A COMPARISON OF THE PERFORMANCE OF OBESE AND NORMAL SUBJECTS ON A NON-FOOD DIRECTED TASK

DISSERTATION

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The problem of this study was to compare the number of trials required for obese and normal subjects to master the first new concept in a set of cards and the degree of negative transfer exhibited by the two groups on a second new concept in that same set once the first concept had been acquired. It was hypothesized that the obese and normal groups would not differ significantly with respect to the number of trials taken to acquire the first concept in each set. It was also hypothesized that the obese group would exhibit significantly more negative transfer than the normal group when a second new concept in a set was introduced following the mastery of the first new concept in that same set.

The subjects for the study were selected on the basis of their weight. The requirements for the obese group were over 15% above the average weight. The requirements for the normal group was 8% below and 9% above their average body weight. Intelligence was measured because this was a dimension which might influence their performance. The two groups did not differ in this respect.

The results indicate that the obese and normal group perform in the same way on the first concept. The results also indicate that the two groups perform relatively in the

same way on the second concept. The major hypothesis of this study was that the obese would exhibit significantly more negative transfer than the normal subjects when a second concept was introduced following the mastery of the first concept. The results do not support this hypothesis. It was concluded that (1) these two groups do not differ on all non-food directed tasks, and (2) that the obese do not always exhibit more negative transfer than normals.

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CHAPTER I

INTRODUCTION

For many people, life in the twentieth century in the United States of America (U.S.A) symbolizes the pinnacle of progress in human history. During this era, impressive scientific advances have accrued: democracy and freedom have flourished, affluence and prosperity have emerged. However, at the same time, the evolution of progress in contemporary American society has been paralleled by the development of many devastating problems: poverty, inflation, ecological waste, and government corruption. The accumulation of wealth and the emergence of more leisure time seem to be related at some level to the development of many contemporary problems in the U.S.A.

Most authorities agree that one problem definitely related to our modern-day affluency and leisure (which is characterized by inactivity) is the decline of health standards in the U.S.A. (Berland, 1975). The fact that more Americans are physically unhealthy than in prior times is assumed to be a function of overeating and underexercising (Mayer, 1953; Public Health Service, 1966 & 1970; Berland, 1975). The natural result of these two factors is obesity and overweight. Consequently, many professionals concerned with the physical well-being of Americans have come to view obesity

as the major health and nutrition problem in the U.S.A. (Mayer, 1953; Wollersheim, 1970; Young, 1971; Berland, 1975). This view has emerged largely as a result of the findings that mortality rates increase at least by fifty percent in the overweight (Mudge, 1955; Public Health Service, 1961), and that obesity associated with any physical disorder invariably has a detrimental effect on the progress and prognosis of the accompanying disease (Kaplan & Kaplan, 1957). Thus, in lieu of the fact that estimates of the incidence of obesity in the American population range from one-fifth to one-half (Mudge, 1955; Wyden, 1970), it is obvious that the number of people whose physical well-being is affected by this condition is overwhelming.

Furthermore, the undesirable effects of obesity are not limited to physical health. The emotional and social consequences of overweight can be as devastating and debilitating as the adverse physical effects (Dublin, 1953). Our weight conscious society selectively excludes and punishes the "fat" members of their populace (Buchanan & Rubin, 1973; Berland, 1975). In the face of all these facts, professionals in the fields of medicine, psychology, sociology, and education have become concerned with the problems of obesity and weight control. However, due to deficits in the present knowledge concerning the factors producing and controlling obesity, treatment of the overweight and obese have been very disheartening (Stunkard, 1959). If the overweight and the

obese are to live a normal physical and mental life, more research must be conducted to analyze the variables which result in these conditions.

This study will be an attempt to add to this knowledge. It will attempt to analyze whether or not obese people solve problems in ways selectively different from normal-weight individuals. It is believed that studies of this type that isolate the characteristics of the obese may provide information useful to the educational, social, and clinical treatment of this population.

Statement of the Problem

The problem of this study was to compare the number of trials required for obese and normal subjects to master the first new concept in a set and the degree of negative transfer exhibited by the two groups on a second new concept in that same set once the first concept had been acquired.

Purposes of the Study

The purposes of the investigation are:

1. To compare the number of trials required for obese and normal subjects to master the first concept in each set, and

2. To compare the degree of negative transfer exhibited by obese and normal subjects when a second new concept in a set is introduced following the mastery of the first new concept in that same set.

Hypotheses

To carry out the purposes of this study, the following hypotheses will be tested:

I. The obese and normal groups will not differ significantly with respect to the number of trials taken to acquire the first concept in each set.

II. The obese group will exhibit significantly more negative transfer than the normal group when a second new concept in a set is introduced following the mastery of the first new concept in that same set.

Synthesis of the Review of the Literature

Obesity is a major problem in the U.S.A. today. The statistics on the incidence of obesity illustrate the dimensions of this problem. Estimates of the number of overweight and obese people in the United States at this time vary from one-fifth to one-half of the total population (Mudge, 1955; Kaplan & Kaplan, 1957; Wyden, 1970; Berland, 1975). Although these figures clearly demonstrate that a significant number of Americans are overweight, they do not reflect the true enormity of the effects of the problem. In recent years, Americans have become almost obsessed with the question of whether or not they are overweight. This obsession becomes even more extreme if a person decides, as many Americans do, that he is overweight and, therefore, must diet. Once a person makes the decision to diet, he becomes preoccupied

with curbing his food intake as well as being concerned with his weight. Dr. Theodore Van Itallie (1973) calls this era of preoccupation with dieting, "the age of caloric anxiety."

Problems assume national prominence when the average person becomes personally concerned about them. Presently, people in the U.S.A. worry considerably about whether or not they are overweight. One reason this obsession with weight and then dieting has become so pervasive and exaggerated is because obesity recognizes no boundaries such as race, color, sex, age, income, or education. Anyone can be overweight regardless of his social, cultural, or economic standing in the society.

The recent mushrooming consciousness about obesity and weight control is reflected in many facets of American life. By 1973, the U.S.A. diet industry had become a soaring ten million dollar business and is still rapidly expanding. As many as one-third of the non-overweight population are struggling to keep their weight down (Berland, 1975). Weight control books, groups, and clinics have proliferated in every corner of the country. The U.S.A. has become a weight-conscious society.

Although the statistics connecting obesity with increased mortality rates and innumerable disease complications have contributed to the development of the weight and diet obsession, probably the most critical factors in its growth

have been the evolution of two concepts in our society, "Slender is beautiful" and "Fat is ugly." The "fat" person in our society is exposed to ridicule and shame. "Our culture associates obesity with ugliness, laziness, and poor self-control" (Buchanan & Rubin, 1973). Obesity is a "personal handicap" (Dublin, 1953). This condition is debilitating socially, emotionally, and interpersonally. It is even likely to affect employment (Dublin, 1953). Being "fat" severly interferes with a person's interpersonal relationships (Mudge, 1955; Toch, 1965). Personal accounts of the self-deprecating feelings experiences by "fat" people as a result of these attitudes are both sorrowfully numerous and heart rending (Allon, 1973; Crew, 1973; Harmetz, 1974; Snider, 1974; Berland, 1975). Thus, considering the fact that the incidence of obesity is expanding and that obesity has such devastating social consequences, it is no wonder that the American populace has become obsessed with its weight.

Various types of treatment have been utilized with the overweight. Treatments for obesity range from professional therapy such as individual psychotherapy (Fromm, 1958; Fischer, 1973), group psychotherapy (Grant, 1951; Mees & Keutzer, 1967; Kotkow, 1969; Snow & Held, 1973), hypnotherapy (Hershman, 1955; Erickson, 1960; Oackley, 1960; Brodie, 1964), psychoanalysis (Bruch, 1957; Becker, 1960), appetite depressants (Silverstone & Solomon, 1965; Penick, 1970), dietary instruction (Young, Moore, Berrestord, Einset, & Waldner,

1955), and behavior modification (Bornstein, 1972; Stuart & Davis, 1972; Abramson, 1973; Jefferey, 1974), to nonprofessional group activities such as exercise clubs, yoga, and self-help organizations (Allon, 1973), "diet-clinic" approaches (Franklin & Rynearson, 1960), chemotherapy (Gordon, 1969; Modell, 1973), and starvation (Bortz, 1969; Kollar, Atkinson, & Albin, 1969; Stokes, 1969). In general, the results of all these types of treatment have been extremely disheartening (Stunkard, 1959). Claims of success are few and generally temporary. Furthermore, the treatment research has been poorly designed and the independent variables poorly specified (Feinstein, 1960; MacGush, Munro, & Duncan, 1968; Wollersheim, 1970; Bornstein, 1972; Abramson, 1973). Consequently, very few functional relationships have been isolated in the treatment of the obese.

In recent years much research has been done and a more fruitful analysis of obesity has begun to evolve. In general this research has been isolated from the treatment aspects of the problem. A group of researchers, primarily inspired by Schachter, initiated the empirical analysis of the variables controlling obesity. One set of studies analyzes the independent variables associated with the eating behavior of the obese. The other set of studies is concerned with isolating the behavior patterns which distinguish the obese from the normal person.

The results of the experiments comparing the consummatory behavior of the obese and normals seem to indicate that

the obese person's eating is more controlled by external environmental cues than from internal physiological stimulation. This conclusion is based on the findings of several studies. The obese ate more than normals when food was visible and less than normals when it was not (Nisbett, 1968). The obese ate more than normals when shelled nuts were freely available and less than normals if unshelled nuts were available (Schachter, 1971). Johnson (1974) found that the obese would work harder than normals for food if it was visible or if they had previously tasted the food but less hard than normals if the food was out of sight or if they had not previously tasted it. Ross (1974) showed that the obese ate more cashews than normals when the nuts were brightly illuminated and less when they were dimly illuminated. Also, the obese ate significantly more cashews than normals if they heard a dialogue focusing on the gustatory qualities of the cashews than if they heard a neutral tape or no tape at all. The obese actually ate less than normals when the cashews were either lowly illuminated or when they heard a neutral tape or no tape at all. Furthermore, the obese are more likely to eat than normals when the hands on the clock say it is time to eat even if they are not physically deprived (Schachter & Gross, 1968). Also, the obese eat more than normals if food is available after they have been sated with food (Schachter, Goldman, & Gordon, 1968). Their eating is more controlled by taste than normals (Decke, 1971).

Numerous studies have also been designed to show that obese people respond differently than normals along numerous dimensions not related to the gustatory response. Rodin, Herman, and Schachter (1974) found that obese persons performed better than normals on discriminative reaction time test, on immediate recall and on tachistoscopic recognition. In another study (Rodin, 1974), obese subjects were less accurate than normals on a proofreading task when distracted by a tape played during their proofreading activities and more accurate than normals when no distractions were present. In another facet of the same study, Robin (1974) found that the latency of the reaction time to a light for the obese was significantly more than for the normals when they heard an emotional tape. When the subjects heard no tape, the obese persons responded more quickly than the normal weight people. Also, the obese subjects made a significantly greater number of errors than the normals during the emotional tape. Pliner (1973) demonstrated that the estimates of obese subjects as to the length of a tape was significantly different from the effect of the same procedure with normals. The obese judged the tape to be shorter than normals when the blips were soft and longer than normals when they were loud. Also, the obese estimated the tapes to be of a shorter duration than normals when there were forty pulses per minute and of a longer duration than normals when there were eighty pulses per minute. The obese subjects in a study by

Stutz, Warm, and Woods (1974) inaccurately judged the duration of several tones more often than normal subjects. Singh conducted two experiments comparing the obese and normals which yielded several significant results (Singh, 1973; Singh, Swanson, Letz, & Sander, 1973). He found that obese subjects made significantly more errors during negative transfer testing than normals. When compared to normals, the obese subjects consumed significantly less food than normals when the response required to obtain food was incompatible with a response previously acquired to obtain food. The obese subjects' accuracy on a timing task was inferior to normals' accuracy when both had received interference training on a time task prior to the testing. Lastly, he found that obese subjects evidenced a stronger tendency in subsequent problem solving than normals to respond consistent with a mental set once it had been acquired. If the mental set was not established prior to the problem solving task, no difference in the tactics of the problem solving were noted between the two groups. Rodin and Slochower (1974) demonstrated that obese people's opinion was affected more by the weight and behavior of the person making the request than was the normal persons' compliance. The obese were more likely to comply with a normal weight person than one who was overweight. Also, the obese was more likely to comply with a person's wishes if he were nice than if he were nasty. These findings did not hold true for normal weight persons.

The role of emotionality in the behavioral differences between the obese and normal weight population has also been studied. Schachter, Goldman, and Gordon (1968) reported that obese subjects were more frightened by the threat of electric shock than are normal subjects. Rodin (1974) found that the performance of obese subjects on a proofreading activity and on reaction time was more disrupted by emotional tapes than the performance of normal subjects on these tasks. Rodin, Elman, and Schachter (1974) compared the performance of obese and nonobese subjects on an electronic maze using a shock avoidance paradigm and a reinforcement paradigms. The obese made significantly fewer errors than the normals in the no shock condition and significantly more errors than the normals in the shock condition. Rodin (1974) reported that when threatened with shock contingent by a failure to master one puzzle and promised a reward contingent upon mastery of another puzzle, more of the obese chose to work on the shock puzzle first than normals. Furthermore, most of the obese spent all of their time on the shock puzzle, ignoring the reward puzzle. Again, these tendencies were not true of normals. Pliner, Meyer, and Blankstein (1974) found that obese subjects responded more strongly than normals to two types of affective stimuli--slides and situations. Furthermore, obese subjects responded more strongly than normals to the negative slides but not to the negative situations.

Thus, in the past ten to fifteen years, more and more researchers have begun to study numerous independent variables

related to obesity. Their findings have been certainly interesting and often surprising. It is hoped that further basic research will result in the development of a comprehensive theory to account for obesity and to provide a base for the treatment and education of the obese.

Significance of the Study

Although some basic research on obesity has emerged within the past decade, most of this research has been concerned with comparing the consummatory behavior of the obese and normals. In all studies reported in the literature, the eating behavior of the obese was controlled by different stimulus variables than the normal person's eating behavior. To date only a few studies have investigated the differences between normal weight and obese persons in terms of non-food directed behaviors. However, in virtually all instances in which the researchers studied the performance of the obese and normals in tasks not related to eating, these two populations performed differently. Thus, differential performances between the obese and normal populations have been obtained in experiments on both consummatory and nonconsummatory behaviors.

Although these differences have been found in almost all studies, the focus of these experiments has been rather limited and has consequently limited the analysis of the variables involved in obesity. The obesity studies on both consummatory and nonconsummatory behavior have been concerned

primarily with comparing the behavior of the obese and normals in terms of the saliency of a relevant stimulus. This concern with stimulus saliency is a reflection of the fact that these studies were based on the externality hypothesis or the "stimulus-binding" hypothesis as proposed by Schachter and his associates to explain obesity. As a result of this focus, the design of the studies on obesity has been rather narrow and restricted. As Singh (1973) has pointed out, these researchers have neglected the response parameters involved in obesity. Consequently, other than the experiments done by Singh, few if any studies have been conducted from the response perspective.

While Singh has a valid criticism of Schachter's work, his own work could be faulted for the same reason. Like Schachter and his associates, Singh designs his research from a static theoretical point of view. Schachter stresses almost exclusively the role of the stimuli in his analysis, Singh the role of the response. As a result of their stereotyped modes of thinking, both Schachter and Singh bias the design and analysis of their research. Moreover, their research is designed to test their specific theories, one with a stimulus bias, the other with a response bias. A more fruitful approach might be to investigate the differences in the functional relationships between the behavior of the obese and nonobese and the stimuli in their environment related to these behaviors. In other words, both stimulus and response variables should be taken into account

with the primary focus on the relationships between the two variables rather than on one variable or the other.

This criticism of the limited manner in which these two leading authorities have designed their studies and analyzed their data does in no way discount the validity of their data. Data are empirical observations and can be considered separate from the reasons they were collected. Nevertheless, research confined by a specific theoretical orientation often tends to ignore other relevant variables that are often important to the understanding of the total problem.

This study is significant in that it compares the performance of the obese and normals on concept formation and then negative transfer with a concomitant effort to place both the response and stimulus variables in perspective. Since this study did take into account both the response and stimulus parameters involved in obesity, it is more likely to contribute to a more comprehensive explanation of obesity within a general theory of human behavior than studies reflecting either a stimulus or response bias. As a result of this focus, some new and important relationships might be established which would facilitate the educational and therapeutic treatment of the obese.

Furthermore, concept formation has so often been related to the characteristically human activities of thinking, reasoning, and problem solving (Millenson, 1967). Also, meaning and understanding are considered as interrelations between concepts. Meaning and understanding are things we

try to teach in schools. Even science and art are sometimes said to be quests for them.

The topic of transfer has been one of the central problems for educational psychologists and educational theorists (Deese & Hulse, 1958). Almost all educational and training programs are built upon the basic premise that human beings have the ability to transfer what they have learned in one situation to another. An integral part of this process involves negative transfer as well as positive transfer. Transfer is an essential aspect of problem solving in human behavior. Since this is true then the present study has significance to educators. If these two populations selectively differ in these processes (concept formation and negative transfer), then they should receive differential treatment in terms of educational instructional materials. Further it is presumed that the delineation of characteristics of different types of people has meaning to educators because it goes toward an individual approach to education; it recognizes the uniqueness of the individual and its possible influence upon the educational process.

Definition of Terms

The following will have restricted meaning and are thus defined for this study.

Obese subject.--15% above the average weight for that height and frame size as defined by Metropolitan Life Insurance Co.

Normal subject.--Ranging between 8% below and 9% above average weight for that height and body type as defined by Metropolitan Life Insurance Co.

(The midpoint of a particular weight range is used as the reference point from which to calculate the percentage above or below the average weight. For example, the weight range for a small framed, 5'10" male is 140-150 pounds (see Appendix A); thus 145 would be used as the reference point in calculating this hypothetical person's percentage above or below the average weight.)

Frame size.--Is obtained by measuring circumference of ankle. Ankle measurements for males over 18 years of age range from 19.5 centimeters to 25.5 centimeters (McCammon, 1970); small, medium, and large frame sizes are calculated by dividing this range into three parts.

small -- 19.5-21.4 centimeters

medium-- 21.5-23.4 centimeters

large -- 23.5-25.5 centimeters

Concept formation.--A concept is formed when the behavior of an individual comes under the differential control of a broad class or related stimulus situations currently being reinforced (Millenson, 1967).

Set.--Group of ten stimulus cards.

Stimulus card.--Measures two inches by two inches and has one figure that has twelve stimulus classes.

Stimulus class.--A common assortment along which a discrimination is made.

Concept.--The event of the selection of five stimulus cards out of an array of ten stimulus cards; these five cards contain one stimulus class upon which reinforcement is made contingent.

Mastery of a concept.--Twenty successive correct responses.

Trials to criterion.--Number of trials it takes to master a concept, including trials in which no response was made; the twenty successive correct responses were not included.

Negative transfer.--Interference in the learning of a new concept as a result of previous exposure to the learning of another concept. In this study it is reflected by the measure of trials to criterion on a second concept following the mastery of a first concept.

CHAPTER II

REVIEW OF RELATED LITERATURE

This chapter contains a summary of the major topics concerned with obesity. It includes an introductory section followed by a review of the following areas: the physical effects of obesity, the causes of obesity, the characteristics of the obese, and the treatment of the obese.

Introduction

During the past two decades, Americans have become obsessed with their waistlines. Almost every man and woman in the U.S.A. if given the choice, would choose to be slim rather than fat. Mr. and Ms. America are inevitably portrayed as slender, muscular, and lithe. The "heroes" on the American movie screen, in American television programs, in all the American advertising, and on all the American billboards are seldom overweight; rather, they are usually gorgeously, disgustingly, and conspicuously skinny. The media's concept of the ideal American citizen reflects the attitude in our culture that slimness is synonymous with success, economic prosperity, popularity, beauty, and sexual virility. At the same time, being "fat" is equivalent to failure, economic mediocrity, rejection, ugliness, and sexual impotence. Consequently, overweight people in our

society are often unhappy with themselves and their lives. As Rubin (1966) says, "In so many ways, it (obesity) is a destroyer of happiness" (p. 17).

Most overweight people are indeed unhappy with their excess poundage. As a matter of fact, most of them become obsessed with their weight. However, for the truly obese person, this obsession is not simply a neurotic concern; those people have good reason to be upset about being overweight. Rubin (1966) adeptly describes why gaining weight destroys most people's happiness. "The accumulation of excess weight is clearly destructive because it kills psychologically, and, in our culture, it is also a killer of self-esteem, social possibilities, and even of economic opportunities" (p. 43). Thus, due to the attitude of our culture about "fat" people, excess weight has a devastating effect on the psychological health of the obese person. Also, as Rubin and others have pointed out, "fat" members of our society experience very real adverse consequences for being overweight; they are deprived of many economic, social, and interpersonal benefits available to the nonminority nonobese members of society. Kaplan and Kaplan (1957) contend that the personal and socio-economic consequences of obesity are as severe as the medical liabilities. Obese Americans are systematically discriminated against in most important facets of their life.

Working with a sample of obese adolescents, Canning and Mayer (1966) showed that school counselors were less apt to

write reference letters for obese students than for normal students and that, as might be expected, the obese group was less likely than the normal group to be accepted into colleges, despite the fact that their intelligence and achievement scores were not inferior to the scores of their normal weight counterparts (Canning & Mayer, 1967).

Employment is another significant area in which obese people receive differential treatment relative to the non-obese. "Fat" people are discriminated against in the job market. They simply are less likely to find employment than their normal-weight counterpart (Dublin, 1953).

Most overweight persons also selectively experience detrimental effects in two very important aspects of everyone's life--their social contacts and their interpersonal relationships (Mudge, 1955; Wollersheim, 1970; Buchanan & Rubin, 1973). In most social environments, the "fat" person is snubbed, excluded, and ridiculed. Even those closest to him, be it his mother, father, siblings, wife, or husband, usually punish and berate him because of his "fatness" (Mudge, 1955; Toch, 1965). Thus, it is not surprising that most obese persons develop emotional problems and have a poor self concept (Allon, 1973; Crew, 1973; Harmetz, 1974; Johnson, 1974; Berland, 1975). Excluded from every important part of life--job, family, and social contacts--the "fat" person is generally riddled with shame and guilt (Allon, 1973; Crew, 1973; Harmetz, 1974; Johnson, 1974; Berland, 1975).

Although it is true that our society discriminates blatantly against only the very "fat," persons who are overweight to any degree experience devastating psychological effects as a retuls of their weight. Many persons persecute and torture themselves psychologically whenever they are slightly overweight or gain a few pounds. Although their weight gain may not radically change the way people treat them or effect their employment opportunities, it usually destroys their self-concept and limits their life style severely. Thus, although the obsession that these individuals have concerning their weight may be neurotic and irrational, the result it has on their ability to cope is often as destructive as it is for obese people.

As a result of the societal attitudes towards obesity, most overweight Americans are presently preoccupied with losing weight. Many "fat" people see losing weight as the road to happiness, prosperity, and success. Consequently, dieting is rapidly becoming a "national pastime in America" (Allon, 1973). In 1957 Kaplan and Kaplan stated,

> Today, the American public is so weight conscious that millions of books are being sold on reducing; fifteen million cases of low-calorie soft drinks are being ingested annually; the baking, sugar, and beet industry are concerned about large decreases in their sales which are apparently related to the emphasis on reducing diets; and the new industry of the dietetic or weight reducing food is booming (p. 185).

In 1973, it was estimated that dieters that year alone would buy millions of copies of the several hundred diet books on the bookstore shelves and would spend ten

billion dollars on diet foods. Furthermore, they predicted that in the years following 1973, the diet industry would continue to expand rapidly.

Professionals concerned with the treatment of the obese and overweight populations can view the solution of this problem from two possible vantage points. They can either alter the behavior of the obese population or they can alter the attitudes of society. The basic question to be considered then is, "Should the people in the helping professions endeavor to develop techniques to induce the overweight person to lose weight so that he conforms with the national standards of weight or should they try to change the nation's attitudes about the importance of being slender so that the obese person would no longer be selectively punished for his weight?" Thus, one way to approach the problem would be to develop treatment techniques that would result in a weight loss on the part of the overweight person. This strategy would enable the overweight person to lose weight until he reached the ideal weight for his size and build as specified by cultural norms. The other approach could involve modifying the national conscience so that "thinness" is no longer the ideal for American society. Supposedly, changes in the attitudes of society towards weight should mitigate the undesirable economic, social, and interpersonal effects selectively experienced by the obese. Most professionals have selected the former approach. They endeavor to provide the overweight person with some type of therapy or treatment

which will enable the patient to lose weight and, thereby, shed the feature which distinguishes him from the rest of the population.

With certain problems it is very important to try to alter societal attitudes. With obesity it is probably more important to have the person conform to societal standards, because of the adverse effects that obesity and overweight have on a person's health and physical well-being. Recent evidence from the field of medicine and physiology suggest that the chosen strategy is a prudent choice. It has been empirically demonstrated in numerous studies that obese and overweight persons are more likely to have more serious diseases than normals and that they die at an earlier age as a result of numerous conditions. Other studies show that overweight people function less efficiently than normal persons on numerous measures.

Physical Debilitating Effects of Obesity

This section of the review will discuss the physical debilitating effects of obesity. Three types of effects will be discussed: (1) the association between obesity and mortality rates; (2) the association between obesity and rates of illness; (3) the association between obesity and physical capacities. The evidence clearly shows that obesity is correlated with increased mortality rates at each age level. Similarly, obesity is associated with increased incidence of many illnesses. The studies also show that the

physical performance of obese people is generally not as efficient as normal-weight individuals.

The Association Between Obesity and Mortality Rates

The correlation between obesity and increased mortality rates has been documented several times by insurance companies (Mudge, 1955; Stat. Bull. Metropl. Life Ins. Co., 1960). The statistics from these studies conducted by insurance companies indicate that obese persons have a higher than normal death rate in every age group. Dublin and Marks (1930) estimate that the death rate in obese patients is one and one-half times greater than the death rate of persons of normal weight. Newburgh (1942a) demonstrated that for men between the ages of forty and fifty, mortality rates increase one percent for each pound they are overweight.

The Association Between Obesity and Rates of Illness

However, mortality statistics do not give an adequate picture of the total devastating effects that excess weight has on the physical well-being of people. The obese are more susceptible than normals to diabetes, cardiovascular disease, and cholelitheases (Dublin, 1953). Berland (1975) states that overweight males are more likely to die of cancer, diabetes, strokes, heart attacks, high blood pressure, digestive diseases, and kidney diseases. Moreover, it appears that if an overweight person has almost any disease, his excess weight will have a detrimental effect on the prognosis

of that condition (Berland, 1975). Armstrong and his associates (1954) studied the effects of weight loss on their overweight patients suffering from various types of organic diseases. Following weight loss, fifty percent of the patients showed no progression of the disease. Also, after five years of their reduced weight they felt much better physically.

In addition to being higher risks in relation to all diseases, the obese have other medical and physical problems. Overweight persons are more accident prone (Dublin, 1953; Berland, 1975). Also they are increased risks in surgery (Dublin, 1953; Berland, 1975). Toxemia, certain complications during delivery, and stillbirths are more frequent among overweight mothers than normal weight ones (Berland, 1975). Men who are overweight have trouble copulating and often produce sterile sperm (Berland, 1975).

The Association Between Obesity and Physical Capacities

Physiologists have examined the differences between the performance of obese and normal subjects on various physiological measures. As a result of their investigations, they have isolated several differences in the physical functioning of obese and normal persons. Most studies indicate that obese persons have decreased respiratory functioning as compared to normal-weight persons. Hypoventilation is typically correlated with obesity (Hackney, Crance, Collier, Rokaw, & Griggs, 1959; Sharp, Henry, Sweany, Meadows, & Putras, 1964).

Furthermore, for obese patients who suffer from hypoventilation, there are generally heightened intraplural pressures (Hackney et al., 1959; Sharp et al., 1964). Other common respiratory problems associated with obesity are pulmonary arterial hypertension (Alexander, 1964) and reduced lung capacity and total compliance of the respiratory system (Naimark & Cherniak, 1960; Hackney et al., 1959; Sharp et al., 1964). Several investigators (Kaufman, Ferguson, & Cherniak, 1959; Hackney et al., 1959; Sharp et al., 1964) have shown that the respiratory work of the system is significantly greater for obese individuals than normal weight individuals. Newmark and Cherniak (1960) found that the respiratory muscles of obese persons performed more than twice as much work as those of normal-weight individuals.

Many authorities feel that it is the difficulty that the obese have with breathing that makes them susceptible to heart attacks. Hackney et al. (1959) contend that the mechanical difficulty associated with obesity increases the difficulty of ventilation and thereby produces the marked increase in the work of breathing. This increase then results in hypoventilation which produces carbon dioxide retention and an oxygen deficiency. Furthermore, these researchers point out that lack of oxygen can produce cardiovascular problems, and pulmonary hypertension often results in heart failure.

Research indicates that the heart of the obese patient is indeed adversely affected by his condition. Alexander

(1964) found both differences in the cardiac performance of the obese and the actual structure of their heart as compared to normal-weight individuals. He also reports that necropsy studies of obese people show that they tend to have enlarged hearts and overweight hearts.

Another facet of physical performance which is adversely affected by obesity is mechanical efficiency. Dempsey, Reddan, Balke, and Rankin (1966) and Wang, Strouse, and Morton (1930) demonstrated that obese subjects are significantly less mechanically efficient that normal subjects.

Does Obesity Cause Increased Mortality Rates, Illnesses and Decreased Functioning?

Although substantial correlations have been noted between obesity and increased mortality rates, obesity, and increased incidences of illness, and obesity and decreased physiological functioning, no cause and effect relationships can be formulated between these factors. Thus, it is not legitimate to say that obesity causes increased mortality rates or that obesity causes increased susceptibility to certain diseases or that obesity causes decreased physiological functioning. A correlational relationship is not necessarily a causal one. The fact that these factors tend to vary together suggests that there may be some type of relationship between the two. However, this tendency may be due to some other factor related to both variables. In such an instance, the two variables that correlate may be unrelated

to each other. In any case, it is inaccurate to conclude that there is any cause and effect relationship present.

Causes of Obesity

Authorities who study obesity have been unsuccessful in their attempts to isolate the causes of most forms of obesity. Scientific research directed towards analyzing the variables that produce obesity has been limited (Stuart, 1971; Cappon, 1958). Although the causes of obesity have been studied more extensively with rats and mice than man, even the findings of these studies are in no way conclusive. Regardless of the paucity of empirical evidence available supporting most analyses, many different causal factors have been postulated. Some of these propositions are based on limited evidence; some are mainly conjecture; none are founded on solid scientific evidence (Cappon, 1958). As Stuart (1971) states, "The literature pertaining to the causes of obesity abounds with hunches but there are hardly any controlled study to establish the facts" (p. 178).

This section of the review of the literature will discuss the different propositions that have been proposed to account for the development of obesity. The discussion of causes will be classified into four major categories: genetic, physiological, neurological, and psychological.

Genetic Causes of Obesity

Various investigators involved in the study of obesity believe that obesity is hereditary in origin. Genetic variables

associated with obesity have been isolated in nonhuman populations and in a few human populations. However, most contemporary authorities feel that the evidence for inherited obesity, particularly in man, is not substantial enough to receive serious consideration (Newburg, 1942a; Hamburger, 1951; Kaplan & Kaplan, 1957; Stuart & Davis, 1972).

Experimental Studies with Animals

Several investigators have studied obesity in the yellow strain of mice (Dickey & Wooley, 1946; Dickenson & Gowen, 1947; Fenton & Chase, 1951; Kasten, 1952; Greenberg, 1952). These investigators all found that in-bred yellow mice attain a body weight two to three times greater than their non-yellow littermates. The gene involved in this form of obesity is a dominant one. Dickerson and Gowen (1947) observed that these mice increased their food intake and decreased their activity level. Bendict and Lee (1936) noted that these mice had lower basal metabolic rates than normal mice.

Ingalls, Dickie, and Snell (1950) discovered another form of inherited obesity in yellow mice called the "hereditary obese-hypoglycemic syndrome." This type of obesity is associated with a single Mendelian recessive gene and characterized by extreme obesity. The basal metabolic rate of these mice is fifty percent lower than the rate of nonobese mice. These obese animals consume twenty percent more food than the nonobese whereas the nonobese mice are fifty to one hundred percent more active than the obese (Mayer, 1953).

Mayer and his students (Mayer, 1953) have isolated a third type of genetic obesity. They found evidence of an inherited type of obesity in Shetland shepherd dogs. This type of obesity also involves a single recessive Mendelian gene. These dogs tend to prefer the consumption of carbohydrates over other forms of food.

Genetic Studies in Man

In man, genetically transmitted forms of obesity have been demonstrated in several syndromes such as the Nieman-Pick disease, the Tay-Sachs disease, the Gaucher's disease, and the Schuller-Christian syndrome (Mayer, 1953). These conditions are all very aberrant syndromes involving many other physiological abnormalities in addition to the accumulation of fatty tissue. Thus, it is unlikely that any of these syndromes have any relationship to most forms of obesity seen in man.

More viable evidence concerning the role that genetic factors may play in obesity comes from twin studies. Newman, Freeman, and Holzinger (1937) and Dorfman (1946) found an extremely high correlation between the weights of identical twins. This correlation was almost as great as the correlation between their heights. Also, this correlation was much higher than the correlation for fraternal twins or siblings. Mayer (1953) reports that Von Verscher found very little difference in the body weights of identical twins reared together and identical twins reared apart. Mayer concludes

that "these results would tend to demonstrate that, while environmental factors display a role in the control of body weight, genetic factors are also of paramount importance" (p. 505).

On the other hand, Garn (1970) presents data which question the certainty of Mayer's conclusion. His data analysis showed a decreasing correlation between the weights of monozygotic twins as they got older. He suggests

> There is genetic control of fat patterning, there may be genetic control of relative fatness, but since twins who cease to eat together then diminish their fat resemblances, the genetic hypothesis for obesity is less tenable than that of the home environment (p. 7).

In terms of a genetic-environmental issue, studies of familial incidences of obesity are somewhat significant. Bauer (1947) found that seventy-three percent of his obese subjects had one or more obese parent. Angel (1949) noted that eighty percent of the obese children in his sample had at least one fat parent and twenty-five percent had both a fat mother and a fat father. Gurney (1937) found that only nine percent of children of average weight parents were overweight. However, it is impossible to assess the relative role that environmental factors and genetic factors play in these findings.

Thus, although there is some evidence suggesting a possible hereditary base for at least some forms of obesity, most contemporary professionals do not feel that most forms of obesity in man are caused by genetic aberrations (Stuart & Davis, 1972).

Physiological Causes of Obesity

In general, two areas of physiology have received particular emphasis in the study of the causes of obesity--metabolic disturbances and endocrine disorders. Investigators studying these variables recognize that if these systems are abnormal in any way it may be due to genetic variables and/or environmental trauma. A recent study presents some interesting data of the accumulation of fat cells during infancy due to overeating.

Endocrine Disorders

Although laymen most often attribute obesity to problems in the endocrine system, there is little evidence to support this notion (Hamburger, 1951; Kaplan & Kaplan, 1957; Stuart & Davis, 1972). Mayer (1953) states,

> A small percentage of the cases is attributable to known endocrine disorders. As for the rest of the cases, we do not know, in the present state of our ignorance in endocrinology what the part of the known and unknown factors may be (p. 487).

Nevertheless, it has been conclusively shown that the earlier concepts concerning the universality and importance of abnormalities of endocrine factors in the etiology of obesity are erroneous (Hamburger, 1951; Newburgh, 1942a). However, data does exist with animals and man supporting the idea that a few forms of obesity may be associated with endocrine disturbances. Protamine zinc insulin administration produces hyperphagia and obesity in the rat (Barnes & Keeton, 1940; McKay, Callaway, & Barnes, 1941). Kogle and Mzamis (1943)

found that injecting rats with insulin induces obesity in forced feeding situations.

The evidence for endocrinological disturbances in obese humans is similarly scanty. It has been demonstrated that overweight humans often suffer from hyperinsulemia (Karam, Grodsky, & Forsham, 1963). Also, they are not as responsive to insulin as normal weight people (Rabinocovitz & Ziesler, 1962) and more likely to be diabetic than normal weight people (Olgivie, 1935; Berland, 1975).

Thus, although there is some evidence to support the old adage that obesity is a function of endocrine problems, this evidence is sparse and inconclusive.

Metabolic Disturbances

Prior to 1950, many laymen and professionals believed that obesity was primarily due to some kind of metabolic disturbance. During this period of time, metabolic factors were studied extensively in the obese population. However, these studies failed to find any consistent metabolic disturbances in obese patients. Consequently, from 1950 to 1970 most authorities discounted metabolic disorders as important causes of obesity (Hamburger, 1951; Kaplan & Kaplan, 1957). However, in more recent years more sophisticated techniques of physiological measurement have been developed. As a result of these developments, many previously undetected metabolic differences in obese and normal weight persons have been discovered.

In a summary of findings up to 1972, Wise, Hendler, and Felig (1972) noted that investigators have found that obesity is characterized by a variety of abnormalities in carbohydrate metabolism. Several researchers have demonstrated empirically that obese subjects show resistance to ketosis (Gordon, Goldberg, & Brandabur, 1962). Gordon et al. (1962) noted that the group of obese patients that he studied had an exceeding low rate of glucose metabolism in the presence of acceptably normal indices of thyroid function. His findings also indicated that the hypometabolic state characteristic of the population that he studied could be alleviated with daily injection of triiodothyronine for six days. These injections resulted in a dramatic loss in weight.

Wise, Hendler, and Felig (1972) compared the amount of glucagon present in the blood of obese and normal subjects prior to the administration of alanine. He measured these levels both before and after twenty-four hours fasting. The basal concentrations of glucagon did not differ in the obese and normal weight groups prior to fasting. However, the maximum glucagon response to the alanine before fasting decreased fifty percent more in the obese group than in the normal group. Following starvation, the basal concentration of glucagon rose in the nonobese group but remained unchanged in the obese group. The glucagon response to alanine was also analyzed in both groups following the eighty-four hour fast. Similar to their response before fasting, the glucagon

response of the obese group was less than fifty percent of that response with the nonobese group.

McKee and Belinger (1960) compared the amount of energy expended by obese and normal persons. They found that the obese expended significantly more energy during the basal or resting state than normal persons. The number of calories expended during a standard work task was also greater for the obese group than the nonobese group. Wang, Strouse, and Morton (1930) found the same phenomenon to be true when the subjects were asked to perform a standard exercise on a bicycle.

Although metabolic differences between obese persons and normals have been measured, the role that these factors play in obesity is difficult to decipher. The question that must be considered even when differences are found is, "Does the metabolic condition cause obesity or does obesity result in the differential metabolic condition?" Thus, it is just as reasonable to assume that the differences obtained may be a result of the person being overweight as it is to assume that the differences cause the person to be overweight (Stuart & David, 1972).

Early Overeating and the Development of Adipose Cells

Knittle and Hirsch (1968) studied the differences in the number of adipose (fat) cells developed in young obese rats and nonobese rats. He found that the obese rats had more fat cells than the nonobese rats at five, ten, fifteen,

and twenty weeks of age. The thin rats stopped producing cells at fifteen weeks; the obese rats continued producing cells until the end of the study.

Later tests showed that when the obese rats were put on a diet they lost weight. However, during the deprivation period, the number of cells did not decrease; they simply became smaller. When the rats were free to eat, the shriveled fat cells filled out again.

Wyden (1970) states, "Researchers now believe that this pattern may hold true for many human beings, too--that overfeeding in childhood produces excess fat cells that are a permanent part of the body" (p. 129).

Neurological Causes of Obesity

Several investigators interested in the study of obesity have found that lesions in the central nervous system of a rat will cause the rat to overeat and thereby become very obese. Early researchers in the field of obesity (Brooks, 1946; Brooks & Lambert, 1946; Brooks, Lockwood, & Wiggins, 1946; Hetherington & Ransom, 1940; Miller, Bailey, & Stevenson, 1950; Reynolds, 1963) demonstrated that bilateral lesions of the ventromedial nuclei of hypothalmus produce a hyperphagic, obese rat. These lesions result in the immediate consumption of tremendous amounts of food. This dynamic phase of eating produces rapid weight gains followed by a leveling period in which the weight gain is maintained. A decrease in the spontaneous level of activity occurs concomitant with the increase in food intake.

Recent research in this area has benefited from the development of more sophisticated operating instruments and surgery techniques. As a result of these developments, the investigators have been able to produce more focal, precise lesions. Under these conditions, a more exacting analysis of the relevant variables is possible. Gold (1973) found that radioactivity-produced lesions of the ventromedial nucleus did not result in obesity. He found also that larger knife cut lesions produced far greater weight gains than small lesions and that small lesions restricted to the ventromedial nucleus did not result in obesity. He noted that hypothalmic lesions produced by energy or knife cuts resulted in obesity if the damage produced was in the nearby ventral norandrenergic bundle or its terminals. Thus, Gold concluded that it was this bundle, not the ventromedial nucleus of the hypothalmus,that is associated with the control of eating. Former lesions in the ventromedial nucleus produced obesity because the techniques were crude and lesions produced in one area overflowed to other organs.

It has never been empirically demonstrated that lesions of the central nervous system in man produce obesity. In view of the definitive results in rats, some clinicians feel that the neural mechanism may be disturbed in at least some cases of obesity (Kaplan & Kaplan, 1957). However, as Hamburger (1951) points out, obese patients usually do not have a demonstrable lesion in the central nervous system and

any conjectures of this sort are highly questionable until further evidence is available. Nevertheless, certain individuals (Morovsky, 1971) are convinced that in many instances obesity is associated with some impairment of the hypothalmus.

Psychological Causes of Obesity

Prior to 1940, the analysis of the causes of obesity focused primarily on the physiological and genetic causes of obesity. Following 1940, the emphasis shifted to the analysis of the psychological causes underlying the development of obesity. This shift occurred for a number of reasons. Firstly, after considerable study, it became apparent to those professionals studying obesity from a metabolic and genetic point of view that a comprehensive explanation of obesity would involve more than just a simple genetic or metabolic disorder. A causal analysis of obesity was obviously going to be much more complex. Secondly, clinicians involved in the treatment of the obese noted that the obese person's excess weight was generally only one of a host of problems. They noted that obese persons usually manifested numerous psychological problems that often did not seem to be directly related to their weight. Thirdly, the clinicians who rendered treatment to the obese usually were psychiatrists. These people were trained to look for the psychological causes of a syndrome, not the physiological ones.

Thus, during the period of 1940-1970, most authorities in the field came to view obesity as a psychological problem rather than a physiological one. The initial development of psychological models was mainly the work of psychiatrists or medical doctors. Prior to 1960, these individuals were the primary therapists involved in the treatment of obesity. Consequently, the traditional psychological analyses of obesity were based on a psychodynamic model of behavior. Obesity was viewed as a symptom of underlying emotional disorders. In subsequent years, psychologists became increasingly involved in the treatment of obesity. As a result, new accounts of obesity developed based on numerous psychological theories.

The discussion of the role of psychological factors in obesity has come to involve three basic approaches. One approach has been to categorize different types of obesity according to the type of eating pattern exhibited by the person and/or the psychological variables in the person's immediate milieu that result in overeating. The second tack has been to view obesity as a symptom of a more general emotional disorder. From this point of view, overeating assumes a relatively unimportant role relative to the total syndrome. The third approach has been to try to isolate the possible factors in a person's past history which produced his obese condition. This latter approach is the only one which truly endeavors to develop an explanation of why obese persons overeat and thereby gain weight.

Categories of Obesity

Some authorities who have studied obesity have tried to categorize different types of obesity based on the pattern whereby the person overindulges and the events in his environment which result in this overindulgence. Most theorists consider emotional variables to be important in classifying the precipitating conditions. Stunkard (1959) described three basic patterns of eating behavior. The first pattern, "the night-eating syndrome," is characterized by morning anorexia, evening hyperphagia, and insomnia. Periods of life stress usually accompany these eating spells. The second pattern, "the eating binge," involves the ingestion of enormous quantities of food in a relatively short period of time and tends to occur in periods of stress. Stunkard's third pattern is "eating without satiation." These persons eat large amounts of food once they begin to eat. Their eating is not precipitated by any particular emotional or personal state.

Bruch (1957) has categorized the obese population into three groups. The first group consists of those individuals who are "naturally" overweight. Their eating problems are in no way related to emotional problems. The individuals in the second group tend to eat in situations involving psychological stress or deprivation. For these people, overeating supposedly reduces tension or depression. Bruch calls the problem of this second group of obese individuals "reactive obesity." The third type of obesity described by Bruch has

been labelled "developmental obesity." This type of obesity involves the total personality and existence of the patient. Bruch (1941) states that this type of obesity "represents an essential aspect of the person's whole endowment and it is endowed with important psychological and symbolic meaning; it holds a core or central position in the life history (p. 467). Developmental obesity generally begins prior to or during adolescence.

Hamburger (1951) discusses four basic types of hyperphagia. One type that he describes overeats in response to nonspecific emotional upsets such as depression, anxiety, or boredom. The second type includes those persons who overeat whenever they encounter intolerable frustrating life situations such as disturbed marital relationships or financial worries. In the third group, Hamburger includes all those obese individuals for whom overeating was only one symptom of a severe underlying emotional disorder. The fourth group of patients described by Hamburger is characterized by a compulsive craving for food that is apparently unrelated to external precipitating events. The individuals in this group constantly crave food.

Mendelson (1966) conceptualizes the obese population in terms of a continuum characterized by increasing degrees of emotional instability. At one end of the continuum are those obese individuals who are emotionally stable. A little further along the continuum are those patients who clearly eat to defend against or compensate for various types of

emotional tensions. These patients may eat when they are anxious, angry, lonely, bored, discouraged, or depressed. At the other end of the continuum are those patients for whom eating is the central theme of their existence. For these individuals overeating does not occur just during emotional periods. Eating is the focus of their lives.

All these classification systems have certain similarities. First, all these noted authorities distinguish between different types of eating patterns and the environmental variables related to these patterns. Thus, they all believe that obesity is not just one syndrome. Rather obesity is the end result of different eating patterns that involve different precipitating factors. For certain obese people, these environmental factors that result in emotional reaction increase the likelihood that they will overeat. For others, these factors do not seem to be important in their patterns of eating. Some obese persons seem to overeat once they begin eating regardless of the conditions. For still others, overeating is the main component of their existence. If these descriptions are in any way accurate, they have important implications to the study of obesity. It may be that different causal factors are associated with the different kinds of obesity. If it is true that there are many types of obesity, then this fact must be taken into consideration in any discussion of the causal factors involved in obesity or the appropriate treatment for an obese individual.

Obesity as a Symptom of an Emotional Disorder

Numerous authorities consider obesity to be one symptom of a more general emotional disorder. From this point of view, overeating is not the real problem; it is simply an indicator of a serious internal emotional conflict. Obesity is an overt representation of a covert disorder. Other symptoms will generally accompany overeating. Furthermore, all individuals suffering from the same disorder will not overeat. Some patients with emotional conflicts will exhibit a complex of symptoms which includes overeating; others will exhibit a host of symptoms that does not include overindulgence in food.

One common view of obesity is to look at overeating as an overt manifestation of neurosis. One of the first professionals to assume this point of view was Richardson (1946). In 1946, he proposed that obesity was simply one symptom of neuroses. Richardson had noticed that many of his obese patients were highly anxious and seemed to eat to reduce this anxiety. Since anxiety is the primary component of a neurotic reaction, he proposed that overindulgence in food is a symptom of neurosis.

Another one of the earliest authorities in the field was Hilde Bruch (1941, 1946). Like Richardson, her exposure to obese patients led her to conclude that many of them were suffering from severe emotional disorders (1941, 1946, 1957). As discussed previously, Bruch categorized the obese into four groups. One of these groups was the developmental

obese. Bruch feels that this category of obese persons have severe emotional problems. She contends that the developmentally obese exhibit severely maladjusted behaviors which inhibit the development of his total personality. According to Bruch, they are characterized by extreme overdependency, social and emotional immaturity, unrealistic fantasies, deficient social relationships, and a lack of aggressiveness. She feels these characteristics are symptoms of a very severe emotional illness. Bruch (1958) states

> For many of the fat young people, being fat, the very experience represents a protection against more severe mental illness. Obesity serves as an alibi for the avoidance of threatening and unacceptable social demands, and food indulgence permits the experience of at least a semblance of satisfaction in an otherwise dismal existence (p. 67).

Other professionals involved in the treatment of the obese view obesity as a defense mechanism which the obese uses to cope with his internal conflicts (Richardson, 1946; Brosin, 1953; Hecht, 1955; Simon, 1963). These individuals contend that obese people eat as a defense against conflicts between conscious and unconscious impulses. These conflicts produce unpleasant feelings such as insecurity, anxiety, depression, guilt, and hostility. The consumption of food serves to alleviate the unpleasant experiences associated with these feelings. The obese person may also use his weight as a defense to control the actions of others in his interpersonal environment.

Another common way to view obesity is to see it as one form of the obsessive-compulsive syndrome (Bychowski, 1950; Rubin, 1966; Salzman, 1972; Buchanan & Rubin, 1973). For the obsessive-compulsive, the obsessions and compulsions that he exhibits are merely methods of satisfying his needs in an otherwise dismal existence. Due to personal inadequacies, the obsessive-compulsive is unable to satisfy his desires and needs through socially acceptable channels. Consequently, he seeks gratification through means readily available to him such as drinking, taking drugs, or smoking. Thus, the obsessive-compulsive individual exhibits an addiction to some element of life.

Numerous individuals involved in the study of obesity have noted similarities between the general obsessive-compulsive syndrome and the behavior patterns of the obese. Rubin (1966) compiled and summarized his observations of obese people in "An Obesity Profile." The common personality features of the obese that Rubin noted were: obsessive preoccupation with food, compulsive oral activities including eating, addiction to food, and alienation from the actual self. These characteristics he ways are all typical of the obsessive-compulsive syndrome. Particular emphasis is placed on the similarity between the obese's addiction to food and other addictions such as alcohol, cigarettes, and drugs.

The general consensus of opinion among these authorities is that fat people are addicted to food in much the same way

as alcoholics are addicted to alcohol and drug addicts are addicted to drugs.

Thus, many different theories have been developed which assume that obesity stems from emotional problems that are not directly related to obesity. These propositions are all based on the psychodynamic model of man in which overt behavior is viewed as an expression of internal energy dynamics. Its meaning revolves around the interplay between all these conflicting wishes, urges, and feelings.

Psychological Explanations of Obesity

The latter discussion discusses obesity as a symptom of emotional conflict. Prior to that discourse, the different categories of obesity were discussed. Often people assume that these accounts in some way explain obesity. They feel that these analyses analyze the causes of obesity. However, neither approach isolates the psychological conditions which result in the overconsumption of food. The categorization approach attempts to isolate the different eating patterns and the factors which precipitate these patterns. However, this approach fails to provide an account of how these eating patterns become established initially and why the individual learns to respond to certain conditions such as stress by overeating. Until these relationships are established, any explanatory account of obesity will be incomplete.

The second approach to explaining obesity was to attribute this condition to some covert emotional conflict.

As in the first instance, this explanation is incomplete. One must ask, "What conditions in the person's past history resulted in this emotional disorder and why is the disorder expressed through overeating rather than some other symptom?"

Some theorists in the field of obesity have attempted to account for the psychological variables which cause a person to overeat and thereby gain weight. In general, these approaches can be categorized into four main camps: the psychoanalytic theory, learning theory, early childhood experiences, and socio-cultural factors.

The Psychoanalytic Concept of Obesity

Numerous psychiatrists and psychologists have extended the original concepts proposed by Freud in his psychoanalytic theory of mankind to an explanation of the development of obesity (Bruch, 1940, 1941, 1946, 1957; Schick, 1947; Hamburger, 1951; Deri, 1955; Fromm, 1958; Rubin, 1966; Buchanan & Rubin, 1973). Schick (1947) states, ". . . the underlying psychopathology of obesity . . . is the unconscious desire to experience again the satisfaction derived as an infant in the intake of food" (p. 173).

Thus, according to psychoanalytic theory, obesity is closely linked to what happened to the person during his infancy when food was so important. The first period of development in an infant's life is the oral stage. This stage has two important aspects that relate to the manner in which psychoanalysts feel obesity develops. Firstly, due to

the fact that the infant's mother feeds him, a strong relationship is established for the infant between the ingestion of food and maternal love. Thus, the infant supposedly comes to equate love and the ingestion of food. According to Hamburger (1951), the oral activity associated with ingestion becomes disassociated from the actual eating process. As a result, during this period of development the infant comes to derive erotic pleasure from any oral movements such as sucking, chewing, licking, etc. These activities pacify thie child particularly in situations involving stress or emotional conflict. Thus, under these conditions, the infant finds a substitute alleviation from unpleasant situations through oral activity.

Secondly, during the oral stage of development, the human infant by nature is almost completely dependent on his mother for satisfaction of his wants and needs. Consequently, at this age, a child is typically dependent on others and very demanding.

According to psychoanalytic theory, in the normal course of development, socialization of the infant occurs, and the child progresses to the next stage in his development. As the child becomes older and better able to take care of his own basic needs, most mothers encourage independence and insist that the child conform to some basic societal norms such as self-feeding and toilet training. However, if the mother does not treat the child in this

manner, he will not progress to the next stage, and he will remain fixated at the oral stage of development. This fixation can occur as a result of excessive maternal love or inadequate maternal love. If the mother neglects the child during this stage, his socialization will be retarded. Similarly, if the mother continues to satisfy his every want and desire, the child will not progress beyond this stage. According to psychoanalytic theory, a person who has become fixated at the oral stage of development will be a dependent, passive, demanding individual. Also, he will seek pleasure in oral activities particularly in times of stress.

Several individuals report observations which they feel support a psychoanalytic account of obesity. Buchanan and Rubin (1973) noted that obese persons engage in an excessively high rate of oral activity such as eating, smoking, talking, finger nail biting, chewing gum, and lip and tongue movements. Hamburger (1951) observed that many obese people tend to eat in times of stress or emotional upset. Bruch (1957) had been repeatedly impressed by the fact that the developmentally obese are dependent passive, demanding individuals.

Furthermore, Bruch (1957) has extensively studied the childhood experiences of the developmentally obese. She "was especially struck by the parental relationship between the mother and the obese child . . ." (Mudge, 1955, p. 113). Bruch (1957) noted that mothers of obese children were usually oversolicitous and anxious about them. At the same time, they were very domineering. These mothers tended to treat

their children as prized possessions upon whom they lavished excessive material things including food. Food acquired a highly symbolic and emotional significance for these children since their mothers manipulated it as a symbol of love. These mothers were overprotective and possessive of their children; they did not encourage independence and initiative.

Bruch (1957) feels that the child-mother relationship fits the psychoanalytic, stereotype of the type of interaction that would produce an orally-fixated child. Furthermore, she notes that these children are overly dependent, emotionally immature, and lacking in initiative.

The Learning Theory Concept of Obesity

Learning theorists have not devoted much attention to a developmental account of obesity. Although in recent years, the major focus of treatment has been based on the principles of learning, none of these individuals has attempted to explain what factors in the obese person's past history produced his condition. A few learning theorists (Wollersheim, 1970; Stuart, 1971) have attempted to isolate the controlling variables in the immediate environment which result in the obese person's overeating. Nevertheless, a learning theory account would certainly consider obesity to be a result of the person learning faulty eating patterns. It would look to the relationships in his past history between the stimuli in the individual's environment, the eating response, and in internal deprivation state of the organism.

A Socio-Cultural Explanation of Obesity

Socio-cultural factors are obviously important variables in determining the weight and eating patterns of an individual (Mayer, 1953; Kaplan & Kaplan, 1957; Stuart & Davis, 1972). Ethnic variables can be shown to govern a wide variety of the conditions associated with eating, ranging from the delineation of times when it is important to eat and the selection of edible substances to the means of food preparation and ceremony associated with eating, among others (Stuart & Davis, 1972). Thus, people in some cultures or ethnic groups eat more fattening foods than people in other groups. Also, some groups simply encourage eating more than others. As Kaplan and Kaplan (1957) say, "The Pennsylvania Dutch are well known to make a feast of every meal; Italian and Jewish families are exceptionally proud of their 'good tables.' Obesity is the price they pay." Also, the methods of preparation used by some groups involve more calories than other groups.

The standards of obesity as well as the patterns of eating vary from culture to culture and from ethnic group to ethnic group. "Just as fashions in clothes vary, norms and ideals for bodily appearance change from culture to culture and over time. Arabs, for example, esteem different, plumper body types than do Americans" (Dwyer, Feldman, & Mayer, 1970, p. 273). Thus, persons from certain cultures and ethnic groups may weigh more than persons from other cultures and

ethnic groups. Furthermore, many of these individuals may be obese by American standards but not by the standards of their culture or group. As Kaplan and Kaplan (1957) state, "the culture of a 'quote' obese person must be considered before any judgment is made concerning his obesity" (p. 189).

Most of the data supporting a socio-cultural analysis of obesity comes from a study conducted by a group of investigators under the general directionship of Dr. Lee Srole (Stuart & Davis, 1972). These researchers randomly sampled 1,660 adults residing in New York City during the early 1960's. The study is called the Midtown Manhattan Study and the results were published in several articles. Stunkard (1968) reported that one factor that is pertinent to obesity is the ethnic group of the individual. He found that the incidence of obesity was much greater among some ethnic groups than others. He analyzed the percentage of obese individuals per ethnic group population. The order of incidence starting with the greatest number was as follows: Hungarian, Czech, Italian, German-Austrian, Irish, Russian, fourth generation Americans. Goldblatl, Moore, and Stunkard (1965) report that first-generation women were almost five times as likely to be obese as fourth-generation women. Moore, Stunkard, and Srole (1962) analyzed this data in terms of social class. This analysis showed an inverse relationship between the prevalence of obesity and social class, that is, the lower the social class the higher the

probability of obesity. Obesity is seven times more frequent among women of the lowest socio-economic level; among men the same relationship exists, although to a much lesser degree. The data from the Midtown Manhattan Study clearly indicates that socio-cultural factors must be taken into account in any analysis of obesity.

Excessive Calorie Intake as an Explanation of Obesity

Kaplan and Kaplan (1957) state that

> During the past three decades, an increasing number of investigators and clinicians have come to conclusion that the overwhelming majority of cases of obesity are not caused by any organic disorder of metabolism, as was previously believed by many, but are simply a result of "overeating" (p. 181).

Thus, presently, the general consensus of opinion in this field is that regardless of the type of obesity, it is primarily due to the consumption of more calories than the body needs for its current activity (Newburgh, 1942a; Hamburger, 1951; Kaplan & Kaplan, 1957; Wyden, 1970; Young, 1971; Stuart & Davis, 1972; Berland, 1975).

However, to say that obesity is caused by overeating is not to explain why a person becomes obese. As Mayer (1968) so succinctly points out,

> No one would deny that obesity does betray an imbalance between energy intake and energy output. This statement, however, casts no light on the problem. It simply redefines it in other words. To say that obesity is due to "overeating" is hardly more illuminating than to equate alcoholism and excessive drinking. The problem is to elucidate the nature of the factors which have disturbed the mechanism of regulation of food in such a way that the energy balance is tipped in favor of excessive intake (p. 15).

Decreased Physical Activity as a Cause of Obesity

Numerous investigators have reported that obese people are less active than normal weight persons. Johnson, Burke, and Mayer (1956) studied the role of inactivity in the development and maintenance of obesity of obese adolescent girls. They found that the inactivity of these girls was so extreme that it seemed more important than overeating in the development and maintenance of their obesity. Buller, Reed, and Mayer (1964) also noted much lower levels of activity for obese adolescent girls at camp than normal weight girls.

Dorris and Stunkard (1957) used pedometers to measure the physical activity of fifteen obese women and fifteen normal weight women. This study revealed that obese women were less than half as active as their nonobese counterparts.

Cherico and Stunkard (1960) compared the activity level of the obese and nonobese of both sexes. They also measured the physical activity of fifteen obese women and twenty-five obese men with mechanical pedometers. Then they compared these measurements with the activity of matched nonobese subjects. Obese subjects were significantly less active than nonobese subjects. The differences were greater between the two groups of women than men.

There is much controversy over the role of inactivity in the development of obesity. Some authorities feel that obesity may arise as a result of very low levels of activity (Johnson, Burke, & Mayer, 1964). Other authorities point

out that considerable energy must be undertaken in order to burn excess calories (Stuart & Davis, 1972). Thus, although it has been clearly established that obesity and inactivity are closely associated, at least in women, the exact relationship is not known. Physical inactivity could cause obesity or obesity could cause physical inactivity or some other variable may concomitantly produce both obesity and inactivity.

A Multicausal Concept of Obesity

Most professionals concerned with the treatment of obese persons feel that the concept of multicausality can be better employed to explain the development of obesity than the concept of one major cause (Mayer, 1953; Kaplan & Kaplan, 1956; Young, 1971; Stuart & Davis, 1972). Thus, obesity is the end product of overeating. The reasons that people overeat and therefore gain weight are probably innumerable. As Young (1971) states,

> We should use the term, "the obesities," instead of "obesity" because we are not dealing with a single disease but rather with a symptom of some underlying energy imbalance which may have many causes: genetic, metabolic, psychological, cultural, or even economic (p. 58).

Thus, different people eat more calories than their bodies require to maintain an ideal weight for many different reasons. To lump all of the obese people in one category and assume that the reasons why they are overweight is the same is probably ludicrous.

Characteristics of the Obese

This section of the review of the literature will discuss the characteristics of the obese. The major divisions of this section will include studies analyzing the consumatory behavior of the obese, emotionality of the obese, and the personality and behavioral characteristics of the obese.

Empirical Studies Involving Differences in the Consummatory Response of the Obese and Nonobese

One major area of focus in the empirical analyses of obesity has involved the differences in the consummatory behavior of the obese and nonobese. This emphasis naturally follows in that the one rather certain aspect of obesity is that the obese eat more food than their body uses. This section of the review of the literature will cover the studies involving the eating and drinking of the obese as compared to normals. Three major areas have been isolated: differences in the eating patterns of the obese and nonobese; differences in the variables controlling the eating behavior of each group; and the differences in the variables affecting the eating patterns of the newborns.

Eating patterns.--Researchers involved in the study of obesity have observed that obese and nonobese humans exhibit very different eating patterns. In 1971, Schachter (1971) published a summary article encompassing the findings of all the studies in this area. He reports that several consistent differences have been noted. Fatter subjects generally

ingest slightly more food per day than slimmer subjects. These data come from ad-lib feeding situations in which the person is placed in a room where he is free to eat as much as he wishes. Furthermore, although they eat more than the nonobese, the obese eat fewer meals per day. It follows from these two facts that obese persons eat more at each meal than normals. The studies also show that obese subjects for the most part eat more rapidly than their normal counterparts and more good tasting food. This conclusion is supported by behavioral data.

Differences in the Environmental Variables Controlling the Consummatory Response of the Obese and the Nonobese

Initial findings.--Numerous studies have been conducted to analyze the differences between the environmental variables that result in eating in the obese and the nonobese populations. These articles proliferated following Stunkard and Koch's (1964) surprising discovery in 1964. Their study became a landmark in the research analysis of obesity. Stunkard and Koch were interested in the extent to which stomach contractions in the obese and nonobese correspond with self-reports of hunger. They studied twenty-seven obese and twenty-seven nonobese subjects of both sexes. The subjects were instructed to come to the experiment at 9:00 a.m. without breakfast. When they entered the laboratory, the subjects were given a gastric balloon to swallow. This balloon measured stomach contractions in the subjects.

Stunkard and Koch continuously recorded the stomach contractions of their subjects for four hours. At the same time, every fifteen minutes, they asked the subjects if they were experiencing hunger. Stunkard and Koch found a remarkable difference between the obese and normal-weight subjects. For the normal-weight subjects, self-reports of hunger and actual stomach contractions paralleled each other closely. When his stomach contracted, the normal-weight person was likely to report hunger; when his stomach was quiescent, he was likely to say that he is not hungry. On the other hand, the self-reports of obese subjects had little to do with the gastric motility of their stomachs. Some obese subjects never reported hunger; some reported hunger infrequently; some reported that they were always hungry regardless of contractions.

These astounding findings sparked a group of investigators led by Schachter to a new and fruitful approach to most of the subsequent research done in the field of obesity. Schachter felt that the results of the study by Stunkard and Koch might indicate that the obese are less sensitive to internal physiological cues than the nonobese. In 1968, Schachter and his students (Schachter, Goldman, & Gordon, 1968) reported the results of their first experiment based on this premise. They studied the effects of high and low deprivation levels on the consummatory behavior of obese and nonobese subjects. They instructed their subjects to come

to the study without breakfast. Upon entering, half of the subjects were fed and half were not. The researchers then gave each subject five bowls of crackers to taste. They were free to eat as many as they wished in fifteen minutes. The normal subjects ate more crackers when deprived than when sated. In contrast, the obese ate as much when their stomachs were full as when they were empty. These findings led Schachter to conclude that "eating by the obese seems unrelated to any internal, visceral state, but is determined by external, food-related cues such as sight, smell, and taste of food" (Schachter et al., 1968, p. 97).

This conclusion precipitated a long series of studies by Schachter and his students designed to his "externality" or "stimulus-binding" hypothesis. Some of the variables studied by this group have been levels of deprivation, the visibility of food, the perceived time of day, the amount of effort to get food, negative transfer, the perceived caloric content of food, and preloading with food. This group of studies has been concerned with the differences in amount of food consumed by the obese and nonobese under different manipulations. Furthermore, in order to conceal the real intent of the investigators, most studies have been conducted under the guise of a taste test.

Deprivation studies.--Following the initial deprivation study by Schachter et al. (1968), several other studies have been conducted to further analyze the effects of this variable.

Nisbett (1968a) studied the relationship between levels of food deprivation and subjective reports of hunger with the obese and nonobese. He found little correlation between the length of time that the obese had been deprived of food and how hungry they felt. The obese did not rate themselves as hungrier the longer they went without food. In contrast, there was a direct relationship between hours of deprivation and the degree of hunger reported by the normal-weight population.

Price and Grinker (1973) studied the effects of food deprivation under very controlled conditions. They measured the amount eaten by the obese and nonobese at four and at eight hours of deprivation. They hospitalized their subjects so that they would rigorously control the hours of deprivation. One half of each group of subjects (four and eight hour groups) were given six roast beef sandwiches and a can of Coke prior to testing. These subjects were required to eat at least two sandwiches and to take at least two drinks of Coke. The other half of each group were given nothing to eat or drink at the time of the test. All subjects were then placed in the test situation--twenty minutes ad-lib feeding. Regardless of weight, all subjects are more following eight hours of deprivation than following four hours. Also, the obese ate more than normals under both conditions of deprivation. They also ate more than normals under all other conditions; during preloading, with preloading, without preloading. However, the obese and nonobese both ate approximately

the same amount regardless of whether they were preloaded or not. The obese simply ate more than the normals in both instances.

Visibility of food.--Experimenters have found that the sight of food, regardless of levels of deprivation, is more likely to precipitate eating with the obese than the nonobese. Nisbett (1968b) provided obese and nonobese subjects who were four hours deprived with either one or three roast beef sandwiches. Then he exposed them to an ad-lib feeding situation. Before leaving the room, he told the subjects to feel free to eat those sandwiches in view and to get as many more as they wanted from a refrigerator across the room. The obese subjects ate significantly more sandwiches than normals when they were presented with three sandwiches. However, they ate significantly less than normals when one sandwich was in view. Normals ate approximately the same amount regardless of the number of sandwiches present. Nisbett concludes from these findings that obese people tend to eat those foods that they can see. If the foods are out of sight, they are unlikely to eat them.

In a subsequent study, Johnson (1974) did a more precise analysis of the role of food visibility with the eating response in the obese and nonobese. Half of the subjects saw a sandwich wrapped in transparent paper as they worked. The other half saw an object shaped like a sandwich but wrapped in white nontransparent paper. The task for the study

involved the flexing of the index finger. All subjects were required to flex their finger fifty times to receive one-quarter sandwich. Those obese subjects who could actually see a sandwich made significantly more responses than those who could not see one. The normal weight subjects responded approximately the same number of times regardless of whether or not they could actually see the sandwich.

Ross (1974) studied the visibility of food salience cues in a more abstract manner. He manipulated this factor first by changing how much light fell on a can of cashews. He found that the obese ate more cashews than normals when the nuts were brightly illuminated and less than normals when they were dimly lit.

In the second part of the same study, Ross (1974) attempted to study the saliency of food cues through another medium other than vision. He manipulated auditory cues by exposing half of the subjects to a tape informing them of the gastatory qualities of the cashews and the other half to a neutral tape. Obese subjects ate significantly more cashews after hearing the former tape than the latter. The normal weight subjects ate approximately the same amount under both conditions.

Another type of data which Schachter and his associates feel support the contention that obese people are more influenced by the sight of food than nonobese individuals involves their response to fasting. Obese subjects are more likely than normal weight persons to undergo prolonged

fasting voluntarily (Nisbett, 1968a; Goldman, Jaffa, & Schachter, 1968; Schachter & Gross, 1968). Also, they are more likely to be successful in fasting if they stay away from the sight of food (Goldman, et al., 1968).

The perceived time of day.--Schachter and Gross (1968) studied the effects of another external variable on the eating response of the obese and nonobese--the perceived time of day. They felt that the obese would be more influenced to eat by what time they thought it was than by internal stimulation. Thus, they rigged two clocks to induce the subjects to perceive it to be either dinnertime or fourty minutes before dinner. All subjects were placed in a waiting room prior to testing. They all arrived at 5:00 p.m. and were left alone for thirty minutes in a windowless room. For half the subjects, a clock in the room ran twice normal speed. Thus, when the experimenter returned the clock read 6:05 p.m. instead of 5:30 p.m. For the other half of the subjects, a clock ran half normal speed and thus, after thirty minutes read 5:20 p.m. When the experimenter returned, he left a box of crackers. The obese ate almost twice as many crackers when they thought it was 6:05 p.m. than when they believed the time to be 5:20 p.m. The normals behaved in just the opposite way; they ate less than half the number of crackers at 6:05 as they did at 5:20.

The taste of the food.--It has also been demonstrated that the obese's eating is more influenced by the taste of

food than normal's eating. Decke (1971) was the first researcher to study the differential effects of taste. She provided her obese and nonobese subjects with either a regular vanilla milk shake or one laced with quinine water. The obese subjects drank a significantly greater quantity of the good tasting milk shake than normals and significantly less of the bad tasting one.

Nisbett (1968a) studied the effects of taste on the eating of the two populations using ice cream. One-half of the subjects were given expensive French vanilla ice cream; the other half was given ice cream adulterated with quinine. Overweight subjects ate far more good tasting ice cream than the bitter ice cream. Normal weight subjects ate slightly more nonadulterated ice cream. The obese ate much more than the normals of both kinds of ice cream.

Although Hashim and Van Itallie (1965) did not intend to study the differential effects of taste on the amount eaten by the two populations, the data from their study can be analyzed accordingly. They fed hospitalized obese and normal weight subjects a bland, ill-tasting, liquid diet. Obese patients consumed only 400-500 calories of the formula per day. Normal weight individuals ingested enough of the same food to maintain both their caloric intake and their weight. The drastic reduction in the amount eaten by the obese is generally attributed to the differential effects of bad taste on the amount eaten by the obese (Schachter, 1971;

Nisbett, 1972).

Wooley (1971) reports similar findings. He found that although the obese report increased hunger the longer they stay on a bland liquid diet, they do not increase their intake.

Goldman, Jaffa, and Schachter (1968) analyzed the effects of taste in the field situation. They studied college students at Columbia. These investigators found that 86.5 percent of the obese students as compared to 67.1 percent of the nonobese discontinued the dorm meal plan after the initial trial period despite a fifteen dollar fine. These authors feel that it is the differential response of these two populations to taste that accounts for this discrepancy.

Other investigators have studied the taste reports and discriminations of these two groups. Cabanac and Duclaux (1970) studied the differences in the ratings of sucrose solutions by obese and normal weight fasting subjects. Both the obese and nonobese fasted for twelve hours. Then they were given a taste test on a series of sucrose solutions of different concentrations. The subjects were asked to rate the taste pleasantness of each solution. Immediately after the rating, the subjects ingested fifty grams of glucose. One hour later, both groups evaluated the pleasantness of each sucrose solution again. Prior to the glucose ingestion, all subjects reported the taste of all solutions to be pleasant. After glucose ingestion, the taste of all concentrations

was rated unpleasant by the nonobese subjects. In contrast, the obese rated their pleasantness as only slightly less than prior to ingestion of glucose.

Grinker, Hirsch, and Smith (1972) studied the taste sensitivity of obese and nonobese populations. They found no differences in the ability of the obese and nonobese to detect sucrose in a solution when a red, tasteless dye was added to some sucrose solutions and not others. Both obese and normal subjects tended to rate red suprathreshold solutions as sweeter than plain solutions.

The Amount of Effort.--Another external variable which is believed to differentially affect the amount of food consumed by the obese and nonobese is the effort required to get the food. The data suggests that the obese tend to eat less than normals if they have to work hard to acquire the food. Schachter and Friedman (1974) found that obese subjects are significantly fewer nuts when they were shelled than when they were not. Normal-weight persons ate approximately the same number of nuts regardless of whether they were shelled or unshelled.

Schachter, Friedman, and Handler (1974) conducted a field study on effort. They hypothesized that fat persons would be more likely than normals to choose the easiest way of eating. Thus, they visited a large number of Chinese and Japanese restaurants where they categorized each patron as normal or obese and then noted whether he ate with chopsticks

or other silverware. They found that among accidentals, 22.4 percent of the normals ate with chopsticks compared to 4.7 percent of the obese.

Negative transfer.--Singh (1973) analyzed the effect of a negative transfer situation on the consummatory behavior of normals and obese. One half of the subjects were deprived of food for eight hours. The other half were fed immediately before the study. In the initial phase of the study, the subjects were trained with their preferred hand to remove metal disks interspersed with circular crackers from a metal wire. As they removed each cracker, they ate it. After this training, the subjects from each deprivation condition were randomly assigned to either a compatible or an incompatible test condition. Subjects in the compatible condition moved the disks and crackers in the same direction as training; subjects in the incompatible condition moved both in the direction opposite from training. Singh found that the obese subjects ate significantly more crackers under the compatible condition than under the incompatible condition. Under the compatible condition, obese subjects ate slightly more than than normals. Under the incompatible condition, however, obese subjects ate significantly less than normals. The deprivation conditions did not significantly affect the cracker consumption of either group.

Liquid vs. solid preloads.--Pliner (1973) found that obese and normal weight subjects respond differently to

liquid and solid preloads. Normal subjects adjust the amount they eat in accordance with caloric preload on both solid and liquid diets. Obese subjects regulate intake on the liquid diet but not on the solid diet.

Perceived caloric content of food.--Wooley and associates (Wooley, 1971; Wooley, 1972; Wooley, Wooley, & Dunham, 1972) felt that differences in the food intake of the obese and nonobese might be a function of different cognitive patterns and not of their differential ability to perceive internal stimuli. They reasoned that the obese may be less able to regulate food intake under conditions where feedback is lacking.

To test their hypothesis, Wooley and fellow investigators manipulated the actual nutritional value of the food eaten by the subject independently of the apparent nutritional value of that same food. They gave their subjects drinks containing either 200 or 600 calories. Half of the time, these milk shakes appeared to be rich (high calorie) and the other half of the time, low caloric. In all three studies, neither the obese nor the normal subjects adjusted their intake according to the actual caloric value of the drink. The volume of intake of both groups was slightly greater when the caloric count was low but very little. The amount that all subjects consumed in a later test was more affected by the appearance of the drink or how many calories that they said they thought were in the drink. If the drink

looked to be higher in calories, all subjects were likely to eat less in the subsequent test situation than if it looked to be lower calorie (Wooley, 1971; Wooley, 1972). Similarly, if a subjects judged the drink to be high calorie regardless of whether or not it actually was, he ate less during the testing condition (Wooley, Wooley, & Dunham, 1972). At the same time, he felt fuller if he thought it was high calorie than if he thought it was low calorie.

The only variable which distinguished the obese from the nonobese in the Wooley studies was the hunger ratings. The obese consistently reported greater hunger than normals whenever they believed the drink was low calorie (Wooley, Wooley, & Dunham, 1972).

Along the same lines as the Wooley group, Gold (1971) conducted a study to investigate the effects of cognitive suggestions about hunger levels on the eating behavior of sated normal-weight and obese subjects. In one condition, subjects were told that a pill would increase their hunger; in a second condition, they were informed it would decrease their hunger; and in a third condition, no suggestion was given. After the pill ingestion and suggestion, all subjects were asked to taste crackers. There were no differences between the obese and normal groups in terms of the number of crackers consumed regardless of the suggestion that they had received.

Differences in the Eating Behavior of Heavy and Normal-Weight Newborns

Nisbett and Gurwitz (1970) studied newborn infants (two to four days old) to see if any of the variables which differentially affect the consummatory response of obese and normal-weight adults have similar effects with heavy and normal-weight infants. In the first experiment, the effects of taste (sweetness) on the amount of formula that the infants ingested was analyzed. Forty-two babies took part in the study. Nurses were asked to feed the babies regular formula one morning and sweetened formula another morning. The investigators instructed the nurses to allow the infants to have all the formula they seemed to want at each feeding. Dramatic differences in the amount of formula were noted between the heaviest third of the infants and the remaining infants. The heavy infants consumed twenty-eight percent more of the sweetened formula than of the unsweetened formula, while lighter infants consumed only eight percent more of the sweetened than unsweetened formula. The difference between the two groups was highly significant.

In a second experiment, Nisbett and Gurwitz (1970) studied the effects of effort on the ingestion of heavy and light-weight newborns. The amount of effort was manipulated by changing the size of the hole in the nipple. Mothers of newborn infants were given three sets of nipples. Two of the nipples had standard hole sizes. They were used in the first and third feedings. The third nipple was identical to

the others except that the hole was half the standard diameter. The mothers used this nipple in the second feeding. The heaviest third of the infants consumed significantly less formula when the effortful nipple was used for feeding. The other two-thirds of the infants consumed approximately the same amount of food regardless of the nipple employed in feeding.

Nisbett and Gurwitz conclude from these findings that like obese adults, heavy infants are first more responsive to taste than lighter infants. Second, they are also less willing than normal infants to exert effort to obtain food.

Empirical Studies Analyzing the Differences in Emotionality of Obese and Nonobese Subjects

Numerous studies have been conducted in attempts to analyze the differences in emotionality between obese and nonobese subjects. Some investigators feel that the obese are more sensitive to aversive stimuli than the nonobese; others believe they may be more sensitive to both positive and negative stimuli. Many authorities believe that many obese persons tend to eat whenever they are in stressful situations. This section will review the empirical studies in these three areas: sensitivity to aversive stimuli; sensitivity to both positive and negative stimuli; eating as a response to aversive stimuli.

Sensitivity to Aversive Stimuli

Several investigators have studied the emotional responses of normal and obese subjects to negative stimuli.

Schachter, Goldman, and Gordon (1968) conducted a study involving the effects of fear on the eating behavior of obese and normal. To manipulate fear, the investigators threatened the two groups of subjects with either very painful or very mild electric shock. In an auxillary part of this experiment, they asked the subjects to rate themselves as to how nervous or uneasy they felt about being shocked. The obese subjects indicated significantly more experiential fear than normal subjects. They reported themselves to be more afraid of shock than the nonobese did.

Rodin (1974a) conducted an experiment to evaluate the differential reactions of the obese and nonobese to tapes with negative emotional content and neutral content. Each subject worked for a ten-minute period on either a proof-reading task or a complex reaction time task. One half of each group of subjects listened to an emotionally disturbing tape; the other half listened to an emotionally neutral tape. The emotional tapes described either the bombing of Hiroshima or the subject's own death from lukemia. The neutral tapes discussed either rain or seashells. Immediately after listening to the tape, each subject was quiered as to his perceived physiological and emotional state. He was asked to rate the degree of his disturbance on five questions. From these self-reports, a mean emotionality index was calculated. Obese subjects were significantly more disturbed emotionally by the negative tapes than normals. When they listened to

the nondisturbing tapes, the obese describe themselves as significantly less emotional than do normal subjects.

The second part of Rodin's experiment analyzed the degree to which the disturbing tapes affected the performance of obese and nonobese on either proofreading or a complex reaction time test. Rodin found that the mean number of errors made by the obese on the proofreading task was significantly greater during an emotional tape than during a neutral tape. The normal group actually made fewer errors on this task during the emotional tape than during the neutral one. Similarly on the reaction time test, the obese's reaction time was significantly higher while listening to an emotional tape than while listening to a neutral tape. Their errors were also greater. Thus, it appears that the obese's performance on tasks is probably more disrupted by emotional stimuli than the performance of normals.

Rodin (1974b) studied the amount of time that obese subjects spent working an insolvable puzzle as compared to normal subjects when threatened with shock for failure to master the puzzle. The subjects in this study were told that they would receive a reward for completing one puzzle and be shocked if they failed to complete another puzzle. Then they were given both puzzles and allowed to work on either for three minutes. Significantly more of the obese subjects than normals chose to work on the shock puzzle first. Furthermore, most of the obese spend all of their time trying to solve the shock puzzle.

Rodin, Elman, and Schachter (1974) compared the performance of obese and nonobese subjects on an electronic maze under two conditions--shock avoidance and nonshock. Each subject had to thread his way through a maze by pressing a correct sequence of levers. The subjects in the shock group received a shock whenever they pressed an incorrect lever. If they pressed a correct lever, a green light flashed on. For the no-shock group, a green light indicated a correct choice and a red light an incorrect choice. Subjects in both groups continued the task until they had reached a criterion of three errorless trials. The obese subjects made significantly more errors than the normals in the shock condition and significantly fewer errors in the no shock condition.

Schachter and Rodin (1974) conducted two studies on pain sensitivity in obese and normal subjects. In one instance, obese subjects had significantly lower pain thresholds for shock than normal subjects. In the second instance, no differences were found.

These studies were interested in the differential effect of noxious stimuli on the emotionality of the obese. In general, it seems that they are more affected by aversive stimuli than normals.

Sensitivity to Positive and Negative Stimuli

Pliner, Meyer, and Blankstein (1974) studied the responses of obese and normal weight subjects to both positive

and negative emotional stimuli. In the first study, the subjects were shown a series of slides. Imbedded in this series of slides were the three slides important to the study--a positive emotional slide, a negative emotional slide, and a neutral slide. Each slide was presented for thirty seconds. Then the subject was given sixty seconds to rate the slide on several seven-point scales intended to reflect his emotional response to it. The obese subjects rated the positive slide more positively than the normal subjects and the negative slide more negatively.

In the second experiment, Pliner, Meyer, and Blankstein (1974) compared the emotional response of obese and normal children to actual positive and negative situations. The children studied were in a hospital setting. They analyzed the reactions of the children to standard intravenous blood tests. Standard procedure involved one nurse extracting the blood from the child's arm and another nurse soothing the child until he stopped crying. The investigators asked the first nurse to rate the emotional responses on a fifteen point scale of each child she drew blood from. The second nurse timed how long the child cried following the initiation of the comforting. Contrary to expectations, the investigators found that the obese children did not respond more strongly to the negative stimulus than the normal weight children. However, in relation to the positive stimulus (the nurse's comforting), the obese children ceased crying significantly sooner than the normal weight children. These

data supported the prediction that obese children would be more responsive than normals to the positive affective stimulus.

Eating as a Response to Aversive Stimuli

As previously discussed in the section on the causes of obesity, many authorities believe that at least some fat people are more likely to eat under stress conditions produced by aversive stimuli than other normal conditions. Freed (1947) interviewed 500 obese subjects. Seventy-four percent of these subjects said that they ate more when nervous or worried. Three empirical studies suggest that obese people's eating responses are affected differently by noxious stimuli than normal-weight individuals.

Schachter, Goldman, and Gordon (1968) studied the effects of fear on the consummatory behavior of obese and non-obese subjects. All subjects were shown a large, imposing console of electronic gear. One half of the subjects were told that they were going to receive a severe shock during the taste test; the other half were told they would experience at most a slight tingle. Both groups were then asked to taste and rate crackers for a fifteen minute period prior to the shock condition. Shock was never given; the instructions were simply given to induce high fear or low fear. The obese subjects ate slightly but not significantly more crackers during the high fear condition than the low fear condition. The normal-weight subjects are significantly

fewer crackers when they thought they were going to receive a severe electric shock than under low fear conditions.

Conrad (1970) studied the effects of social rejection a presumed negative stimulus, on obese and normal subjects One group of each weight type was subjected to strong social rejection, one of each type to neutral social rejection, and one of each type to strong social acceptance. Conrad's obese subjects ate more if they were rejected than if they were accepted and more if they were accepted than in the neutral condition. Normal subjects ate less when rejected. They ate the most if they were accepted. Conrad also found that obese rejected subjects reported a sharp decrease in boredom after eating. On the other hand, the boredom of the normal subjects increased after eating.

McKenna (1972) studied the effects of two variables on the eating behavior of obese and normal weight individuals--low vs. high anxiety and low vs. high-food cue valence. All subjects were preloaded with two roast beef sandwiches. Then one half of the subjects were exposed to high anxiety conditions and one-half to low anxiety conditions. In the high anxiety condition, after the subjects finished eating, the experimenter acted as if he was preparing to take a blood sample from the subject. Then the experimenter told them that a doctor would be over later to do several medical tests. In the low-anxiety condition, the subjects were made to feel as relaxed as possible. Then one-half of each group (high anxiety and low anxiety) were exposed to the two valence

conditions. Those subjects in the high valence-high anxiety group and the high valence-low anxiety group were given a homemade chocolate chip cookie to taste. Those subjects in the low valence groups received a bland, greenish-grey Scotch shortbread cookie. After eating this cookie, the test conditions began. The subjects were given a box of cookies to taste and rate. They were allowed to eat as many as they wished in fifteen minutes. The overweight subjects ate more under high than low anxiety regardless of the food cue valence. However, they ate by far the most under high anxiety-high food valence cue conditions. The normal weight subjects ate less under high anxiety than low anxiety particularly less high valence food.

Thus, the results from all these studies indicate that anxiety probably does differentially affect the eating response of the obese and nonobese as hypothesized. The exact relationships that exist, however, must wait further empirical analysis.

Empirical Studies Involving Personality and Behavioral Differences Between the Obese and the Nonobese

A rather significant group of studies have been conducted analyzing the differences in the personalities and behavioral responses of the obese and nonobese. Traditionally, the emphasis in this type of research was in personality testing and evaluating differences in body images. In more recent years, an exciting trend has developed in which the investigators are interested in evaluating differences in the

way obese and normals respond on discrimination problems and cognitive tasks. This approach has unveiled several fascinating findings.

Research in the area of personality and behavioral differences is significant in many respects. It is possible that these differences are the root of obesity and explain why some people become obese. If this analysis is accurate, then any treatment of the obese first must focus on changes in the person's personality or behavior. On the other hand, it may be the case that once a person becomes obese, the differential treatment he receives produces these different characteristics and differential responses to tasks. Another possibility is that both the obesity and the behavioral differences come about as a result of a third set of independent variables. If this is so, these latter factors will be the most important ones in any account of obesity and in the treatment of the obese. At present, the role of all variables has not been clarified. This section will discuss the empirical studies involving personality tests, body image disturbances, and behavioral differences on discriminative and cognitive tasks.

Studies Involving Personality Tests

Several investigators have attempted to demonstrate that the obese and nonobese have different personalities or at least different personality traits. Most often these studies attempt to demonstrate that the obese will have

deviant scores on clinical scales when compared to normative data.

The MMPI and the Rotter Internal-External Control of Reinforcement (I-E) Scale have been studied by Snow and Held (Snow & Helf, 1973a; Held and Snow, 1972). Held and Snow (1972) administered the MMPI, the Rotter Scale, and the Mooney Problem Check List to obese and normal adolescences. The obese scored significantly higher than the nonobese on five of the ten basic clinical scales on the MMPI; D, P_D, P_A, P_T, S_C. No significant differences between the two groups were obtained on I-E scale although obese scored more in the external direction. On the Mooney Problem Check List, the obese were characterized by feelings of dependency, alienation, and low self-worth. They tended to be nonconforming and to have problems in impulse control. In a follow-up study, these same investigators administered the MMPI and Rotter scale to another group of obese adolescences. They hypothesized that with the obese, externality tendencies on the I-E scale would be positively correlated with measures of maladjustment on the MMPI. They found a significant positive correlation between the I-E score and eight of the ten basic clinic scales on the MMPI for these obese adolescents.

Moore, Stunkard, and Srole (1962) in the Midtown Manhattan Study included several items in their interviews that were designed to assess the individual's psychological and interpersonal functioning. A series of nine psychological

scores was constructed from these items. The obese respondents made more pathological scores on eight of the nine measures than normals and on three of these the differences were statistically different--immaturity, rigidity, and suspiciousness.

Saffer (1968) administered the California Personality Inventory to a group of matched normal and obese subjects. The obese scored significantly lower on six of the thirteen standard scales: self-control, responsibility, flexibility, intellectual efficiency, achievement via independence, and achievement via conformity.

Wunderlich, Johnson, and Ball (1973) noted that most tests given to the obese populations are useful in evaluating extreme behavioral disorders but do not reflect less pathological personality characteristics. Thus, they administered the Adjective Check List and the Edwards Personal Preference Schedule to a group of obese subjects. The obese scored lower than the normative group on the Achievement, Affiliation, Dominance, Endurance, Order, Personal Adjustment, and Self-control scales of the two tests. They scored higher on the Aggression, Exhibitionism, Heterosexuality, and Intraception scales. In addition, the obese sample checked a significantly fewer number of Favorable Adjectives than did the normative group and more descriptive adjectives pertaining to Autonomy.

Differences in Body Image of Obese and Normals

Early investigators (Bruch, 1940, 1941, 1957, 1958) noted that the obese consistently demonstrated disturbances in their body image. In 1967, Stunkard and Mendelson (1967) stated, "Of the many behavioral disturbances to which obese people are subject, only two seem specifically related to obestiy. One is overeating, the other is a disturbance in body image." The term, "body image" refers to the picture that the person has of the physical appearance of his body (Stunkard & Mendelson, 1967) The disturbance in body image by the obese is characterized by a feeling that their body is grotesque and loathesome and that others view it with hostility and contempt (Stunkard & Mendelson, 1967).

Stunkard has analyzed the origins of the disturbance in body image with the obese (Stunkard & Mendelson, 1967; Stunkard & Burt, 1967). He noted that the age of onset was very important factor in the development of this disturbance. It occurs almost exclusively among persons who became obese during childhood or adolescence. He found that persons who were obese in childhood but not in adolescence had much lower frequency of body image disturbances than those persons who were obese in adolescence only or in adolescence and childhood. Stunkard concluded that adolescence is the critical period for the development of a disturbed body image and is related to the censure of others during this period.

Nathan (1973) studied differences in body image between obese and normal children via figure drawings. Each child was asked to draw one male and one female drawing. These drawings were then scored blind according to the Goodenough Harns Method. The obese subjects obtained significantly lower scores than the normals. The obese children's drawings were less differentiated and more global. Thus, a disturbed body image was noted for the obese even at this level. Also, Nathan noted that the differences between the drawings of the two groups became greater the older the children were.

Stunkard (Stunkard & Mendelson, 1967) noted that weight reduction had little effect on the way the obese perceived their bodies. Gluckoman and Hirsch (1969) studied the phenomenon using perception of body size. They used a body distorting mirror which subjects could adjust to make the image of themselves look more obese or thin. The obese subjects were tested during three phases; six week weight maintenance, fifteen week weight loss, and six week weight mantenance. The obese subjects had a mean weight loss of 86.7 pounds. The obese subjects consistently overestimated their body size before, during, and following weight loss. In contrast, the nonobese subjects underestimated their own body size during a period of weight maintenance. In the reduced state, the obese subjects perceived themselves as if they had lost almost no weight. Furthermore, they consistently overestimated the size of other stimuli external to themselves before, during, and following weight loss.

Thus, it appears that obese subjects who are obese during childhood and/or adolescence overestimate their body size. Also, they generally develop negative, derisive feelings about their bodies.

Studies Involving Discriminations or Cognitive Tasks

Numerous investigators have studied the difference between the discriminative functioning of the obese and nonobese. Rodin, Herman, and Schachter (1974) investigated the responses of obese and normal subjects on three tasks; reaction time tests, immediate recall, and on tachistoscopic recognition. The reaction time tests involved a simple reaction time and a choice reaction time. In the simple reaction time test, the subject continuously pressed a key directly below a light until he saw the light appear. When he detected the light, he was to release his finger. On this test, the obese were significantly slower to react than the normals. On the choice time test, the subject pressed two telegraph keys, one with the forefinger of the right hand and one with the forefinger of the left hand. A light was mounted above each key. When the light flashed above the right key, the subject was to release the left key and vice-versa. On this task, the latency of the obese's response was significantly less than the latency of the nonobese's response. The immediate recall task involved presenting the subject with groups of words or numbers or objects for five seconds. Then the subject was asked to recall the items

on the slide. The obese were better able to recall the items from immediate memory than normals. The last test in this study involved the tachistoscope. Words were flashed to the subject on a tachistoscope in increasing intervals until he correctly identified the word. The obese performed better than normals on this task also.

Doost (1973) investigated the difference between obese and normal subjects on three aspects of information processing: encoding, short-term memory, and trace maintenance and retrieval. Obese subjects had a significantly lower rate of iconic recall on a six-item letter array than normal subjects (encoding). In the short-term memory part of the experiment, the subjects were asked to recall a word triad after performing one of four tasks of varying difficulty. Normals tended to perform better than obese as the tasks increased in difficulty. On the third task, the subjects had to scan and retrieve items. Female obese had the most rapid item scan and male obese the slowest. Normal subjects feel in between the two extremes.

Rodin (1974a) found that the obese made more errors than normals on a proofreading task when distracted by a tape played while they worked. However, they were more accurate than normals on the same task when not distracted. In another facet of the same study, Rodin studied choice reaction time using the same procedure as Rodin, Herman, and Schachter (1974). Rodin found that the obese reacted slower

on this task than normals during the tape. As in a former study, without the tape (Rodin, Herman, & Schachter, 1974) they had a faster reaction time than normals. Also, the obese subjects made a significantly greater number of errors than normals when the tape was played. Rodin concludes that the obese seemed to be more distracted by irrelevant stimuli than normals.

Pliner (1973) demonstrated that the estimates of obese subjects as to the length of a tape was significantly affected by the intensity of the tone. Furthermore, this effect was significantly different from the effect of the same procedure with normals. The obese judged the tape to be shorter than normals when the blips were soft and longer than normals when they were loud. Also, the obese estimated the tapes to be of a shorter duration than normals when there were forty pulses per minute and of a longer duration than normals when there were eighty pulses per minute.

Stulz, Warm, and Woods (1974) investigated the differences in the ability of normal and obese subjects to judge the duration of a tone. Four durations of a 1,000-tiz tone were employed: three, eight, thirteen, and eighteen seconds. At the start of each trial, the experimenter told the subject hos long the duration of the tone was to be on that trial. The subject extinguished the tone when he felt the interval had expired. The obese were significantly less accurate in judging durations than the normals. The effect was notable predominantly at the longer stimulus durations.

Karp and Pardes (1965) investigated what they called field dependence with obese women. All subjects were given a battery of three tests involving finding a simple figure contained within a more complex figure. Extent of field dependence is reflected in the amount of difficulty the subject has in separating the simple figure from the surrounding field. The obese women were significantly more field dependent than normals; that is, they had more difficulty separating the simple figure from the more complex figure.

Pliner (1973) studied the effects of external cues on the thinking behavior of obese and normal subjects. Under the pretext of having their physiological responsiveness to cold assessed, obese and normal subjects were required to immerse their hands in an ice water solution for six three-minute trials. The three experimental conditions were: cues-present condition, cues-absent condition, and no-cues condition. In the cues-present condition, the subjects were asked to think about a scene that was flashed on the screen (a mountain or a beach) during each trial. In the cues-absent condition, the subjects were asked to think about a scene that was described to them prior to each trial. In the no-cues condition, the subjects were not asked to think about anything. Two measures were taken. At the end of each trial, the subject was asked what percentage of the time did he think about the scene on the screen or described to him. Before each trial, each subject was asked to report

when he first experienced pain. The obese subjects spent significantly more time than normals thinking about an assigned topic of thought if topic-relevant cues were present. On the other hand, they spend less time than normals if there were no topic-relevant external cues present. In the cues-present condition, the obese had significantly lower pain latencies than normals. In the cues-absent condition, these results were reversed.

Singh and his associates (Singh, 1973; Singh, Swanson, Letz, & Sander, 1973) conducted a series of experiments comparing normals and obese on negative transfer of learning. Negative transfer refers to the fact that if a subject is trained to perform one task and then exposed to a new task which has elements incompatible with the first, the acquisition of the former task will interfere with the learning of the new task. Thus, pretraining on the initial discrimination interferes with the learning of the second one. Singh was interested in studying this phenomenon with the obese because he believes that they are deficient in response inhibition. Thus, they tend to respond in a new situation just as they did in the prior one. Once they exhibit a certain behavior such as eating under one set of conditions, they are likely to be unable to inhibit this response in a new situation.

In one experiment, Singh (1973) studied the effects of pretraining in one timing situation on a subsequent incompatible timing task with obese and normals. The latter task

involved a differential reinforcement of low rates of responding schedule of reinforcement (DRL). To obtain reinforcement on this schedule, the subject must wait for a fixed period of time before he responds. If response is made before this interval has elapsed, he forfeits reinforcement. One half of all of the subjects were given pretraining on a fixed ratio of reinforcement (FR) which engenders a very high rate of responding. The other half was given no pretraining. It was hypothesized that initial exposure to the FR schedule and the high response rates would interfere with performance on the DRL schedule which required low rates of responding. Singh found that the obese subjects performed worse than normal subjects on the DRL schedule when interference training was given but better than normals when no prior training was provided. Thus, Singh's prediction was upheld; the obese did exhibit poorer response inhibition than normals.

In another experiment, Singh et al. (1973) studied negative transfer of training with the obese and normals using a standard mirror-drawing test. In the positive phase of the study, all subjects traced the outline of a star when the star was directly in their view. They used their preferred hand. In the second phase of the study, the negative phase, they traced the outline of the same star except they could only view it in the mirror as they traced its outline. In the final stage, the reversal stage, they traced the star

in the mirror using their nonpreferred hand. As expected, in the negative phase of the study, the previous training interfered with the performance of both groups. However, the magnitude of the negative transfer effect was significantly greater for the obese subjects than the normals. The obese also performed more poorly than normal subjects in the reversal phase of the study.

Singh et al. (1973) evaluated the effects of negative transfer on the reaction times of obese and normal weight subjects. In the first phase of the study, obese and normal subjects were given thirty-two trials to learn to respond as quickly as possible to a positive stimulus and to withhold the response if a negative stimulus appeared. The response was to push a telegraph key; the positive stimulus was pairs of triangles of the same size; the negative stimulus was dissimilar sized pairs of triangles. After original learning, the subjects were instructed to respond to the previously negative stimulus and to withhold the response to a previously positive stimulus for thirty-two trials. Contrary to previous findings (Rodin, Herman, & Schachter, 1974), no significant difference was evident in the reaction time of the obese and normals although the normal subjects tended to have shorter reaction times. The obese subjects continued to respond at the same speed on the reversal task as the original task but made significantly more errors. The normal subjects, on the other hand, showed an increase in reaction time during reversal as compared to original learning.

However, their error rate did not change. Singh contends that these data show that obese and normals use different decision-making strategies. The stragety adopted by normal subjects is to establish an error criterion and then adjust the amount of time needed to meet that criterion. Obese subjects adopt a response time criterion and respond as best they can within that interval. Singh says that, "Once the obese subjects have chosen a time interval to respond, they cannot without the response any longer than that time interval" (p. 248).

In the last study in a series (Singh, 1973), Singh studied negative transfer relative to the problem solving strategies of obese and normal subjects. Subjects were tested for the Einstellung effect (mental set effect). This effect is inferred when subjects persist in using some initial method of solving problems in spite of the fact that other methods, some of which are much simpler and more direct than the initial method, are feasible. The subjects were given the water jar problems developed by Knight (1963). On the first seven problems, only one solution is possible (Procedure 1). On problems eight to eleven, several other solutions are possible. Subjects were randomly assigned to either the experimental or the control group. If the subject was assigned to the control group, problems two through seven were omitted; experimental subjects were given all eleven problems. The results were consistent with Singh's predictions. No significant difference between normal and obese

subjects was obtained under the control condition. However, those subjects in the experimental group demonstrated a greater Einstellung effect than normal subjects. They preferred Procedure 1 to solve problems even though other easier solutions were possible.

In summary, Singh found that in numerous situations the behavior of obese subjects is profoundly affected by existing response tendencies. This effect was obtained with timing, tracing, and problem-solving.

Two studies have been conducted analyzing the susceptibility to the influence of others by the obese as compared to normals. Glass, Lavin, Henchy, and Mayhew (1969) compared the degree to which the obese's and normal's opinions affected by persuasive arguments. The procedure consisted of three parts. The first part involved as Initial Questionnaire measuring opinions on four topics. Each topic was followed by three questions as to what the person's opinion was on that topic. The second part of the procedure involved giving the subjects Booklet I which contained four persuasive communications on one topic followed by three opinion questions from the Initial Questionnaire. The third part of the procedure, the subjects were given Booklet II. In Booklet II, there were four persuasive articles on the same topic as Booklet I, but taking a directly opposing viewpoint. After Booklet II, the subjects were given the same three opinion questions as they answered in the Initial Questionnaire and Booklet I. Overweight subjects showed overall greater

changes of opinion in both directions than normal subjects exposed to the same persuasive appeals.

In a second study on the differential response of the obese to the wishes of other people was conducted by Rodin and Slochower (1974). All subjects first taught a list of three-letter words to a confederate. Subsequently, the confederate taught a similar list to the subject. During the second task, the confederate's behavior towards the subject was either nice or neutral or nasty. Also, one-half of the confederate were overweight themselves and half were not. After the subject had learned the list, he was asked to distribute some attitude surveys that the confederate needed for a course. Compliance of this request was measured by the number of surveys the subject agreed to take. Also, the subjects were asked to check any attribute that had influenced their opinion of the confederate from a list of personality, intelligence, and physical characteristics that included heavy and thin. The results of this study showed that the opinion that the obese person formed of the confederate was affected more by the latter's weight and behavior than it was for the normal person. Furthermore, the obese were more likely to comply with a normal weight person than one who was overweight. Also, the obese was more likely to comply with a person's wishes if he were nice than if he were nasty. These findings did not hold true for normal weight persons.

In summary, numerous studies have been conducted comparing the behavioral responses of the obese. Whether or

not these findings can be integrated in a comprehensive theory of obesity is still in question. The controversy concerning the interpretation of these findings is still raging. Nevertheless, the main conclusion that can be drawn now is that in almost every study conducted, the obese did behave differently than the normal-weight person regardless of the task or the intent of the investigator.

Treatment of the Obese

As an outgrowth of various theoretical positions on the etiology of obesity a resultantly large number of methods for the treatment of this problem have emerged. While it is generally recognized that overeating is a consistent feature of the behavioral repetoire of the obese, it is not always the primary focus of treatment. Even in cases in which the consummatory behavior of the obese is viewed as the secondary concern of treatment, it is recognized by these positions that regulating food intake functionally related to weight gain or weight reduction (Bruch, 1957; Rubin, 1968).

In a most comprehensive analysis of the methods for the treatment of obesity, Dr. Feinstein in 1960 concluded

> In every completely reported dietary program the percentage of failure is far greater than that of success. Weight reduction regimens may thus be optional according to experimental and theoretical standards but may fail to show any value when actually used on patients (Feinstein, 1960, p. 349).

This report represented all published professional and lay articles for the treatment of obesity from 1928-1960. An

exhaustive analysis of the methods, results, and factors which influence success was presented. One consistent feature of each method is an explicit view of the etiology of obesity. Dr. Feinstein (1960) makes this point by stating

> The explanations of the effects of weight reduction programs have been as varied as the programs themselves and the only consistent feature apparent in many of them has been their relationship to the orientation of the writer reporting them (p. 350).

Dr. Feinstein made two immediate observations from his data: (1) The obese patient whose food intake was controlled and imposed by environmental restrictions did lose weight consistently regardless of what the diet consisted, and the amount of weight loss was directly proportional to the amount of caloric deprivation, and (2) For outpatients, who were free to maintain or reject the prescribed diets, no reported diet or dietary adjunct has been consistently successful. Dietary adjuncts included (a) appetite depressants (anorexiants, bulk producing agents, preprandial carbohydrate, production of nausea, and low protein intake), (b) homostatic alteration (exercise, massage, high fat intake, dinitrophenol, diuretics, hormones), (c) mood alteration (individual psychotherapy, group meetings, hypnosis, special incentive, pharmaceutical agents).

Conflicting and markedly contrasting results have occurred with identical diets used by different physicians, with different diets used by the same physician, and with isocaloric changes in the form and composition of dietary

ingredients. As an explanation of these results, Dr. Feinstein (1960) came to the obvious and yet profound conclusion that

> Adherence to a dietary program and the consequent weight reduction occur as a result of the interaction of three sets of factors which are intrinsic to (1) the patient, (2) the therapeutic relationship, and (3) the dietary program itself (p. 389).

Up until this time, the importance of (1) and (2) had gone relatively unnoticed. This probably has much to do with the fact that training of medical professionals revolved around the third class of variables and at that time, the medical profession was the primary source of treatment for obesity. The attainment of success then appeared to depend more on the features which made the patient adhere to a dietary program than on the specific structure of the diet program itself. The factors which promote dietary adherence are influenced by the patient's own status and by the nature of his therapeutic relationship.

Much of this data was not experimental in the sense of being designed as research although some of the procedures may be considered experimental in the sense of being used without any prior knowledge of effects. This was a survey of almost exclusively medical treatments. It is interesting to note that as early as 1951 Tolliffe and Alpert (1951) designed a "Performance Index" which checked the patient's actual weight loss against his expected loss. This "performance index" is closely akin to some later developments

in the treatment of obesity, which will be discussed in the following. When compared to other treatments, the "Performance Index" showed greater average losses than all treatments in that category although it was not consistently effective for each individual person. Also, it should be noted that no choice of food in an unrestricted environment showed greater effectiveness than dietary adjuncts and standard diets where the patient is responsible for selecting foods and limiting the size of their portions. This strategy appears to isolate consumatory behavior and remove it from other food signals which may lend to other established patterns of eating. It gives the patient one consistent mode of responding.

In summary, it was concluded by Feinstein's study that many treatments have been tried and all have met with <u>some</u> success. While all treatments met with some success, some treatments appeared better than other treatments although the results for a particular treatment were not consistent within a group. Also it should be noted that success in almost all cases was shortlived. The need for establishing a standardized measure for reporting weight loss was discussed. The existing reports are difficult to compare because so many different measures are used. A standardized measure would facilitate comparing different weight reduction treatments for effectiveness, regardless of the theoretical model and techniques employed. Another weakness of past and

current reports was failure to take into account the attrition rate in treatment programs; to ignore patients who reject or abandon dietary programs and to cite only the results of those who continue to participate is to bias the reported results.

Dr. Feinstein summed it up this way:

> These features suggest that higher percentages of success might be obtained in the treatment of obesity by less rigid devotion to concepts of diets, drugs, and devices and by more flexible attention to the total status of the dieting patient (p. 392).

Stunkard and McLaren-Hume (1959) made a similar observation of the state of affairs for the treatment of obesity. They said, "Most obese persons will not remain in treatment. Of those who do remain in treatment, most will not lose much weight, and those who do lose weight, most will regain it" (p. 79). Unfortunately, they, unlike Feinstein, had no solutions or suggestions for improving the situation. Most professionals took a pessimistic view of the obese individual's chances of controlling his/her weight. As a matter of fact, obesity was and is still viewed as somehow separate and apart from other human problems. It is still viewed as a form of moral deviance rather than the result of a pathogenic environment, and thus the individual himself is held responsible. Mayer (1968) asserted this notion by saying,

> The old view of medicine, that patients are sick because of their sins, including their lack of self-restraint, a view which has been generally abandoned in the Western world even in the matter of alcoholism, still dominates as far as obesity

> is concerned. Obesity, almost alone among all the pathologic conditions, remains a moral issue (p. 125).

Since 1960 an abundance of research, professional and lay articles appeared in the literature on the treatment for obesity. A continuance of the use of former treatment modes persisted. These treatments range from individual psychotherapy (Deri, 1955; Fromm, 1958; Bruch, 1957, 1963, 1970; Fischer, 1973), group psychotherapy (Mees & Keutzer, 1967; Harmetz & Lapue, 1968; Kotkow, 1969; Penick, Filion, Fox, & Stunkard, 1971; Snow & Held, 1973b), hypnotherapy (Erickson, 1960; Oakley, 1960; Brodie, 1964; Hanley, 1967; Hartman, 1969; Kroger, 1970), appetite depressants (Silverstone & Solomon, 1965; Penick, 1970), to non-professional group activities such as exercise clubs, yoga, and self-help organizations (Allon, 1973), diet clinic approaches (Franklin & Rynearson, 1960; Peer, 1972), chemotherapy (Modell, 1960; Gordon, 1969), and starvation (Rowland, 1968; Bortz, 1969; Kollar, Atkinson, & Albin, 1969; Stokes, 1969). In a most recent survey of diets, Dr. Berland elaborates on at least sixty-five different diet programs, all of which emphasize the diet regime itself. Unfortunately more or less the same conclusions have been drawn from all of this literature: that the results almost are remarkably similar and remarkably poor.

Psychological research, particularly that of learning theory orientations, represents the majority of publications during the past fifteen years. As a result of this trend the focus of treatment shifted from the dietary program

itself to the patient variables. While this new focus offers some new ways of viewing treatment, the majority of these research reports still do not consider the total status of the patient. Rather, these reports are confined to testing the efficacy of a particular learning paradigm and, therefore, isolate the problems in terms of one process. While this is true, this general field of research nevertheless presently offers the most promising avenue for treatment (Stunkard, 1972). The literature on learning theory approaches for the treatment of obesity will follow.

The first formal usage of a learning theory approach in the treatment of overeating has been attributed to Wolpe (1954). He had his subject form an image of a selected food, and then, when this had been accomplished, the subject signaled him by raising her finger. He then passed an intense faradic shock on to her forearm. The obessive food related thoughts were reduced almost entirely within very few treatment sessions. This study was the forerunner of what is called the aversive conditioning procedures (Meyer & Crisp, 1964; Thorpe, Schmidt, Brown, & Castell, 1964; Stollak, 1967; Harmatz & Lapuc, 1968; Kennedy & Foreyt, 1968; Wolpe, 1969; Foreyt & Kennedy, 1971; Morganstern, 1974).

Essentially, this approach pairs noxious stimuli with "forbidden" food stuffs. Theoretically, it relies on a classical conditioning paradigm. While there were early claims of great success, there is very little evidence to

indicate that the aversive procedures are an effective treatment for obesity (Abramson, 1973). The most optimistic conclusion is that it may be used as an adjunct with other treatment procedures (Foreyt & Kennedy, 1971). There were three other articles (Ferster, Nurnberger, & Levitt, 1962; Allyon, 1963; Homme, 1965) which appeared in the early 1960's which also set the trend for the treatment of obesity.

Self control.--Ferster, Nurnberger, and Levitt (1962) published a classical article concerned with "uncontrolled eating" and the possibilities for self control. The paper begins

> Although many investigators have described patterns of eating behavior and reported a wide range of factors related to obesity, specific techniques for changing an individual's eating behavior are given little or no attention in published reports, and programs of weight control based on behavioral principles are virtually non-existent. This report is an account of the application of some elementary general principles of reinforcement theory to the analysis of the behavior of the human eater. This theoretical framework of reinforcement was used to analyze actual performances in eating, and particularly self-control and eating. Supplementing the account of this system are descriptions of experimentally developed techniques which should illustrate practical application of the theoretical principles of self-control (p. 87).

The actual data obtained from this pilot study in terms of success were mediocre. The importance of this paper was that it provided a description of the medium within which specific techniques of control can be applied to the problem of overeating. The report was intended to provide a theoretical and practical model for more structured programs of self

control in eating. As a result of this report, many studies appeared in the literature that utilized the analysis that was suggested (Goldiamond, 1965; Stuart, 1967; Harris, 1969; Wollersheim, 1970; Harris & Bruner, 1971, Penick, Filion, Fox, & Stunkard, 1971; Stuart, 1971; Hall, 1972; Harris & Hallbauer, 1973; Mahoney, 1973, 1974; Romanczyk, 1973, 1974; Bellack, Rozensky, & Schwartz, 1974; Hagen, 1974).

Therapist control of consequences.--Ayllon (1973) first described therapist control of reinforcement in the control of eating behavior. He demonstrated that a schizophrenic patient was able to reduce her initial body weight by seventeen percent. Following this study, many studies appeared that used therapist control of reinforcement. Four studies made use of token economies in affecting weight loss in institutional settings (Barnard, 1968; Moore & Crum, 1969; Upper & Newton, 1971; Klein, Steele, Simon, & Prinauer, 1972). Other studies in a non-institutional setting made use of contingency contracting techniques as a way for the therapist to control reinforcement (Harris & Gruner, 1971; Jeffrey, Christensen, & Pappas, 1972; Mann, 1972; Korman, 1973; Tobias, 1973; Abrahms & Allen, 1974). Therapist reinforcement techniques have been most effective in institutional settings as opposed to outpatient treatment (Abramson, 1973). This is probably due to the fact that

(a) in an institutional setting the actual behaviors involved are not followed by consequences as opposed to the

product (weight loss or gain) of these behaviors;

(b) the diet program itself can be controlled in an institutional setting;

(c) more therapist contact with the patient can be achieved.

Covert control.--Homme (1965) first coined the term "coverant." It is a contraction of the words covert and operant. He suggested that private events could be conditioned that were incompatible with obesity (i. e., eating behavior, their physical state, possible future complications, etc.) and as a result would effect weight loss. Tyler and Straughan (1970) and Horan and Johnson (1971) investigated the use of "coverant" conditioning in the treatment of the obese. Their results were discouraging. The utility of coverant procedures remains to be demonstrated, but like Ferster, et al., Homme's paper provides a theoretical and practical model for modifying behavior, and as a result much research has been stimulated. The covert sensitization procedures developed by Cautela were an outgrowth of Wolpe's study and Homme's paper. Typically, the client is taught to relax and the therapist has the client imagine himself approaching forbidden foods and subsequently becomes nauseous and vomits. Interdispersed with these scenes are scenes in which the patient approached the target food, felt nauseous, retreated, and immediately felt a sense of relief. Recently, Cautela (1972) outlined a treatment program which

adds covert reinforcement to the covert sensitization program. Cautela makes mention that there is no generalization of treatment responses to acceptable eating behavior (Cautela, 1966).

Many studies followed that investigated the efficacy of covert sensitization procedures for the treatment of obesity (Stuart, 1967; Harris, 1969; Cautela, 1972; Janda & Rimm, 1972; Manne & Marsten, 1972; Sache & Ingram, 1972, Foreyt & Hagen, 1973). In four studies significant weight losses were obtained. In these studies significant weight losses meant that there were statistically significant but not necessarily significant in terms of weight loss relative to entering weight of subject. Nevertheless, some weight loss was effected as a result of the treatment. In those cases in which weight loss was found not to be significant, it should be noted that clients changed their food preferences but did not lose weight because of their increased consumption of non-target foods. Just as Cautela said that there is no generalization of treatment responses to acceptable eating behavior, there seems to be no generalization to other unwanted foods. Since the effects covert sensitization are very specific, the therapeutic application might require conditioning a wide range of foods. With respect to the efficacy of covert sensitization procedures, more or less the same conclusion is reached as with the aversive conditioning procedures, that is, there is little evidence

to indicate that these procedures in and of themselves are an effective treatment for obesity. Foreyt and Kennedy (1971) said the most optimistic conclusion was that the aversive conditioning procedures could be used as an adjunct with other treatment procedures. The same conclusion can be made of the covert sensitization procedures.

Case Studies to Experimental Studies

The earliest attempts in the application of learning theory principles to treat overeating were uncontrolled case studies (Wolpe, 1958; Ferster et al., 1962; Allyon, 1963; Meyer & Crisp, 1964; Thorpe et al., 1964; Goldiamond, 1965; Homme, 1965; Cautela, 1966; Stuart, 1967; Barnard, 1968; Kennedy & Foreyt, 1968; Moore & Crum, 1969; Wolpe, 1969; Moore & Crum, 1969, Wolpe, 1969; Upper & Newton, 1971; Jeffrey et al., 1972; Klein, 1972).

Typically one or two subjects were used in these studies. They were "uncontrolled" in terms of planned research comparisons. The techniques employed ranged from aversive conditioning procedures, covert procedures, self control techniques, and therapist control of consequences. The case studies led to more controlled experimental studies in which various controls were used. No treatment group control and attention placebo group control and other treatment control were used to investigate the effects of each of these techniques (Stollak, 1967; Harmatz & Lapuc, 1968; Harris, 1969; Wollersheim, 1970; Hagen, 1970; Tyler & Straughan, 1970;

Foreyt & Kennedy, 1971; Harris & Bruner, 1971; Horan & Gilmore, 1971; Penick et al., 1971; Stuart, 1971; Hall, 1972; Janda & Rimm, 1972; Manno & Marsten, 1972; Harris & Hallbauer, 1973; Korman, 1973; Mahoney, 1973; Romanczyk et al., 1973; Tobias, 1973; Abrahms & Allen, 1974; Bellack et al., 1974; Hagen, 1974; Romanczyk, 1974), and often these techniques were compared with each other (Harris, 1969; Harris & Bruner, 1971; Penick et al., 1971; Hall, 1972; Korman, 1973; Tobias, 1973; Romanczyk et al., 1973; Abrahms & Allen, 1974; Hagen, 1974; Romanczyk, 1974), and further, different variations of the same technique have also been compared (Harris, 1969; Hagen, 1970; Manno & Marsten, 1972; Harris & Hallbauer, 1973; Mahoney et al., 1973; Romanczyk et al., 1973; Bellack et al., 1974; Romanczyk, 1974).

Hall and Hall (1974) categorized all of the behavioral research on the treatment of obesity as either experimenter-managed (EM) or self managed (SM) approaches to treatment.

> These are not two totally dichotomous categories, rather they emphasize relative differences in experimenter activities (director vs. teacher), subject activities (passive vs. active) and location (therapy hour vs. natural environment) (Hall & Hall, 1974, p. 353).

The experimenter managed treatments are the aversive conditioning procedures, the covert procedures, and therapist control of consequences. Self managed treatments employ self control techniques and some covert procedures.

Abramson (1973), in a review of the behavioral literature to date, concluded that self managed treatment offers

the most promise. Hall and Hall (1974) also make this same conclusion but with some reservation: ". . . It is worth noting that studies using non-college student populations have produced less striking results than studies using college students" (p. 362). The usefulness of complex combination of self management techniques has been indicated by controlled studies (Harris, 1969; Wollersheim, 1970; Hagen, 1970; Harris & Bruner, 1971; Penick et al., 1971; Stuart, 1971; Hall, 1972; Bellack et al., 1974; Romanczyk, 1974). A consistent finding among these studies is a relatively slow consistent weight loss (one to two pounds per week). A consistent finding of studies employing experimenter managed procedures has been the relatively rapid weight loss obtained when these techniques were successful. This leads to the conclusion that experimenter managed procedures could be used in combination with self management procedures early in treatment. Initially, slow weight losses may be very discouraging to the person although moderate weight loss is healthy.

Penick et al. (1971) employed a combination of the two (EM and SM) and reported more rapid weight loss. Jeffrey et al. (1972) also combined therapist controlled reinforcement with self control techniques and found this to be most effective. These results compare favorably with Penick et al., despite the comparatively modest amount of patient contact (fourteen hours vs. fifty-four hours).

It was Stuart (1967) who first suggested combining different techniques of behavioral control. He employed covert sensitization in conjunction with self management procedures. Stuart's original work was inspired by Ferster and his associates. Stuart (1971) expanded these ideas and applied them in a more comprehensive and detailed way to gain control over the eating environment. In doing so, he has incorporated some of the more basic research findings of Stunkard and Koch (1964), Nisbett (1968), and Schachter (1968). Stuart generalized their findings to set up practical rules for controlling the environment of the obese. He did not seem interested in testing which procedure worked better than another, but rather he was interested in bringing to bear all behavioral techniques which would build the most powerful control over the eating environment.

Stuart (1971) called his treatment program "a three-dimensional program for the treatment of obesity" (p. 177). While Stuart was the first to combine different behavioral techniques (Stuart, 1967), he was also the first to combine (1) behavioral control over the eating environment with (2) individualized dietary programs (Stuart & Davis, 1972) and (3) individualized exercise program of Cooper (1968). In short, Stuart was interested in drawing upon any information from other disciplines to develop a more effective, economic and a general regime for weight control. The management of the situational controls of eating and the

management of energy consumption and expenditure give a broad and comprehensive view of treatment for the problem. It is an educational approach which relies as much as possible upon those controls of behavior related to weight-management which are found in the natural environment. Stuart's data is the most convincing in terms of success, attrition, rates, and follow up (Abramson, 1973). At the same time, conclusions will have to wait as the number of subjects was very few.

Summary of Treatment

Since the discouraging reports of Stunkard and McLaren-Hume (1959) and Feinstein (1960), some promising developments have occurred with respect to more affective treatment for the obese. The behavioral learning approach is largely responsible for these developments. Not only does this approach offer effective techniques; it brings a new and long awaited set of attitudes about the nature of the problem; it is in direct contradiction of the old view of obesity as a moral issue. The behavioral approach views obesity quite simply as an environmental problem. It stresses the use of empirical data and learning principles derived from experimental investigations.

It has been quite clearly demonstrated that learning principles can be applied to the treatment of obesity. As a matter of fact, it has gone far beyond the demonstration stage. In some ways this approach is guilty of making the

same mistakes as Feinstein (1960) said others made before them. It is recalled that Feinstein said professionals could profit "by less rigid devotion to concepts of diets, drugs, and devices and by more flexible attention to the total status of the dieting patient" (p. 392). The same could be said of the psychologist's devotion to concepts of a particular learning paradigm and testing the efficacy of one paradigm as opposed to another paradigm. While doing this the psychologist seems to indeed lose sight of "the total status of the dieting patient." This is not to discount their efforts as it was in this field that great advances in the treatment of the obese have been made.

Stuart (1971; Stuart & Davis, 1972) seems to have been the only practitioner to have "heard" Feinstein's proclamation. Stuart has not only taken into account "the total status of the dieting patient," but also has taken into account the total status of the behavioral literature, both treatment and basic research finding on behavioral characteristics of the obese, and has applied them in a most comprehensive and impressive way. Stuart's "three-dimensional program for the treatment of obesity" will stand as a landmark in the treatment of obesity. Stunkard (1959), a more or less pessimistic medical practitioner, has been convinced of the value of behavioral techniques. As a result of his association with Stuart, he is now very optimistic about the treatment of the obese (Stunkard, 1972).

Since the behavioral approach has gone beyond the demonstration state, it is time to begin studying more systematically the problems of (1) patient drop outs, (2) standardized improvement measures, (3) long term maintenance (4) cost-effectiveness analysis, (5) research strategies, (6) the development of behavioral predictors, and (7) an analysis of both successes and failures (Jeffrey, 1974). Feinstein (1960) made similar recommendations with regard to 1, 2, 3, 4, and 7. Despite different philosophical, theoretical, and practical tactics employed by the behavioral approach, these areas have been no less of a problem for it (Harris & Bruner, 1971; Abramson, 1973; Hall & Hall, 1974; Jeffrey, 1974).

CHAPTER III

METHODS AND PROCEDURES

This chapter deals with a description of the procedures for the collection of data, a description of the instruments, the population and selection of sample, and the procedures for the analysis of the data.

Procedure for Collection of Data

The subjects for the study were solicited through the North Texas Daily. At the initial meeting they were given the California Test of Mental Maturity to assess intellectual functioning. The purpose of this was to compare the two groups in this study along a dimension (intelligence) which might influence their performance. They were also measured for weight, height, and frame size. The subjects were selected for participation in the experiment on the basis of whether or not they fulfilled the requirements for either group--obese or normal. The requirements for selection was based on the definition in this study. The data for weight was based upon tables of the Metropolitan Life Insurance Company as specified in Appendix A. The criteria were used for judging ideal ranges of weight for different heights and frame sizes because these standards are almost universally employed in all research concerning obesity. If the same

criteria are used in two studies, then it can be assumed that the subjects in these studies are from the same population and comparisons can be made between the studies. Those subjects selected were paid five dollars each for completing the study. The weight range of the subjects constituted the independent variable for this study.

The experimental room was located in the Center for Behavioral Studies at North Texas State University.

The only other apparatus in the room other than the furniture were four sets of ten index cards and a pasteboard screen. The ten cards in each set had figures varying in several dimensions, e.g., red arrows (1A), green arrows (1B), black borders (6A), white borders (6B), etc. (see Appendix B). The figures in each set of cards encompassed six dichotomous dimensions. Thus, each dimension had two stimulus classes within it; therefore, there are twelve stimulus classes in each set of cards and, hence there are twelve possible concepts in each set of cards (see Appendices B, C, D, and E). Each of the ten cards in a set has various combinations of these six dimensions (see Appendices B, C, D, and E). Five cards in set I have red arrows (1A) on them and five cards have green arrows (1B) on them; five cards have black borders (6A) on them and five cards have white borders (6B) on them, etc. (see Appendix B).

The subjects were given conceptual training on two concepts within each of four sets of cards. First, each subject

was taught one concept in a set. Once the subject acquired this initial concept, a second new concept was introduced, and the subjects were trained to discriminate this concept.

Prior to training, the subjects were given the following instructions:

> I'm going to show you ten cards that have several different dimensions or characteristics. I want you to select five out of the ten that are alike in one way, that have one common feature. There are many possible combinations of these ten cards that can be alike. I will give you feedback as to whether or not you selected the five that are alike that I have in mind. If you have selected the five I have predetermined, I will say, "Yes, that is the correct selection." If it is not the selection I have in mind, I will say, "No, that is incorrect." When this occurs it does not necessarily mean that you did not select five cards that had a single common element. It rather simply means that it was not the selection I was looking for. Continue to select according to the feedback you receive. If you receive "incorrect" feedback, sort along another dimension on the next trial. If you receive "correct" feedback continue to sort along the same dimension or characteristic on the next trial. I will give you twelve seconds on each trial to scan the cards and then five seconds in which to choose five cards that are alike in one way; that is, that share a single common characteristic or element. You are expected to make errors. Remember, Just because you receive "incorrect" feedback does not necessarily mean that you did not sort along a common characteristic; it simply means that it wasn't what I was looking for. Is that all clear? Good. Let's begin. When you pick the cards up please do not turn them around.

Then the experimenter raised the screen and the display of ten cards was now in view of the subject. After the twelve seconds elapsed the subject was told, "please choose," and was allowed five seconds in which to choose five cards. At the end of five seconds, the experimenter placed the screen

between the subject and the display of cards to terminate the trial. If the subject selected the appropriate five cards, the experimenter said, "Yes, that is correct." If he did not choose the correct cards, the experimenter said, "No, that is not correct." After each trial the placement of the cards was randomized. The manner in which the subject selected the five cards is known as the identification method in concept learning experiments (Deese & Hulsa, 1958). This procedure was continued in this fashion until mastery of the first concept was achieved. This criterion was twenty successive correct responses. Once mastery of the first concept in Set I was achieved, a second new concept in Set I was introduced. When a new concept within a set was introduced, it was not a reversal shift; that is, it did not contain the same dimensions as the former mastered concept, e.g., movement from large circle to small circle. It has been shown that reversal shifts are acquired very rapidly (Kendler & D'Amato, 1955); thus, nonreversal shifts were used to enhance the sensitivity of possible differences in negative transfer.

Once the second concept in the first set had been learned, a second new set of cards was introduced. The same procedures were followed for the second set as the first; the initial concept was taught to master; then the second concept in the set was taught to master. Once the subject has acquired the second concept in Set II, the third set of

cards was introduced using the same training format as for the first and the second set. The same procedure was followed in relation to the fourth set of cards. As soon as the subject acquired the second concept in Set III, training on the fourth set of cards began. The teaching procedure was identical to the procedure used to teach the subjects the concepts as used with Set I, II, and III. The concepts used for each set of cards can be found in Appendix F.

Each subject advanced through all four sets of cards, i.e., Set I, Set II, Set III, and Set IV. The rate at which all subjects completed each concept was dependent on each individual's performance. The dependent variable or measure for this study was the number of trials it took to reach the criterion for each concept.

Instruments

Body weight was measured by a Detecto Doctor's Scale (U.S. Patent no. 118, 701). Body height and frame size were measured with a measuring tape. Intelligence was measured by the California Short-Form Test of Mental Maturity (CTMM). Reliability coefficients on the total scores of 250 college freshmen were .94 with a standard error of measurement (S.E. Meas.) of 3.4 on the I.Q. scale (Sullivan, Clark, & Tiegs, 1957). A .95 reliability coefficient on the total score of 250 adults was also obtained. The S.E. Meas. for this population was 3.6 on the I.Q. scale (Sullivan et al., 1957). Also correlation coefficients of .634 and .87 were reported

in relation to the Otis, Gamma, and the Terman-McNemar, respectively (Sullivan et al., 1957).

Population and Selection of Sample

The population consisted of male students enrolled at North Texas State University. A total of twenty subjects were selected on the basis of their weight. These subjects were classified as obese or normal as defined by this study. Student volunteers were solicited through a classified advertisement in the North Texas Daily. The advertisement read, "Wanted: Male students to participate in simple concept formation experiment. Participants will be paid $5. Please come Friday, Saturday, or Sunday at 2:00 p.m. at the Center for Behavioral Studies, Highland and Avenue D, Room 121. This is a dissertation project. Thanks." The age range for the twenty subjects was nineteen years, nine months to forty-two years, eight months. The mean age was twenty-six years, five months. The weight range for the twenty subjects was from four percent below to sixty-eight percent above the average weight. Intelligence scores for the twenty subjects ranged from 114 to 149 with a mean of 130.9.

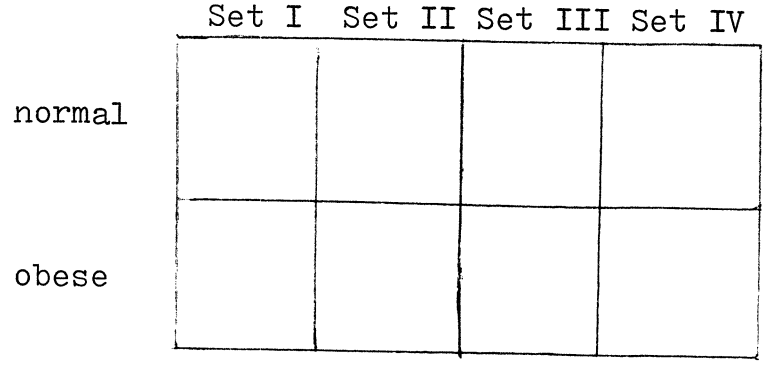
The age range of the normal group was from twenty years, eight months to forty-two years, eight months with a mean of twenty-eight years. The age range of the obese group was from nineteen years, nine months to thirty-four years, one month with a mean of twenty-four years, nine months.

The intelligence range for the normal group was from 117 to 146 with a mean of 130.9. The intelligence range for the obese group was from 114 to 149 with a mean of 131.0. The intelligence scores of the two groups were compared statistically using a t-test for independent samples. The t-test was found to be non-significant at the .01 level of significance. The calculated t value was .02, the the tabled value for the region of rejection was 2.55. All of the individual data for all these measures is found in Appendix G.

Procedures for Analysis of Data

Comparisons were made between the normal and obese group on the number of trials to criterion for the first concept of each set. A two-way analysis of variance with repeated measures on one factor was used to make these comparisons. The design was an A x B with repeated measures on B. There were two levels of Factor A, the obese group and the normal group. There were four levels of Factor B, the score on the first concept for each of the four sets of cards. The repeated measures were on Factor B. The level of significance for acceptance of the null hypothesis was set at .01. The Newman Keul procedure was used to test specific effects of significant main effects. The Hartley procedure (F max) was used to test homogeneity of variance (Winer, 1962). Research hypothesis 1 was tested by computing these statistics. The statistical design is represented by the following diagram.

Trials to Criterion
on first concept



Comparisons were made between the normal and obese group on the number of trials to criterion for the second concept of each set. Thus a two-way analysis of variance with repeated measures on one factor was used to make these comparisons. The design was an A x B, with repeated measures on B. There were two levels of Factor A, the obese group and the normal group. There were four levels of Factor B, the scores on the second concept for each of the four sets of cards.

The repeated measures were on Factor B. The level of significance for acceptance of the null hypothesis was set at .01. The Newman Keul procedure was used to test specific effects of significant main effects. The Hartley procedure was used to test homogeniety of variance. Research hypothesis two was tested by computing these statistics. The statistical design is represented by the following diagram.

Trials to Criterion
on second concept

	Set I	Set II	Set III	Set IV
normal				
obese				

Additional comparisons were also made to test research hypothesis two. This included (1) a comparison of the subjects in the obese group on the first and second concept in each set, (2) a comparison of normal subjects on the first and second concept in each set, and finally (3) a comparison of the difference scores between the first and second concept for the obese and normal group.

In other words, first the obese subjects were compared with themselves on the first and second concept. The statistical design is represented by the following diagram.

Obese

	Set I	Set II	Set III	Set IV
first concept				
second concept				

This is also a two-way analysis of variance with repeated measures on one factor. The design was an A x B with repeated measures on B. There were two levels of Factor A, the first concept and the second concept. There were four levels of Factor B, the four sets of cards. The repeated measures were on Factor B. The level of significance for acceptance of the null hypothesis was set at .01. The Newman Keul procedure was used to test specific effects of significant main effect. The Hartley procedure was used to test homogeneity of variance.

The normal group was also compared with themselves on the first and second concept. Thus, once again a two-way analysis of variance with repeated measures on one factor was used to make these comparisons. The design was an A x B with repeated measures on B. There were two levels of Factor A, the first concept and the second concept. There were four levels of Factor B, the four sets of cards. The repeated measures were on Factor B. The level of significance was set at .01. The Newman Keul procedure was used to test specific effects of significant main effects. The Hartley procedure was used to test homogeniety of variance. The statistical design is represented by the following diagram.

Normal

	Set I	Set II	Set III	Set IV
first concept				
second concept				

Finally, the difference scores between the first and second concept on each set for the obese group and normal group were analyzed. The statistical design is represented by the following diagram.

Difference Scores Between
First and Second Concept

	Set I	Set II	Set III	Set IV
normal				
obese				

This was a two-way analysis of variance with repeated measures on one factor. The design was A x B, with repeated measures on B. There were two levels of Factor A, the normal group and the obese group. There were four levels of Factor B, the four sets of cards. The repeated measures were on Factor B. The level of significance for acceptance of the null

hypothesis was set at .01. The Newman Keul procedure was used to test specific effects of significant main effects. The Hartley procedure was used to test homogeniety of variance.

CHAPTER IV

RESULTS, DISCUSSION, AND CONCLUSION

Chapter IV presents an analysis of the results of the study. In addition, it includes a discussion of these results and the conclusion drawn from them.

Results

The number of trials it took to reach criterion for the two concepts on each of four sets for obese and normal subjects were compared using five separate two-way analyses of variance (ANOVA). The ANOVA's are presented in the following order: (1) a comparison of the performance of obese and normal subjects on the first concept in the four sets, (2) a comparison of the performance of obese and normal subjects on the second concept in the four sets, (3) a comparison of the performance of obese subjects with themselves on the first and second concept in the four sets, (4) a comparison of the performance of normal subjects with themselves on the first and second concept in the four sets, and finally, (5) a comparison of the difference scores between the first and second concept on each set for the obese group and normal group.

Table I presents the ANOVA summary table for the first concept. It is a two-way analysis of Factors A and B with repeated measures on Factor B. Factor A (weight) has two levels, the obese group and the normal group. Factor B has

four levels, the four sets of cards. Prior to any statistical tests on Factors A and B, a test on the homogeneity of variance was computed. For SSsubj. w. groups (df 2.9) the region of rejection was 6.54 at the .01 level of significance. The calculated $F_{max.99}$ was 1.74. Thus the null hypothesis was retained. There was no difference in the variance. Thus the homogeneity of variance requirements was met. If the requirement had not been met, an adjustment on the degrees of freedom would have been made to result in a more conservative statistical test. For $SS_{B \times subj.\ w.}$ groups (d.f. 2, 27) the region of rejection was 2.63 at the .01 level of significance. The calculated $F_{max.99}$ was 1.69. The null hypothesis was retained. Thus the homogeneity of variance requirements were met.

The first statistical test in the ANOVA involved the effects of Factor A--the weight variable. This test analyzed the differences between the total trials to criterion (the combined trials to criterion for the four sets) of the subjects in the obese and normal group. The following null hypothesis was tested at the .01 level of significance.

Ho 1: There will be no significant difference in the trials to criterion for the first concept of the subjects in the obese and normal group.

The results of the analysis of variance on this factor indicated that there was no significant difference (probability greater than .01) between obese and normal group on the number of trials to criterion for the first concept. On the basis

TABLE I

TWO-WAY ANALYSIS OF VARIANCE OF THE TRIALS TO CRITERION ON THE FIRST CONCEPT ON FOUR SETS OF CARDS FOR THE OBESE AND NORMAL GROUPS

Source	SS	df	ms	F
Between Subjects	585.65	19		
A (obese-normal)	3.6	1	3.6	.11
Subjects within groups	585.05	18	32.5	
Within Subjects	1637.75	60		
B	328.15	3	109.38	4.52
AB	3.15	3	1.05	.04
B x subjects within groups	1306.45	54	24.19	

$F_{.99\ (1,\ 18)} = 8.29$

$F_{.99\ (3,\ 54)} = 4.13$

of this data, Ho 1 was retained. Thus, the results of this data indicate that there was no significant difference between the combined number of trials to criterion of subjects in the obese and normal group. The weight variable did not differentially affect the overall scores of the subjects.

The second factor in the analysis (Factor B) was the trials to criterion on the four sets of cards. The second statistical test involved an analysis of the differences in the trials to criterion for the four sets regardless of their grouping on Factor A. The following null hypothesis was tested at the .01 level of significance.

Ho 2: There will be no significant differences among the trials to criterion on each of the four sets of cards for the first concept.

The results of the ANOVA on this factor indicated that there was a significant difference (probability greater than .01) among the trials to criterion on each of the four sets of cards.

TABLE II

NEWMAL KEUL COMPARISON OF ORDERED MEANS OF FIRST CONCEPT ON FOUR SETS OF CARDS

Sets	b_3	b_2	b_4	b_1		
Ordered means	4.75	6.55	7.5	10.35		
	b_3	b_2	b_4	b_1	r	$S_{\bar{B}}q.99(r,54)$
b_3		1.8 (r=2)	2.75 (r=3)	5.6 (r=4)	4	5.01
b_2			.95 (r=2)	3.8 (r=3)	3	4.66
b_4				2.85 (r=2)	2	4.09

$S_{\bar{B}} = 1.09$

$q.99\ (r, 54)$:

r =	2	3	4
	3.76	4.28	4.6

Thus, Ho 2 was rejected. The exposure to the different sets of cards produced a significant change in the number of trials to criterion exclusive of Factor A (the weight variable). The Newman Keul procedure was used to test the

specific effects of the significant main effects on Factor B. Table II presents these comparisons and their results. These data indicate that the only significant difference among the sets of cards was between Set I and Set III. All other comparisons between means were non-significant.

The third statistical test for concept one was made on the interaction effect between Factor A (weight variable) and Factor B (the trials to criterion on the four sets of cards). This statistical test evaluated whether or not these two factors interacted to produce any difference or if they were independent. The following null hypothesis was tested.

Ho 3: There will be no significant interaction effect between the weight variable to the trials to criterion on the four sets of cards for the second concept.

The interaction effect between the two factors was not significant (probability greater than .01). Consequently, Ho 3 was retained.

The results of this first ANOVA support research hypothesis one, that the number of trials to criterion on the first concept for the obese group and normal group would not differ significantly. In other words, the two groups would perform in the same way on the first concept. Research Hypothesis 1 was stated in the same way that the null hypothesis was stated. Since Ho 1 was retained, that there was no difference between the two groups, Research Hypothesis 1 was supported. Ho 2, that there would be no difference in

performance across sets, was rejected. This meant that the performance of all subjects, regardless of grouping, did differ significantly across sets. This indicates that all subjects performances improve acress sets on the first concept. Since Ho 3 was retained, it can be assumed this was true for both the obese and normal group. If there had been a significant interaction effect, the results of Ho 2 could have been possibly attributed to one of the two groups. Since this was not the case, the results of Ho 2 hold true for both the obese group and normal group.

Table III presents the ANOVA summary table for the second concept. It is a two-way analysis of Factors A and B, with repeated measures on Factor B. Factor A has two levels, the obese group and the normal group. Factor B has four levels, the four sets of cards.

Prior to any statistical tests on Factors A & B, a test on the homogeneity of variance was computed. For SS subj. w. groups (df 2, 9) the region of rejection was 6.54 at the .01 level of significance. The calculated $F_{max.99}$ was 4.48. Thus, the variances were homogeneous. For $SS_{B \times subj.\ w.}$ groups (df 2, 27) the region of rejection was 2.63 at the .01 level of significance. The calculated $F_{max.99}$ was 2.28. The null hypothesis was retained. The homogeneity of variance requirements was met, and therefore no adjustments on the degrees of freedom were made which would result in a more conservative statistical test.

The first statistical test in this ANOVA involved the effects of Factor A--the weight variable. This test analyzed the differences between the total trials to criterion (the combined trials to criterion for the four sets) of the subjects in the obese and normal groups. The following null hypothesis was tested at the .01 level of significance.

TABLE III

TWO-WAY ANALYSIS OF VARIANCE OF THE TRIALS TO CRITERION ON THE SECOND CONCEPT ON FOUR SETS OF CARDS FOR THE OBESE AND NORMAL GROUPS

Source	SS	df	MS	F
Between Subjects	514.5	19		
A (obese-normal)	7.8	1	7.8	.27
subjects within groups	506.7	18	28.15	
Within Subjects	1894	60		
B	502.65	3	167.55	6.65
AB	31.6	3	10.53	.42
B x subjects within groups	1359.8	54	25.18	

$F_{.99\ (1,\ 18)} = 8.29$

$F_{.99\ (3,\ 54)} = 4.13$

Ho 1: There will be no significant difference in the trials to criterion for the second concept of the subjects in the obese and normal group.

The results of the analysis of variance on this factor indicated that there was no significant difference (probability greater than .01) between the obese group and normal group on the number of trials to criterion for the second concept. On the basis of this data, Ho 1 was retained. Thus, the results of this data indicate that there was no significant difference between the combined number of trials to criterion of subjects in the obese and normal groups. The weight variable did not differentially affect the overall scores of the subjects.

The second factor in the analysis (Factor B) was the trials to criterion on the four sets of cards. The second statistical test involved an analysis of the differences in the trials to criterion for the four sets regardless of their grouping on Factor A. The following null hypothesis was tested at the .01 level of significance.

Ho 2: There will be no significant differences among the trials to criterion on each of the four sets of cards for the second concept.

The results of the ANOVA on this factor indicated that there was a significant difference (probability greater than .01) among the trials to criterion on each of the four sets of cards. Thus, Ho 2 was rejected. The exposure to the different sets of cards produced a significant change in the number of trials to criterion exclusive of Factor A (the weight variable). The Newman-Keul procedure was used to

test the specific effects of the significant main effects on Factor B. Table IV presents these comparisons and their results. These data indicate that Set I differs significantly from Set III and Set IV. All other comparisons between means were non-significant.

TABLE IV

NEWMAN KEUL COMPARISON OF ORDERED MEANS FOR SECOND CONCEPT

Sets	b_3	b_4	b_2	b_1		
Ordered means	5.8	6.15	9.55	11.9		
	b_3	b_4	b_2	b_1	r	$S_{\bar{B}}q.99(r,54)$
b_3		.35 (r=2)	3.75 (r=3)	6.1 (r=4)	4	5.15
b_4			3.4 (r=2)	5.75 (r=3)	3	4.79
b_2				2.35 (r=2)	2	4.21
$S_{\bar{B}}$ = 1.12		r =	2	3	4	
q.99(r, 54)			3.76	4.28	4.6	

The third statistical test for the second concept was made on the interaction effect between Factor A (weight variable) and Factor B (the trials to criterion on the four sets of cards). This statistical test evaluated whether or not these two factors interacted to produce any difference

or if they were independent. The following null hypothesis was tested.

Ho 3: There will be no significant interaction effect between the weight variable and the trials to criterion on the four sets of cards for the second concept.

The interaction effect between the two factors was not significant (probability greater than .01). Consequently, Ho 3 was retained.

Since Ho 3 was retained, it can be assumed that the significance obtained on Ho 2 was not attributed to one group or the other. Thus both groups demonstrated an improvement in performance across sets on the second concept.

Table V presents the ANOVA summary table for the obese group comparison of themselves on the first and second concept on the four sets of cards. It is a two-way analysis of factors A and B, with repeated measures on Factor B. Factor A has two levels, the first concept and the second concept. Factor B has four levels, the four sets of cards.

Prior to any statistical tests on Factor A and B, a test on the homogeniety of variance was computed. For $SS_{subj. w. groups}$ (df 2, 9) the region of rejection was 6.54 at the .01 level of significance. The calculated $F_{max.99}$ was 1.74. The null hypothesis was retained and therefore the variances were homogeneous. For $SS_{B \times subj. w. groups}$ (df 2, 27) the region of rejection was 2.63 at the .01 level of significance. The calculated $F_{max.99}$ was 1.69. The null hypothesis was

retained. The homogeneity of variance requirements were met; therefore no adjustments on the degrees of freedom were made which would have resulted in a more conservative statistical test.

TABLE V

TWO-WAY ANALYSIS OF VARIANCE OF THE TRIALS TO CRITERION FOR THE FIRST AND SECOND CONCEPTS ON FOUR SETS OF CARDS FOR THE OBESE GROUP

Source	SS	df	MS	F
Between Subjects	703	19		
A (first concept-second concept)	51.2	1	51.2	1.41
Subjects within groups	651.8	18	36.21	
Within Subjects	2065.75	60		
B	489.85	3	163.28	5.86
AB	71.1	3	23.7	.85
B x subjects within groups	1504.8	54	27.86	

$F_{.99(1, 18)} = 8.29$

$F_{.99(3, 54)} = 4.13$

The first statistical test in this ANOVA involved the effects of Factor A--the learning of the first and second concept. This test analyzed the differences between the total trials to criterion (the combined trials to criterion for the four sets) of the first concept and the second concept for the obese group. The following null hypothesis

was tested at the .01 level of significance.

Ho 1: There will be no significant difference in the trials to criterion on the first concept and the second concept for obese subjects.

The results of the analysis of variance on this factor indicated that there was no significant difference (probability greater than .01) between the first concept and second concept for obese subjects. On the basis of this data, Ho 1 was retained. Thus, the results of this data indicate that there was no significant difference between the combined number of trials to criterion for the first concept and the second concept for obese subjects. The learning of the first or second concept did not differentially affect the overall scores of the obese subjects.

The second factor in the analysis (Factor B) was the trials to criterion on the four sets of cards. The second statistical test involved an analysis of the differences in the trials to criterion for the four sets regardless of their grouping on Factor A. The following null hypothesis was tested at the .01 level of significance.

Ho 2: There will be no significant differences among the trials to criterion on each of the four sets of cards for the obese subjects.

The results of the ANOVA on this factor indicated that there was a significant difference (probability greater than .01) among the trials to criterion on each of the four sets

of cards. Thus, Ho 2 was rejected. The exposure to the different sets of cards produced a significant change in the number of trials to criterion exclusive of Factor A (the learning of the first or second concept). The Newman Keul procedure was used to test the specific effects of the significant main effects on Factor B. Table VI presents these comparisons and their results. These data indicate that Set I differs significantly from Set III and Set IV. All other comparisons between means were non-significant.

TABLE VI

NEWMAN KEUL COMPARISON OF ORDERED MEANS FOR OBESE GROUP

Sets	b_3	b_4	b_2	b_1		
Ordered means	5.25	6.30	8.20	11.75		
	b_3	b_4	b_2	b_1	r	$S_{\bar{B}}q.99(r, 54)$
b_3		1.05 (r=2)	2.95 (r=3)	6.5 (r=4)	4	5.42
b_4			1.9 (r=2)	5.45 (r=3)	3	5.05
b_2				3.55 (r=2)	2	4.43

$S_{\bar{B}} = 1.18$

r =	2	3	4
q.99 (r, 54)	3.76	4.28	4.6

The third statistical test was made on the interaction effect between Factor A (the learning of the first and second concept) and Factor B (the trials to criterion on the four sets of cards). This statistical test evaluated whether or not these two factors interacted to produce any difference or if they were independent. The following null hypothesis was tested.

Ho 3: There will be no significant interaction effect between the learning of the first or second concept and the trials to criterion on the four sets of cards for the obese subjects.

The interaction effect between the two factors was not significant (probability greater than .01). Consequently, Ho 3 was retained.

Since Ho 3 was retained, it can be assumed that the significance obtained on Ho 2 was not attributed to the learning of the first concept more than learning of the second concept. Thus, for the obese there was an improvement in performance across sets for both the first and second concept.

Table VII presents the ANOVA summary table for the normal group comparison of themselves on the first and second concept on the four sets of cards. It is a two-way analysis of Factors A and B, with repeated measures on Factor B. Factor A has two levels, the first concept and the second concept. Factor B has four levels, the four sets of cards.

Prior to any statistical tests on Factors A and B, a test on the homogeneity of variance was computed. For

$SS_{subj.\ w.\ groups}$ (df 2, 9) the region of rejection was 6.54 at the .01 level of significance. The calculated $F_{max.99}$ was 3.76. The null hypothesis was retained and therefore the variances are homogenous. For $SS_{B \times subj.\ w.\ groups}$ (df 2, 27) the region of rejection was 2.63 at the .01 level of significance. The calculated $F_{max.99}$ was 1.81. The null hypothesis was retained. The homogeneity of variance requirements were met; therefore no adjustments on the degrees of freedom were made which would have resulted in a more conservative statistical test.

The first statistical test in this ANOVA involved the effects of Factor A--the learning of the first and second concept. This test analyzed the differences between the total trials to criterion (the combined trials to criterion for the four sets) of the first concept and the second concept for the normal group. The following null hypothesis was tested at the .01 level of significance.

Ho 1: There will be no significant difference in the trials to criterion on the first concept and the second concept for normal subjects.

The results of the analysis of variance on this factor indicated that there was no significant difference (probability greater than .01) between the first concept and second concept for normal subjects. On the basis of this data Ho 1 was retained. Thus, the results of this data indicated that there was no significant difference between the combined

number of trials to criterion for the first concept and the second concept for normal subjects. The learning of the first or second concept did not differentially affect the overall scores of the normal subjects.

TABLE VII

TWO-WAY ANALYSIS OF VARIANCE OF THE TRIALS TO CRITERION FOR THE FIRST AND SECOND CONCEPTS ON FOUR SETS OF CARDS FOR THE NORMAL GROUP

Source	SS	df	MS	F
Between Subjects	445.95	19		
A (first concept-second concept)	6.05	1	6.05	.24
subjects within groups	439.9	18	24.3	
Within Subjects	1466	60		
B	270.05	3	90.01	4.18
AB	34.45	3	11.48	.53
B x subjects within groups	1161.5	54	21.5	

$F_{.99\ (1,\ 18)} = 8.29$

$F_{.99\ (3,\ 54)} = 4.13$

The second factor in the analysis (Factor B) was the trials to criterion on the four sets of cards. The second statistical test involved an analysis of the differences in the trials to criterion for the four sets regardless of their grouping on Factor A. The following null hypothesis was tested at the .01 level of significance.

Ho 2: There will be no significant differences among the trials to criterion on each of the four sets of cards for the normal subjects.

The results of the ANOVA on this factor indicated that there was a significant difference (probability greater than .01) among the trials to criterion on each of the four sets of cards. Thus Ho 2 was rejected. The exposure to the different sets of cards produced a significant change in the number of trials to criterion exclusive of Factor A (the learning of the first or second concept). The Newman-Keul procedure was used to test the specific effects of the significant main effects on Factor B. Table VIII presents these comparisons and their results. These data indicate that Set I differs significantly from Set III. All other comparisons between means were non-significant.

The third statistical test was made on the interaction effect between Factor A (the learning of the first or second concept) and Factor B (the trials to criterion on the four sets of cards). This statistical test evaluated whether or not these two factors interacted to produce any difference or if they were independent. The following null hypothesis was tested.

Ho e: There will be no interaction effect between the learning of the first or second concept and the trials to criterion on the four sets of cards for the normal subjects.

The interaction effect between the two factors was not significant (probability greater than .01). Consequently,

Ho 3 was retained.

TABLE VIII

NEWMAN KEUL COMPARISON OF ORDERED MEANS FOR NORMAL GROUP

Sets	b_3	b_4	b_2	b_1		
Ordered means	5.35	7.35	7.9	10.5		
	b_3	b_4	b_2	b_1	r	$S_{\bar{B}}q.99(r, 54)$
b_3		2.01 (r=2)	2.55 (r=3)	5.15 (r=4)	4	4.73
b_4			.55 (r=2)	3.15 (r=3)	3	4.40
b_2				2.6 (r=2)	2	3.87

$S_{\bar{B}}$ = 1.03

q.99 (r, 54)

r =	2	3	4
	3.76	4.28	4.6

Since Ho 3 was retained, it can be assumed that the significance obtained on Ho 2 was not attributed to the learning of the first concept more than the learning of the second concept. Thus, for normals there was an improvement in performance across sets for both the first and second concept.

Table IX presents the ANOVA summary table for the difference scores between the first and second concept on each set for the obese group and normal group. It is a two-way

analysis of Factors A and B, with repeated measures on Factor B. Factor A (weight) has two levels, the obese group and the normal group. Factor B has four levels, the four sets of cards.

Prior to any statistical tests on Factors A and B, a test on the homogeneity of variance was computed. For $SS_{\text{subj. w. groups}}$ (df 2, 9) the region of rejection was 6.54 at the .01 level of significance. The calculated $F_{\text{max.99}}$ was 2.05. Thus, the variances were homogenous. For $SS_{\text{B x subj. w. groups}}$ (df 2, 27) the region of rejection was 2.63 at the .01 level of significance. The calculated $F_{\text{max.99}}$ was 1.05. The null hypothesis was retained. The homogeneity of variance requirements were met, and therefore no adjustments on the degrees of freedom were made which would have resulted in a more conservative statistical test.

The first statistical test in this ANOVA involved the effects of Factor A--the weight variable. This test analyzed the differences between the total of the differences scores between the first and second concept (the combined difference scores for the four sets) of the subjects in the obese and normal group. The following null hypothesis was tested at the .01 level of significance.

Ho 1: There will be no significant difference in the difference scores of the subjects in the obese and normal group.

The results of the analysis of variance on this factor indicated that there was no significant difference (probability

greater than .01) between the obese group and normal group on their difference scores between the first and second concept. On the basis of this data, Ho 1 was retained. Thus, the results of this data indicate that there was no significant difference between the combined difference scores of subjects in the obese and normal groups. The weight variable did not differentially affect the overall scores of the subjects.

TABLE IX

TWO-WAY ANALYSIS OF VARIANCE OF THE DIFFERENCE SCORES (BETWEEN FIRST AND SECOND CONCEPT) ON FOUR SETS OF CARDS FOR THE OBESE AND NORMAL GROUPS

Source	SS	df	MS	F
Between Subjects	1771.74	19		
A (obese-normal)	6.61	1	6.61	.06
subjects within groups	1765.13	18	98.06	
Within Subjects	3326.25	60		
B	244.64	3	81.54	1.44
AB	29.04	3	9.68	.17
B x subjects within groups	3053.32	54	56.54	

$F_{.99\ (1,\ 18)} = 8.29$

$F_{.99\ (3,\ 54)} = 4.13$

The second factor in the analysis (Factor B) was the difference scores between the first and second concept on the four sets of cards. The second statistical test involved an analysis of the differences of the difference scores for the four sets regardless of their grouping on Factor A. The following null hypothesis was tested at the .01 level of significance.

Ho 2: There will be no significant differences among the difference scores on each of the four sets of cards.

The results of the ANOVA on this factor indicated that there was not a significant difference (probability greater than .01) among the difference scores on each of the four sets of cards. Thus, Ho 2 was retained. The exposure to the different sets of cards did not produce a significant change in the difference scores exclusive of Factor A (the weight variable).

The third statistical test was made on the interaction effect between Factor A (weight variable) and Factor B (the difference scores between the first and second concept on the four sets of cards). This statistical test evaluated whether or not these two factors interacted to produce any difference or if they were independent. The following hypothesis was tested.

Ho 3: There will be no significant interaction effect between the weight variable and the difference scores (between the first and second concept) on the four sets of cards.

The interaction effect between the two factors was not significant (probability greater than .01). Consequently, Ho 3 was retained.

Discussion

The results of the first ANOVA, a comparison of the performance of obese and normal subjects on the first concept in the four sets, supported Research Hypothesis one. Research Hypothesis one stated that the obese and normal groups would not differ significantly with respect to the number of trials taken to acquire the first concept in the four sets. In other words, the two groups would perform in the same way on the first concept. This is precisely what the results indicated.

The results on the second, third, fourth, and fifth ANOVA's do not support Research Hypothesis two, the major tenet proposed in the introductory chapter. The main hypothesis of the study was that the obese subjects would exhibit significantly more negative transfer than the normal subjects when a second concept was introduced following the mastery of the first concept.

The second ANOVA, a comparison of the performance of obese and normal subjects on the second concept in the four sets, revealed no difference between the two groups. The third ANOVA, a comparison of the performance of obese subjects with themselves on the first and second concept in the four sets, and the fourth ANOVA, a comparison of the performance

of normal subjects with themselves on the first and second concept in the four sets, revealed no significant differences between the first and second concept for either the obese or normal group. An inspection of the raw data in Appendix H shows slightly more trials for both groups when shifting from the first concept to the second concept. This effect was negligible but was slightly more pronounced for the obese. This was especially true of Set I. The trends also show a reversal of this effect for both groups on the last set. The fifth ANOVA, a comparison of the difference scores (between the first and second concept) on each set for the obese group and normal group, revealed no difference between the two groups. It is interesting to note that there was no significant difference on the difference scores across sets. On the other hand, on the first, second, third, and fourth ANOVA's a significant difference on the trials to criterion across sets was obtained. The exposure to the four sets of cards for both groups on the first and second concept produced what Harlow (1949) called the learning sets phenomenon.

In view of the results obtained in this study, the question must be raised as to why they were not commensurate with past findings on non-food directed tasks.

First the population should be considered. All males made up the subjects for this study. All of the experiments done by Schachter and his students and Singh and his students employed entirely male subjects. Since these studies

obtained differences using the same sex, the possibility of this affecting the results was not very probable. It could be that the relatively high I.Q. scores for all subjects accounts for the fact that no differences were obtained. Since these other studies did not report any measures of intelligence, a comparison between subjects in the present study and other studies cannot be made.

Second, the task itself must be scrutinized. The task may have been insensitive to detect any differences because it was not difficult enough. While this is a possibility, other studies employing such simple tasks as reaction time tests, immediate recall, and tachistoscope recognition tests obtained significant differences with "easy" tasks. On the other hand, Doost (1973) found that as tasks increased in difficulty, the normal subjects performed better than the obese subjects. Perhaps if the task in the present study had been more difficult a significant difference would have been obtained. While this is true, the level of difficulty may not really be in the actual stimulus elements (the four sets of cards) so much as it is in the nature of the feedback involved with the task. The fact that on every trial the subjects were supplied with correct or incorrect feedback changes the "difficulty" of the task.

In contrast to Singh's (1973) study on negative transfer with problem solving strategies, the present study offered the subjects external feedback on every trial. It

could be that this was precisely the reason that no significant differences were obtained in the present study. Another possibility for the discrepancy in the results of this study and Singh's (1973) experiment might be that a negative transfer phenomenon did not actually occur in Singh's experiment. His results could be interpreted from a response cost analysis rather than a deficiency in response inhibition. Even though Singh said that there were easier solutions to the problem that involved less steps, it is entirely possible that the first solution involving more steps was easier in the sense that it required less effort of the subject; making a new solution involving fewer steps very well could be more difficult because it possibly required more effort to come up with any new solution. In the present study, there was no choice of different solutions; there was only one solution while each concept was in effect. This probably served to equalize the effort variable.

Although Singh's experiment did not supply an outside source of external feedback in another experiment in the same published report, he did supply instructions on a reaction time test as to when the "incompatible condition" was in effect. The normals performed better than the obese. It may be that obese and normals differ in the way they respond to the antecedents (instructions) directly related to a task. The same may also be true of the feedback directly related to a particular task. Perhaps if feedback from the experimenter would have been given during the reaction time tests, the

obese and normal subjects may have performed in the same way or the obese may have even performed better than the normal subjects.

Glass, Lavin, Henchy, and Mayhew's (1969) results on opinion change lie in sharp contrast to Singh's (1973) results on negative transfer experiments. It is recalled that the opinions of the obese as compared to normals changed markedly as a result of persuasive appeals. If the obese suffer from a response inhibition deficiency, as Singh asserts, one would predict that the opinions of the obese would be relatively fixed and insensitive to changing conditions. Indeed this may be true separate and apart from any feedback component. In many ways, the experiment of Glass and his associates (Glass et al., 1969) demonstrates a flexibility rather than a rigidity on the part of the obese. In any case, the obese may show a greater sensitivity than normals to feedback components under certain conditions. This could be consistent with the findings of Schachter, although typically his work did not involve stimuli in the form of feedback related directly to the task. If feedback is an important variable for the obese, this could affect their performance on numerous tasks such as problem solving, reasoning, and creative endeavors.

Conclusions

In conclusion, the data from this study do not support the hypothesis that obese subjects exhibit significantly

more negative transfer than normal subjects when a second concept is introduced following the master of a first concept. The results of this study indicate that both groups of subjects perform relatively in the same way on the first and second concept on the four sets of cards.

The major hypothesis of this study was founded on the documented fact that obese and normal subjects perform differently on non-food directed tasks. This was an outgrowth of the well documented fact that obese and normal subjects perform differently on food directed tasks. To generalize this to all non-food directed tasks may not be legitimate.

It was further concluded that the obese do not always exhibit a deficit in response inhibition. There seem to be complex interactions of these with other variables. The nature of what is investigated may be responsible for these contrasting results; moving from simple, motorical behaviors to the more complex high level verbal behavior may reverse these phenomenon or possibly vitiate them. Although it can be said that some non-food directed experiments employed verbal materials, these were highly echoic in nature and therefore relatively primitive relative to other higher level verbal processes. In any case, to say that the obese are "stimulus bound" or that they suffer from a response inhibition deficit implies that this is true across all conditions. Singh (1973) showed that under certain conditions the obese actually consumed less than normals. He clearly demonstrated that the results of Schachter and his students were highly

conditional on the setting and the experimental design. To say that the obese suffer from a deficiency in response inhibition, as Singh proposed, is also an absolute unqualified statement about the nature of the obese population. The results of this study indicated that the obese do not always exhibit more negative transfer than normals. Any statement about the status of any population should be conditional in nature. In terms of the etiology of obesity, a multicausal account has evolved and is more functional; a relativistic conditional descriptive account of ongoing behavioral processes is also more functional.

Because the results of this study do not support the contention that obese and normals differ in the amount of negative transfer that they exhibit on a conceptual task, this does the cancel its importance for educators. The categorization exists independent of the recognition of it as a possible variable related to differential treatment during the educational process. It is concluded that the recognition of this categorization as it might relate to the educational process is important. Canning and Mayer (1966) showed that school counselors were biased toward the obese in terms of reference letters. Education involves not only these processes directly related to the learning process itself but also includes the social and affective components of the educational process as it related to the general area of learning. In other words it is concluded that any behavioral

differences between normals and the obese can be and probably are reflected in facets of education other than the actual learning of certain concepts. Since this is true, educators should become familiar with these facts.

In view of the foregoing discussion and conclusions, it is recommended that further studies be conducted to clarify the nature of all of these relationships. The area of non-food directed comparisons of obese and normal subjects is indeed a fertile area for research. Possible variables to be scrutinized are varying levels of feedback with concomitant changes in the difficulty of the task. Also feedback variables could be considered in relation to tasks involving creative behavior. Aside from investigating the processes directly related to learning specific materials, research could be directed toward investigating the role of the differences between obese and normal as they relate to the overall educational process.

Average weights for MEN of ages 18 and over
Weight in pounds according to frame (in indoor clothing)

Height (Shoes on 1" heels)	Small Frame	Medium Frame	Large Frame
5'2"	112-120	118-129	126-141
5'3"	115-123	121-133	129-144
5'4"	119-126	124-136	132-148
5'5"	121-129	127-139	135-152
5'6"	124-133	130-143	138-156
5'7"	128-137	134-147	142-161
5'8"	132-141	138-152	147-166
5'9"	136-145	142-156	151-170
5'10"	140-150	146-160	155-174
5'11"	144-154	150-165	159-179
6'0"	148-158	154-170	164-184
6'1"	152-162	158-175	168-189
6'2"	156-167	162-180	173-194
6'3"	160-171	167-185	178-199
6'4"	164-175	172-190	182-204

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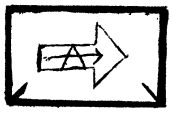
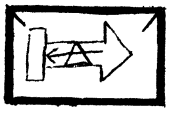
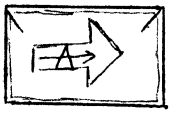
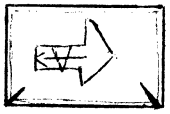
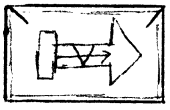
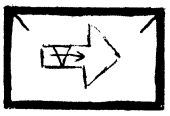
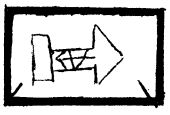
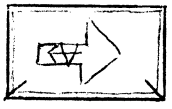
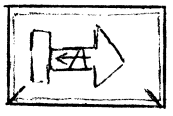
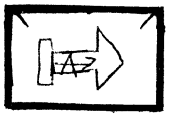
	1B	2B	3A	4B	5A	6A
	1B	2A	3A	4A	5B	6A
	1B	2B	3A	4B	5B	6B
	1B	2B	3B	4A	5A	6B
	1B	2A	3B	4B	5B	6B
	1A	2B	3B	4B	5B	6A
	1A	2A	3B	4A	5A	6A
	1A	2B	3B	4A	5A	6B
	1A	2A	3A	4A	5A	6B
	1A	2A	3A	4B	5B	6A

1A-red
1B-green

2A-platform
2B-no platform

3A-triangles
3B-triangles upside down

4A-left arrow inside arrow
4B-right arrow inside arrow

5A-lines on bottom corners
5B-lines on top corners

6A-black borders
6B- white borders

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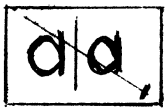
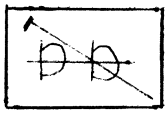
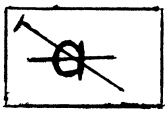
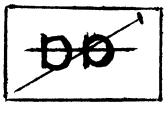
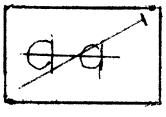
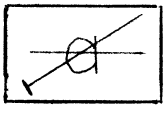
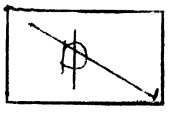
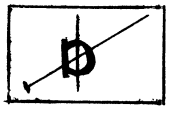
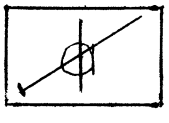
	1B	2B	3A	4A	5B	6A
	1B	2B	3B	4A	5B	6B
	1B	2A	3A	4B	5B	6A
	1A	2B	3B	4B	5A	6A
	1B	2B	3A	4B	5A	6A
	1B	2A	3B	4B	5A	6A
	1A	2A	3B	4B	5A	6B
	1A	2A	3A	4A	5B	6B
	1A	2B	3A	4A	5A	6B
	1A	2A	3B	4A	5A	6B

1A-two letter (a)s
1B-one letter (a)

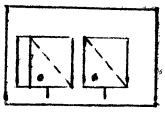
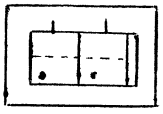
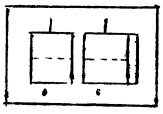
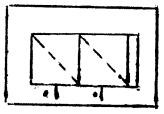
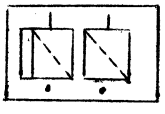
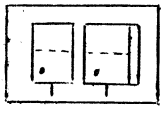
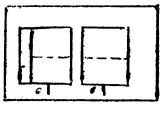
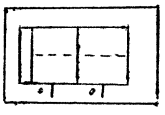
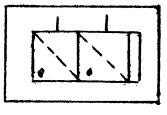
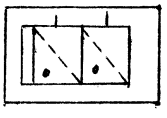
2A-thin lines
2B-thick lines

3A-upside down letter (a)s
3B-letter (a)s

4A-vertical lines
4B-horizontal lines

5A-diagonal lines
right-top to left-bottom
5B-diagonal lines
left-top to right-bottom

6A-platform in top corners
6B-platform in lower corners

	1A 1B	2A 2B	3A 3B	4A 4B	5A 5B	6A 6B
	1B	2B	3B	4B	5B	6B
	1B	2A	3A	4B	5A	6A
	1B	2A	3A	4A	5B	6A
	1B	2B	3A	4A	5A	6B
	1B	2B	3B	4A	5B	6A
	1A	2A	3A	4B	5B	6B
	1A	2A	3B	4A	5B	6B
	1A	2A	3B	4B	5A	6B
	1A	2B	3A	4A	5A	6A
	1A	2B	3B	4B	5A	6A

1A-white squares
1B-shaded squares

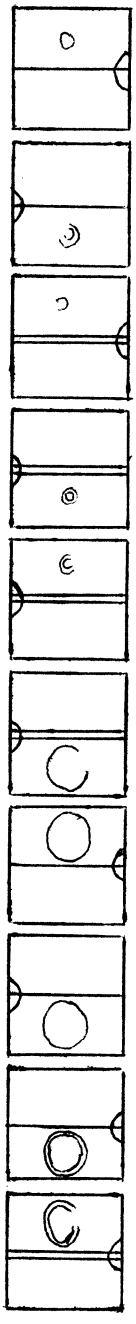
2A-horizontal dotted lines
2B-diagonal dotted lines

3A-rectangle on right
3B-rectangle on left

4A-dots outside
4B-dots inside

5A-adjacent squares
5B-space between squares

6A-lines on top
6B-lines on bottom



1A 1B	2A 2B	3A 3B	4A 4B	5A 5B	6A 6B
1B	2B	3B	4A	5B	6A
1B	2A	3B	4B	5A	6B
1B	2A	3A	4A	5B	6A
1B	2B	3A	4B	5A	6B
1B	2A	3A	4B	5A	6A
1A	2A	3A	4B	5B	6B
1A	2B	3B	4A	5B	6A
1A	2B	3B	4B	5B	6B
1A	2B	3B	4A	5A	6B
1A	2A	3A	4A	5A	6A

1A-large circles
1B-small circles

2A-open circles
2B-closed circles

3A-double middle lines
3B-single middle lines

4A-semi-circles right
4B-semi-circles left

5A-double circles
5B-single line circles

6A-circles on top half
6B-circles on bottom half

Appendix F

Set I

First concept--4A--See Appendix B
Second concept--6B--See Appendix B

Set II

First concept--4A--See Appendix C
Second concept--3B--See Appendix C

Set III

First concept--2B--See Appendix D
Second concept--6A--See Appendix D

Set IV

First concept--6B--See Appendix E
Second concept--5A--See Appendix E

Appendix G

Subject number	I.Q.	Age years-mos.	ankle in cm.	Frame size	height	ideal wt.	actual wt.	% above or below
1	139	24-8	20.2	small	6'0"	153	156	2% above
2	121	20-5	22.5	medium	5'11"	157	165	5% above
3	133	27-2	21.1	small	5'10"	145	150	3% above
4	119	24-8	23.1	medium	5'10"	153	162	6% above
5	146	31-6	20.8	small	6'0"	153	157	2½% above
6	117	26-0	23.0	medium	5'10"	153	160	4½% above
7	138	28-2	24.8	large	5'11"	169	179	6% above
8	131	42-8	24.4	large	5'10"	165	165	0%
9	134	27-6	21.1	small	6'2"	161	154	4% below
10	131	27-1	22.3	medium	5'10"	153	150	2% below

normal 1-10

obese 11-20

Appendix G--continued

Subject number	I.Q.	Age years-mos.	ankle in cm.	Frame size	height	ideal wt.	actual wt.	% above or below
11	132	21-0	22.8	medium	6'0"	162	221	36% above
12	131	23-11	22.3	medium	6'0"	162	200	23% above
13	143	19-9	25.2	large	6'1"	179	310	68% above
14	135	24-5	22.5	medium	5'11"	158	223	41% above
15	149	21-5	21.9	medium	6'1"	167	230	38% above
16	128	24-2	25.0	large	6'2"	184	221	20% above
17	136	27-7	24.2	large	6'0"	174	235	35% above
18	114	34-1	23.8	large	5'11"	169	204	20% above
19	122	23-5	23.2	medium	6'1"	167	273	65% above
20	120	28-5	23.0	medium	5'10"	153	208	36% above

Appendix H

		First concept				Second concept			
Subject		Set I	II	III	IV	Set I	II	III	IV
1		5	3	5	10	9	22	6	6
2		28	0	4	10	5	7	9	7
3		9	9	7	9	8	7	10	8
4		9	9	5	8	13	9	7	10
5		8	7	5	6	14	3	5	4
6		4	7	5	7	8	8	6	5
7		1	5	5	7	21	10	5	5
8		5	1	6	11	10	9	1	8
9		26	20	7	6	8	8	7	6
10		8	6	1	6	11	8	1	8
Normal 1-10 Obese 11-20	Total	103	67	50	80	107	91	57	67
11		29	9	4	7	8	13	4	2
12		5	3	0	6	31	6	11	3
13		11	2	4	11	24	17	7	7
14		5	11	5	9	4	3	4	2
15		7	4	0	4	22	11	1	5
16		4	1	7	10	10	23	8	11
17		8	5	8	5	15	11	7	6
18		13	6	8	7	7	3	10	11
19		13	16	3	4	4	4	3	5
20		9	7	6	7	6	9	5	4
	Total	104	64	45	70	131	100	60	56

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