	Control	15	93.68	7.830	2.022
	Experiment	15	96.50	5.693	1.470
Abdomen2	Control	15	88.33	7.375	1.904
	Experiment	15	91.37	6.388	1.649
Mean_UpperArms2	Control	15	32.03	2.308	0.596
	Experiment	15	33.45	2.786	0.719
Weight4	Control	15	70.17	9.554	2.467
	Experiment	15	73.97	6.924	1.788
BMI4	Control	15	26.26	1.888	0.487
	Experiment	15	27.39	1.831	0.473
Bodyfat4	Control	15	32.23	4.071	1.051
	Experiment	15	33.23	5.084	1.313
Mean_Thighs4	Control	15	63.27	4.493	1.160
	Experiment	15	61.45	9.014	2.327
Hips4	Control	15	106.61	6.778	1.750
	Experiment	15	109.91	7.496	1.935
Waist4	Control	15	92.61	7.930	2.048
	Experiment	15	95.67	5.811	1.500
Abdomen4	Control	15	86.37	8.417	2.173
	Experiment	15	91.55	6.930	1.789

Mean_UpperArms4	Control	15	31.97	1.997	0.516
	Experiment	15	33.40	2.346	0.606
Weight6	Control	15	70.80	9.533	2.462
	Experiment	15	74.38	6.845	1.767
BMI6	Control	15	26.48	1.978	0.511
	Experiment	15	27.55	1.909	0.493
Bodyfat6	Control	15	32.67	4.351	1.123
	Experiment	15	32.59	4.777	1.233
Mean_Thighs6	Control	15	62.60	4.455	1.150
	Experiment	15	64.33	3.467	0.895
Hips6	Control	15	106.35	6.501	1.678
	Experiment	15	109.77	7.732	1.996
Waist6	Control	15	92.66	7.769	2.006
	Experiment	15	94.68	5.695	1.471
Abdomen6	Control	15	87.00	8.426	2.176
	Experiment	15	90.93	7.552	1.950
Mean_UpperArms6	Control	15	31.62	1.771	0.457
	Experiment	15	33.80	2.350	0.607
Weight8	Control	15	70.13	9.147	2.362
	Experiment	15	74.00	7.013	1.811
BMI8	Control	15	26.25	1.796	0.464
	Experiment	15	27.41	1.901	0.491
Bodyfat8	Control	15	32.95	4.002	1.033
	Experiment	15	32.07	4.186	1.081
Mean_Thighs8	Control	15	61.59	3.845	0.993
	Experiment	15	63.21	3.594	0.928
Hips8	Control	15	106.20	6.491	1.676
	Experiment	15	109.59	7.618	1.967
Waist8	Control	15	92.03	7.575	1.956
	Experiment	15	95.37	5.814	1.501
Abdomen8	Control	15	87.75	8.262	2.133
	Experiment	15	91.83	7.566	1.954
Mean_UpperArms8	Control	15	31.47	1.906	0.492
	Experiment	15	33.22	2.502	0.646

APPENDIX K

NON PARAMETRIC TESTS

Appendix K-1: Mann Whitney Test: Ranks

	Group	N	Mean Rank	Sum of Ranks
Age	Control	15	16.23	243.50
	Experiment	15	14.77	221.50
	Total	30		
Weight1	Control	15	13.10	196.50
	Experiment	15	17.90	268.50
	Total	30		
Height1	Control	15	14.37	215.50
	Experiment	15	16.63	249.50
	Total	30		
BMI1	Control	15	12.07	181.00
	Experiment	15	18.93	284.00
	Total	30		
Bodyfat1	Control	15	14.53	218.00
	Experiment	15	16.47	247.00
	Total	30		
Mean_Thighs1	Control	15	14.20	213.00
	Experiment	15	16.80	252.00
	Total	30		
Hips1	Control	15	13.10	196.50
	Experiment	15	17.90	268.50
	Total	30		
Waist1	Control	15	13.03	195.50
	Experiment	15	17.97	269.50
	Total	30		
Abdomen1	Control	15	12.20	183.00
	Experiment	15	18.80	282.00
	Total	30		
Mean_UpperArms1	Control	15	13.43	201.50
	Experiment	15	17.57	263.50
	Total	30		
Weight2	Control	15	13.33	200.00
	Experiment	15	17.67	265.00
	Total	30		
BMI2	Control	15	12.63	189.50
	Experiment	15	18.37	275.50
	Total	30		
Bodyfat2	Control	15	14.67	220.00
	Experiment	15	16.33	245.00
	Total	30		
Mean_Thighs2	Control	15	14.43	216.50
	Experiment	15	16.57	248.50
	Total	30		
Hips2	Control	15	13.87	208.00
	Experiment	15	17.13	257.00
	Total	30		
Waist2	Control	15	13.73	206.00

	Experiment	15	17.27	259.00
	Total	30		
Abdomen2	Control	15	13.93	209.00
	Experiment	15	17.07	256.00
	Total	30		
Mean_UpperArms2	Control	15	13.00	195.00
	Experiment	15	18.00	270.00
	Total	30		
Weight4	Control	15	13.27	199.00
	Experiment	15	17.73	266.00
	Total	30		
BMI4	Control	15	12.53	188.00
	Experiment	15	18.47	277.00
	Total	30		
Bodyfat4	Control	15	14.70	220.50
	Experiment	15	16.30	244.50
	Total	30		
Mean_Thighs4	Control	15	15.00	225.00
	Experiment	15	16.00	240.00
	Total	30		
Hips4	Control	15	13.60	204.00
	Experiment	15	17.40	261.00
	Total	30		
Waist4	Control	15	13.90	208.50
	Experiment	15	17.10	256.50
	Total	30		
Abdomen4	Control	15	12.67	190.00
	Experiment	15	18.33	275.00
	Total	30		
Mean_UpperArms4	Control	15	12.93	194.00
	Experiment	15	18.07	271.00
	Total	30		
Weight6	Control	15	13.33	200.00
	Experiment	15	17.67	265.00
	Total	30		
BMI6	Control	15	12.93	194.00
	Experiment	15	18.07	271.00
	Total	30		
Bodyfat6	Control	15	15.93	239.00
	Experiment	15	15.07	226.00
	Total	30		
Mean_Thighs6	Control	15	13.97	209.50
	Experiment	15	17.03	255.50
	Total	30		
Hips6	Control	15	13.60	204.00
	Experiment	15	17.40	261.00
	Total	30		
Waist6	Control	15	14.57	218.50
	Experiment	15	16.43	246.50
	Total	30		
Abdomen6	Control	15	13.67	205.00
	Experiment	15	17.33	260.00
	Total	30		
Mean_UpperArms6	Control	15	11.30	169.50
	Experiment	15	19.70	295.50
	Total	30		
Weight8	Control	15	13.20	198.00

	Experiment	15	17.80	267.00
	Total	30		
BMI8	Control	15	12.53	188.00
	Experiment	15	18.47	277.00
	Total	30		
Bodyfat8	Control	15	16.60	249.00
	Experiment	15	14.40	216.00
	Total	30		
Mean_Thighs8	Control	15	13.70	205.50
	Experiment	15	17.30	259.50
	Total	30		
Hips8	Control	15	13.37	200.50
	Experiment	15	17.63	264.50
	Total	30		
Waist8	Control	15	13.30	199.50
	Experiment	15	17.70	265.50
	Total	30		
Abdomen8	Control	15	13.47	202.00
	Experiment	15	17.53	263.00
	Total	30		
Mean_UpperArms8	Control	15	12.30	184.50
	Experiment	15	18.70	280.50
	Total	30		

Appendix K-2: Test Statistics

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Age	101.500	221.500	-0.462	0.644
Weight1	76.500	196.500	-1.496	0.135
Height1	95.500	215.500	-0.708	0.479
BMI1	61.000	181.000	-2.140	**0.032**
Bodyfat1	98.000	218.000	-0.602	0.547
Mean_Thighs1	93.000	213.000	-0.809	0.419
Hips1	76.500	196.500	-1.496	0.135
Waist1	75.500	195.500	-1.536	0.125
Abdomen1	63.000	183.000	-2.055	**0.040**
Mean_UpperArms1	81.500	201.500	-1.286	0.198
Weight2	80.000	200.000	-1.349	0.177
BMI2	69.500	189.500	-1.784	0.074
Bodyfat2	100.000	220.000	-0.519	0.604
Mean_Thighs2	96.500	216.500	-0.664	0.507
Hips2	88.000	208.000	-1.018	0.309
Waist2	86.000	206.000	-1.100	0.271
Abdomen2	89.000	209.000	-0.975	0.329
Mean_UpperArms2	75.000	195.000	-1.557	0.120
Weight4	79.000	199.000	-1.391	0.164
BMI4	68.000	188.000	-1.846	0.065
Bodyfat4	100.500	220.500	-0.498	0.619
Mean_Thighs4	105.000	225.000	-0.311	0.756
Hips4	84.000	204.000	-1.184	0.237
Waist4	88.500	208.500	-0.996	0.319
Abdomen4	70.000	190.000	-1.763	0.078
Mean_UpperArms4	74.000	194.000	-1.597	0.110
Weight6	80.000	200.000	-1.349	0.177
BMI6	74.000	194.000	-1.597	0.110
Bodyfat6	106.000	226.000	-0.270	0.787
Mean_Thighs6	89.500	209.500	-0.955	0.340
Hips6	84.000	204.000	-1.183	0.237
Waist6	98.500	218.500	-0.582	0.561
Abdomen6	85.000	205.000	-1.141	0.254
Mean_UpperArms6	49.500	169.500	-2.614	**0.009**
Weight8	78.000	198.000	-1.432	0.152
BMI8	68.000	188.000	-1.847	0.065
Bodyfat8	96.000	216.000	-0.686	0.493
Mean_Thighs8	85.500	205.500	-1.120	0.263
Hips8	80.500	200.500	-1.330	0.184
Waist8	79.500	199.500	-1.370	0.171
Abdomen8	82.000	202.000	-1.265	0.206
Mean_UpperArms8	64.500	184.500	-1.992	**0.046**

APPENDIX L

NONPARAMETRIC TESTS WITH IN GROUPS OVER TIME

Appendix L-1: BMI

Group		N	Mean	Std. Deviation	Minimum	Maximum
Control	BMI1	15	26.57	1.651	25	30
	BMI2	15	26.42	1.782	25	30
	BMI4	15	26.26	1.888	23	30
	BMI6	15	26.48	1.978	23	31
	BMI8	15	26.25	1.796	23	30
Experiment	BMI1	15	27.73	1.695	25	30
	BMI2	15	27.50	1.834	25	30
	BMI4	15	27.39	1.831	24	30
	BMI6	15	27.55	1.909	24	30
	BMI8	15	27.41	1.901	25	30

Appendix L-2: Body Fat Percentage

Group		N	Mean	Std. Deviation	Minimum	Maximum
Control	Bodyfat1	15	32.91	4.193	27	40
	Bodyfat2	15	32.43	3.890	27	38
	Bodyfat4	15	32.23	4.071	26	39
	Bodyfat6	15	32.67	4.351	22	38
	Bodyfat8	15	32.95	4.002	23	39
Experiment	Bodyfat1	15	34.43	5.583	26	46
	Bodyfat2	15	33.58	5.296	26	45
	Bodyfat4	15	33.23	5.084	26	44
	Bodyfat6	15	32.59	4.777	25	42
	Bodyfat8	15	32.07	4.186	24	40

Appendix L-3: Thighs

Group		N	Mean	Std. Deviation	Minimum	Maximum
Control	Mean_Thighs1	15	63.32	5.137	56	73
	Mean_Thighs2	15	63.67	4.731	59	71
	Mean_Thighs4	15	63.27	4.493	58	71
	Mean_Thighs6	15	62.60	4.455	57	70
	Mean_Thighs8	15	61.59	3.845	56	69
Experiment	Mean_Thighs1	15	64.53	3.161	58	69
	Mean_Thighs2	15	64.32	3.147	57	69
	Mean_Thighs4	15	61.45	9.014	31	71
	Mean_Thighs6	15	64.33	3.467	59	73
	Mean_Thighs8	15	63.21	3.594	59	73

Appendix L-4: Hips

Group		N	Mean	Std. Deviation	Minimum	Maximum
Control	Hips1	15	107.09	5.992	102	121
	Hips2	15	107.99	5.948	101	121
	Hips4	15	106.61	6.778	94	119
	Hips6	15	106.35	6.501	95	119
	Hips8	15	106.20	6.491	97	119
Experiment	Hips1	15	111.00	7.286	101	126
	Hips2	15	110.05	6.558	99	121
	Hips4	15	109.91	7.496	99	125
	Hips6	15	109.77	7.732	97	125
	Hips8	15	109.59	7.618	97	127

Appendix L-5: Waist

Group		N	Mean	Std. Deviation	Minimum	Maximum
Control	Waist1	15	93.42	8.590	80	109
	Waist2	15	93.68	7.830	81	107
	Waist4	15	92.61	7.930	78	104
	Waist6	15	92.66	7.769	80	105
	Waist8	15	92.03	7.575	81	104
Experiment	Waist1	15	97.69	5.263	91	108
	Waist2	15	96.50	5.693	86	104
	Waist4	15	95.67	5.811	86	104
	Waist6	15	94.68	5.695	84	105
	Waist8	15	95.37	5.814	85	105

Appendix L-6: Abdomen

Group		N	Mean	Std. Deviation	Minimum	Maximum
Control	Abdomen1	15	87.81	6.775	74	99
	Abdomen2	15	88.33	7.375	75	103
	Abdomen4	15	86.37	8.417	75	102
	Abdomen6	15	87.00	8.426	74	100
	Abdomen8	15	87.75	8.262	75	101
Experiment	Abdomen1	15	93.68	6.791	82	106
	Abdomen2	15	91.37	6.388	83	103
	Abdomen4	15	91.55	6.930	81	104
	Abdomen6	15	90.93	7.552	81	108
	Abdomen8	15	91.83	7.566	80	109

Appendix L-7: Upper arm

Group		N	Mean	Std. Deviation	Minimum	Maximum
Control	Mean_UpperArms1	15	31.63	2.459	27	36
	Mean_UpperArms2	15	32.03	2.308	29	37
	Mean_UpperArms4	15	31.97	1.997	29	36
	Mean_UpperArms6	15	31.62	1.771	29	35
	Mean_UpperArms8	15	31.47	1.906	29	35
Experiment	Mean_UpperArms1	15	33.07	2.744	29	37
	Mean_UpperArms2	15	33.45	2.786	28	37
	Mean_UpperArms4	15	33.40	2.346	30	38
	Mean_UpperArms6	15	33.80	2.350	31	38
	Mean_UpperArms8	15	33.22	2.502	29	37

1 - Week one
2 - Week two
3 - Week three
4 - Week four
5 - Week five
6 - Week six
7 - Week seven
8 - Week eight

APPENDIX M

FRIEDMAN TEST OF RANKING

Appendix M-1:Body Mass Index Ranks

Group		Mean Rank
Control	BMI1	3.47
	BMI2	3.00
	BMI4	2.60
	BMI6	3.57
	BMI8	2.37
Experiment	BMI1	3.83
	BMI2	3.07
	BMI4	2.40
	BMI6	3.00
	BMI8	2.70

Appendix M-2: Body Fat Percentage Ranks

Group		Mean Rank
Control	Bodyfat1	3.47
	Bodyfat2	2.77
	Bodyfat4	2.43
	Bodyfat6	3.03
	Bodyfat8	3.30
Experiment	Bodyfat1	4.27
	Bodyfat2	3.53
	Bodyfat4	2.63
	Bodyfat6	2.37
	Bodyfat8	2.20

Appendix M-3: Hip Ranks

Group		Mean Rank
Control	Hips1	3.07
	Hips2	4.00
	Hips4	2.67
	Hips6	2.67
	Hips8	2.60
Experiment	Hips1	3.83
	Hips2	3.23
	Hips4	2.70
	Hips6	2.77
	Hips8	2.47

Appendix M-4: Waist Ranks

Group		Mean Rank
Control	Waist1	3.37
	Waist2	3.37
	Waist4	2.90
	Waist6	2.80
	Waist8	2.57
Experiment	Waist1	3.80
	Waist2	3.43
	Waist4	2.70
	Waist6	2.30
	Waist8	2.77

Appendix M-5: Thigh Ranks

Group		Mean Rank
Control	Mean_Thighs1	3.63
	Mean_Thighs2	4.00
	Mean_Thighs4	3.17
	Mean_Thighs6	2.60
	Mean_Thighs8	1.60
Experiment	Mean_Thighs1	3.37
	Mean_Thighs2	3.07
	Mean_Thighs4	2.80
	Mean_Thighs6	3.40
	Mean_Thighs8	2.37

Appendix M-6: Upper arm Ranks

Group		Mean Rank
Control	Mean_UpperArms1	3.27
	Mean_UpperArms2	3.70
	Mean_UpperArms4	3.13
	Mean_UpperArms6	2.67
	Mean_UpperArms8	2.23
Experiment	Mean_UpperArms1	2.37
	Mean_UpperArms2	3.13
	Mean_UpperArms4	2.90
	Mean_UpperArms6	3.73
	Mean_UpperArms8	2.87

Appendix M-7: Abdomen Ranks

Group		Mean Rank
Control	Abdomen1	3.33
	Abdomen2	3.47
	Abdomen4	2.60
	Abdomen6	2.27
	Abdomen8	3.33
Experiment	Abdomen1	4.17
	Abdomen2	2.77
	Abdomen4	2.90
	Abdomen6	2.20
	Abdomen8	2.97

1 - Week one
2 - Week two
3 - Week three
4 - Week four
5 - Week five
6 - Week six
7 - Week seven
8 - Week eight

APPENDIX N

PAIRED SAMPLES STATISTICS

Group			Mean	N	Std. Deviation	Std. Error Mean
Control	Pair 1	Mean_Thighs1	63.32	15	5.137	1.326
		Mean_Thighs2	63.67	15	4.731	1.221
	Pair 2	Mean_Thighs1	63.32	15	5.137	1.326
		Mean_Thighs4	63.27	15	4.493	1.160
	Pair 3	Mean_Thighs1	63.32	15	5.137	1.326
		Mean_Thighs6	62.60	15	4.455	1.150
	Pair 4	Mean_Thighs1	63.32	15	5.137	1.326
		Mean_Thighs8	61.59	15	3.845	0.993
Experiment	Pair 1	Bodyfat1	34.43	15	5.583	1.442
		Bodyfat2	33.58	15	5.296	1.367
	Pair 2	Bodyfat1	34.43	15	5.583	1.442
		Bodyfat4	33.23	15	5.084	1.313
	Pair 3	Bodyfat1	34.43	15	5.583	1.442
		Bodyfat6	32.59	15	4.777	1.233
	Pair 4	Bodyfat1	34.43	15	5.583	1.442
		Bodyfat8	32.07	15	4.186	1.081
	Pair 5	Abdomen1	93.68	15	6.791	1.753
		Abdomen2	91.37	15	6.388	1.649
	Pair 6	Abdomen1	93.68	15	6.791	1.753
		Abdomen4	91.55	15	6.930	1.789
	Pair 7	Abdomen1	93.68	15	6.791	1.753
		Abdomen6	90.93	15	7.552	1.950
	Pair 8	Abdomen1	93.68	15	6.791	1.753
		Abdomen8	91.83	15	7.566	1.954

1 - Week one
2 - Week two
3 - Week three
4 - Week four
5 - Week five
6 - Week six
7 - Week seven
8 - Week eight

APPENDIX O

WILCOXON SIGNED RANKS TEST

Group			N	Mean Rank	Sum of Ranks
Control	Bodyfat2 - Bodyfat1	Negative Ranks	10(a)	7.25	72.50
		Positive Ranks	3(b)	6.17	18.50
		Ties	2(c)		
		Total	15		
	Bodyfat4 - Bodyfat1	Negative Ranks	11(d)	8.00	88.00
		Positive Ranks	3(e)	5.67	17.00
		Ties	1(f)		
		Total	15		
	Bodyfat6 - Bodyfat1	Negative Ranks	7(g)	8.86	62.00
		Positive Ranks	8(h)	7.25	58.00
		Ties	0(i)		
		Total	15		
	Bodyfat8 - Bodyfat1	Negative Ranks	7(j)	7.36	51.50
		Positive Ranks	7(k)	7.64	53.50
		Ties	1(l)		
		Total	15		
	Mean_Thighs2 - Mean_Thighs1	Negative Ranks	4(m)	10.13	40.50
		Positive Ranks	11(n)	7.23	79.50
		Ties	0(o)		
		Total	15		
	Mean_Thighs4 - Mean_Thighs1	Negative Ranks	10(p)	7.20	72.00
		Positive Ranks	5(q)	9.60	48.00
		Ties	0(r)		
		Total	15		
	Mean_Thighs6 - Mean_Thighs1	Negative Ranks	13(s)	7.23	94.00
		Positive Ranks	2(t)	13.00	26.00
		Ties	0(u)		
		Total	15		
	Mean_Thighs8 - Mean_Thighs1	Negative Ranks	12(v)	7.08	85.00
		Positive Ranks	2(w)	10.00	20.00
		Ties	1(x)		
		Total	15		
	Abdomen2 - Abdomen1	Negative Ranks	6(y)	8.00	48.00
		Positive Ranks	9(z)	8.00	72.00

		Ties	0(aa)		
		Total	15		
	Abdomen4 - Abdomen1	Negative Ranks	10(bb)	8.45	84.50
		Positive Ranks	5(cc)	7.10	35.50
		Ties	0(dd)		
		Total	15		
	Abdomen6 - Abdomen1	Negative Ranks	10(ee)	7.45	74.50
		Positive Ranks	5(ff)	9.10	45.50
		Ties	0(gg)		
		Total	15		
	Abdomen8 - Abdomen1	Negative Ranks	9(hh)	7.06	63.50
		Positive Ranks	6(ii)	9.42	56.50
		Ties	0(jj)		
		Total	15		
Experiment	Bodyfat2 - Bodyfat1	Negative Ranks	11(a)	9.55	105.00
		Positive Ranks	4(b)	3.75	15.00
		Ties	0(c)		
		Total	15		
	Bodyfat4 - Bodyfat1	Negative Ranks	13(d)	8.12	105.50
		Positive Ranks	2(e)	7.25	14.50
		Ties	0(f)		
		Total	15		
	Bodyfat6 - Bodyfat1	Negative Ranks	13(g)	8.38	109.00
		Positive Ranks	2(h)	5.50	11.00
		Ties	0(i)		
		Total	15		
	Bodyfat8 - Bodyfat1	Negative Ranks	12(j)	8.50	102.00
		Positive Ranks	3(k)	6.00	18.00
		Ties	0(l)		
		Total	15		
	Mean_Thighs2 - Mean_Thighs1	Negative Ranks	10(m)	6.40	64.00
		Positive Ranks	5(n)	11.20	56.00
		Ties	0(o)		
		Total	15		
	Mean_Thighs4 - Mean_Thighs1	Negative Ranks	9(p)	9.44	85.00
		Positive Ranks	6(q)	5.83	35.00
		Ties	0(r)		
		Total	15		

	Mean_Thighs6 - Mean_Thighs1	Negative Ranks	6(s)	10.67	64.00
		Positive Ranks	9(t)	6.22	56.00
		Ties	0(u)		
		Total	15		
	Mean_Thighs8 - Mean_Thighs1	Negative Ranks	10(v)	7.75	77.50
		Positive Ranks	4(w)	6.88	27.50
		Ties	1(x)		
		Total	15		
	Abdomen2 - Abdomen1	Negative Ranks	11(y)	7.73	85.00
		Positive Ranks	2(z)	3.00	6.00
		Ties	2(aa)		
		Total	15		
	Abdomen4 - Abdomen1	Negative Ranks	12(bb)	8.46	101.50
		Positive Ranks	3(cc)	6.17	18.50
		Ties	0(dd)		
		Total	15		
	Abdomen6 - Abdomen1	Negative Ranks	12(ee)	8.00	96.00
		Positive Ranks	2(ff)	4.50	9.00
		Ties	1(gg)		
		Total	15		
	Abdomen8 - Abdomen1	Negative Ranks	11(hh)	8.45	93.00
		Positive Ranks	4(ii)	6.75	27.00
		Ties	0(jj)		
		Total	15		

1 - Week one
2 - Week two
3 - Week three
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8 - Week eight