

## **CHAPTER 1**

### **THE PROBLEM**

#### **1.1 INTRODUCTION**

Weight-loss and obesity is a major problem in South Africa as well as in the rest of the world. Weight-loss is associated with improvements in obesity-related complications, but patients and practitioners are frequently disappointed by the long-term results of weight control efforts. Recent research has yielded new findings concerning the causes of obesity, as well as new goals for obesity treatment. Traditionally, the goal of therapy has been to attain ideal weight. Several scientific bodies, now recommend a modest 5% tot 15% reduction in initial weight (Jakicic et al., 2001; Klein, 2000; Anderson & Wadden, 1999). Regardless of how much weight a person would like to lose, modest goals and a slow course will maximize the probability of losing and maintaining weight. It should be recognized that for most people, achieving a body weight or figure like those often depicted by the media is neither reasonable, appropriate, nor achievable. Failure to achieve this “look” does not imply a weakness of will power or character. Numerous methods of weight-loss exist where the objective is short-term, rapid or unsupervised weight-loss, which rely on dietary aids such as drinks, pre-packaged foods or diet pills. Such efforts do not include education and guidance in the transition to a permanent pattern of healthy eating and activity, and have never been shown to lead to long-term success.

#### **1.2 OBESITY DEFINED**

Obesity is defined in terms of excess body fat. Because precise assessment of body fat is cumbersome and expensive, body weight is often used as an estimate of obesity. The term overweight has traditionally referred to weight in excess of some ideal, usually stipulated by actuarial height and weight tables. Unfortunately, the definition of “ideal” weight varies over time and across cultures, thus making it difficult for example, to compare the prevalence of obesity in two nations. In recent years, investigators have begun to use the Body Mass Index (BMI) as a measure of

overweight because it does not rely on comparison with an ideal weight. The World Health Organization has defined overweight as a BMI of 25.0 to 29.9, while obesity is a BMI of 30 or greater (World Health Organization, 1997). South Africa is on its way to overtaking America as the world's fattest nation. Almost half of South Africans over the age of 15 are overweight or obese, and medical researchers warn that the government may soon have to step in to manage the epidemic (Health 24, 2002).

Obesity has long been thought to be a behavioural disorder that resulted from simply eating too much and or exercising too little. There is no question that these factors are associated with weight gain. Changes in our national lifestyle, including the increased consumption of high fat foods, as well as our increasingly sedentary work and leisure habits, undoubtedly contributed to the marked rise in obesity. Recent studies, however, have suggested that body weight is under substantial genetic control, accounting for approximately one third of the variation in BMI (Bouchard, 1997). Genetic influences appear to contribute to differences among individuals in resting metabolic rate (Rice et al., 1996), as well as body fat distribution (Bouchard et al., 1998) and weight gain in response to overfeeding (Bouchard et al., 1990). Some people appear to come into the world with a predisposition to obesity, which is readily nourished by our high-fat, low-activity lifestyle.

Society is unforgiving of overweight individuals. Stunkard (1995) have called the disparagement of obese individuals "the last socially acceptable form of prejudice". Historically, the public has believed that weight-loss is a matter of willpower. Obese individuals have been considered weak-willed and unmotivated, a view that is compounded by the claims of easy weight-loss promised by many books on diet. Unfortunately, many obese persons seem to have accepted this view of themselves. Practitioners are not immune to these beliefs. In one study obese patients were described in such negative terms as "weak-willed", "ugly" and "awkward" (Maddox & Leiderman, 1969). Obese women also have been found to delay or avoid medical care because of weight concerns (Olson et al., 1994). Attitudes, towards obesity appear to be changing with the recognition that obesity is a complex, multidetermined disorder with a genetic component (Bouchard, 1997). Findings suggest that physiological and genetic factors may limit the amount of weight that an individual can lose and maintain (Keeseey, 1996). These findings have led to new empathy for

overweight individuals, as well as to a change in the goals of obesity treatment.

It seems that although obese individuals may have different therapeutic objectives e.g. to reduce disease risk, to ameliorate disease symptomology, to build self-esteem and to increase functional capacity, the immediate measurable outcome variable of body weight becomes the focus intervention. There are many options for treating obese individuals. In the past, obesity has been treated as an acute disorder. Many patients still appear to believe that 10 to 20 weeks of treatment should be enough to “cure” obesity or at least control it for several years. This view of obesity is often encouraged by the commercial diet industry, which promises miraculous results with little or no effort. The results of such an approach indicate clearly that if treated as an acute disorder, obesity will return. Guy-Grand (1992) noted that all obesity treatments to date are palliative, not curative. Practitioners cannot cure obesity any more than they can diabetes or hypertension. Practitioners need to help patients recognize that obesity is a chronic disorder that requires long-term care. Acceptance of this fact should help improve the results of most treatment modalities. Aggressive therapy should be used with persons who are more obese and who have greater health complications. The five recognised treatment modalities available are diet modification, exercise, behaviour modification, medication therapy and surgery. Diet and exercise are the most frequently cited methods for both men and woman attempting to lose weight. Many forms of therapy are used and promoted including countless fad diets, herbal remedies, acupuncture, acupressure, appetite suppressing “aroma sticks”, medication, surgery, electrical muscle stimulation and many more.

### **1.3 ELECTRICAL MUSCLE STIMULATION DEFINED**

Electrical muscle stimulation (EMS) make use off electrical pulse generators which produce repetitive muscular contractions in affected areas (Bailey, 1976). In essence, these apparatus are automatically cycling, multiple-output, faradic muscle stimulators, which produce trains of pulses with variable pulse repetition and frequency. The individual pulses are of short duration and of low energy, but at appropriate gain levels the pulse trains produce rhythmic and powerful muscular contractions when they are fed to the muscle by skin contact electrodes placed over or near the motor points. It is claimed that repeated application of such pulse stimulation produce

breakdown of adipose tissue by local passive exercise of the muscle unit, and so afford a generalized reduction in both size and weight (Bailey, 1976).

The use of electrical muscle stimulation has rapidly increased in the last few years and Slimline slimming machines are a popular modality among the public for the treatment of weight control in South Africa. The usual treatment session last 30 to 40 minutes, and is repeated two or three times per week. The conductive rubber electrode pads are place over those parts of the body (on or near motor points) where muscular contractions are desired, and the gain levels are adjusted so as to produce maximum muscle contractions without discomfort. During the treatment period of eight weeks the patient is given some simple dietary rules, but generally no drastic caloric restriction are imposed. Electrical muscle stimulation is a useful tool in training the obese patient, although it may not stimulate muscle hypertrophy, it has positive effect on muscle firming and further re-educates and develops the nerve muscle interaction.

#### **1.4 THERMOGENIC STIMULATION DEFINED**

Thermogenesis is a term referring to the body's production of heat. Heat production is a normal part of metabolic processes. At certain times, such as when exposed to cold temperatures, the body may bring about an additional form of thermogenesis-shivering. Shivering is an attempt by the body to create needed supplemental body heat by increasing muscular activity. Certain nutritional substances can also stimulate thermogenesis. Thermogenesis, when not simply needed for routine food digestion and metabolism, is both a source of heat and when stimulated through appropriate dietary supplementation serves as a mechanism to increase metabolic rate. Fuel for this increased metabolic rate can be provided by stored body fat, if released and available for use.

Nutritional stimulation of the body's  $\beta$  (beta) receptor pathway, can induce the breakdown and release of stored body fat, and thereby allow stored fats to be turned into energy. The  $\beta$ -agonists path is a signalling pathway in the body for a number of related areas. Many cell surfaces, especially muscle and fat cell surfaces, contain  $\beta$ -receptors. When a  $\beta$ -agonist (or antagonist) binds to a  $\beta$ -receptor site, a sequence of processes are activated that can both induce lipolysis (the breakdown and use of stored

fat for energy production) and increase muscle metabolism. This increased muscle metabolism may facilitate muscle cell growth.

Common  $\beta$ -agonists already available in the body include the neurotransmitter catecholamines, epinephrine and norepinephrine. These agonists are especially released during times of stress. Other materials which can interfere with the sequence of steps in the  $\beta$ -agonist process include dietary materials such as caffeine. Obese individuals interested in nutritionally supporting the body's natural fat-release and thermogenic mechanisms could consider the use of thermogenic agents as part of their dietary and weight management program. Thermo Lean is one such product on the South African market and comprises a unique formulation of special extracts and herbs to nutritionally support the release and burning of stored body fat.

## **1.5 STATEMENT OF THE PROBLEM**

Women may have unrealistic expectations of attainable weight and body shape associated with the Western emphasis on thinness. Substantial costs are incurred in the attempt to alter body weight and shape. Federal surveys indicate that among US adults trying to lose weight, over a two year period women make an average of 2.5 weight-loss attempts, each lasting an average of 6.4 months, and men make an average of two attempts, each lasting an average of 5.8 months. As a result, in the United States over \$30 billion dollars are spent annually on weight-loss efforts (Technology Assessment Conference Panel, 1992). As with any goal, there are costs and consequences associated with the quest for the ideal body. If taken to an extreme, the ultimate cost may be life itself.

Some of the support for a healthy weight management paradigm, rather than the traditional weight-loss management paradigm, comes from exercise scientists. The American College of Sports Medicine acknowledges that obese individuals could reap health benefits from exercise without demanding that the exercise meet the traditional intensity requirements suggested for weight-loss (American College of Sports Medicine, 1990). The Surgeon General's Report on Physical Activity and Health declared that physical activity need not be vigorous to improve health (US Department of Health and Human Services, 1996).

Research reflects a paucity of knowledge with respect to electrical muscle stimulation (EMS) and thermogenic stimulation (TS). To illustrate this point it is evident that no clear definitive guidelines, recognised specialists or body of literature reporting experimental and/or long-term studies exist in this area of exercise science. Despite the meager data base to support claims that electrical muscle stimulation, thermogenic stimulation, diet or a combination of these three modalities are effective in long-term weight control, this should not deter the pursuance of health intervention strategies for the obese. In cognisance of the foregoing, the question comes to mind whether or not, and to what extent, the advent of electrical muscle stimulation (EMS) and thermogenic stimulation (TS) can make a significant contribution to help the obese.

## **1.6 MOTIVATION FOR THE STUDY**

- The treatment of obesity and weight-loss strategies has become a commercial enterprise.
- Unless the efficacy of a potential therapeutic modality, whether it is exercise, behavioural, dietary, pharmacological or electrical, has been scientifically proven, its application can be considered irresponsible.
- Electrical muscle stimulation and thermogenic stimulation has great appeal to many sedentary and obese subjects because it promises some of the benefits of vigorous exercise without strenuous effort.

## **1.7 PURPOSE AND AIM OF THE STUDY**

The aim of the study was to conduct a randomized placebo-controlled trial to evaluate the effect of electrical muscle stimulation (EMS) performed on *Slimline Slimming Machines*, in conjunction with and without a thermogenic agent (*Thermo Lean*) and dietary control, on various physiological parameters among obese females.

## 1.8 HYPOTHESES

In accordance with the stated purpose of this study the following hypothesis was formulated:

A program of electrical muscle stimulation (EMS) performed on *Slimline Slimming Machines*, in conjunction with a thermogenic agent (*Thermo Lean*) and dietary control would have a beneficial effect on various physiological parameters among obese females.

## 1.9 DELIMITATION

The scope of research undertaken was delimited to an experimental epidemiological study. Within this context obesity was interpreted as a form of pathology/disease, with the evaluation of electrical stimulation in conjunction with a thermogenic agent and dietary control serving as an assessment of the efficacy of both interventions as a rehabilitative modality (Walter & Hart, 1990; Van Heerden, 1996).