1987

Genetic and Environmental Factors in Obesity: Case Studies

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An Abstract Presented to the Faculty
of the Graduate School of Lindenwood College
in Partial Fulfillment of the Requirements
for the Degree of Master of Arts

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ABSTRACT

This research project consisted of seven case studies of obese women who sought treatment for their weight problems at a hospital weight loss clinic and fitness center. The purpose of these studies was to consider the extent to which heredity and/or environmental factors contributed to these subjects' being overweight. The case studies suggested that six of the subjects' overweight problems were mainly caused by environmental factors. It was determined that one subject was overweight largely due to genetic predisposition, but that environmental factors also played a role. The two primary environmental factors appeared to be eating large portions of food and lack of physical activity. Once the relative influence of genetic and environmental factors was determined, appropriate treatment plans were made. These treatment plans included behavior modification techniques, a nutritionally-balanced diet, and regular exercise sessions.

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ACKNOWLEDGEMENTS

I sincerely thank Bess Maxwell, Ph.D., Cherry Sharp, Darrin Muhr, and Berni Schyvinch, the staff at DePaul's Fitness Center, for referring clients to me in order to have a variety of subjects as case studies for this project. A special thank you to all of the clients I have counseled for being patient and understanding as I learned counseling techniques with them. I especially thank Holly Edmiston, without whom this paper could not have been completed, and my husband, Randy, for being understanding of the need to pursue my education and career goals.

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CHAPTER I

Introduction

Obesity and being overweight is a disorder that is serious, prevalent, and resistant to treatment (Brownell, 1986). Obese people are more likely than their thin counterparts to have hypertension, hyperlipidemia, diabetes mellitus, and other serious health problems. A recent Consensus Conference of the National Institutes of Health (1985) concluded that weight as little as 20% above ideal brings an increased risk of coronary heart disease and premature death. The prevalence of obesity (it affects more than 25% of all adults) makes it a serious public health problem (Brownell, 1986).

Despite the medical risks of obesity, health is not the reason most overweight persons want to lose weight. As a group, obese individuals are more concerned with the psychological and social consequences of their condition than with medical issues (Brownell, 1986).

Throughout time, humankind has tried to treat obesity with various methods, ranging from miracle foods and medications to starvation and all kinds of special diets which guaranteed weight loss. More

recently, with Americans becoming more health conscious and the ever present desire to be thin, exercise has also become another means in the pursuit of losing weight.

According to Anderson, Dibble, Turkki, Mitchell, and Rynbergen (1982), energy expenditure is as important as food intake in the development of obesity. Obese persons usually have negative associations with exercise; therefore, they avoid exercise in any form for many reasons, which can further add to their obesity problem (Brownell, 1986).

General factors contributing to obesity are well known; i.e., decreased activity level and increased caloric intake, but the underlying cause of obesity is what this culminating project addressed. The issue is how both genetic and environmental variables affect the development of obesity.

It is known that genetics does contribute to obesity, as indicated by twin and adoptee studies. However, the amount of influence heredity has on the development of obesity is not known and further research needs to be conducted to answer this question.

Environmental factors that contribute to the development of obesity are known. Some of these factors are parental and social influence on the types

of foods consumed, the amount of food consumed, and lack of interest and/or participation in physical activity. Much further research also needs to be conducted on how the environmental factors influence the development of obesity.

Statement of Purpose

The purpose of this project was to examine seven case studies to consider the possible relative contributions of heredity and environmental factors to individual differences in obesity. The case studies were also used as a vehicle for critically analyzing the various theoretical orientations from other related research studies.

CHAPTER II

Review of the Literature

Overview of the Causes of Obesity

The terms being obese and overweight are often used interchangeably; however, each term has a specific definition or description. Overweight means being overheavy, but it does not always refer to fatness. It can also refer to weighing more than the ideal body weight due to excessive muscle mass, such as in the case of body builders. Obesity is generally defined as a bodily condition marked by excessive generalized deposition or storage of fat in adipose tissue. A person who is obese is 20% above the weight for his or her age and sex in the height and weight tables published by the Metropolitan Life Insurance Companies (Anderson et al., 1982).

From the evidence available today, it appears that the etiology of obesity is multifactorial. In addition to energy imbalance, the derangement of glucose and fat metabolism, genetics and psychological processes may also contribute to the development of obesity (Anderson et al., 1982).

One direct cause of obesity is the intake of more calories than are expended in energy by an individual, but excessive intake is only part of the problem.

Some obese individuals do not eat excessively, but their energy expenditure is significantly less than that of a thin or normal weight individual. It is generally accepted that 3500 calories equals one pound of body fat. Therefore, maintaining weight is achieved by the intake and expenditure of energy being equal (Anderson et al., 1982).

According to Hernandez and Hoebel (1980), in a small percentage of obese people there is an imbalance in the endocrine system or in the hypothalamus. The endocrine glands are those that produce one or more internal secretions (hormones) that enter directly into the blood and affect metabolic processes (Wilson, Fisher, & Fuqua, 1975). The thyroid gland is one of the glands in the endocrine system. People with insufficient thyroid function (hypothyroidism) are usually overweight, but they respond to treatment with thyroid hormone. This condition contributes only a small percentage to the total number of overweight persons (Anderson et al., 1982).

Hypothalamus Theory

The hypothalamus is the area of the brain where hunger and satiety signals are released to neural connections that tell the body when it is hungry or satiated. Research on animals has shown that when the ventromedial portion of the hypothalamus is destroyed,

an animal will continue to overeat and never reach satiety. If the lateral hypothalamus, which is next to the ventromedial portion, is destroyed, an animal will stop eating. It appears that when an animal is hungry, there is a high level of neural activity in the lateral hypothalamus. As the animal becomes satiated, activity in the ventromedial satiety region increases, thereby inhibiting further stimulation of the feeding center (Wilson et al., 1975). This research suggests that if crucial parts of the brain which control satiety and hunger are destroyed or injured due to trauma; a head injury in an accident, for instance; a human could uncontrollably overeat and become obese.

Fat Cell Theory

The fat cell theory of obesity was originally developed by Hirsch and Knittle in the late 1960s. This theory proposes that adult-onset obese persons have much larger fat cells, a condition known as hypertrophy, than those of normal-weight adults. Childhood-onset obese persons have an increased number of fat cells, a condition known as hyperplasia (Brownell, 1984). The hypothesis is that nutritional and genetic influences early in life lead to hyperplastic obesity and that the number of fat cells in the body stabilizes sometime during adolescence.

Therefore, weight gain and loss in adult life could occur by changes in cell size but not in cell number (Brownell, 1984).

Several other studies have indicated that as adipose tissue increases to approximately 30 kg, there is no further increase in adipocyte size, instead there is an increase in the number of adipocytes (Daniels, 1974). If this theory is true, then it is essential to start weight control and prevent overeating in childhood to prevent hyperplasia (Brownell, 1984). The findings from these studies suggest that the formerly obese person who reduces body weight and even body fat to near normal levels is still not cured of his or her obesity, at least in terms of the number of fat cells present.

Clinical evidence reveals that formerly obese patients have an extremely difficult time maintaining their new body size. It is possible that the large number of relatively small fat cells in the reduced person is somehow related to the appetite control center in the brain. When this appetite center is stimulated, the person craves food, overeats, and regains the lost weight. Some nutritionists have referred to the repetitive "yo-yo like" cycle of weight loss and gain among the obese as the "plight of the starving fat cell" (Katch & McArdle, 1983, p. 140).

Thermogenesis Theory

Only recently have investigators begun to understand why some persons remain lean for years with no effort to control food intake while others become obese in spite of strenuous efforts to limit intake. The study of large individual variations in the energy requirements of laboratory animals has shown that brown adipose tissue buffers changes in food intake (Himms-Hagen, 1984). When appropriately stimulated, brown adipose tissue dissipates (as heat) energy derived from ingested food in a process called thermogenesis. There are two types of external stimuli that trigger thermogenesis: exposure to cold (that is temperature below thermoneutrality) and the ingestion of food (Himms-Hagen, 1984).

Brown adipose tissue is located in a number of places in the body. In mammals it is found in relatively small deposits in the intrascapular, subscapular, and axillary regions; the nape of the neck; along the length of the great vessels in the thorax and abdomen; around the heart and kidneys; and in small patches between the ribs. Brown adipose tissue has a rich sympathetic innervation with nerve endings on both cells and blood vessels, and an extensive network of vascular capillaries. Its

metabolic activity is regulated primarily by norepinephrine secreted by the nerve supply. In contrast, the sympathetic innervation in white adipose tissue is limited to blood vessels. The metabolic activity of brown adipose tissue is regulated primarily by circulating hormones, such as insulin and epinephrine. The two external stimuli that trigger thermogenesis in brown adipose tissue, cold and food ingestion, increase sympathetic nervous activity in the tissue (Young, Saville, Rothwell, Stock, & Landsberg, 1982).

With the advance of discovering the function of brown adipose tissue and thermogenesis, experiments conducted on genetically obese rodents have shown there is defective thermogenesis in brown adipose tissue in obese rats. With this defect in energy expenditure, there is an increase in the amount of energy stored, which in turn contributes to obesity (Himms-Hagen, 1984). Evidence indicates that human energy metabolism resembles that of rats and mice, in that in each case brown adipose tissue is present and sympathetic nerves mediate changes in energy expenditure in relation to changes in the diet and environmental temperature. However, studies in humans are complicated by heterogeneity of the subjects and by the probable influence of age, sex, prior

nutritional and climate experience, and the genetic makeup on the processes being studied.

There is currently no direct evidence that thermogenesis in brown adipose tissue acts as an energy buffer in human beings. However, indirect evidence indicates that human beings are like laboratory rodents in their metabolic responsiveness to norepinephrine, cold, and diet, although these responses are more marked in rodents. Until more efficient and accurate forms of measurement of the actual function of brown adipose tissue in humans can be developed, the theory of a defect in brown adipose tissue causing obesity will remain unsupported (Himms-Hagen, 1984).

Set Point Theory

Another widely accepted theory regarding obesity is the set point theory. According to Katch et al. (1983), this theory proposes that an individual has an ideal biological weight or "set point." The body has an internal control mechanism, probably located deep within the brain's hypothalamus, that drives the body to maintain a particular level of body fat. The set point can be lowered by the drugs amphetamine and nicotine as well as by exercise, but dieting does not have any effect.

The set point theory suggests that each

individual body "wants" a characteristic quantity of fat and proceeds to balance food intake, physical activity, and metabolic efficiency in order to maintain that amount. The speculated physiological process behind the set point theory is that the fat cells which store fat apparently release chemical signals telling the brain how much fat they contain and, when necessary, ask for more. The set point mechanism seems to involve much of the body, not just an obscure cluster of cells at the base of the brain. This theory regards activity, eating, and metabolic rate as equally important and sees them as the means for maintaining a certain quantity of fat (Bennett & Gurin, 1982).

According to the set point theory, when an individual reduces his or her fat level below its "natural" set point, the body makes internal adjustments to resist this change and conserve body fat. This concept is supported by research findings indicating that severe caloric restriction depresses the resting metabolic rate by as much as 45%. For this reason, people may reach a plateau in weight loss, even when calories are further decreased to continue the weight loss. When this happens, dieters often become discouraged and discontinue dieting. They return to their old eating habits, regaining the lost

weight. Proponents of the set point theory have one solution to lower the set point, and that is sustained vigorous activity (Katch et al., 1983).

Cultural Evolution Theory

From about 10,000 years ago until the middle of the eighteenth century, most of the earth's people lived in constant jeopardy of famine. Before about 250 years ago, these food crises were built into the agricultural economy, which was more prone to periodic, severe breakdowns than the hunter-gatherer lifestyle that humans had pursued for the 3 or 4 million years before the garden was invented. As long as humans were gatherers and hunters, they had to move around frequently to find the kinds of food they favored. Based on observations of existing primitive tribes and on other species of animals that hunt food, leanness is deemed an asset to the act of chasing prey. The fact that the set point is lower when people exercise than when they are inactive reflects the basic condition before agriculture. As agriculture became the dominant means of food procurement, humans became fatter. The reason was not an abundance of food, but due to the reoccurrence of famine often followed by plague, the human body set point became more efficient during times of food shortages and decreased activity levels. The extra

energy provided by fat storage was also necessary to help fight off the recurrent diseases that plagued the human population as cities grew (Bennett & Gurin, 1982).

In recent times, Americans have gained weight because their environment has changed in ways that encourage fatness. Three specific factors are likely to be responsible for this trend. The main factor is decreased physical activity, due to mechanization and automation, which results in lower caloric demands. A second possibility is that the reduced burden of infectious diseases, as a result of the development of immunization and antibiotics since World War II, has allowed people to fatten due to less stress placed on the body to fight off various diseases. The third factor is dietary changes. Food is readily available and the consumption of sugar and fat through fast foods and convenience foods has increased (Bennett & Gurin, 1982).

Dieting has become the American way to decrease weight. If dieting alone were effective, then reduction in caloric intake should bring the national body weight to a lower, not higher, level. The American population has not become increasingly gluttonous, but more sedentary. Americans now eat 10% fewer calories than they did 15 years ago, yet they

weigh 4 or 5 pounds more on the average. The main difference between fat and lean people is the level of daily physical activity. Lean people move around much more and consequently expend more calories than their obese counterparts (Katch et al., 1983).

Genetic and Environmental Factors

Evidence for Gene Effects

The inheritance of certain genetic traits has been shown to contribute to obesity in experimental laboratory mice (Mayer, 1976). There are also several genes of major effect that are associated with obesity in human beings. Some examples of syndromes in which obesity is a prominent feature include: Bardet-Biedl, Laurence-Moon, Alstrom, and Prader-Lakhart-Willi. These are all believed to be transmitted as Mendelian recessive genes (Foch & McClearn, 1980).

General obesity, excessive localized lipid deposition, and eruptive xanthomas are all clinical features of triglyceride storage diseases and hyperlipoproteinemias, both of which can segregate as single genes (Foch & McClearn, 1980). Much research has been conducted on these and similar genetic metabolic disorders which relate obesity and coronary artery disease. Two of the most common genetic disorders, non-insulin-dependent diabetes and familial combined hyperlipidemia, have an association with mild

to moderate obesity. The obesity in both disorders is similar to that associated with coronary artery disease, develops during early life, and may lead to premature coronary disease. The lipid abnormalities in these individuals are more pronounced than those in obese people lacking a family history of these disorders (Iverius & Brunzell, 1985).

The familial occurrence of obesity has long been reported. A nineteenth century physician in France, Bouchard, noted that most of his obese patients had at least one obese parent. In the 1930s Rony found that over two-thirds of 250 obese patients in Chicago had at least one obese parent (Foch & McClearn, 1980). In an informal observation of high school graduates in Massachusetts, Mayer (1975) reported that only 14% of the students observed having normal weight parents were judged obese. When one parent was obese, the percentage of students judged obese rose to 40%. This percentage increased to 80% when both parents were obese.

In a study on human obesity and twins, Stunkard, Foch, and Hrubec (1986) found that human obesity is genetically determined. The subject sample used consisted of 5,884 monozygotic and 7,492 dizygotic pairs of twin males who were born between 1917 and 1927 and who served in the Armed Forces during

World War II or in Korea. The subjects' original heights and weights were measured and recorded during the induction physical examination at ages ranging from 15 to 18 years. Questionnaires were mailed 25 years later asking each subject his height and weight at the present time (in 1967) and of his height and weight at age 25. Responses to the 25-year follow-up were received from 1,974 monozygotic pairs and 2,097 dizygotic pairs. The results from this study suggested that obesity is under substantial genetic control. Concordance rates for different degrees of overweight were twice as high for monozygotic twins as for dizygotic twins. In this study there was a high heritability for height, weight, and body mass index, both at age 20 (.80, .78, and .77, respectively) and at a 25-year follow-up (.80, .81, and .84, respectively). Height, weight, and body mass index were highly correlated across time, and a path analysis suggested that the major part of that covariation was genetic.

In studies of twins by Brook, Huntley, and Slack (1975), similar results were reported. This study of 78 monozygotic and 144 same-sexed dizygotic pairs reported a heritability of .77 plus or minus .17 for the entire sample. The sample was then divided into twins under or over 10 years of age. Heritability was

greater in the older twins than in the younger twins.

A study by Borjeson (1976) had a twin sample of 40 monozygotic and 61 same-sexed dizygotic pairs. The results were that one or both members of the twin pair exceeded by two standard deviations the weight predicted from age and height. Analysis of fat fold thickness yielded a heritability of .88. Distributional comparisons of fat fold thicknesses between ordinary siblings and between monozygotic and dizygotic twins were consistent with polygenic inheritance. No evidence was found in the study by Borjeson for important contributions of intrauterine environment or early nutrition to the development of obesity, which he ascribed almost solely to heredity.

A study conducted by Stunkard et al. (1986) examined the contributions of genetic factors and the family environment to human fatness in a sample of 540 Danish adoptees. These subjects were selected from a population of 3,580 adoptees and divided into four weight classes: thin, median weight, overweight, and obese. The results indicated a strong relationship between the weight class of the adoptees and the body-mass index of their biological parents. There was no relationship between the weight class of the adoptees and the body-mass index of their adoptive parents. This relationship between both biological

parents and adoptees and between the adoptees and their adoptive parents was not confined to the obesity weight class, but was present across the whole range of body fatness, from thin to obese. The conclusion of this study was that genetic influences have an important role in determining human fatness in adults, whereas the family environment alone has no apparent effect.

Evidence for Environmental Effects

The support for the idea that genetic factors contribute predominantly to being overweight is strong; however, other studies have shown that environmental factors are at least as significant as genetic factors as contributors to human fatness. Shenker, Fishichelli, and Lang (1974) conducted a study to obtain records of weight gain in 66 infants, predominantly black, who were temporarily placed in foster homes. The 66 foster mothers were divided into an overweight group in which the minimum weight was estimated at 68 kg and a normal weight group in which weight was judged to be average for age and height. Weights and lengths of the babies were measured at monthly intervals. There was a tendency for both sexes of infants of overweight foster mothers to be heavier than those of normal weight foster mothers. Significant differences were obtained for boys at 3,

5, 6, and 7 months and for girls at 9 months. These facts supported the theory that environmental factors contribute to weight gain during the first year of life. There was no evidence that the weight gained by the infants accumulated in any systematic amount over the year.

Garn and Clark (1975, 1976) took data from the Ten State Nutrition Survey to determine the prevalence of obesity in different socioeconomic groups and in different population segments. The number of subjects used in this study were: 2,961 pairs of spouses, 20,554 parent-child pairs, and 29,545 sibling pairs for black and white people ranging in age from 1 to 80 years. The measurement of fat of all of the subjects was obtained by measuring the tricep skinfolds. The results of this study showed considerable family resemblance for obesity between parents and offspring ($r = .30$) and between siblings ($r = .40$). These findings suggest that either shared genes or shared meals, or both, contributed to obesity.

In a study conducted by Srole, Langner, and Michael (1962), influences of social environment on obesity were first obtained. This study, called the Mid-Town Study, was originally designed as a comprehensive survey of the epidemiology of mental illness of women in medium-sized population towns in

America. The subjects were women divided into three groups according to their socioeconomic status. There were 329 in the low socioeconomic status group, 315 in the medium socioeconomic status group, and 325 in the high socioeconomic status group. The results of this study showed a significant correlation between socioeconomic status and the prevalence of obesity. The results also indicated that 30 percent of the lower class women were obese, in comparison to 16 percent in the middle class and no more than 5 percent in the upper socioeconomic class.

Another study conducted to determine whether environmental factors contributed to obesity was the Framingham Heart Study. Correlations of both height and relative weight were studied among adult relatives. The parental generation was first examined, starting in 1949 when they were between the ages of 30 and 62 years. The offspring and their spouses were examined beginning in 1971, when they were between the ages of 20 and 49 years. This made it possible to compare adult levels of body size in two generations. The results for height indicate there was a correlation between relatives that suggests large genetic variation for adult body height. For relative weight as measured by Quetelet's Index (weight divided by height squared), the

associations between relatives show a pattern that is more difficult to interpret and gives little support for sizable contributions of genetic differences to the population variation in relative weight. It was the conclusion of the authors of this study that despite the debate about the genetic versus environmental influences on obesity, the application of these results may lie in the field of prevention. As relative weight does appear to be mainly environmentally determined, knowledge of this may give obese people and their medical advisers hope that weight reduction is possible and can decrease the risk of coronary disease in parents and their offspring (Heller, Garrison, Havlik, Feinleib, & Padgett, 1984).

The search for predictors of success at weight reduction has been long and largely discouraging. Such information could provide an index for prognosis of treatment so that clinical efforts could be targeted to those most likely to succeed. The identification of predictor variables may also have an important implication for the classification of obesity. Behavioral, environmental, and psychological variables might predict how a person will respond to attempts to lose weight and these factors may, in turn, relate to the genesis of obesity in individuals. There may also be interactions between these

predictive variables and the physiological and anatomical correlates of being overweight (Brownell, 1984).

In fact, several behavioral, psychological, and environmental factors are related to the likelihood that an individual will be obese and to that person's chances of success at weight reduction (Brownell, 1984). Included in the behavioral factors category is physical activity. An individual's ability and willingness to be physically active is one predictor of how obese he or she will be and how likely treatment is to succeed (Brownell, 1984).

Self-control is another behavioral factor which is used as a predictor variable. It is the ability to recognize positive achievements of weight loss and to reinforce oneself either emotionally or materially for the accomplishment of weight reduction (Brownell, 1984).

Restraint is a psychological/cognitive factor that refers to a person's resistance to physiological or psychological pressures to eat, perhaps created by one's body weight being below a biologically ideal set point. It may provide some index of how difficult it will be for an individual to lose weight and, more importantly, how well he or she will maintain a weight loss when challenged by the inevitable factors that

promote overeating (Brownell, 1984).

Some individuals have a weight increase threshold. These people have the capacity to institute corrective action when their weight climbs above some self-imposed level. This may be a learned behavior that is influential in the ability to control weight (Brownell, 1984).

The degree to which an individual receives support from important persons in his or her social environment is an important predictor of susceptibility to and recovery from a number of medical and psychological problems (Colletti & Brownell, 1982). With regard to the problem of obesity, there is evidence suggesting that people living in supportive environments are more likely to have positive short-term and long-term results in weight loss and maintenance programs (Brownell, 1984).

Studies conducted by Stunkard (1975) have pointed to several demographic variables that are important in the development of obesity. The prevalence of obesity in the socioeconomic lower class is substantially higher than in the socioeconomic upper class, and obesity is more prevalent in some ethnic and religious groups than in others.

In counseling an obese person, it is important to learn from the individual the history of the family

environment he or she was raised in, as well as the type of environment he or she presently lives in. With this information, an idea of the type of treatment to be implemented and possible predictors of successful weight reduction can be formulated. Social support is one such predictor that may help determine whether a person will be obese and how effective treatment may be. In addition, attempts aimed at altering a person's social support network may be influential in promoting weight loss (Brownell, 1982).

Weight Control and Nutrition

According to Brownell (1986), dieters are notorious for following inadequate and faddish diet plans. It is important that the dieters be educated in making sensible food choices. The challenge to a nutritionist or registered dietitian is to plan a nutritionally adequate diet and combine it with the patient's desire to lose weight as rapidly as possible, as well as to counter the many nutrition myths surrounding dieting.

In designing a diet for each individual, an appropriate calorie level is determined on the basis of the person's metabolic needs. These are determined by height, sex, age, activity level, and lifestyle (Anderson et al., 1982). In order to design an appropriate diet for an individual who needs to lose

weight, an interview with a nutrition expert, i.e., qualified nutritionist or registered dietitian, is necessary to assess a person's present dietary habits, food allergies, and daily physical activity. The estimates of energy intake and physical activity obtained from the interview are then used to design a diet that should promote weight loss.

According to Wilson et al. (1975), a diet should permit the gradual loss of weight of no more than .9 kilograms, or two pounds, per week. If the daily calorie deficit is 500 kilocalories, then the weekly loss will be approximately one pound. For moderate weight reduction, a daily diet for most women should contain between 1000 and 1500 kilocalories and 1500 to 2000 kilocalories for most men. These levels supply the approximate amount of energy needed for basal metabolism and the recommended amount of essential nutrients required by the body.

The Recommended Dietary Allowances of essential nutrients are set by a research review food and nutrition board that is associated with the National Research Council of the National Academy of Sciences (1980). The calculated amount of calories for a client's daily intake are then divided into a percentage of protein, carbohydrates, and fat. It is recommended for adults that 20% of the calories be

from protein, 30-35% from fat, and 45-50% from carbohydrates (Anderson et al., 1982). The diet should also provide all other essential nutrients, such as minerals and vitamins, in quantities that are at least equivalent to the Recommended Dietary Allowances. If the caloric intake is very restricted, e.g., less than 1000 kilocalories, vitamin and mineral supplements are needed (Anderson et al., 1982).

The "exchange plan" is the most widely accepted and usually the most helpful regimen for guiding people to select an adequate diet (Brownell, 1986). In the 1950s the American Dietetic Association, in cooperation with the Committee on Education of the American Diabetes Association, first published a system of diet calculations for diabetic patients known as the Exchange System. This system was revised in 1976 and the newest revision was released in 1986. Although the Exchange System was originally planned for the calculation of dietary patterns for people with diabetes mellitus, it is now used for other therapeutic diets, such as energy-restricted and fat-restricted diets (Anderson et al., 1982). The term "exchange" means that an individual may select a food item within one of six food groups and substitute it for another food within the same group. The six food groups are: milk, vegetable, fruit, bread

(starch), meat, and fat. After the diet pattern is calculated, the pattern is then explained to the patient, along with how to use the exchange system in following a nutritionally balanced but restricted-calorie diet. This form of diet allows people to eat nutritiously in smaller amounts and educates them in learning to eat all of the right foods. It also eliminates their having to count calories directly.

To follow a diet for the treatment of obesity or the maintenance of some desired level of body weight is to attempt to gain a measure of control over one's eating behavior (Van Itallie, 1980). The original notion of prescribing a diet for weight reduction seems to have come from an assumption that knowledge about the caloric value of foods was the limiting factor in weight control (Jolliffe, 1952). It was later believed that such knowledge and sufficient motivation to adhere to an appropriate diet were the essential ingredients to success in restraining an individual's food consumption (Feinstein, 1960).

The problem with emphasizing the key role of motivation was that the adequacy of a given obese person's motivation was judged by his or her ability to lose weight. Hence, those who were unsuccessful in losing weight were considered to have been insufficiently motivated. But in most, if not all,

fields of endeavor, motivation is only one of the ingredients needed for success. Others include skill, endurance, persistence, and the capacity to exercise restraint over one's behavior and to endure frustration and discouragement. Only recently has it been recognized that the ability to control one's eating behavior does not merely depend on motivation and information about calories; it also calls for considerable self-knowledge and the learning of skills and techniques that can help a person implement more effectively their motivation to achieve some desired weight (Stunkard, 1975).

Exercise and Weight Control

According to Katch and McArdle (1983), a negative caloric balance produced either by dietary restriction or by exercise can result in a desirable modification in body composition--that is, a decrease in body weight and the percent of the body fat. It is certain that the combination of exercise and diet offer considerably more flexibility for achieving a negative caloric balance and accompanying fat loss than either exercise or diet alone.

Exercise for weight reduction differs from exercise for cardiovascular fitness. For the obese person, the total number of calories expended during exercise is the primary concern. The most important

characteristics of exercise are its type and duration (Brownell & Stunkard, 1980). Types of exercise for obese persons are: consciously walking further distances, increased use of stairs instead of taking elevators or escalators, and exercising at least three to five times per week for at least 15 minutes per session, which is best done by walking, jogging, swimming, or cycling (Brownell et al., 1980).

In a study conducted by Woo, Garrow, and Pi-Sunyer (1982), obese women participated in 57 days of moderate physical exercise but continued to eat in their usual manner. The results were that negative energy balance was obtained and sustained and body weight decreased. This study also showed that exercise did not regulate food intake. The amount of time weight loss was maintained after completion of this study was not reported.

In a study conducted by Harris and Hallbauer (1973), subjects participated in three group programs. The three groups were: self-control/contract for eating, self-control/contract/exercise, and a control group. The results were that all participants in all three groups lost weight, but the behavior modification (self-control) group had superior results in long-term maintenance of the weight loss over the control group. However, the weight control group,

which stressed control of exercise behavior as well as eating, appeared to be more successful than the group dealing with eating habits alone.

The use of motion pictures to estimate energy expenditure from physical activity has shown that obese subjects are less active than lean subjects (Daniels, 1984). Mayer, Roy, and Mitra (1956) concluded that individuals in physically strenuous occupations weigh less than those in more sedentary occupations. Goldman and Haisman (1975) concluded in a study that energy expenditure for a given amount of work is the same for obese and lean individuals. Thus, there is no intrinsic defect in energy costs for physical activity in obese subjects. Studies cited by Katch and McArdle (1983) indicate that obese persons expend less energy than normal weight individuals. The indication from these studies is that a moderate exercise program needs to be incorporated into weight control programs, because inactivity is a major behavioral characteristic that distinguishes overfat from nonobese people. Obese persons must not only relearn or modify existing eating behaviors, but they also need to reverse the existing syndrome of insufficient caloric output due to a sedentary lifestyle. They need to replace daily periods of relative inactivity with more strenuous activity

requiring greater energy expenditure and experience enjoyment and success in their exercising program (Katch & McArdle, 1983). Performing and adhering to exercise programs is influenced by the environment. Brownell and Stunkard (1980) noted that social support from family and friends was found to be influential in whether individuals adhered to specific exercise programs for weight loss.

Behavior Therapy and Weight Control

According to Wilson (1980), behavioral treatment differs from alternative forms of treatment, such as special diets, drugs, or surgery, which do not deal with changing behaviors in eating or exercise. The goal of behavioral treatment is to alter the obese person's eating and activity habits. The emphasis is on changing the behavior in order to restrict caloric consumption and increase caloric expenditure through physical exercise.

In recent years, the use of behavior therapy techniques has been incorporated into weight loss and weight control programs. The different techniques, which universally are referred to as behavior modification techniques, include: aversive conditioning, covert sensitization, covert conditioning, self-control of eating, therapist reinforcement of weight loss, and stimulus control.

Aversive Conditioning

The studies that have investigated punishment or avoidance conditioning programs have usually used as avoidance stimuli electric shock (Meyer & Crisp, 1964), noxious odors (Foreyt & Kennedy, 1971), and noxious covert stimuli (Cautela, 1972) to eliminate the consumption of problematic foods. The purpose of aversive control procedures is to eliminate a response. This type of program has been used to help people stop smoking. The goal of stop smoking programs is abstinence. However, the goal in obesity treatment programs is not elimination of eating but reduction of the amount of food consumed.

In a review of aversive conditioning treatment, Abramson (1973) stated, "It appears safe to conclude that despite some early enthusiasm, there is little evidence to indicate the aversive procedures are an effective treatment of obesity" (p. 548).

Covert Sensitization

In 1966, Cautela reported the successful use of a procedure called covert sensitization in treating obesity. This technique involves the pairing of problematic behaviors with unpleasant scenes in imagination. Cautela's clients lost a total of 30 kg and demonstrated perfect maintenance at a 7-month follow-up (Stunkard & Mahoney, 1976).

Other studies followed that tested covert sensitization (Meynen, 1970; Lick & Bootzin, 1971) with results showing weight loss, but not a significant amount. However, in another study that tested covert sensitization by Janda and Rimm (1972), 18 subjects were divided equally into three groups; a covert sensitization group, a no-treatment group, and a control group that received some attention from the researchers. The results showed that the covert sensitization group lost 4.3 kg in six weeks and maintained a 5.3 kg weight loss after a six-week follow-up period. Manno and Marston (1972) compared a control group of twelve subjects to a covert sensitization group of thirteen subjects and a covert reinforcement group with 13 subjects. The results of this study showed a mean weight loss of 4 kg by the subjects in both covert groups with a maintenance of this loss after a 3-month follow-up period.

Although the results of these studies were encouraging in producing weight loss using covert sensitization, Abramson (1973) noted that if covert sensitization is viewed as a technique for reducing consumption of specific problematic foods or decreasing eating in specific situations, it is reasonable to assume that it is effective by measuring consumption of target foods rather than weight loss.

The relevance of thoughts and self-statements to significant daily behaviors was emphasized by Homme (1965) in his paper entreating behavioral researchers to deal with "coverants"--the covert operants of the mind. Controlled research on Homme's paradigm has been sparse; several investigators have used variants of it in the treatment of obesity (Stunkard & Mahoney, 1976). In a research study conducted by Tyler and Straughan (1970), coverant conditioning was compared to a breath-holding (self-punishment) strategy and relaxation training. The weight loss in the three groups over a nine-week program was minimal. In other studies conducted by Horan and Johnson (1971), the results were a significant weight loss in subjects who had a coverant control technique applied.

Cognitive strategies have been used as a device for maintaining motivation as well as prompting behaviors. Mahoney and Mahoney (1975) developed an extensive program for the improvement of "cognitive ecology" (cleaning up what you say to yourself). They classified weight relevant thoughts into five categories with appropriate and inappropriate responses in each. The subjects reported that their cognitive restructuring was an invaluable component in successful weight reduction.

The contribution of cognitive and covert

conditioning strategies in the treatment of obesity requires further controlled investigation. However, based on preliminary results and the significant role of cognitive influences in other complex human behaviors (Mahoney, 1974; Meichenbaum & Cameron, 1974), the clinical promise of these strategies appears to be impressive (Stunkard & Mahoney, 1976).

Self-Control Techniques

Self-monitoring or self-control was first introduced by Ferster, Nurnberger, and Levitt (1962), who theorized that the act of putting food into one's mouth is reinforced by its immediate pleasurable consequences, while the negative consequences (i.e., getting fat) are postponed to some indefinite time in the future. The goal of treatment was to make the negative consequences more immediate so they would become more potent as determinants of eating behavior (Abramson, 1973).

Harris (1969) compared a no-treatment control group with a behavioral group treatment comprised of three techniques: training subjects to reinforce themselves for appropriate eating behavior; reducing the number of stimuli eliciting eating; and lengthening the chain of responses involved in eating--for example, chewing food slowly and taking short breaks during meals. After two and a half

months of treatment, the 21 subjects of 10 men and 11 women were divided into two groups for a continuation of group treatment or individual covert sensitization sessions. The results indicated significant differences between treatment and control groups and between sexes. Men lost more weight than women, but no additional weight loss could be attributed to covert sensitization.

In a study by Stuart (1967), a self-control technique was used with eight overweight subjects. The subjects were seen during 12 separate interviews in which self-control and stimulus control techniques were explained to the subjects and carried out by them. The results proved to be significant in terms of weight loss, even one year later. This form of treatment was aimed at building the skill of the patient in being his or her own contingency manager. This is a self-control procedure that was reinforced through the patient's experience of success in the control of his or her own behavior, through the reduction of the aversive consequences of a lack of self-control, and through considerable reassurance by the therapist.

In nearly every study that has employed stimulus control strategies, there has been reported an average weight loss of at least .45 kg per week (Stunkard et

al., 1976). In terms of treatment consistency, the stimulus control techniques developed by Ferster et al. (1962) and further refined by Stuart (1967) have proven themselves to be somewhat superior to other procedures. Jongmans (1969, 1970), Hagen (1970), and Fernan (1973) have shown that some individuals can achieve substantial reductions by simply receiving a treatment manual that describes stimulus control strategies. According to Mahoney (1972), however, the prognosis for clinical success in weight reduction is best when stimulus control procedures are supplemented by other self-regulatory strategies.

Therapist-Controlled Reinforcement

Therapist-controlled reinforcement technique has suffered from one continuing problem. The therapist is only present for one hour of treatment per week when working with outpatients (Abramson, 1973). Harmatz and Lapuc (1968) conducted a study using therapist-controlled reinforcement on 21 hospitalized schizophrenic male subjects. In this study, a comparison of the effectiveness of behavior modification, group therapy, and diet alone treatments was made on the subjects. The behavior modification subjects were deprived of a portion of their $5 weekly allotment if they did not exhibit a weight loss at the weekly weighing. The results at the end of 6 weeks

indicated that the group therapy and behavior modification groups lost a significant amount of weight in comparison to the control diet alone group. However, at the end of a 4-week follow-up period, only the behavior modification group weighed less than the group therapy or diet alone groups.

A study conducted by Mann (1972) had 8 overweight subjects deposit their money and/or personal possessions at the beginning of treatment with the therapist. The subjects signed a contract which specified the subjects' terminal weight reduction goal, as well as the number of pounds to be lost during each 2-week period during the study. The contingency was that if the subjects did not lose the weight as specified in the contract, they would lose a percentage of the money or personal possessions they had given up at the beginning of the treatment program. This punishing contingency of the possibility of losing their possessions or money was an essential component in the treatment to lose weight. This treatment was successful in that the subjects lost weight; however, the weight loss was accomplished through taking laxatives and diuretics. The goal of weight loss was the target rather than the actual change of eating behaviors. Long-term effects of treatment were not reported because there was no

follow-up data.

A study completed by Jeffery, Christensen, and Pappas (1972) on the long-term effects of repossessing possessions reinforcement was conducted on 4 overweight subjects. The results of this study found that after a 6-month follow-up, 1 of 4 subjects returned to baseline weight while a second regained 6 of 15 kg lost. With the use of reinforcers, the specific eating behavior is not modified directly, only weight losses are reinforced. Thus, for treatment to result in permanent change, subjects have to devise their own techniques for altering eating behaviors (Abramson, 1973).

Stimulus Control Behavioral Treatment

Stimulus control is an instrumental learning process whereby a cue in the environment comes to control the behavior of an individual. This form of treatment strategy has been demonstrated to be a very powerful component in the successful regulation of obesity (Stunkard et al., 1976).

Ferster, Nurnberger, and Levitt (1962) were the first researchers to analyze the extent to which naturalistic cues come to elicit and control eating responses. Examples of these cues include, a room frequently associated with eating, a clock indicating meal time, and a bountiful display of snacks are all

stimuli which may trigger the desire to consume food.

Ferster et al. (1962) recommended several specific strategies to alter the cues associated with eating. Examples of the strategies are: (a) separate eating from all other activities, (b) make high-calorie foods unavailable, inconspicuous, or hard to prepare, (c) alter food portions by using smaller bowls or plates, (d) eat slowly, and (e) avoid waste eating, or "don't clean the plate" or "eat the food because it was paid for." The goal of these techniques was to progressively restrict both the range and frequency of cues associated with eating.

Stuart (1967) utilized these stimulus control procedures with 8 obese female subjects in a study on the behavioral control of obesity. In the initial treatment sessions, the 8 subjects met 3 times a week with the therapist over a 5-week period. Subsequent sessions occurred every 2 weeks for the next 12 weeks and maintenance sessions continued on a monthly meeting basis for the remainder of the year. The results of this study were that the least successful subject lost 12 kg and the other 7 subjects ranged up to a 21 kg weight loss.

Behavioral Studies with Follow-Up

Large weight losses during treatment are not sufficient to establish the value of a behavior

modification treatment program since weight loss is of little worth if it cannot be maintained. At present, few studies have conducted long-term follow-up assessments of subjects that would determine the success or failure in using behavior modification techniques to maintain weight loss after their treatment has been completed. However, in a study conducted by Beneke, Paulsen, McReynolds, Lutz, and Kohrs (1978), an 18-month follow-up was done after a behavior modification treatment study to determine the maintenance of weight loss on the original subjects. There were 54 subjects in two behavioral weight loss treatments. The subjects were divided into 8 groups of 5 to 8 members and received 15 weekly treatment sessions. Four groups received a behavioral self-control treatment and the other 4 groups were in a stimulus control food management group. The results of the 18-month follow-up were that 80% of the food management group and 50% of the behavior self-control group had maintained their initial weight loss. Four subjects in the behavior self-control, but none in the food management group had regained all of the weight they had lost during treatment. Four subjects in each treatment condition lost additional weight during the 18-month post-treatment period.

In another study of behavior modification and

weight loss, Kingsley and Wilson (1977) conducted a follow-up one year after the subjects participated in an 8-week treatment program. The subjects were 78 overweight women who were divided into three groups: social pressure, individual behavioral, and group behavioral. The initial results immediately after the 8-week treatment program were that the two behavioral treatment groups lost more weight than the social pressure group. During the one-year follow-up, the group behavioral subjects were significantly better at maintaining the lost weight relative to the individualized behavior treatment subjects. The researchers' theory for these results was that the superior maintenance of weight loss in the group treatment was due to better motivation. Group cohesiveness and the resultant group pressure to adhere to weight reducing strategies probably makes group treatment more powerful than individual therapy in terms of sustaining commitment and motivation. Each subject initially learned effective methods to lose weight, then it became an individual function whether or not the skills learned to lose weight were implemented in a natural setting.

Behavior therapy was found to be more effective in weight loss than other alternative methods, including nutrition education, group psychotherapy, and peer

pressure approaches (Brownell, 1980). Whether behavioral treatment results in better long-term maintenance of weight loss than alternative treatment methods cannot yet be determined due to the lack of a significant number of well-controlled, long-term follow-up studies.

CHAPTER III

Method

Subjects

The subjects were seven women ranging in age from 34 to 70 years. All were participants in the Weight Loss Clinic of DePaul Health Center's Fitness Center located in Bridgeton, Missouri. All of the subjects were overweight and they had been in psychological counseling/behavior modification for at least one month for weight reduction at the time they participated in the study.

All of the subjects volunteered and verbally consented to have their case studies presented in this project. They had the understanding that only initials would be used to refer to individuals within the context of this paper.

Procedure

All of the subjects were examined by a medical doctor associated with the Fitness Center to establish any medical restrictions on their exercise or diet. All of the subjects checked their weight on the same standing scale (located in the Fitness Center) once per week.

Each subject exercised on either stationary or

air-dyne bicyles and a treadmill. The length of time and speed on the exercise equipment was determined by experienced exercise physiologists for each individual's physical abilities. Each subject was individually instructed on a nutritionally-balanced diet designed specifically for her by a registered dietitian employed by DePaul Health Center. Each diet was calculated according to appropriate calories to allow a .45 to .9 kg weight loss per week, but nutritionally adequate to meet the Recommended Dietary Allowances for all essential nutrients. The Exchange System was the type of diet plan used by each subject; these plans were designed after obtaining the subjects' food preferences, food intolerances, and a 24-hour dietary recall. The use and purpose of the Exchange System was explained in detail to each subject.

Counseling/behavior modification sessions were conducted by a Master of Arts degree candidate in a counseling psychology program at Lindenwood College. During one of the first 3 sessions, each subject's individual and family history regarding obesity and eating habits was obtained. This information was later used to develop case histories for this project. The counseling for each subject was based on the needs of each individual's problem relating to weight loss.

Stimulus control, a behavior modifcation technique, was employed to change eating and exercise behaviors in all cases. Examples of stimuli used included: a room associated with eating, a clock indicating meal time, availability of high-calorie foods, portion sizes consumed during and between meals, rate of food consumption, and exercising outside of the fitness center.

In addition to information obtained during the 45-minute therapy sessions, once a month the subjects completed food, activity, and behavior records for 1 week (see the Appendix). These records were designed to make the subjects aware of their eating habits and behaviors, to help the therapist identify the eating behaviors which needed to be modified, and to index the subjects' success or failure in modifying these behaviors.

The overall goal in therapy was to alter inappropriate behaviors that contributed to the subjects' inability to lose weight.

CHAPTER IV

Case Study Observations

Case Study #1

V.M. was a 70-year-old, 165 cm tall female who began participating in the Fitness Center program in October 1986. Her initial weight was 90 kg, 17.3 kg above her goal weight of 73 kg. At the end of seven months, this subject had lost 12.3 kg. V.M. had adult onset diabetes mellitus controlled by diet and an oral hypoglycemic medication. A gradual weight gain of 16 kg occurred three years ago after the client quit smoking cigarettes. She replaced smoking with food by snacking on candy and snack foods. The increase of food consumption in addition to a sedentary lifestyle contributed to the weight gain. V.M. had a family history of diabetes mellitus and adult onset obesity. The client's mother was extremely obese and a non-compliant, insulin-dependent diabetic who led a very sedentary life. The client's father was thin and worked a strenuous job as a coal packer. Her maternal and paternal grandmothers were not overweight but had diabetes mellitus.

As a child, the client and her siblings, one brother and one sister, both of whom have diabetes mellitus, were encouraged to clean their plates and

were rewarded for this behavior with desserts.

After a very active lifestyle, which included frequent walks with her (now deceased) husband, ice skating, and swimming, the client became inactive approximately 10 years ago after the loss of all her personal belongings and house from a fire. She lived with another woman who insisted on cooking all of the meals, therefore not allowing V.M. the feeling of independence and autonomy she once experienced.

When the client began counseling, she appeared depressed, passive, and withdrawn and had a low self-esteem. After the fourth session, the therapist assessed that these emotional problems were a contributing factor in her change of lifestyle and overeating. The client responded well to stimulus control for changing eating behaviors. She followed the Exchange System diet plan closely by eating the appropriate foods and portion sizes at regularly scheduled times and eliminated all between-meal snacking, except for the planned evening snack. Part of the changed behavior was motivated by her strong desire to keep her blood glucose level within a normal range, in addition to losing weight to improve her health.

Through counseling, the client's depressed state also improved. This was accomplished by the client

exploring, understanding, and owning her feelings of anger, stress, and dependency, which she has experienced throughout the past 10 years. After becoming aware of how these suppressed feelings controlled her life, she was able to recognize and deal with them more effectively instead of retreating to overeating and the safeness of her room. Her self-esteem had also improved, which was indicated by her smiling more, looking the therapist in the eye, and talking openly about her feelings, problems, and her solutions.

From the history and information provided by this client during therapy, the possible genetic factor influencing her to become obese was that her mother was obese. However, the family's eating pattern of consuming high-calorie foods and their very sedentary lifestyle, both environmental factors, were much more likely the reasons that the client and her mother were overweight.

It was therefore concluded that the client's being overweight was due to the environmental factors of overconsumption of high-calorie foods between meals to help ease the unpleasant events in her life and the sedentary lifestyle she developed as depression engulfed her. Because the client's history of eating high-calorie snacks between meals was discovered, a

strict diabetic diet was implemented, in addition to stimulus control of not eating any snacks other than the planned evening snack.

Case Study #2

L.D. was a 65-year-old female who had been in counseling since February 1987. She was 166.37 cm tall and weighed 69 kg at the beginning of counseling. This client had not lost any weight but fluctuated between 68.6 kg and 70 kg. L.D. remembered her weight problem beginning at the age of 8 after having the measles. She began cooking for her domineering mother around the age of 10. One of her favorite foods to prepare was pie. Her mother complimented her on how well she cooked and continually told L.D. how much she needed L.D. to be with her. The mother apparently suffered from a mental illness known as agoraphobia, the fear of leaving the house or going outside. She also was afraid of staying at home alone. For this reason she kept the client from returning to school after completing the 6th grade and did not allow her to associate with other children. L.D. remembers weighing 90.9 kg at age 14.

At age 18, L.D. went on a strict diet and achieved a weight of 61.4 kg, after weighing 91 kg. She worked as a waitress until she married her

husband, who, like her mother, was domineering and manipulative. As she became older and after she bore three children, L.D.'s weight reached 81.4 kg, but she later lost some of it and maintained a weight of 60.5 kg until two years ago when her house exploded. The stress of rebuilding encouraged old eating habits and interfered with a regular exercise program, which led to a weight gain of 9 kg.

Through counseling it became apparent that the client had been depressed most of her adult life. She had been hospitalized for depression three times. She was able to deal with the depressed state by participating in activities daily away from her home and no longer required antidepressants. She remained unhappy with her husband's constant demeaning of her but chose to remain in the marriage. It seemed that the continued unhappiness she felt in her life was the primary contributor to her snacking and not participating in a regular walking program outside of the fitness center.

From the information provided by L.D., a genetic factor contributing to her being overweight was ruled out because neither parent was overweight at any time throughout their lives. The environmental factor of being unhappy with her life while growing up with a domineering mother and having a similar relationship

with her husband caused her to overeat to soothe the unpleasant emotions of depression and a poor self-esteem.

For these reasons, the therapy chosen for this client was stimulus control. Techniques of eliminating the temptation of high-calorie food from her house, eating only three meals a day without in-between meal snacking, and decreasing portion sizes of all foods consumed were implemented.

Case Study #3

C.M. was a 171.5 cm tall, 46-year-old woman who began receiving counseling in January 1987. She lost 7.3 kg from an initial weight of 86.4 kg, and she wanted to reach a goal weight of 68.2 kg. This client's progress was gradual but steady, despite many compounding environmental factors, including having been a victim of rape in July 1986, which led to depression. The depression resulting from the trauma was the main underlying factor contributing to a weight gain of 9 kg in the six months following the incident. C.M. recalled that as a child, sweets such as homemade cookies were given to her to soothe bad feelings or make her stop crying. She stated that her maternal grandmother would give her sugar cookies and say, "Eat the cookies and you will feel better." C.M. began eating more pastries, ice cream, and other

high-calorie foods after the rape. The depression and fear she experienced eventually led to her quitting her job and not wanting to leave her house. She then became less active and ate more high-calorie snack foods, which encouraged weight gain.

Through counseling, diet, and exercise, C.M. made progress in controlling and changing her eating and exercising habits. She stopped nibbling on snacks in the evening while watching television and replaced this habit with doing exercises or paperwork and eliminated many high-calorie foods from her diet and home. Coming into the Fitness Center at least three times per week relieved some of her fear of going outside of the house alone. The client had always enjoyed outdoor activities requiring energy and persistent hard work, for instance, gardening and hiking. She also had enjoyed taking evening walks with her husband around the neighborhood prior to the rape. As a therapy assignment to help her decrease her fear of leaving the house and to increase her activity level, she was encouraged to take walks with her husband again. The client felt safe when she was in the presence of her husband. This assignment did help the client to go out alone during the day and to do gardening work outside of the house.

C.M.'s family history revealed that her mother

was overweight all of her life until she developed Parkinson's Disease a few years ago. Her maternal grandmother was also overweight and lived with C.M.'s family while she was growing up on a farm. Despite an active lifestyle and hard work on the farm, both her mother and grandmother were overweight. The client remembered always having meat, potatoes, gravy, and high-calorie desserts for the family meals because that was what her father liked to eat. These kinds of foods are what the entire family ate as well.

C.M. had a weight problem most of her adult life due to overeating high-calorie foods. From the client's history of her family's eating habits of consuming high-calorie foods in conjunction with an active lifestyle, it was concluded that the environmental factor of overconsumption of foods contributed to the client being overweight. A genetic factor that might have contributed to her weight problem, her mother and grandmother's obesity, was discounted because her father was not overweight nor was the client overweight until she was an adult. After experiencing a traumatic incident as an adult which led to the overconsumption of rich pastries and high-calorie snacks, in addition to a decreased activity level due to depression, these environmental factors caused C.M. to gain excess weight.

Once the problems were determined, the form of treatment used to change the old behaviors was stimulus control. C.M. was encouraged to replace snacking with another form of activity not related to food. These replacements included doing paperwork or exercise in the evening while watching television. To help her gain confidence in going out of the house in the evening and to increase activity, she was to take walks with her husband. These replacement techniques were utilized by the client.

Case Study #4

L.C. was a 33-year-old female who weighed 120.5 kg when she began counseling the first week in April 1987. She was 170 cm in height. In one month she lost 2.7 kg, but she gained the weight back the following month.

This client had been extremely overweight all of her life. She recalled weighing 55.5 kg in the first grade at the age of 6. High calorie foods were an important part of her family's structure. The family meals consisted of fried meats, potatoes and gravy, creamed sauces on vegetables, and desserts every day. Each week, an evening meal was designated as a special food night, for example, "pizza night." The client's mother gave her cookies or ice cream every day after school. L.C. did not have any friends her age to play

with in the neighborhood so she came home and ate in front of the television. Nearly every evening the family ate large bowls of ice cream together. There was never any type of activity or exercise participation by L.C. or her family during her childhood.

All of the family members were overweight. L.C.'s mother was 160 cm tall and weighed between 104.5 and 107 kg. Her father was approximately 9 kg overweight. According to the client, her father's weight problem was primarily due to his consumption of beer. A brother, two years older, was also overweight by at least 14 kg.

Through counseling and behavior modification, L.C. learned to (a) decrease the portion sizes of all the foods she consumed, (b) eat nutritionally balanced meals, (c) eliminate the foods from her diet that she was unable to eat in smaller proportions, (d) decrease her consumption of alcoholic beverages and replace them with non-caloric beverages, and (e) develop a regular exercise program at the Fitness Center. She had a strong tendency to come to the center for counseling but not always stay to exercise after her session. With therapy it was discovered that this client usually ate high-calorie foods when she was feeling lonely. Instead of accepting the aloneness,

she tried to fill the loneliness with food, watching television, talking on the telephone, or drinking alcoholic beverages with friends. This perhaps stemmed from the loneliness she experienced as a child not having friends and her eating ice cream to fill the loneliness. One of the client's assignments was to learn to experience being alone without distractions and to remember how she felt as a child.

From the information provided by L.C. about her history of overeating and lack of physical exercise, environmental factors appeared to be the main reasons the client remained obese throughout her life. Although L.C. and her parents were overweight, it cannot be concluded that genetic factors contributed to her obesity. The reason for this conclusion was that both parents consumed high-calorie foods and/or beverages in addition to leading a very sedentary lifestyle.

The stimulus control techniques L.C. needed to implement to help her lose weight included eliminating all high-calorie foods from her home, drinking non-caloric beverages when out with friends instead of alcoholic beverages, and participating in a planned exercise program at the Fitness Center at least three times per week.

Case Study #5

P.S. was a 38-year-old female who was 162.5 cm tall and weighed 93 kg at the beginning of counseling in April 1987. In one month this client lost 4.5 kg. Her goal was to lose 29.5 kg. She had been overweight her entire life. Overeating all foods and a strong dislike for exercise contributed to her gaining weight. The types of foods P.S. and her family ate while she was growing up were high in fat and concentrated sugar, such as potatoes and gravy, fried foods, and high-calorie desserts and pastries.

Both of P.S.'s parents were 13.6 to 18 kg overweight. Two brothers also were each at least 13.6 kg overweight. Her maternal grandmother was extremely obese, weighing approximately 136.4 kg. P.S. recalls that both of her paternal grandparents were relatively short and overweight. In the client's words, "We are all short and fat butterballs." The fact that all of P.S.'s family members were overweight was one indicator that her obesity was caused by a genetic factor. Another indicator of genetic predisposition to obesity for this individual was a physiological defect in her thyroid which required medication to increase her metabolism.

While in counseling this client learned to change her eating by decreasing portion sizes and feeling

satiated. She also increased her activity level by exercising at the Fitness Center at least two times per week. Positive reinforcement was the primary therapy technique used to keep her exercising on a regular basis.

It was concluded that genetic factors appeared to be the primary contributors to this client's being overweight. This conclusion was based on the fact that both her paternal and maternal grandparents and her parents were overweight. The client also had a dysfunctional thyroid that decreased her metabolism, a hereditary trait passed down in her family through each generation.

Environmental factors of overeating and lack of physical exercise were also present, but seemed to be secondary reasons for this client's weight problem.

The method used to help the client lose weight was stimulus control. She decreased portion sizes by measuring her food and using smaller serving dishes and eliminated all high-calorie foods from her home. Positive reinforcement from the therapist encouraged her to exercise at the Fitness Center at least three times per week.

Case Study #6

S.C. was a 46-year-old female who began counseling in March 1987. She weighed 93 kg, was 166.4 cm tall,

and wanted to lose approximately 18 kg.

During counseling, S.C. discussed her main reason and motivating factor for losing weight. Her mother had died one year ago from a cerebrovascular accident. Her mother had suffered from hypertension and diabetes mellitus, and she had been overweight. S.C. found herself following the same path and wanted to correct her weight to help decrease the risk of developing the same diseases her mother had. It was also revealed that the client ate more high-calorie foods when she felt depressed and under a great deal of stress. This was confirmed by the client's memory of gaining 14 kg while under the stress of taking care of her failing mother.

Through behavior modification and becoming more self-aware of her feelings and emotions when the desire to overeat occurred, the client began to control overwhelming urges to eat during specific times of the day. These times were related to stressful events she was encountering or temporary states of depression. To help gain better control, she not only exercised at the Fitness Center three times per week but walked every evening with a family member or the dog to increase her activity level.

S.C.'s history revealed that as a child she was very small and underweight. She did not eat very much,

but her parents insisted she eat something. The foods she did eat were homemade cookies and bread pudding. In addition to baking, her mother prepared foods by frying in grease and making large quantities of gravy. These foods were prepared for S.C.'s father who insisted on fried meats, potatoes, and gravy every day. Despite this high calorie intake, her father remained thin throughout his life. He died of Alzheimer's Disease. During her father's deteriorating illness, another stressful period in her life, S.C. gained weight.

As S.C. grew, she began developing large, prominent hips, but her weight remained in a normal range area for her height until after she bore three children. She had lost and gained 9 kg over the years with various diets but never exercised because she strongly disliked it.

From the information provided by this client, it appeared that environmental factors contributed to her being overweight. This conclusion was based on the fact that the client was not overweight until after she was approximately 30 years old. It was during the stressful periods of caring for her ailing parents and their deaths that she gained an excessive amount of weight with the overconsumption of high-calorie foods and lack of exercise. Although S.C.'s mother was

overweight, her father was not, nor were she or her siblings as youngsters. For these reasons, a genetic factor contributing to her being overweight was discounted.

The form of therapy used to change the client's behavior of overeating was stimulus control. S.C. eliminated all high-calorie foods from her house and prepared low calorie dinners, letting the family prepare their own dinners if they did not like the foods she prepared. During stressful periods of her life, she was encouraged to drink water or diet soda instead of snacking on high-calorie foods. She also tried to exercise at the Fitness Center at least three times per week, but if this was not possible, she took walks in the evening with a family member or her dog.

Case Study #7

K.F. was a 36-year-old female who was 170 cm tall and weighed 83.6 kg before counseling therapy began. This client lost 3.2 kg in one month. Her goal was to lose approximately 33 kg.

At the beginning of counseling, the problem in this case appeared to be an overconsumption of high-calorie snack foods, especially regular soda--in other words, poor eating habits without any specific reason. As counseling progressed, an underlying problem of stress seemed to be associated with eating.

K.F. appeared to have good control over her life most of the time but dealt with stress factors inflicted on her with compulsive and excessive behavior. In the previous year she had quit smoking cigarettes after reaching a three-pack-a-day habit and had eliminated all of her credit cards because of excessive use that led to her filing for bankruptcy. After the client quit smoking, the consumption of regular soda and high-calorie foods increased, apparently due to excessive stress.

The client was able to gain much control over the poor eating behavior by following the nutritionally-balanced diet supplied to her, by switching to the use of diet soda in place of regular soda, and by exercising at the Fitness Center five times per week. The determination of this client was extremely good as was her ability to change bad habits relatively quickly. As therapy progressed, the attention was placed on helping the client decrease stress factors or cope with them effectively rather than dealing with the frustrations through self-destructive, excessive behaviors.

The client's family history indicated that she had learned good eating habits from her mother, who had provided nutritionally-balanced meals on a regular basis. Her mother had always maintained a normal

weight and an active lifestyle. Her father (deceased) was never more than 9 kg overweight, and he usually kept excess weight under control. The client started gaining weight around the age of 15 by eating erratically, drinking regular soda in excessive amounts, and eating high-calorie foods, in addition to leading a very sedentary lifestyle.

In this case study, the factors that led to the client's being overweight were environmental. These factors were the consumption of high-calorie beverages in large amounts, eating high-calorie foods such as candy and pizza on a regular basis, and lack of physical exercise. By changing the foods she consumed and increasing her activity level, this client's weight loss indicated environmental factors were major contributors to her weight problem.

There was no indication that genetic factors contributed to her being overweight, because neither parent was ever overweight. The client did not begin gaining weight until her eating habits changed from good, nutritionally balanced meals to the consumption of high-calorie foods as she gained her independence from her family's control. The choice of treatment for this client based on the environmental factor of overeating high-calorie foods and beverages when under stress was stimulus control. K.F. was to eliminate all

high-calorie foods, substitute diet soda for regular soda, and control food consumed by measuring the amounts.

In all of the cases, the set point theory seems to have been supported. The subjects all tried various diets to lose weight without exercising. The weight was lost, but was always regained to the original set point, or weight, and usually more. The importance of exercise was stressed by the therapist by explaining the set point theory to the clients. It was further explained to the clients that activity, proper eating habits, and the metabolic rate are all equally important and dependent upon each other to maintain a certain quantity of fat (Bennett et al., 1982) which seems to support the set point theory. In order to prove that this theory is supported by these case studies, long-term follow-up would be required.

CHAPTER V

Discussion

From these case studies it was concluded that a main contributing factor in obesity, genetic or environmental, could be determined through counseling. This conclusion was reached after examining each case history as it was presented by the clients to the therapist. With this knowledge of the clients' eating and exercise behaviors throughout their lives, the therapist is better equipped to help the client change her behaviors. Once the inappropriate behaviors are realized by the client and therapist, specific behavior modification techniques were implemented to meet each individual's needs. In some genetic factor cases, clients need to be aware of and accept the limits of their possible success.

It was determined that only one case study revealed a strong indication that genetic factors were the primary cause of the client's being overweight. That study, No. 5, revealed that the client's parents and grandparents were all overweight. This client also had an underactive thyroid, as did her mother, and while obesity is not, in itself, strong evidence for a genetic factor, such family trends are consistent with a genetic hypothesis. The dysfunction of the thyroid

gland, which regulates metabolism, contributed to her weight gain throughout her life. In addition to the genetic factors, the environmental factors of overeating all kinds of foods and lack of physical activity were the secondary causes of her being overweight. The environmental factors were changeable by implementing specific behavior modification techniques. Controlling portion sizes was the primary technique the client used, as well as participating in a regular exercise program. Positive reinforcement from the therapist and a gradual steady weight loss encouraged this client to continue the program. Because of the genetic components of her stature and the tendency to always be overweight, this client accepted the fact that she would never be slender. She was content with the knowledge that by controlling food portions, along with regular exercise, she could reduce her weight to an acceptable level throughout her life.

The other six case studies indicated environmental factors as main contributors to the clients' being overweight. Many of these factors stemmed from early eating behaviors learned in childhood from parents and/or grandparents. High-calorie foods were used as a reward, manipulation for proper behavior, or as a calming or soothing tool to quiet their fears or crying spells, as in Case Studies 2, 3, and 4. In all

of these cases, the clients' childhood environments included high-calorie foods on an everyday basis, in addition to specific treats or foods to discourage behaviors the parents deemed undesirable or unnecessary. In these cases it was possible that the clients' being overweight stemmed from developing larger fat cells, hypertrophy, or an increase in the number of fat cells, hyperplasia, as speculated in the fat cell theory (Brownell, 1986). With the consumption of more calories than their bodies needed, more fat cells possibly developed, or increased in number, thereby promoting weight gain in childhood.

In Case Study No. 2 the client became aware that high-calorie foods she prepared and ate throughout her life were a way she received emotional recognition from her manipulative mother and husband. With this awareness, she discontinued the preparation of high-calorie desserts, a stimulus control technique, because she learned that her husband was manipulating her into cooking what he wanted as opposed to displaying genuine caring and loving emotions toward her. Through counseling she became aware of her need and desire to build her self-esteem and was able to establish better eating and exercise habits.

Case Study No. 3 revealed a depressed person after a rape, reverting to overeating pastries and ice cream

to soothe her emotional upsets as had been learned in childhood when her grandmother used sugar cookies to quiet her when she cried. Through counseling she became less depressed by exploring and owning her emotions instead of repressing them by eating high-calorie foods.

Case Study No. 4 learned to control portion sizes of food and decrease the consumption of alcohol by replacing alcohol with non-caloric beverages to achieve her desire to lose weight. These forms of stimulus control techniques were implemented to change the old behaviors. The cue that being out with friends meant it was acceptable to drink alcoholic beverages was changed to drinking non-caloric beverages. The availability and presence of high-calorie foods stimulated the client to consume the foods. To change this behavior, the client learned that elimination of these foods was necessary to prevent her from eating them. This client became aware through counseling of the behaviors which contributed to excessive weight gain and their relationship to the feeling of being alone or left out of friendships. With this new understanding of how her feelings influenced her old behaviors, she began reducing her overconsumption of food and alcohol, increasing exercise, exploring the feeling of aloneness, and dealing with the emptiness

without trying to fill it up with food or alcohol.

The environmental factors that contributed to the weight gain of V.M., Case Study No. 1, were a result of being depressed about unpleasant and stressful events in her life over the past ten years. Through her desire to maintain as healthy a lifestyle as possible, and through counseling, she learned to discuss and cope with her problems openly instead of keeping her feelings and emotions suppressed. Eating high-calorie foods at meal time and between meals was also a coping mechanism used by this client to make her feel better. Once she relearned good eating habits by following a diet and began a regular exercise program, she developed a stronger feeling of independence and self-esteem. In order to relearn the good eating habits, stimulus control techniques were implemented. The stimuli that cued her to eat were all the snacks and candy in dishes throughout the house. To change the behavior of nibbling on these available foods, she eliminated them from the house.

In Case Studies Nos. 6 and 7, stress seemed to be the primary factor causing these clients to overeat. Once this fact was brought into their awareness, alternative coping mechanisms other than food were used. The understanding of how they reacted to stress, an external stimulus, by the overconsumption of

high-calorie foods encouraged each client to explore and implement alternative actions to deal with stressful events in their lives.

In all seven case studies, weekly counseling sessions enabled the therapist to evaluate and explore with the clients the underlying causes that contributed to their overeating. Once the reasons were brought into the clients' awareness, improved control and change in eating and exercise behaviors was begun. The primary behavior modification technique used by all the clients was stimulus control. In each case one or more stimuli triggered overeating. After these were identified by the client through the use of eating and behavior records, the various behaviors could be altered through the development of specific behavior changes designed and used by each client. As Abramson (1973) noted, for treatment to result in permanent change, subjects have to devise their own techniques for altering eating behaviors. This form of behavior modification was in agreement with other studies (Stunkard et al., 1976 and Ferster et al., 1962), that stimulus control strategies are more effective in weight loss than diet, exercise, and other behavior techniques.

The question of whether or not these clients will continue to lose and maintain the lost weight after the

therapy sessions end would provide the basis for another study, a follow-up to analyze the effectiveness of the combination of diet, exercise, and counseling/behavior modification therapy. As was noted in the literature review, long-term follow-up studies after treatment are sparse. Unfortunately, at the time of this writing no follow-up data was available.

Obesity is an important problem because of its serious social and medical outcomes and its prevalence. It is a complex phenomenon with genetic, environmental, psychological, and physiological causes and consequences. Recent improvements in treatment have increased initial and long-term weight losses. There is much more to be learned about the causes and effective treatment of obesity, but it is believed by this author that the proper education in nutrition and good eating and exercise habits should begin early in life. As Chernin (1985) states, "our efforts to gain a vital sense of trust, autonomy, initiative, and industry--these struggles that take us into adolescence--are all issues that are experienced, perhaps even in their most crucial form, by the way we are taught to conduct ourselves with the food we eat" (p. 101).

Limitations of the Present Method

The inherent difficulty of assessing the relative

contribution of heredity and environmental factors to any human characteristic is that there is a lack of experimental control. In order to accurately determine whether a person is overweight due to genetic or environmental reasons, each individual to be studied would have to be observed at all times, beginning at birth. This observation would be done to record the eating patterns, amount of exercise, and food consumed over his or her lifetime and to determine if environmental factors contributed to the person's becoming overweight, if indeed they did.

There is also a lack of experimental control in determining genetic causes for obesity. At this time, genetic research has not identified a specific gene or group of genes that may contribute to a person becoming obese. An overall problem in experimentation with humans is that each person is different in several ways. Therefore, the results found from one group of people studied cannot be generalized to the entire population of human beings due to individual differences.

As Foch and McClearn (1980) have stated, "We need not argue any more about whether genes play a significant role. They do. We need to proceed to identify the resources of individual variation, both genetic and environmental, and eventually come to

understand their joint interaction throughout development" (p. 69).

The case study method of investigation has some weaknesses. In obtaining the data and conducting the study, the researcher may be subjective rather than objective, causing a lack of internal validity. The case study also lacks a control or comparison group. Without a control group to compare the treatment group with, there is not a strong basis for inferring that a specific variable used caused a specific outcome. The data collected from a case study cannot be generalized to a larger population. The reasons for this are that the sample size is extremely small and the cases were selected because they had a problem or characteristic that is different from the general population (Evans, 1985).

APPENDIX

FOOD RECORDS

Day/Date	Food & Beverages Consumed	Time Began Time Ended	Where Eaten (home/restaurant) (sitting/standing)	Social (Alone/With Whom)	Mood When Eating (happy/depressed/ anxious/angry/ sad)	Exercise (How Long)

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