AN ABSTRACT OF THE THESIS OF

Nadine M. Schneider Wood for the degree Master of Science in Health presented on May 8, 1992.
Title: Effectiveness of Selected Components in Behavioral Weight-Loss Interventions: A Meta-Analysis

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The purpose of this study was to conduct a meta-analysis to determine which components used in behavioral weight loss interventions were most effective in producing weight loss. This project was a replication and expansion of a study conducted by Bennett (1986). Published and unpublished studies written between January 1, 1985 and March 1, 1992 were located through an extensive search of the literature. Only studies meeting specific inclusion criteria were included. Three dependent variables (mean posttreatment weight loss (MPWL), mean follow-up weight loss (MFWL), and maintenance ratio (MR)) were used to determine the effect of 39 independent variables. Overall mean analysis, Pearson Product Moment Correlations, and ANOVA were employed to determine significant relationships ($p \leq .05$) between the dependent and independent variables. A total of 130 treatments were coded from 77 studies. Mean pooled weight loss was 12.89 pounds at posttreatment and 12.96 pounds at follow-up. MPWL was most affected by longer weeks

of treatment duration and higher number of hours of treatment contact. Higher weight losses were also found at posttreatment in those programs that used strict diets of ≤1000 kcalories per day, conducted exercise in the treatment sessions, held treatments in a hospital or clinical setting, and employed professional therapists as opposed to students or lay leaders. The primary determinants of MFWL appeared to be longer treatment duration and treatment contact hours, higher amounts of weight loss reported at posttreatment, strict diets of ≤1000 kcalories per day, and hypnotherapy used in treatment. Use of hypnotherapy, no monetary incentives, and individual contact during treatment appeared to be the primary determinants of MR. While effective during the treatment phase, monetary incentives negatively affected MFWL. Additionally, higher monetary incentives coupled with higher monetary refunds negatively affected MFWL and MR. Based on the conclusions of this meta-analysis, the following recommendations were made. Increase the amount of research conducted on the use of hypnotherapy as an effective behavioral strategy in weight loss programs. Competition and monetary incentives not be used as the only motivator for weight loss in a treatment program. In order to avoid inflated weight loss results, calculation of weight loss results should include all participants in the treatment program rather than just those who completed treatment.

Effectiveness of Selected Components in Behavioral Weight-Loss Interventions: A Meta-Analysis

by

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DEDICATION

The completion of is thesis is dedicated to the memory of my father, Jacob Victor Schneider - March 17, 1919 to February 11, 1988.

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Chapter 1

INTRODUCTION

It is estimated that the lives of nearly one-third of all American adults are threatened by a pervasive, yet highly preventable condition. Despite often drastic measures to reduce its prevalence, more individuals than ever are affected. Although people should have control over this condition, it is one which few are able to overcome. The condition responsible for putting roughly 32 million American adults at risk is obesity.

Prevalence and connected risks of obesity are well documented in studies that clearly show epidemic levels of obesity and overweight in this country. Data from a national study indicated that over 26% of Americans between the ages of 20 and 75 years were overweight (Van Itallie, 1985). The devastating effects of overweight on the health of individuals increases the need for prevention of obesity and promotion of methods through which obese individuals can successfully lose weight.

Van Itallie (1985) reported on data collected between 1976 and 1980 for the second National Health and Nutrition Examination Survey (NHANES II). Results showed an increased risk of hypertension, elevated blood cholesterol, diabetes

and cancer among overweight individuals between the ages of 20 and 45 compared to their normal weight counterparts. A huge weight loss industry offering many types of treatment is supported by a large population wanting to lose weight. Schlosberg (1987) reported that 48% of Americans had dieted. While many people have attempted to lose weight, few have actually succeeded in losing weight and keeping it off. Brownell and Wadden (1986) summarized behavioral weight loss programs and found the average length to be 13 weeks with participants losing an average of 1.2 pounds per week. Follow-up data reported by Lavery, Loewy, Kapadia, Nichaman, Foreyt, and Gee (1989), and Kramer, Jeffery, Forster, and Snell (1989) suggested that at least half of weight lost during initial treatment was gained back within a two to four year period. While reports have consistently showed minimal weight loss and maintenance of that weight loss, behavioral interventions have remained the most widely used and accepted form of treatment for obesity (Foreyt & Kondo, 1984).

Behavioral interventions share the rationale that eating and exercise are learned behaviors subject to change. The overall goal of weight loss treatment is to provide a majority of individuals with a framework from which safe weight loss and maintenance is achieved. While weight loss goals are well stated and agreed upon, the guidelines for achieving those goals are not. Little information exists to

support specific elements within behavioral programs that lead to successful weight loss. Problems in determining predictor variables for weight loss described by Brownell (1984) occurred due to several factors within individual studies and as studies were compared. Among these factors were measures with low validity or reliability and absence of standardized assessment tools. Succinctly stated by Foreyt and Kondo (1984) "Treatment programs are exceedingly varied both in manner and content. Thus, it is difficult to identify a "standard" treatment approach" (p. 236).

Despite recognized limitations, studies show that behavioral interventions appear to be more successful than other types of treatment modalities. However, professionals point out that there was relatively little information that supports the effectiveness of specific behavioral components. The actual success of these programs is still questionable. Foreyt and Kondo (1984) questioned the effectiveness of behavior therapy for obesity due to limited comparison of treatments. They stated:

> Yet, summary statistics obtained from the literature reviews assume, by implication, a minimal degree of comparability of the programs examined. If such a minimum does not exist, then the summary statistics are inappropriate. Until we are better able to evaluate and compare treatment studies, the answer to the question of behavior therapy's effectiveness remains equivocal. (p. 236)

Kirschenbaum (1988) reiterated this sentiment when he stated:

> ... despite the hundreds of studies on the treatment of adult obesity conducted over the past two decades,... we still must rely substantially on ethereal clinical judgements when constructing a clinical program for the treatment of adult obesity in 1988.

Extensive research continues into the question of which components of behavioral programs are most predictive of success. Most of the studies focus on isolated components of behavioral interventions or behavioral interventions in conjunction with other forms of treatment such as pharmacotherapy or very low calorie diets. In either case, resulting data cannot answer the question of which specific characteristics of those programs are most indicative of successful outcomes. Research reviews attempt to do this by summarizing results of many behavioral weight loss studies. The problem with a traditional research review is that it fails to examine the methods and conclusions of previous reviews, focuses on only part of the full sets of studies, often gives crude representations of results, and reveals little or no information concerning methods used to perform the review (Tran, 1990 personal communication, October 25, 1990). Research reviews also lack the statistical strength of primary research. Discretion must be used when interpreting the summary results of a narrative review article.

A better method for summarizing results of studies is one that follows more closely the methods used in empirical

research. The ability to quantify results from various studies on the same subject using different methodologies is possible through the use of a relatively new method called meta-analysis (Glass, McGaw, & Smith, 1981). Meta-analysis is based on the use of a common metric (effect size), calculated from results of individual studies. Resulting effect sizes are used in traditional statistical analysis resulting in a quantifiable summary of studies. Behavioral intervention for weight loss is an area well suited for meta-analysis. Over the past decade hundreds of studies employing highly varied methods and outcome measures have been performed in this area. Due to high variability in methods and outcome measures of treatment programs, the traditional review article can report only on limited findings. Meta-analysis offers a sophisticated approach to analyzing the combined results of completed studies of behavioral weight loss.

To date, research utilizing meta-analysis in the area of weight loss has been limited. Eufemia (1985) used meta-analysis to determine if monetary attendance deposits reduced attrition in behavioral weight loss programs. Black, Gleser and Kooyers (1990) conducted a meta-analyses to evaluate the effectiveness of weight loss programs which actively involved partners in the treatment process. Bennett (1986) used a modified meta-analysis to determine relationships between characteristics of treatment programs and successful weight

loss. His study included behavioral programs conducted up to January 1, 1985. Since that time many more studies on behavioral weight loss have been conducted. No known attempt has been made to quantify data gathered in the last six years to determine which program components appear to be most indicative of successful weight loss.

Statement of the Problem

The purpose of this study was to conduct a meta-analysis using a modified version of Bennett's (1986) procedures to determine which components used in a behavioral weight loss intervention were most effective in producing weight loss. Data were collected from studies referenced January 1, 1985 through March 1, 1991. Program effectiveness or outcome was operationalized as total body weight loss (pounds) measured from the beginning of initial treatment to specified endpoints. The first of these endpoints represented short term weight loss and was measured at the conclusion of the initial treatment program. The second of these endpoints represented long-term weight loss and was measured at the conclusion of any follow-up intervention. Some of the program components included use of diets, exercise, social support, type of group leader, treatment contact, and length and duration of treatment.

Research Questions

Specifically, the following research questions were investigated:

1. Is there a relationship between the dependent variables:
    a) mean posttreatment weight loss (MPWL)
    b) mean follow-up weight loss (MFWL)
    c) maintenance ratio (MR) (mean follow-up loss divided by the mean posttreatment loss)

    and the following behavioral intervention treatment characteristics:
    a) year study was published
    b) treatment duration in weeks
    c) follow-up duration in weeks
    d) treatment contact hours
    e) follow-up contact hours
    f) dollars paid to participate
    g) highest potential refund
    h) age of treatment group participants
    i) age of follow-up group participants
    j) number of participants entering treatment
    k) number of participants completing treatment
    l) number of participants entering follow-up
    m) number of participants completing follow-up
    n) mean weight loss at end of treatment
    o) mean weight loss at end of follow-up

2. Are there significant mean differences for the following dependent variables:

    a) mean posttreatment weight loss (MPWL)

    b) mean follow-up weight loss (MFWL)

    c) maintenance ratio (MR)

    based on different levels of the treatment characteristics listed below:

    a) therapist experience

    b) therapist profession

    c) treatment contact

    d) exercise component

    e) dietary component

    f) family support

    g) peer support

    h) anorectic drugs

    i) hypnotherapy

    j) competition

    k) monetary incentives

    l) gender of treatment group

    m) gender of follow-up group

    n) type of follow-up contact

3. Are there significant mean differences for the following dependent variables:

    a) mean posttreatment weight loss (MPWL)

    b) mean follow-up weight loss (MFWL)

    c) maintenance ratio (MR)

based on different levels of the study characteristics listed below:

a) author status

b) source of article

c) treatment setting

d) recruitment

e) control group used

f) group assignment

g) self-reported weight loss

h) use of dropouts

Statistical Hypotheses

The following related hypotheses were developed to test research questions 1-3 respectively:

1. Correlations between selected treatment characteristics and MPWL, MFWL and MR:

   a. year study was published $_{(YSP)}$

      H_0: $\rho_{MPWL,\ YSP} = 0$

      H_1: $\rho_{MPWL,\ YSP} \neq 0$

      H_0: $\rho_{MFWL,\ YSP} = 0$

      H_1: $\rho_{MFWL,\ YSP} \neq 0$

      H_0: $\rho_{MR,\ YSP} = 0$

      H_1: $\rho_{MR,\ YSP} \neq 0$

   b. treatment duration in weeks $_{(TD)}$

      H_0: $\rho_{MPWL,TD} = 0$

      H_1: $\rho_{MPWL,\ TD} \neq 0$

H_0: $\rho_{MFWL,\ TD} = 0$

H_1: $\rho_{MFWL,\ TD} \neq 0$

H_0: $\rho_{MR,\ TD} = 0$

H_1: $\rho_{MR,\ TD} \neq 0$

c. follow-up duration in weeks $_{(FD)}$

H_0: $\rho_{MPWL,\ FD} = 0$

H_1: $\rho_{MPWL,\ FD} \neq 0$

H_0: $\rho_{MFWL,\ FD} = 0$

H_1: $\rho_{MFWL,\ FD} \neq 0$

H_0: $\rho_{MR,\ FD} = 0$

H_1: $\rho_{MR,\ FD} \neq 0$

d. hours of treatment contact $_{(HT)}$

H_0: $\rho_{MPWL,\ HT} = 0$

H_1: $\rho_{MPWL,\ HT} \neq 0$

H_0: $\rho_{MFWL,\ HT} = 0$

H_1: $\rho_{MFWL,\ HT} \neq 0$

H_0: $\rho_{MR,\ HT} = 0$

H_1: $\rho_{MR,\ HT} \neq 0$

e. hours of follow-up contact $_{(HF)}$

H_0: $\rho_{MPWL,\ HF} = 0$

H_1: $\rho_{MPWL,\ HF} \neq 0$

H_0: $\rho_{MFWL,\ HF} = 0$

H_1: $\rho_{MFWL,\ HF} \neq 0$

H_0: $\rho_{MR.\ HF} = 0$

H_1: $\rho_{MR,\ HF} \neq 0$

f. dollars paid to participate $_{(DP)}$

H_0: $\rho_{MPWL, DP} = 0$

H_1: $\rho_{MPWL, DP} \neq 0$

H_0: $\rho_{MFWL, DP} = 0$

H_1: $\rho_{MFWL, DP} \neq 0$

H_0: $\rho_{MR. DP} = 0$

H_1: $\rho_{MR, DP} \neq 0$

g. highest potential refund $_{(HPR)}$

H_0: $\rho_{MPWL, HPR} = 0$

H_1: $\rho_{MPWL, HPR} \neq 0$

H_0: $\rho_{MFWL, HPR} = 0$

H_1: $\rho_{MFWL, HPR} \neq 0$

H_0: $\rho_{MR, HPR} = 0$

H_1: $\rho_{MR, HPR} \neq 0$

h. mean age of treatment group $_{(AT)}$

H_0: $\rho_{MPWL, AT} = 0$

H_1: $\rho_{MPWL, AT} \neq 0$

H_0: $\rho_{MFWL, AT} = 0$

H_1: $\rho_{MFWL, AT} \neq 0$

H_0: $\rho_{MR, AT} = 0$

H_1: $\rho_{MR, AT} \neq 0$

i. mean age of follow-up group $_{(AF)}$

H_0: $\rho_{MPWL, AF} = 0$

H_1: $\rho_{MPWL, AF} \neq 0$

H_0: $\rho_{MFWL, AF} = 0$

H_1: $\rho_{MFWL, AF} \neq 0$

H_0: $\rho_{MR,\ AF} = 0$

H_1: $\rho_{MR,\ AF} \neq 0$

j. number entering treatment $_{(NET)}$

H_0: $\rho_{MPWL,\ NET} = 0$

H_1: $\rho_{MPWL,\ NET} \neq 0$

H_0: $\rho_{MFWL,\ NET} = 0$

H_1: $\rho_{MFWL,\ NET} \neq 0$

H_0: $\rho_{MR,\ NET} = 0$

H_1: $\rho_{MR,\ NET} \neq 0$

k. number completing treatment $_{(NCT)}$

H_0: $\rho_{MPWL,\ NCT} = 0$

H_1: $\rho_{MPWL,\ NCT} \neq 0$

H_0: $\rho_{MFWL,\ NCT} = 0$

H_1: $\rho_{MFWL,\ NCT} \neq 0$

H_0: $\rho_{MR,\ NCT} = 0$

H_1: $\rho_{MR,\ NCT} \neq 0$

l. number entering follow-up $_{(NEF)}$

H_0: $\rho_{MPWL,\ NEF} = 0$

H_1: $\rho_{MPWL,\ NEF} \neq 0$

H_0: $\rho_{MFWL,\ NEF} = 0$

H_1: $\rho_{MFWL,\ NEF} \neq 0$

H_0: $\rho_{MR,\ NEF} = 0$

H_1: $\rho_{MR,\ NEF} \neq 0$

m. number completing follow-up $_{(NCF)}$

H_0: $\rho_{MPWL,\ NCF} = 0$

H_1: $\rho_{MPWL,\ NCF} \neq 0$

H_0: $\rho_{MFWL, NCF} = 0$

H_1: $\rho_{MFWL, NCF} \neq 0$

H_0: $\rho_{MR, NCF} = 0$

H_1: $\rho_{MR, NCF} \neq 0$

n. mean weight loss at end of treatment $_{(WET)}$

H_0: $\rho_{MPWL, WET} = 0$

H_1: $\rho_{MPWL, WET} \neq 0$

H_0: $\rho_{MFWL, WET} = 0$

H_1: $\rho_{MFWL, WET} \neq 0$

H_0: $\rho_{MR, WET} = 0$

H_1: $\rho_{MR, WET} \neq 0$

o. mean weight loss at end of follow-up $_{(WEF)}$

H_0: $\rho_{MPWL, WEF} = 0$

H_1: $\rho_{MPWL, WEF} \neq 0$

H_0: $\rho_{MFWL, WEF} = 0$

H_1: $\rho_{MFWL, WEF} \neq 0$

H_0: $\rho_{MR, WEF} = 0$

H_1: $\rho_{MR, WEF} \neq 0$

2. Mean differences among levels for selected treatment characteristics:

H_0: $\phi_{ij}=0$ where $_i \neq _j$ and $_i <_j$ and

ϕ is a pairwise $(\mu_1-\mu_2=0)$ contrast

H_1: at least one $\phi_{ij} \neq 0$

3. Mean differences among levels for selected study characteristics:

H_0: $\phi_{ij}=0$ where $_i=_j$ and $_i<_j$ and

ϕ is a pairwise $(\mu_1-\mu_2=0)$ contrast

H_1: at least one $\phi_{ij}=0$

Delimitations

The study was delimited to the following:

1. Studies performed on adult populations.
2. Studies using total body weight loss as an outcome measure.
3. Studies completed between January 1, 1985 and March 1, 1991.
4. Studies that employed behavioral methods for weight loss.
5. Journals that required a hand search were limited to those within a 100 mile radius of Corvallis, Oregon.

Limitations

Requests for reference lists and additional information from authors and professionals in the field were subject to responses received from these individuals.

Definitions

Behavior Modification - treatment approach using techniques to modify existing patterns and cognitions with the intended result of positive, permanent behavior change.

Behavior Therapy - same as behavioral intervention.

Behavioral Intervention - treatments which employ behavior modification practices.

Body Mass Index (BMI) - body weight in kilograms divided by height in meters squared.

Components - strategies used in a behavioral intervention.

Effectiveness - the ability to produce desired outcomes, for this study effectiveness is based on weight loss.

Family Support - any help or encouragement through the weight loss process from family members.

Follow-Up Treatment - structured treatment or assessment that continues after initial treatment is completed.

Initial Treatment - the main part of the treatment program prior to and not including any follow-up or maintenance program.

Maintenance Program - same as follow-up treatment.

Maintenance Ratio - Used as one of the indices of outcome calculated by dividing the mean follow-up weight loss by the mean posttreatment weight loss.

Meta-Analysis - a statistical method for summarizing results from many studies conducted in one area.

MFWL - (mean follow-up weight loss) weight loss measured from the beginning of the initial treatment to end points of follow-up treatment.

MR - (maintenance ratio) mean follow-up weight loss divided by the mean posttreatment weight loss.

MPWL - (mean posttreatment weight loss) weight loss measured from the beginning of initial treatment to the end of initial treatment.

Obesity - an excess of body fat above 20% for men and 30% for women.

Outcome - weight loss from the beginning of initial treatment to specified end points.

Overweight - Body weight 20% or more above desirable body weight according to the 1959 Metropolitan Life Insurance Company tables.

Peer support - any help or encouragement through the weight loss process from friends or other program participants.

Social Support - using any people other than the program leaders to aid in the weight control process.

Study Characteristics - Items coded for tracking studies and to determine study quality.

Success - Based on objectives and outcomes of individual programs.

Treatment Characteristics - Items coded that are specific to initial and follow-up treatment.

Weight Control - the ability to alter energy intake and energy expenditure to lose, maintain, or increase weight as desired.

Weight Loss - the ability to alter energy intake and expenditure resulting in loss of body weight.

Weight Maintenance - the ability to alter energy intake and expenditure to maintain weight at a desired level.

Chapter 2

LITERATURE REVIEW

Hundreds of research studies have been conducted on behavioral weight loss programs. To date, no comprehensive framework of techniques associated with weight loss exists. While some basic treatment components are utilized in all behavioral interventions, Foreyt and Kondo (1984) suggested that current treatment interventions were "used more because of efficacy and tradition than because of proven effectiveness" (p. 241). The authors described behavioral weight loss interventions as taking a "kitchen sink" (Foreyt & Kondo, 1984, p. 241), approach. Studies conducted with the purpose of finding components most indicative of weight loss and maintenance typically look at one component at a time. Isolating components reduces the ability to synthesize results of previous research.

Bennett (1986) provided one of the first and most comprehensive attempts to synthesize the vast research on behavioral weight loss interventions. Utilizing a meta-analytic procedure, Bennett summarized data from 105 published studies to determine which selected treatment characteristics were most indicative of weight loss and maintenance. Not since Bennett's article has another meta-analysis been performed on behavioral weight loss interventions.

The purpose of the present study was to perform a meta-analysis using a modified version of Bennett's (1986) study to determine which components of behavioral weight loss programs are most indicative of initial and long-term weight loss. Meta-analytic results provide a structured statistical analysis of existing data.

This chapter is dedicated to the review of relevant literature pertaining to obesity, weight loss, and meta-analytic procedures. An overview of obesity and overweight focuses on defining the terms, and describing prevalence and related health risks associated with these conditions. Traditional and behavioral weight loss methods are characterized, as are the results from interventions for both initial and follow-up phases of treatment. Limitations of research attempting to find predictor variables of weight loss successes are discussed. The inherent shortcomings of the traditional review article leads to a discussion of the meta-analytic process, and three studies of behavioral weight loss using meta-analysis, are presented.

Obesity and Overweight Defined

Terms used to describe the conditions of physiological body mass above set norms are obesity and overweight. More specifically, obesity is an excess in body fat resulting from increased size and number of adipocytes. Obesity is assessed in terms of the percent of total body weight that

is fat. Methods used to determine the amount of body fat include underwater weighing and anthropometric measures. According to McArdle, Katch and Katch (1985) women are considered obese when their total body fat is higher than 30%. Men are considered obese at a total body fat higher than 20%. Whereas obesity is concerned with specific body composition, the definition of overweight does not take into account body composition.

Overweight is defined as a condition in which weight is above the population standard based on gender, height and frame size. Tables used for this assessment are based on average values for men and women of specific ages who purchased life insurance policies between the years 1888 and 1905. Weights are categorized into gender, height and frame size. A person is considered overweight if their weight falls one pound over the high end range for their gender and frame size (Pollock, Wilmore & Fox, 1984).

Both obesity and overweight are aggravated by positive energy balance where more energy is consumed in the form of kcalories than is expended over a period of time. Genetic, endocrine, hypothalamic and environmental factors are likely to be involved in the pathogenesis of these conditions.

Although obesity and overweight are terms used to describe different conditions, they are often used interchangeably in the literature. Articles included in this current study are no exception. Total body weight was

the outcome measure used for this meta-analysis, therefore overweight, not obesity was the correct term to describe the condition of subjects in the studies. However, it was not uncommon to see these terms used interchangeably throughout the literature.

Prevalence of Obesity and Overweight in the U.S.

The most comprehensive data available on prevalence of overweight comes from two National Health and Nutrition Examination Surveys. NHANES I which was conducted between the years 1971 and 1975, and NHANES II conducted between the years 1976 and 1980. In these studies overweight was defined by using body mass index (BMI) which is calculated by dividing weight in kilograms by height in meters squared. Results from NHANES I reported 28.6 million or 21% of American adults were overweight. NHANES II reported 34 million, or 26% of the adult American population as overweight. Data from NHANES II, summarized in a government document of vital and health statistics (1987), reported that 27% of women compared to 24% of men age 20 to 70 years were overweight. Additionally, 9.4% American adults were severely overweight; 10% of all women and 8% of all men fell into this category. Van Itallie (1985) also reported that body weight increased with age at a faster rate for women than for men, and at a faster rate for black women than for white women. The age related weight increase in women was

proportionally greater than age related weight increase in men. An additional socioeconomic factor appeared to affect women's weight. Thirty-seven percent of low-income women 20 years and older were overweight. Different patterns of race and age related weight change were found with men. Between the ages of 20 and 34, more white than black men were overweight. The reverse was true for men between the ages of 35 to 54. After age 55 there were no apparent weight differences between black and white men. (National Center for Health Statistics, 1987)

Williamson, Kahn, Remington and Anda (1990) used Body Mass Index (BMI) to estimate the ten year incidence of weight gain in American adults. Data for this study were used from NHANES I conducted between 1971 and 1975. Data results indicated that major weight gain "(a gain of >= 5kg/m2 in BMI)" (Williamson et al., 1990, p. 667), was highest for those in the 25 to 34 age group; weight gain decreased as individuals aged, and was twice as high in women than men in all age groups (Williamson, et al., 1990).

Health Risks

Other results taken from the NHANES studies and clinical observations revealed the risks to health associated with being overweight (National Institutes of Health, 1985). Hypertension, defined as blood pressure at or above 160/95, was diagnosed 5.6 times more often in the

overweight population responding to NHANES II. Elevated blood cholesterol, defined as blood cholesterol at or above 250 mg/dl, was diagnosed 2.1 times more often in the overweight subjects. A similar pattern of increased risk has been noted among diabetic individuals who appeared to have 3.8 times the health risk of their normal weight controls (Van Itallie, 1985).

Cardiovascular and diabetic risks are not the only ones faced by overweight adults. An American Cancer Society study cited in an article by the National Institutes of Health (1985) found that obese men had a higher mortality rate for cancer of the colon, rectum, and prostate. Obese women had higher mortality rates from cancer of the gall bladder, biliary passages, breast, uterus and ovaries. In addition to these serious complications, Bray (1985) discussed other physiological problems common among the overweight population. Included in this list were disorders of the digestive tract, pulmonary and endocrine system, complications during pregnancy and childbirth and, stress related conditions of the joints.

Overview of Weight Loss Interventions

Historically, there have been many different types of weight loss interventions employing techniques that ranged

from associating negative images or outcomes with desirable foods, to severely reducing the daily kcalorie intake for persons wanting to lose weight.

Aversive conditioning is a technique where the subject receives a negative stimulus (electrical shock, noxious odors) when an undesired behavior or image is portrayed or acted out. Leon (1976) and Abramson (1973) reported results of adverse conditioning for treatment of weight loss conducted between 1954 and 1974. Abramson reported high attrition in adverse conditioning interventions. Leon reported some significant weight losses during treatment which were not maintained during a follow-up period. Both authors suggested significant results in treatment may have been due to other factors such as self-monitoring, exercise and therapist contact.

Covert sensitization is an approach to weight loss where negative imagery is connected to thoughts of forbidden foods and behaviors not compatible with weight control. As described by Leon (1976) "The client is placed in a state of relaxation and develops an avoidance response through imaging the undesirable stimulus (eating) paired with an extremely adverse stimulus" (p. 564). The largest average weight loss produced by covert sensitization was 11.7 pounds, reported after six weeks of treatment. In general, average weight losses reported were 4 to 6 pounds (Leon, 1976; Abramson, 1973).

Another technique which employs the use of thought and images to modify eating behavior is coverant control. Reviews by Leon (1976) and Abramson (1973) both agreed that data did not demonstrate coverant control used alone to be a useful treatment for obesity.

Other early interventions as reported by Stunkard, McLaren-Hume (1959) focused mainly on kcalorie restrictions. In their review, Stunkard and McLaren-Hume analyzed eight studies conducted in the years 1931 through 1958. Of the eight studies in his review, six focused mainly on dietary treatment; four placed subjects on diets ranging from 600 to 1000 kcalories per day. Of the other two treatments, one used anorectic drugs as part of the treatment, the other used interviews or group discussions. Weight loss was reported as a percentage of subjects losing four ranges of pounds: less than 10, 10 - 20, 20+ or 40+. In five of the eight studies about half the patients lost 10 pounds or less. Ten to 20 pounds were lost by those in two of the remaining three studies, and a majority of subjects in the remaining study reported weight losses in the 20 plus range. Stunkard and McLaren-Hume summarized this review by saying that the results were similar and poor.

In this same article, Stunkard and McLaren-Hume (1959) reviewed the results of 100 obese persons who had gone through treatment at the Nutrition Clinic of the New York Hospital. The focus of this treatment was on diet and

maintaining a 800-1500 kcalorie intake per day. Results showed that out of 100 patients only 12 obtained a weight loss of more than 20 pounds; only one of these individuals lost more than 40 pounds. Maintenance of weight loss was poor. After one year, six of the original twelve who lost more than twenty pounds had kept the weight off; at two years posttreatment only two of the original twelve had managed to maintain at least a 20 pound weight loss.

The studies reviewed above do not employ all the techniques commonly used in a behavioral treatment for obesity. While current behavioral interventions utilize cognitive processes as described by Leon (1976) and Abramson (1973) and nutritional components as described by Stunkard and McLaren-Hume (1959), behavioral interventions defined by today's standards employ other techniques, such as stimulus control and reinforcement, that have developed through early research in behavioral methods.

Overview of Behavioral Weight Loss Interventions

Current behavioral interventions were shaped by the initial work of Ferster, Nurnberger and Levitt (1962). They developed a self-control paradigm to control overeating which was determined to be the cause of overweight. A surge of research into the effectiveness of behavior modification occurred after Stuart (1967) reported success with a program design using the work of Ferster and his colleagues.

Stuart's report described the treatment and results observed in eight overweight women. Subjects were seen for 30 minutes three times weekly for a four to five week period. Patients kept records of their food consumption and fluctuation in body weight. The purpose of self-monitoring behaviors was for increased awareness of personal patterns which may have led to overweight. Self-monitoring was also used to help individuals feel in control over their own eating behaviors. Weight loss reported at the end of twelve months showed an average weight loss of 37.75 pounds. Components of this and other early behavioral programs included attention to diet, stimulus control, and self-monitoring. Newer methods have complemented this framework with additional attention to nutrition education and inclusion of exercise, cognitive restructuring and social support.

An extensive review conducted by Brownell and Jeffery (1987) summarized treatment results by four cohorts calculated from controlled trials for studies completed before and during 1974 and during 1978, 1984 and 1986. The authors categorized behavioral programs into three "generations" (Brownell et al., p. 356) based on advances in programming and outcome success. The first generation included those studies conducted up to the mid 1970's. During this time more importance was placed on testing the theory of behavioral interventions than on the management of

obesity. Early work in obesity treatment resulted in average weight loss of about 8.5 pounds in treatments which lasted an average of 8.4 weeks. Follow-up treatment averaged 15.5 weeks with an additional weight loss from posttreatment an average of .04 pounds. Studies conducted after 1974 through the early 1980's were considered the second generation of studies. Brownell and Jeffery acknowledged a shift in program format which they termed the "package" (p. 357). This package consisted "primarily of self-monitoring, stimulus control, and reinforcement strategies" (Brownell & Jeffery, 1987, p. 357). Average weight losses of 12.4 pounds were achieved in treatments that averaged 12 weeks. Length of follow-up treatment increased to an average of 44 weeks during which time an average participant gained most of initial weight loss or were a few pounds heavier than at pretreatment.

The third generation of programs conducted in the mid 1980's did not differ in content, however, average weight loss at posttreatment increased slightly. Average weight loss of 22 pounds was found in treatments averaging 16.7 weeks. Length of follow-up averaged 44 weeks with participants, on the average, gaining 14 of the 22 pounds at posttreatment.

Brownell and Jeffery (1987) suggested improved weight loss from the first to the third generation could be due to the following factors: increased use of cognitive

restructuring techniques, reinforcement techniques used, social support, exercise, attention paid to body image issues, more highly trained therapists, and a focus on relapse prevention and increased treatment length.

Goals of Behavioral Weight Loss Interventions

Behavior therapy has become the most widely used method for weight loss. Brightwell and Sloan (1977) described a clinically useful weight loss treatment as one that " . . . should demonstrate sustained weight loss with a meaningful decrease in obesity and a low premature termination rate" (p. 901). Professionals in the field, including Foreyt and Gotto (1983), Weinsier, Wadden, Ritenbaugh, Harrison, Johnson, and Wilmore (1984), and Wilson (1984), agreed that the goal of behavioral weight loss interventions were to alter eating and exercise habits to produce a negative energy balance resulting in weight loss. Foreyt and Gotto (1983) added that treatment goals should include a long term maintenance plan. Recognizing that quick weight loss could have adverse effects on an individuals health, Rock and Coulston (1988) in a review by the California Dietetic Association stated that weight loss should not come at the expense of overall health.

Components of Behavioral Interventions

Current behavioral programs include: self-monitoring, stimulus control, cognitive change, reinforcement of desired behaviors, nutrition, exercise and social support.

Self-Monitoring

Self-monitoring is a standard component of behavioral interventions. It is used to aid individuals in awareness of their own behaviors. The behaviors most frequently tracked through self-monitoring include eating and exercise. Early use of "food data sheets" (Stuart, 1967, p. 358) included information on time the meal was eaten, the type and quantity of food eaten, including how the food was prepared, and the specific circumstances under which the food was consumed including if others are present, mood and other activities engaged in during the meal. Current self-monitoring exercises include the same components as described above. Brownell and Kramer (1989) also note the use of self-monitoring as a method to mark progress towards goals. A review by Cameron and Best (1987) suggested that unless it was combined with other behavioral strategies, the effectiveness of self-monitoring was questionable.

Stimulus Control

Stimulus Control is a technique used to limit the stimuli that normally influences eating. An obese person,

according to Ferster, et al., (1962), eats in response to a large variety of circumstances. Therefore, narrowing those circumstances will lead to fewer occasions for eating. Examples of stimulus control presented by Ferguson (1975) included eliminating visual food cues, reducing the number of cues associated with eating, using methods to eat less quantities of food, and preplanning shopping, meals and snacks. Individuals learned to differentiate between internal and external eating cues.

Cognitive Restructuring

Cognitive restructuring or cognitive change attempts to alter the thought patterns of the obese away from the negative thoughts that they may have about themselves, and their past and present attempts to lose weight. Individuals are given positive self-statements in an effort to halt unwanted eating. Foreyt and Gotto (1983) referred to cognitive techniques as coping strategies for situations that "generate anxiety or stress" (p. 210). Two of the more common methods described by Foreyt and Gotto (1983) were progressive relaxation and imagery.

Reinforcement

Reinforcement provides acknowledgement and rewards the positive progression in acquiring new behaviors and achieving weight loss. Brownell and Kramer (1989) described

two types of rewards or reinforcements. "The simple sort of reinforcement is provided through satisfaction that comes from observing (via self-monitoring) desired behavior changes. More powerful reinforcements include self-reinforcement and those provided by family and friends" (p. 193). Generally, rewards should not be related to eating.

Nutrition

Nutrition plays an important part in any weight loss intervention. The nutritional aspect of a behavioral weight loss program often comes along with the changes made while performing other behavioral activities such as stimulus control and self-monitoring. In each of these activities special attention is paid to amount of food eaten and the circumstances surrounding the eating behavior. Indirectly this may have an affect on the quality and quantity of food eaten (Wilson, 1984). More structured instructions generally pertain to the specific amounts of carbohydrates, fats and proteins eaten or to total daily kcalories (Shaban & Galizia, 1989). Brownell and Kramer (1989) noted that when a behavioral program was concerned with specific kcalorie intake, a prescribed diet usually carried about 1200 kcalories for women, and 1500 kcalories for men. These baseline amounts were adjusted to fit individual needs.

Exercise

Exercise as a valuable component of behavioral program is highly recognized. Brownell (1982), Shaban and Galizia (1989), and Wilson (1984) noted the benefits of exercise may be more important in long-term maintenance of weight loss than in the initial weight loss. A review by Brownell and Wadden (1986) noted the long-term positive results of studies when patients had exercised. Patients who exercised in conjunction with behavior therapy lost additional weight (2-4 pounds) in the follow-up period, while those not exercising gained weight during this follow-up period. Brownell and Kramer (1989) described two types of exercise typically used in treatments. The first involved teaching people ways to increase their daily movement with instructions to use stairs rather than an elevator or escalator, park in a space further from a building entrance and, walk or ride a bike whenever possible. A second type of exercise described by these authors was the more structured type of exercise where time was set aside and an activity such as walking or swimming was performed. The type of exercise should be enjoyable to the participant and a slow start with gradual increases in intensity is crucial. Brownell (1982) noted the benefits of exercise which include: an increase in energy expenditure, improvements in physiological functioning such as lowered blood pressure, increased basal metabolic rate and, minimized loss of lean

body weight. Shaban and Galizia (1989) also noted how exercise can have an indirect effect on "enhanced psychological well-being" (p. 56).

Social Support

Social support as a behavior change strategy is based on the notion that humans are social beings and practiced behaviors do not occur in a vacuum (Foreyt & Kondo, 1984). The importance of family and friends should not be overlooked. Workgroups, weight loss groups, family and friends are all considered to be potential supporters of those attempting to lose weight. The supporting partner can monitor behavior, model appropriate behavior and help develop coping strategies to help get through tough times. Within a weight loss group individuals share setbacks and successes receiving support from other members going through the same experience. In a review by Brownell (1982) results from therapies employing spouse involvement showed conflicting results. Foreyt and Kondo spoke of similar equivocal results. They suggest the reasons for varied results were due to the complexity of relationships between partners. Another aspect of social support is teaching individuals how to recognize a partner that will be helpful and determining in which areas help is needed.

Behavioral Intervention Characteristics and Outcome

The integration of these program components as a group and along with other treatment conditions have been reported in the literature extensively. The following section of this literature review reports the results of behavioral treatments and follow-ups as documented in traditional literature reviews.

Treatment Descriptions

Behavioral weight loss interventions are typically conducted in groups meeting weekly (Jeffery, Wing & Stunkard, 1978; Kalodner & DeLucia, 1990; Stunkard & Berthold, 1985), for one to two hours with an average of 10 participants per group (Kalodner and DeLucia, 1990). Stunkard and Berthold noted differences in number of participants in clinical settings (n=5-10), and number participating in "lay-led" programs (n=60-80).

Brownell and Wadden (1986) found average length of behavioral treatment interventions prior to and including those conducted in 1974 to be 8.4 weeks. Murray (1975) reviewed studies from 1967 to 1975 and found average treatment length to be 12.5 weeks. A review of two sets of data from behavioral interventions completed during 1978 and 1986 showed average length of treatment at 13.2 and 16.7 weeks (Brownell & Jeffery, 1987; Brownell & Wadden, 1986). Stunkard & Berthold (1985) noted variability in treatment

duration when students conducted programs compared to clinical investigations. Duration of the students programs were as short as two months, clinical interventions lasted from four to six months. A more recent review by Westover and Lanyon (1990) suggested treatments have increased to an average of 20 weeks. Likewise, Kalodner and DeLucia (1990) reported the average length of treatment to be between 16 and 20 weeks.

Attrition rates as noted by Brownell and Jeffery (1987) and Brownell and Wadden, (1986) have increased. Studies conducted prior to 1974 showed an average attrition rate of 11.4% at posttreatment compared to 20.7% in studies completed during 1986. Part of this increase in attrition may be the increased sample size reported in studies collected for the reviews. In the same review by the above authors, sample size increased from an average of 53.1 subjects in reviews prior to 1974 and 93.3 for an average sample size in studies completed during 1986.

Weight Loss

A review of self-control treatments conducted between 1967 and 1976 showed a mean weight loss of 11.5 pounds (Jeffery, et al., 1978). Murray (1975) reported weight changes ranging from a loss of 2.3 pounds to a loss of 37.8 pounds in eight self-control interventions conducted between 1969 and 1975. The mean average weight change over the

eight studies was 10.67 pounds in treatments averaging 14.8 weeks. Brownell and Wadden (1986) reported data from controlled trials of behavioral interventions conducted before and during 1974, during 1978 and during 1984. Results showed average weight loss for these three data points to be 8.4 pounds, 10.5 pounds and 13.2 pounds. These weight losses were achieved in treatments lasting an average of 8.4 weeks, 10.5 weeks and 13.2 weeks. Weight loss per week for the years 1974, 1978, and 1984 were 1.2, 0.9, and 1.2. Foreyt and Kondo (1984) reported on findings from reviews of behavioral interventions which showed average posttreatment weight loss of 10 to 12 pounds achieved in treatments lasting eight to 12 weeks. Brownell and Jeffery (1987) found an average weight loss of 22 pounds in an average treatment lasting 16.7 weeks. The resulting weight loss per week for this study was 1.4 pounds.

Higher weight losses obtained from current studies are not as impressive when the increased length of treatment is also considered. According to Brownell and Jeffery (1987), Westover and Lanyon (1990), review data on weight losses per week of treatment were similar now to what they were in the early 1970's. Wilson and Brownell (1980) found consistently that weight losses of 1-2 pounds per week were found in programs of 10-12 weeks.

Caution in analyzing weight loss results has been suggested for several reasons. Two factors which may reduce the meaningfulness of increased weight losses as noted by Brownell and Jeffery (1987) were high attrition rates and publication bias. Studies reporting low weight losses may not be accepted for publication. Omission of these studies from the literature falsely increases the apparent average weight losses over clinical treatments. Brownell and Kramer (1989) also noted that subjects involved in more current treatment studies were heavier than their earlier counterparts. Initial weight for subjects prior to and including 1974 was 163 pounds compared to 210 pounds for subjects in studies completed in 1986 (Brownell & Jeffery, 1987; Brownell & Wadden, 1986). Higher initial weight is often associated with greater weight losses by posttreatment. Generally, however, the authors felt that over the years short term improvements in weight losses have been made.

While average weight loss in the reported literature appears to be relatively small, Brownell (1982) suggested that larger weight losses have been produced in studies using strong contingencies, spouse support, exercise and appetite suppressants.

Follow-Up Description and Results

Length of Follow-Up Treatments

Average length of weight maintenance programs prior to 1974 was 15.5 weeks (Brownell & Wadden, 1986). Murray (1975) reported on studies conducted between 1969 and 1975 and of those studies reporting follow-up treatments the range of follow-up duration was three to 39 weeks. Brownell and Wadden reported an increase in mean length of follow-up from 30.3 weeks for studies completed in 1978 and 58.4 weeks for studies completed in 1984. Brownell and Jeffery (1987) found a slight decrease (44 weeks) in follow-up length for studies completed during 1986. A range of four to 60 months follow-up duration was reported by Westover and Lanyon (1990).

Follow-Up Weight Loss Results

In a review of behavioral interventions for obesity, Brightwell and Sloan (1977) showed eight of 17 treatments with no significant weight loss maintenance. The remaining nine studies reported some degree of successful weight loss maintenance. The authors concluded that most of those using behavioral treatments can expect success in short-term weight loss in treatments conducted for a "sufficient"

(Brightwell & Sloan, 1977, p. 903) amount of time. They also noted that little evidence supported the continuance of weight loss after program termination.

Wing and Jeffery (1984) reviewed behavioral treatments and found participants maintained 10.8 pounds of a posttreatment loss of 14.5 pounds. A review by Brownell and Wadden (1986) showed only slight improvement in weight maintenance over the years. Follow-up weight loss has increased from 8.9 pounds to 9.8 pounds between the years 1974 and 1984. However, these figures may be more impressive when length of follow-up, which has increased in length from 15.1 weeks to 58.4 weeks between 1974 and 1984. Weight loss appears to be maintained for a longer period of time. Brownell and Jeffery (1987) updated Brownell and Wadden's review data and showed average weight loss at follow-up to be 14.5 pounds in treatments averaging 44 weeks.

Weight loss maintenance was also the focus of an article by Westover and Lanyon (1990). They reviewed 22 articles published between 1982 and mid 1988 in an effort to find factors most indicative of successful weight loss maintenance. The range of time for follow-up programs was from 4 to 60 months. Weight loss measured from posttreatment to end of follow-up ranged from an additional loss of .8 pounds to 33.4 pounds.

From their review, Westover and Lanyon (1990) found 31 different variables which they labeled as "correlates or predictors of successful weight loss maintenance in at least one study" (p. 126). Of the 31 total variables, six were found in two or more studies. According to Westover and Lanyon (1990) the six variable were:

> (a) restricting calorie intake after treatment...(b) consistent exercise after treatment...(c) enrollment in further weight-loss programs or use of further diets after treatment...(d) problem-solving training...(e) regular weighing after treatment...and (f) client therapist contact after treatment... (p. 126).

The 31 predictor variables were categorized into three large groups. The first of these categories entitled "adherence to treatment and continued use of behavioral skills" (Westover & Lanyon, 1990, p. 126) included keeping the subjects active in the behavioral skills after termination of treatment. The second category "posttreatment vigilance" (Westover & Lanyon, 1990, p. 132) suggested that weight loss maintenance was more likely if individuals were aware of weight fluctuations which served as a cue to practice behavioral techniques learned in treatment. Other practices in this category included support from a participating spouse, continued contact from the therapist, daily weighing and daily self-monitoring of eating and exercise habits. "Intraindividual factors" (Westover & Lanyon, 1990, p. 132) such as the individuals physical or emotional state makeup the third category which

contributed to weight loss maintenance. Some factors in this category such as gender, percent body fat, and age of obesity onset are present prior to treatment. Other factors such as weight loss during treatment, and exposure to stressors occurred during the treatment and posttreatment phases. The authors noted the shortcomings of this review which included short follow-up periods and the reliance on self-reported weight loss for follow-up treatment results.

Brownell and Jeffery (1987) made suggestions on ways to improve long-term results. Included in these suggestions were to make a better match of participants to treatments, increase the length of treatment and rate of weight loss, use very-low calorie diets in conjunction with behavior therapy and add exercise to behavioral programs. Among their other suggestions were a need for better use of incentive procedures, methods to increase compliance, more use of social support and to recognize obesity as a chronic rather than an acute condition.

Safer (1991) reviewed studies that employed dietary therapy, behavior modification and exercise separately and in combination to determine which produced the best long-term weight loss results. Eliminated from this review were articles that gave only posttreatment and "brief" (Safer, 1991, p. 1472) follow-up results. He noted: "Immediate posttreatment and brief follow-up studies of therapy for obesity have not been considered because their correlates of

weight reduction generally bear little relationship to long-term weight loss" (Safer, 1991, p. 1472). Results showed that weight loss treatments which employed behavior modification along with dietary advice produced greater weight losses than those programs using only a dietary treatment. Seventy-five percent of the diet-only participants regained most of their posttreatment weight loss after one year; after two years up to 90% had regained the weight. While use of very low calorie diets showed greater initial weight loss, at the end of one year weight regain was similar to other dietary treatments. When behavior modification was used in combination with dietary treatments a small increase in weight loss maintenance was seen. Results showed that at three years posttreatment, average weight loss had dropped by 75%. By the fifth year the average subject had regained all weight loss plus put on an additional 1.5 to 6 pounds. Treatments that combined behavior modification with diet and exercise showed less posttreatment weight regain between the periods of six months and two years posttreatment. Non-compliance with behavioral practices appeared to be a factor in weight regain. A strong indicator of this was seen when "maintainers" and "regainers" (Safer, 1991, p. 1471) were studied. In one to six year follow-up studies those participants who continued to exercise also had success in maintaining posttreatment weight loss. While exercise was

the most dependable correlate of posttreatment weight loss maintenance, other positive correlates included daily weighing and actions to reduce eating. Safer (1991) concluded that while posttreatment weight loss was maintained longer when behavior therapy was used in combination with diet and exercise the amount of weight maintenance was not significant.

Brightwell and Sloan (1977) reviewed articles on behavioral weight loss treatments to determine if data supported long-term effectiveness. They included studies which had treatment and duration lengths of at least 26 weeks each. Of the 17 studies, eight reported no significant weight loss maintenance. Conclusions made about weight loss and maintenance were discouraging. The authors noted that due to the diversity in selected treatment protocols, it was not clear which overall treatment provided the best results.

Weaknesses of Review Articles

While some consistent conclusions can be made about the length, and amount of weight loss at posttreatment and follow-up, there is much to learn about which components of behavioral weight loss programs are most indicative of weight loss and maintenance success. Brownell (1984) referred to factors which mask the relationship between predictor variables and weight loss. Among these factors

are invalid and unreliable measures such as self reports of food intake, exercise, and weight loss, and less quantifiable variables such as self-esteem and social support. Potential predictor variables may be overlooked when significance is not found across all studies employing that program component. Absence of standardized assessment tools and differences in methodologies and subjects also make it difficult to compare results across studies.

Literature reviews included in this paper as well as others, rarely detail for the reader the steps taken in selecting studies included in the review. A reader is unable to make knowledgeable conclusions of a review when information about article selection is omitted. Additionally, review articles rarely search for documents outside of published journals. None of the reviews cited in this review of literature included unpublished studies, thesis or dissertations. The bias of published works was noted by Brownell and Jeffery (1987). They reported that studies with small weight losses may not be accepted by reviewers. The result makes the success of behavioral weight interventions appear better than they may actually be.

Reviewers may set criteria and tell the reader, but still they are biasing results by omitting certain studies. One example of this was from Stunkard and McLaren-Hume (1959) who noted shortcomings of the hundreds of papers that had been written on weight loss treatments. They noted:

> Most, however, do not give figures on the outcome of treatment, and those that do, most report them in such a way as to obscure the outcome of treatment of individual patients. ... Perhaps the greatest difficulty in interpreting the results of weight-reduction programs, however, is due to the exclusion from reports of patients who did not remain in treatment or were otherwise "uncooperative."... Reports which exclude them, therefore, are not useful in evaluating treatment. Out of "hundreds" of studies available for review, Stunkard McLaren-Hume (1959) found eight that fit his criteria. (p. 79)

Literature reviews rarely include detailed steps taken to make conclusions. It is generally not known what rational was used in selecting studies for review, the methods and quality of studies included, or the methods used for summarizing the results of the original pieces of research. Perhaps a better, more thorough method of review is the process called meta-analysis.

Advantages of using meta-analysis include a more thorough search of existing studies, specific standards for inclusion of research, and statistical calculations used in calculating summary results. Meta-analytic procedures can be used in any subject area in which primary research has been performed.

Overview of Meta-Analysis

Meta-analysis is a method of analyzing results from many studies conducted in a subject area. Glass, McGaw and Smith (1981) describe this approach to research integration as "...data analysis applied to quantitative summaries of individual experiments" (p. 21). In the meta-analytic process, the studies become the data points which are calculated into a common denominator and used in traditional statistical analysis. The process of determining the common denominator or 'effect size' allows integration of studies using various methodologies, treatments and outcome measures.

Compared to traditional literature reviews, meta-analysis offers a more systematic approach to summarizing studies. Thomas and French (1986) noted two major advantages of meta-analysis over the traditional review article. The first advantage was the procedure used to perform the meta-analysis. Authors of traditional literature reviews rarely cite the methods used in making their conclusions. Conversely, the meta-analytic process has very specific steps to be followed.

The second advantage is the "quantitative method for analyzing research findings" (Thomas & French, 1986, p. 197). In addition to these advantages, Tran (personal communication, October 25, 1990), suggested that traditional

reviews focus results on part of the full set of studies included often resulting in a misleading representation of the study findings.

Once the problem has been defined, the steps of meta-analysis include a thorough search of the literature, coding of relevant study characteristics, calculating effect size for each study, and using effect sizes in appropriate statistical calculations. An exhaustive literature search includes published and unpublished studies. Methods for conducting a thorough literature search include using a computer data base, conducting a hand search of journals relevant to an area of study, and writing to professionals in the field requesting a list of related articles. Whether an article is used in the meta-analysis depends on whether it meets criteria set by the researcher. These inclusion criteria are dependent on the objectives of the research. Usable articles based on inclusion criteria are coded. Coding of study characteristics is based on objectives of the research. From the coded information, effect sizes are calculated from each study used. Effect size is the difference of the means between the experimental group and the control group, divided by the control group standard deviation. Thomas and French (1986) explain the resulting effect size of .68 "... as the average subject receiving the treatment scored two-thirds of a standard deviation higher

than the average control subject on the dependent measure" (p. 197). Resulting effect sizes are used in traditional statistical analysis.

Meta-Analysis and Weight Loss

In the area of behavioral weight loss, three meta-analytic procedures have been conducted. Reviewing these may give us the most sophisticated look at behavioral weight loss interventions.

A meta-analysis conducted by Black et al., (1990) compared weight loss between behavioral weight loss interventions that actively involved partners in the treatment with those where subjects participated without partner involvement. A literature search conducted through 1987 yielded 13 studies that met inclusion criteria of using an experimental and control group and actively involving a partner in the experimental treatment program. The dependent variable was weight loss over a specified period; the independent variables were treatment as a couples program, or treatment in which the subject participated without any partner support. Posttreatment results showed a significant difference between couples programs and programs where subjects participated without the help of a partner. Correlation in this positive direction, although not significant, was found at follow-up calculated 2-3 months after treatment.

Bennett (1986) performed a modified meta-analysis on selected treatment characteristics of behavioral interventions for weight loss. His purpose was to assess relationships between treatment characteristics and weight loss in an effort to uncover characteristics which influence weight loss. Bennett located behavioral weight loss studies published up to January 1, 1985 which met the following inclusion criteria: "(a) were of behavioral self-control treatments of obesity, (b) provided posttreatment mean weight losses and (c) noted the number of subjects on which these were based, and (d) the number of subjects was at least five" (Bennett, 1986, p. 555). Seventeen pieces of information were coded from each study. Coded information described number of subjects starting and completing treatment and follow-up, weeks and hours of treatment contact, weight loss at posttreatment and follow-up, qualification of treatment leader, group or individual treatment sessions and, if the treatment included exercise, dietary advice, family support, or the use of anorectic drugs. Of the 105 published studies that were located, 191 treatments were coded. Results showed an overall mean posttreatment weight loss and mean follow-up weight loss of 12.44 pounds and 11.86 pounds. Additionally, results showed that longer treatment duration, more hours of treatment contact, using a therapist qualified in behavioral weight loss, incorporating exercise in treatment sessions,

recommending decreased calorie intake, involving family members in treatment, and using anorectic drugs were most positively associated with higher posttreatment weight losses. Follow-up losses were also affected by these treatment characteristics. Weight loss was more often maintained in programs which employed longer treatment duration in weeks, and longer hours and weeks duration of follow-up treatment. Weight loss was poorly maintained for those given anorectic drugs during treatment.

Eufemia (1985) conducted a meta-analysis to determine if the use of monetary deposits lowered attrition rates in behavioral weight loss treatments. Utilizing a computer search for the years 1967 through 1984, Eufemia included studies reporting results on at least five subjects who were treated with the same treatment intervention. The dependent variable was attrition which was calculated by dividing the initial number of subjects into the difference between the initial and end number of subjects. The resulting number was multiplied by 100 to obtain the percent of attrition. Existence and amount of monetary deposit were the independent variables in the study. Retrieved from each article was information on total number of subjects and defaulters, the calculated percent attrition, weeks of treatment, use of monetary deposits, the number of subjects posting deposits and the amount of deposit made. Results showed an overall attrition rate of 25.81%. Just under half

(46%) of the studies investigated, required monetary deposits. The mean attrition rate for those making deposits was 17.49%. An attrition rate of 29.07% was found for studies in which no deposit was required. No significant differences were found between attrition and either amount of deposit or length of treatment.

Summary

Determining the best methods for long-term weight loss is important due to the risks associated with overweight. Current behavioral weight loss programs help a small number of people lose weight long term, but most studies show that few people are losing weight and keeping it off. In the last several decades, behavioral interventions have evolved to being the most widely used form of weight loss treatment. Due to the high variability in methods and outcome between and within behavioral interventions, determination of the best standard treatment approach has been difficult. Identifying those components which are most indicative of success can aid in the development of a standard treatment approach of behavioral weight loss through which the majority of overweight individuals can have long term success at weight control.

Since the work of Bennett (1986) there have been no further attempts at quantifying data results from behavioral weight loss programs to determine which program components

are associated with treatment outcome. The purpose of this study is to replicate and expand on Bennett's (1986) meta-analysis, covering the period from January 1, 1985 to March 1, 1991, to determine if results from current programs are similar to those found by Bennett (1986).

Chapter 3

METHODOLOGY

Reviews of behavioral-based weight loss interventions suggest high variability among the methods used in behavioral treatment programs. As a result, questions remain concerning which behavioral components are most useful for weight loss and maintenance. To date, attempts made to determine the most useful program elements have been based largely on studies which isolated only a few program components thought to be responsible for success. Additionally, typical studies in this area have not used control groups making comparisons between behavioral and non-behavioral programs difficult. Research reviews, which attempt to summarize individual studies, do not follow specific methodology and take a heuristic rather than a statistic approach. Meta-analysis is a method for statistically analyzing the combined results of individual studies. In this study, meta-analysis was used to determine the components of behavioral weight loss interventions which were most indicative of weight loss and maintenance.

Questions to be answered by this research include:

1. Is there a relationship between the dependent variables:
    a) mean posttreatment weight loss (MPWL)
    b) mean follow-up weight loss (MFWL)

c) maintenance ratio (MR) (mean follow-up loss divided by the mean posttreatment loss)

and the following behavioral intervention treatment characteristics:

a) year study was published

b) treatment duration in weeks

c) follow-up duration in weeks

d) treatment contact hours

e) follow-up contact hours

f) dollars paid to participate

g) highest potential refund

h) age of treatment group participants

i) age of follow-up group participants

j) number of participants entering treatment

k) number of participants completing treatment

l) number of participants entering follow-up

m) number of participants completing follow-up

2. Are there significant mean differences for the following dependent variables:

a) mean posttreatment weight loss (MPWL)

b) mean follow-up weight loss (MFWL)

c) maintenance ratio (MR)

based on different levels of the treatment characteristics listed below:

a) therapist experience

b) therapist profession

c) treatment contact

d) exercise component

e) dietary component

f) family support

g) peer support

h) anorectic drugs

i) hypnotherapy

j) competition

k) monetary incentives

l) gender of treatment group

m) gender of follow-up group

n) type of follow-up contact

3. Are there significant mean differences for the following dependent variables:

a) mean posttreatment weight loss (MPWL)

b) mean follow-up weight loss (MFWL)

c) maintenance ratio (MR)

based on different levels of the study characteristics listed below:

a) author status

b) source of article

c) treatment setting

d) recruitment

e) control group used

f) group assignment

g) self-reported weight loss

h) use of dropouts

Meta-Analytic Process

The process of meta-analysis can be broken into the following steps: literature search; reviews of studies to determine inclusion or exclusion; coding of study characteristics; calculation of effect sizes; application of statistical techniques; and analysis of data. For the purpose of this study, modifications to the meta-analytic technique taken from Bennett (1986) include "(a) taking the treatment rather than the study as the unit of analysis and (b) using weight loss rather than effect size as the dependent variable" (p. 557). These modifications were used to relate program outcomes to components of behavioral interventions.

Literature Search

A computer search was performed on the following six data bases: Index Medicus; Psychological Abstracts; General Science Index; Social Science Index; Dissertation Abstracts and; Government Documents. Search strategies were developed through the use of indexes and thesauruses for each data base. Index Medicus and Psychological Abstracts were searched using the same terms describing behavioral

treatments along with many weight loss and obesity descriptors. Social and General Science indexes along with the Dissertation Abstracts and Government Documents were searched using several one word descriptors for each data base. While more non-relevant articles were produced through the latter search, this strategy was necessary to get an exhaustive list of articles.

All records located during the computer searches were downloaded onto a disk for later review. Citations from Index Medicus and Psychological Abstracts included article abstracts which were read to determine whether specific inclusion criteria were met. When an abstract did not provide enough information to determine inclusion the entire article was located and reviewed. All articles meeting inclusion criteria were obtained. A complete list of articles (included and excluded) can be found in Appendix A.

Following the computer search a manual search was conducted of relevant journals not represented in any of the computer data bases, and for the most current journal publications that were not included in the data bases. A list of journals determined most likely to publish articles in the area of behavioral weight loss interventions is included in Appendix B. Articles used in this research were not limited to the journals listed in Appendix B. An index of journals represented in each computer data base was obtained to determine which additional journals would be

subject to a manual search. A manual search was also conducted on current periodical issues not included in the computer data base. Additional articles identified through this process were obtained and reviewed for inclusion.

An additional search strategy solicited input from experts in the field of weight loss. Twelve professionals nationally known for their contributions to behavioral weight loss treatment received a letter asking for lists of any published or unpublished article in the investigation area. A copy of this letter is provided in Appendix C. Cross-referencing bibliographies from articles obtained was used as a final search strategy.

Inclusion Characteristics

Studies identified from all search strategies were included in the analysis only if they met the following criteria: (a) treatments using behavioral methods, (b) outcome at posttreatment was reported, (c) number of participants on which outcome was based was reported, and (d) outcome was based on at least five participants (Bennett, 1986).

Behavioral interventions are those that employ strategies for long term changes. This criteria was met if at least two of the following program components were employed (Bennett, 1986): (a) self-monitoring, (b) changing the stimuli that precedes eating, (c) development of

techniques that change current eating behaviors, (d) cognitive restructuring, or (e) reinforcement of desired behaviors. These components were identified as important based on the early work of Ferster et al., (1962), and Stunkard (1987), which provided models for treatment of obesity. Focusing on behavioral interventions was important because they have become the most widely used form of treatment for the obese. When results from the same group of participants were reported in more than one article, the data were included only once.

From the pool of inclusive studies the following pieces of information were recorded from each different behavioral intervention. (1) identification code, (2) treatment number, (3) year study was written or published, (4) author status (PhD, MD, RN, RD, student, other, unknown), (5) source of article (published refereed, published unrefereed, unpublished dissertation/thesis), (6) treatment setting (hospital/clinic, worksite, community center, home, unknown), (7) recruitment of participants (media ad, existing weight loss group, work group, referred, combination, other unknown), (8) control group used (yes, no), (9) group assignment (random, matching, non-equivalent, none/not applicable, unknown), (10) therapist experience (graduate or post graduate student, qualified professional, lay leader, unknown), (11) therapist profession (psychologist, dietitian, physician/medical practitioner,

social worker, student, lay leader, unknown), (12) treatment contact (bibliotherapy, group therapy, individual treatment unknown), (13) treatment duration in weeks, (14) follow-up duration in weeks, (15) hours of treatment contact, (16) hours of follow-up contact, (17) exercise component (none described, recommendations to increase activity, recommendations and exercise conducted in treatment sessions), (18) dietary component (none described, recommendations to decrease intake, strict dietary guidelines with energy intake below 1,000 kcalories per day), (19) family support (none described, any described), (20) peer support (none described, any described), (21) anorectic drug prescribed (none described, any described), (22) hypnotherapy (none described, any described), (23) competition (none described, any described), (24) monetary incentive (none described, any described), (25) amount paid to participate, (26) highest potential refund, (27) mean age of treatment group, (28) mean age of follow-up group, (29) gender of treatment group (all female, all male, at least 90% female, mixed genders, unknown), (30) gender of follow-up group (all female, all male, at least 90% female, mixed genders, unknown), (31) number of participants entering treatment, (32) number of participants completing treatment, (33) number of participants entering follow-up treatment, (34) number of participants completing follow-up treatment, (35) self-reported weight loss (no, yes, follow-up only,

unknown), (36) use of dropouts in final statistics (included in final statistics, excluded from final statistics, not applicable), (37) number on which posttreatment weight loss is based, (38) mean posttreatment weight loss, (39) mean follow-up weight loss, (40) follow-up contact (structured program, assessment only, combination, no follow-up) (41) number on which follow-up weight loss is based.

The first three variables were used as identification codes. Variables four through nine and 35-36 provided information used to determine study quality. Rationale for coding study quality is taken from L'Abbe, Detsky, and O'Rourke (1987), who suggested that these are recorded to "determine the influence of study quality on demonstrated results" (p. 227). Information from codes 13 through 16, 31 through 34, 37 through 39 and 41 provide a program profile in terms of contact time, number of participants, and outcome measures. Codes 10 through 12, 17 through 26 and 40 provide information on treatment components The remaining four codes, 27 through 30, provide a participant profile.

Coding Strategies

All coding was completed using the following guidelines (Bennett, 1986). Where more than one treatment within a study met the inclusion characteristics, each qualifying treatment was coded separately. Thus, the total number of treatments found exceeded the total number of studies used

in this research. For those studies which used a multifactorial design the treatment dimension was used for analysis. In such a case, the average of the means was calculated. For example, in a study on male and female differences in a behavioral program, the mean value across gender was used as the mean weight loss for the meta-analysis. Additionally, where group sizes differed within a multifactorial design, a mean weighted by the different sample sizes was found and used in the analysis. A sample coding sheet and code book is found in Appendix D. After all coding was completed by the author, a intrarater reliability check was performed. A random selection of nine studies (17 treatments) were recoded by the initial coder to determine an intrarater agreement over all variables and by each variable separately. Results showed 92% overall agreement on 697 variables recoded. Percent agreement for individual variables resulted in perfect agreement (1.00) for 39% of the variables, indices of .90 to .99 for 17% of the variables, .80 to .89 for 29% of the variables, .70 to .79 for 12% of the variables, while 2% of the variables had indices ranging from .60 to .69.

Statistical Treatment of Data

Data analysis for this study was conducted on two groups of characteristics: treatment characteristics and study characteristics. Treatment characteristics included:

therapist experience, therapist profession, treatment contact, treatment duration in weeks, follow-up duration in weeks, hours of treatment contact, hours of follow-up contact, exercise component, dietary component, family support, peer support, anorectic drug prescribed, hypnotherapy, competition, monetary incentive, dollar amount paid to participate, highest potential refund, mean age of treatment group, mean age of follow-up group, gender of treatment group participants, gender of follow-up group participants, number of subjects entering treatment, number of subjects completing treatment, number of subjects entering follow-up, number of subjects completing follow-up, number on which posttreatment weight loss is based, mean posttreatment weight loss, mean follow-up weight loss, number on which follow-up weight loss is based, and type of follow-up contact. Study characteristics are items used for tracking studies and to determine study quality. Study characteristics include year study was published, author status, source of article, treatment setting, method of recruitment, use of a control group, group assignment, use of self-reported weight loss, and use of dropouts in the final statistics.

To determine which treatment characteristics were most indicative of weight loss, the treatment program was used as the unit of analysis. To explore the relationships between characteristics and outcome three indices of outcome were

employed. Mean posttreatment weight loss (MPWL) is the average of all average posttreatment weight loss reported. Mean follow-up weight loss (MFWL) is the average of all average follow-up weight losses reported. The Maintenance ratio (MR) is the first of these indices (MPWL) divided by the second (MFWL) (Bennett, 1986).

Statistics were computed using SPSS/PC (SPSS/PC). The statistical analysis consists of three parts - (a) the overall mean analysis, (b) the correlation analysis, and (c) ANOVA. Specific methods for conducting each type of analysis are discussed below. The SPSS/PC program statements used to compute the data is found in Appendix E.

Overall Mean Analysis

The overall average weight loss was calculated using the treatment as the unit of analysis. To account for the differences in sample sizes among studies average weight loss was weighted by sample size. The weighted mean was calculated by dividing the sum of all sample sizes into the sum of those sample sizes multiplied by mean weight loss achieved for that sample. These figures are referred to as "pooled" means. Attrition rates (computed as percentages) were calculated for initial and follow-up treatment groups. To calculate attrition for initial treatment, the difference between the number of subjects starting treatment and the number of subjects completing treatment was divided by the

total number of subjects starting treatment. To calculate follow-up attrition rates the difference between the number of subjects starting initial treatment with a follow-up treatment and the number of subjects completing follow-up treatment was divided by the number of subjects starting initial treatment.

Correlation Analysis

Pearson Product Moment Correlations were computed to determine the strength and direction of the relationship between the three dependent indices (MPWL, MFWL, MR) and year study was written or published, weeks duration of initial treatment and follow-up treatment, hours of initial treatment and follow-up contact, dollar amount paid to participate in the treatment and highest potential refund, the mean age of initial treatment and follow-up groups, number of participants entering and completing initial treatment, number of participants entering and completing follow-up treatment, mean weight loss at end of initial and follow-up treatments, and the number of participants on which posttreatment weight loss and follow-up weight loss was based. The SPSS/PC program used to calculate correlations performs a casewise deletion method which eliminated any treatments with missing data. The α level for testing if a correlation is significantly different from zero was set to .05. To determine the practical

significance of correlations, the coefficient of determination ($\underline{r}^2$) was computed as an index of the variability shared between the correlated variables.

ANOVA

ANOVA was employed to determine if MPWL, MFWL or MR differed over various levels of 14 treatment characteristics (therapist experience, therapist profession, treatment contact, exercise component, dietary component, family support, peer support, anorectic drug prescribed, hypnotherapy, competition, monetary incentive, gender of treatment group, gender of follow-up group, and type of follow-up contact), and 8 study characteristics (author status, source of article, treatment setting, recruitment, control group used, group assignment, self-reported weight loss, and use of dropouts). A separate one way ANOVA was analyzed for each of the 22 independent variables using the three indices MPWL, MFWL and MR as dependent measures for a total of 66 analyses. A Type I error rate of .05 was used. Scheffe's post hoc comparisons were used to determine significant mean differences for all significant omnibus F tests.

Chapter 4

RESULTS

This chapter presents the statistical results of the meta-analytic data. Ten tables provide descriptive statistics for coded variables, ANOVA and correlation results. Descriptive summaries of program results and attrition are presented. The correlation analysis was broken down by the three dependent variables MPWL, MFWL, and the MR. Correlations are computed on independent treatment characteristics. ANOVA results are reported similarly, presenting independent variables "study characteristics" followed by the independent variables "treatment characteristics". Overall, significant results are reported first, followed by nonsignificant results.

Completeness of Coding Characteristics

Literature searches resulted in 77 articles eligible for review. From these, 130 treatments met the inclusion criteria and were coded for analysis. Tables 1 through 3 present descriptive statistics (central tendency, variability, and percentage of treatments providing information) for each of the nine study and 30 treatment characteristics.

TABLE 1
STUDY CHARACTERISTICS

Study characteristics	Percentage of treatments with information	Treatment category tabulation	Percent based on total treatment reported
Year of Study	100		
1985		13	10.0
1986		32	24.6
1987		17	13.1
1988		36	27.7
1989		19	14.6
1990		12	9.2
1991		1	.8
Source of Article	100		
Published refereed		61	46.9
Published unrefereed		33	25.4
Dissertation/thesis		36	27.7
Author Status	72.3		
PhD		42	44.7
MD		2	2.1
RN		2	2.1
RD		6	6.4
Student		40	42.6
Other		2	2.1
Recruitment	95.4		
Media		58	46.8
Existing wt loss grp		8	6.5
Workgroup		17	13.7
Referred		13	10.5
Combination		22	17.7
Other		6	4.8
Control Group Used	100		
Yes		39	30.0
No		91	70.0

TABLE 1
STUDY CHARACTERISTICS (Continued)

Study characteristics	Percentage of treatments with information	Treatment category tabulation	Percent based on total treatment reported
Group Assignment	94.6		
Random		76	61.8
Matching		9	7.3
Non-equivalent		4	3.3
None/not applicable		34	27.6
Self-Reported Weight Loss	97.7		
No		108	85.0
Yes		7	5.5
Follow-up only		12	9.4
Use of Dropouts	100		
Included in final statistics		14	10.8
Excluded from final statistics		96	73.8
Not applicable		20	15.4
Treatment Setting	60		
Hospital or clinic		47	60.3
Worksite		16	20.5
Community center		9	11.5
Home		6	7.7

TABLE 2
TREATMENT CHARACTERISTICS

Study characteristics	Percentage of treatments with information	Treatment category tabulation	Percent based on total treatment reported
Exercise Component	100		
None described		30	23.1
Recommendations to increase activity		79	60.8
Recommendations/ practice in sessions		21	16.2
Dietary Component	100		
None described		38	29.2
Recommendations to decrease intake		83	63.8
Energy intake > 1000 kcals/day		9	6.9
Family Support	100		
None described		84	64.6
Any described		46	35.4
Peer Support	100		
None described		79	60.8
Any described		51	39.2
Therapist Experience	82.3		
Graduate or postgraduate student		42	39.3
Qualified professional		60	56.1
Lay leader		5	4.7
Therapist Profession	79.2		
Psychologist		28	27.2
Dietitian		19	18.4
Physician		9	8.7
Student		42	40.8
Lay leader		5	4.9

TABLE 2
TREATMENT CHARACTERISTICS (Continued)

Study characteristics	Percentage of treatments with information	Treatment category tabulation	Percent based on total treatment reported
Treatment			
Contact	97.7		
Bibliotherapy		5	3.9
Group therapy		100	78.7
Individual treatment		22	17.3
Follow-Up			
Contact	98.5		
Structured program		22	17.2
Assessment only		63	49.2
Combination		4	3.1
No follow-up		39	30.5
Anorectic Drug			
Prescribed	100		
None		125	96.2
Any		5	3.8
Hypnotherapy	100		
None		123	94.6
Any		7	5.4
Competition	100		
None		120	92.3
Any		10	7.7
Monetary			
Incentive	100		
None		57	43.8
Any		73	56.2

TABLE 2
TREATMENT CHARACTERISTICS (Continued)

Study characteristics	Percentage of treatments with information	Treatment category tabulation	Percent based on total treatment reported
Treatment Gender	90.8		
All female		51	43.2
All male		0	0.0
At least 90% female		20	16.9
Mixed genders		47	39.8
Follow-Up Gender	69.2		
All female		37	41.1
All male		0	0.0
At least 90% female		2	2.2
Mixed genders		12	13.3
No follow-up		39	43.3

TABLE 3
TREATMENT CHARACTERISTICS

Treatment Characteristics	Percentage of treatments with information	Summary of treatment characteristics				
		Mean	SD	Mode	Med.	Mn/Mx
Treat duration in weeks	96.2	15.56	9.54	12	12	4/52
F-U duration in weeks	69.2	43.29	31.56	24	42	3/156
Hours of treat	63.1	22.82	14.79	40	18	3/80
Hours of F-U	50.0	.22	1.23	0	0	0/8
Dollars paid	98.5	58.28	115.15	0	10	0/998
Dollars refunded	95.4	28.82	42.44	0	0	0/175
Age treatment	63.8	39.77	6.29	35	40	22/51
Age follow-up	6.9	41.49	5.11	31	44	31/48
No. enter treat	86.9	77.08	148.20	20	34	5/998
No. complete treat	73.8	46.88	71.13	10	24	5/512
No. enter F-U	20.0	27.54	29.49	16	18	5/149
No. complete F-U	63.1	37.05	59.96	16	18	5/498
Posttreat weight loss (lbs)	100.0	13.83	9.73	64	11	+.13/51
Follow-up weight loss (lbs)	63.8	12.97	9.96	4	10	+.79/63
No. posttreatment weight loss	100.0	48.85	78.07	16	22	5/512
No. follow-up weight loss	64.6	36.43	58.50	16	18	5/498

Completeness of coded information for the 39 characteristics varied greatly. Complete data were coded for 36% of treatments. Between 75% and 99% of characteristics were reported in 31% of treatments coded, between 50% and 74% in 28% of treatments coded, and 5% of the characteristics were reported less than 50% of the time. Study characteristics are displayed in Table 1, and treatment characteristics are presented in Tables 2 and 3.

Overall Mean Analysis

Weight Loss

To account for differences in sample size, pooled mean posttreatment and follow-up weight losses using sample size as the unit of analysis, were calculated. A mean posttreatment weight loss of 12.89 pounds (n=6351), and a follow-up weight loss of 12.96 pounds (n=2965) were calculated using the pooled formula. Weight losses were achieved in average treatments lasting 16 weeks and average follow-up treatments lasting 43 weeks. The average weight loss per week measured from the beginning of treatment to the end of initial treatment was .80 pounds. The average weight loss per week measured from the beginning of initial treatment to the end of follow-up was .22 pounds.

Attrition

Average attrition rates were calculated based on figures recorded for number of individuals entering treatment (8902), number completing treatment (4501), number entering treatments with a follow-up (4459), and number completing follow-up (3038). The posttreatment attrition rate was 49%. Attrition calculated for treatments employing follow-up phases was 32%.

Correlation Analysis

Pearson Product Moment Correlations were computed to determine the strength and direction of the relationship between the three dependent indices (MPWL, MFWL and MR) and all interval level data.

Significant Mean Posttreatment Weight Loss Correlations

The dependent variable, MPWL was significantly related to six independent treatment characteristics (i.e., r_{xy} was significantly different from 0, indicating that the null hypothesis was rejected)(values in parentheses refer to the related null hypotheses stated in Chapter 1): treatment duration in weeks (1b), follow-up duration in weeks (1c), hours of treatment contact (1d), dollars paid to participate (1f), highest potential refund given (1g), mean age of

treatment group (1h), and follow-up weight loss (1o). Of these six, one (mean age of treatment group) was practically significant (i.e; $|r_{xy}| \geq .25$). Correlation results are found in Table 4.

MPWL was positively related to treatment duration in weeks (r=.457, n=125, p=.000). As the number of weeks of treatment duration increased, the average weight loss also increased.

MPWL was positively correlated to follow-up duration in weeks (r=.335, n=90, p=.001). No reasonable explanation can be provided for this result leading to the conclusion that it might be a spurious relationship or a Type I error.

A positive association was found between MPWL and number of treatment contact hours (r=.55, n=82, p=.000). The more exposure a participant had to the behavioral treatment the higher weight loss they achieved. The average treatment hours and weeks reported were 22 and 15.5. Using these figures, the average hours of contact per week for participants in this meta-analysis were 1.4.

The amount of dollars clients paid to participate was positively associated with MPWL. The strength of this relationship was moderate (r=.37, n=128, p=.000). Results suggested that those participants who paid more money to participate tended to lose more weight at posttreatment. About 75% of treatments used monetary incentives and the average amount paid was $58.00.

TABLE 4
CORRELATIONS OF OUTCOME INDICES
AND TREATMENT CHARACTERISTICS

Treatment characteristics	MPWL r_{xy}	MFWL r_{xy}	MR r_{xy}
Year study published	.09[a] (130)[b] p=.156[c]	-.07 (83) p=.275	-.25* (82) p=.012
Treatment duration (wks)	.46* (125) p=.000	.27* (83) p=.007	-.21* (82) p=.028
Follow-up duration (wks)	.33* (90) p=.001	.01 (83) p=.481	-.27* (82) p=.006
Treatment contact (hrs)	.55* (82) p=.000	.31* (58) p=.008	-.33* (58) p=.006
Follow-up contact (hrs)	-.04 (65) p=.391	-.07 (60) p=.312	-.07 (59) p=.293
Dollars to participate	.37* (128) p=.000	-.11 (83) p=.16	-.43* (82) p=.000
Highest refund (dollars)	.25* (124) p=.003	-.08 (83) p=.242	-.41* (82) p=.000
Mean age of treatment group	.18* (83) p=.050	.00 (62) p=.494	-.29* (61) p=.011
Mean age of follow-up group	.04 (9) p=.457	.00 (9) p=.497	.07 (9) p=.431
Number entering treatment	-.07 (113) p=.225	-.02 (74) p=.422	.07 (73) p=.268
Number completing treatment	-.04 (96) p=.342	-.04 (53) p=.374	.03 (52) p=.404

TABLE 4 (Continued)
CORRELATIONS OF OUTCOME INDICES
AND TREATMENT CHARACTERISTICS

Treatment characteristics	MPWL r_{xy}	MFWL r_{xy}	MR r_{xy}
Number entering follow-up	-.07 (26) p=.364	-.10 (25) p=.324	.08 (25) p=.353
Number completing follow-up	-.08 (82) p=.226	.02 (78) p=.448	.10 (78) p=.201
Mean weight loss end of treatment	1.00* (130) p=.000	.65* (83) p=.000	-.20* (82) p=.035
Mean weight loss end of follow-up	.65* (83) p=.000	1.00* (83) p=.000	.49* (82) p=.000
No. subjects post-treatment weight loss based on	-.06 (130) p=.256	.01 (83) p=.451	.08 (82) p=.243
No. subjects follow-up weight loss based on	-.10 (84) p=.169	.01 (81) p=.476	.08 (81) p=.229

[a] Pearson Product-Moment Correlation Coefficient
[b] Number of cases upon which correlation was computed
[c] Probability that correlation is greater than zero
* $p < .05$

A weak relationship was found between highest potential refund and MPWL (r=.25, n=124, p=.000). This suggests that higher weight losses are achieved at posttreatment when participants have either received large refunds or know they are going to receive them later in the treatment program.

As expected, MPWL was positively associated with follow-up weight loss (r=.65, n=83, p=.000). This fairly high correlation suggests that subjects losing high amounts of weight during treatment will show a higher weight loss maintenance at follow-up.

Nonsignificant Mean Posttreatment Weight Loss Correlations

Nonsignificant correlations (i.e., r_{xy} was not significantly different from 0, indicating that the null hypothesis was not rejected) were found between the dependent variable MPWL and the following independent study characteristics (values in parentheses refer to the related null hypotheses stated in Chapter 1): year study was published (1a), hours of follow-up contact (1e), mean age of follow-up group (1i), number entering treatment (1j), number completing treatment (1k), number entering follow-up (1l), and number completing follow-up (1m).

Significant Follow-Up Weight Loss Correlations

The dependent variable MFWL was significantly correlated (i.e., r_{xy} was significantly different from 0 indicating that the null hypothesis was rejected) to three independent treatment characteristics (values in parentheses

are the related statistical hypotheses stated in Chapter 1), treatment duration in weeks (1b), hours of treatment contact (1d), and mean weight loss at the end of treatment (1n).

The strength of the relationship between MFWL and treatment duration in weeks ($\underline{r}$=.27, $\underline{n}$=83, $\underline{p}$=.007), and hours of treatment contact ($\underline{r}$=.31, $\underline{n}$=58, $\underline{p}$=.008) were both somewhat weak. This suggests that more weeks of treatment does not affect weight loss at follow-up to any large degree. The relationship between both these independent variables was stronger for MPWL than MFWL. Increased amounts of contact during treatment increased initial weight loss but did not have a strong affect on follow-up weight loss.

Nonsignificant Follow-Up Weight Loss Correlations

Nonsignificant correlations (i.e., r_{xy} was not significantly different from 0, indicating that the null hypothesis was not rejected) were found between the dependent variable MFWL and the following independent variables (values in parentheses are the related statistical hypotheses stated in Chapter 1): year study was published (1a), follow-up duration in weeks (1c), hours of follow-up contact (1e), dollars paid to participate (1f), highest potential refund (1g), mean age of treatment group (1h),

mean age of follow-up group (1i), number entering treatment (1j), number completing treatment (1k), number entering follow-up (1l), and number completing follow-up (1m).

Significant Maintenance Ratio Correlations

Of the nine statistically significant correlations between the dependent variable MR and independent variables (i.e., r_{xy} was significantly different from 0, indicating that the null hypothesis was rejected), eight are in a negative direction. Six of the eight negative relationships which were practically significant included (values in parentheses are the related statistical hypotheses stated in Chapter 1): year study was published (1a), treatment duration in weeks (1b), follow-up duration in weeks (1c), hours of treatment contact (1d), dollars paid to participate (1f), highest potential refund (1g), mean age of treatment group (1h), and mean weight loss at the end of treatment (1n). MR and mean weight loss at the end of follow-up (1o) were positively associated.

There was a weak negative relationship between MR and year in which the study was published (r=-.25, n=82, p=.012) and follow-up duration in weeks (r=-.27, n=82, p=.006). The negative relationship with MR and year the study was written/published suggests that results from the more recent studies show less weight loss maintenance, and that older studies included in this report showed higher weight loss

maintenance. Additionally, the longer the follow-up duration in weeks the less posttreatment weight loss was maintained.

The dependent variable MR was negatively related to the independent variables treatment contact hours per week (r=-.33, n=58, p=.006) and to a lesser degree, to treatment duration in weeks (r=-.21, n=82, p=.028). These relationships suggest that the more contact time, in both hours per week and weeks of treatment, the less weight loss was maintained during a follow-up period. This result was opposite of the effect that contact hours had on MPWL.

A negative correlation was found between MR and dollars paid to participate (r=-.43, n=82, p=.000), and highest potential refund (r=-.41, n=82, p=.000). This suggests that higher amounts of money paid out by participants, and higher refunds given to participants were not strong motivators for weight loss during the follow-up period. More money paid to participate and higher refunds given were associated with lower maintenance of posttreatment weight loss.

A weak negative relationship was observed between MR and the mean age of the treatment group (r=-.29, n=61, p=.011). This negative relationship suggested that the older participants were less able to maintain weight lost during the initial treatment phase. The average age of the treatment and follow-up groups were 39.77 and 41.49 years.

MR also shows a weak negative association with the independent variable mean weight loss at the end of treatment ($\underline{r}$=-.20, $\underline{n}$=82, $\underline{p}$=.035). This suggested that a higher amount of weight loss during initial treatment may have a weak influence on weight loss maintained during follow-up.

The MR was positively correlated with mean weight loss at end of follow-up ($\underline{r}$=.49, $\underline{n}$=82, $\underline{p}$=.000). This is a logical association, as higher weight losses at the end of follow-up are directly associated with higher maintenance of initial weight loss.

Nonsignificant Maintenance Ratio Correlations

Nonsignificant correlations (i.e., r_{xy} was not significantly different from 0, indicating that the null hypothesis was not rejected) were found between MR and the following treatment characteristics (values in parentheses are the related statistical hypotheses stated in Chapter 1): follow-up contact hours (1e), mean age of follow-up group (1i), number entering treatment (1j), number completing treatment (1k), number entering follow-up (1l), and number completing follow-up (1m).

ANOVA

ANOVA was employed to determine if the three dependent variables MPWL, MFWL, or MR differed between various levels of 22 independent variables (14 treatment characteristics) and eight study characteristics). Scheffe's post hoc comparisons ($p=\leq.01$ and $p=\leq.05$) were used to determine significant pairwise mean differences. ANOVA results for study characteristics are found in Tables 5 through 7. Similar tables for treatment characteristics are found in Tables 8 through 10. The following discussion pertains to hypotheses two and three in Chapter 1.

Study Characteristics

Significant Mean Posttreatment Weight Loss Results.

Study characteristics that significantly affected the dependent variable MPWL included: use of a control group ($p=.020$), use of drop-outs in the final statistics ($p=.046$), treatment setting ($p=.005$), and recruitment ($p=.012$). In each case, the means across independent variables were significantly different from each other indicating that the null hypothesis was rejected. However, with the exception of treatment setting, the omega^2 values were <.10, suggesting marginal practical significance. An omega^2 value of <.10 suggests that of the total variability in the dependent measure, MPWL, less than 10% can be explained by differences in the dependent variables.

Studies which used a control group (M=10.82) reported lower weight losses at posttreatment than groups which did not use a control group (M=15.12). Almost all (91%) of studies included in this meta-analysis did not use a control group. Of those that did utilize a control group, 16% were from studies found in published articles and 67% were from dissertations and theses. Calculation on weight lost per week from graduate papers compared to published studies resulted in graduate papers showing higher weight losses per week (1.12 pounds) than calculated from published studies (.86 pounds).

TABLE 5
ONE-WAY ANOVAS OF POSTTREATMENT WEIGHT LOSS
ACROSS STUDY CHARACTERISTICS

Study characteristics	Posttreatment Weight Loss Mean	SD	n	Omega^2
Source of article				
pub refereed	14.64	8.81	61	
pub unrefereed	12.07	6.94	33	
diss/thesis	14.06	12.94	36	
	p=.471			
Control group used				
yes	10.82	7.50	39	
no	15.12	10.31	91	
	p=.020*			.030
Group assignment				
random	14.27	9.63	76	
non-random	13.29	10.22	47	
	p=.593			
Self-reported wt loss				
yes	10.68	6.33	7	
no	13.93	10.35	108	
follow-up only	13.43	4.33	12	
	p=.694			
Use of dropouts				
in end stats	8.86	9.94	14	
out end stats	14.65	10.03	96	
	p=.046*			.027
Treatment setting				
hospital/clinic	16.63	12.41	47	
worksite	6.61	4.01	16	
community cntr	7.80	5.66	9	
home	12.22	9.44	6	
	p=.005*			.123
Author status				
Ph.D.	17.23	9.50	42	
Student	13.43	12.44	40	
	p=.123			
Recruitment				
Media	15.93$^+$	9.61	58	
Existing wt. loss	12.25	5.08	8	
Workgroup	6.95$^+$	4.12	17	
Referral	14.64	12.99	13	
Combination	15.2	11.23	22	
Other	7.38	5.62	6	
	p=.012*			.078

* $p < .05$
$^+$ Denotes significant pairwise Scheffe' contrasts

Studies which excluded data from those who dropped out of treatment (M=14.65) evidenced a higher MPWL than studies which included data from participants who dropped out of the study prior to treatment completion (M=8.86). Of the total 131 treatments coded for this study, 14 included dropouts in the final statistics, while 96 did not. Twenty treatments reported no dropouts during initial treatment. Weight loss based on only those individuals who completed treatment inflates the average weight loss because those who dropped out of treatment generally had less success. The resulting inflated weight loss figures give the appearance that weight loss treatments are more effective than what they actually are.

There was a statistically significant difference in MPWL and the type of treatment setting. The omega^2 value of .123 suggested that 12% of the total variability in scores can be explained by the treatment setting. While no two groups were significantly different at the .01 level, groups held in a hospital or clinical setting reported the highest average weight loss (M=16.63). Worksite settings reported the lowest amount of weight loss (M=6.61).

Closely related to this result is one which reported statistical significance for MPWL and the method used to recruit subjects into the study. The effect of the different recruitment methods was rather small, (omega^2=.078) which suggested that only 8% of the total

variability of in scores can be explained by knowing which recruitment method was used. Scheffe's post hoc test showed a significant difference between those recruited through the media (M=15.93) and those in workgroups (M=6.95). Studies utilizing the media for recruitment showed a greater weight loss than studies recruited within workgroups.

Nonsignificant Mean Posttreatment Weight Loss Results. Statistical significance was not found for the dependent variable MPWL across source of article, group assignment, self-reported weight loss, and author status. For each of the independent variables the mean posttreatment weight loss was not appreciably different from each other.

Mean Follow-Up Weight Loss. No statistical significance was found for any of the independent study characteristics and the dependent variable MFWL. It is interesting to note that the same variables which showed significance with MPWL (treatment setting, use of control group, recruitment method and used of dropouts in final statistics) did not affect MFWL.

Significant Maintenance Ratios. Statistical significance was found for the dependent variable MR across the following study characteristics: source of article, control group used, author status, and method of recruitment (i.e., means across independent variables were significantly different from each other indicating that the null

hypothesis was rejected). While statistically significant, the use of a control group was not practically significant (i.e., omega^2 <.10), suggesting that less than 10% of the total variability in scores is due to treatments utilizing or not utilizing a control group.

While source of article showed statistical significance overall, Scheffe's post hoc analysis found no two groups significantly different at the .01 level. The highest MR was obtained in studies conducted for graduate research ($\underline{M}$=.1.14), the lowest was from articles published in refereed journals ($\underline{M}$=.75). The MR of articles obtained from unrefereed journals was closer to the graduate work ($\underline{M}$=1.07). An explanation could be that treatments conducted for graduate requirements employed a shorter follow-up period ($\underline{M}$=21 weeks), compared to treatments from all published studies ($\underline{M}$=49 weeks). As has been stated previously, more weight gain occurs as treatment contact ends.

TABLE 6
ONE-WAY ANOVAS OF FOLLOW-UP WEIGHT LOSS
ACROSS STUDY CHARACTERISTICS

Study characteristics	Follow-Up Weight Loss Mean	SD	n	Omega^2**
Source of article				
pub refereed	11.26	7.11	44	
pub unrefereed	14.29	12.93	23	
diss/thesis	15.81	11.52	16	
	p=.224			
Control group used				
yes	13.83	10.39	23	
no	12.65	9.86	60	
	p=.630			
Group assignment				
random	12.60	8.28	55	
non-random	13.49	13.12	22	
	p=.724			
Self-reported wt loss				
yes	12.26	6.01	4	
no	12.82	10.54	67	
follow-up only	10.77	3.12	9	
	p=.842			
Use of dropouts				
in end stats	8.56	10.84	3	
out end stats	12.60	8.27	71	
	p=.415			
Treatment setting				
hospital/clinic	15.45	13.31	34	
worksite	17.47	6.24	3	
community cntr	7.88	3.61	6	
home	13.90	8.40	4	
	p=.532			
Author status				
Ph.D.	12.47	7.38	29	
Student	14.95	10.87	19	
	p=.350			
Recruitment				
Media	11.04	6.68	51	
Existing wt. loss	6.65	1.20	2	
Workgroup	17.47	6.24	3	
Referral	15.08	17.37	12	
Combination	18.24	12.06	12	
Other		—	—	
	p=.127			

* $p < .05$
** Computed for significant F values only
+ Denotes significant pairwise Scheffe' contrasts

TABLE 7
ONE-WAY ANOVAS OF MAINTENANCE RATIO
ACROSS STUDY CHARACTERISTICS

Study characteristics	Maintenance Ratio Mean	SD	n	Omega^2
Source of article				
pub refereed	.75	.44	43	
pub unrefereed	1.07	.39	23	
diss/thesis	1.14	.50	16	
	p=.002*			.120
Control group used				
yes	1.11	.48	22	
no	.85	.44	60	
	p=.025*			.049
Group assignment				
random	.86	.48	54	
non-random	1.04	.44	22	
	p=.124			
Self-reported wt loss				
yes	1.09	.305	4	
no	.90	.50	66	
follow-up only	.85	.33	9	
	p=.689			
Use of dropouts				
in end stats	.50	.34	3	
out end stats	.91	.46	70	
	p=.132			
Treatment setting				
hospital/clinic	1.02	.57	33	
worksite	1.46	.36	3	
community cntr	1.03	.44	6	
home	1.04	.25	4	
	p=.607			
Author status				
Ph.D.	.67	.34	28	
Student	1.14	.47	19	
	p=.000*			.234
Recruitment				
Media	.78$^+$	.41	50	
Existing wt. loss	.71	.11	2	
Workgroup	1.46	.36	3	
Referral	.98	.50	12	
Combination	1.34$^+$	.45	12	
Other		—	—	
	p=.001*			.188

* $p < .05$
$^+$ Denotes significant pairwise Scheffe' contrasts

Participants in studies using control groups tended to maintain all of their posttreatment weight loss plus lose a small amount more (M=1.11), compared to those in treatments not using a control group (M=.85). Additional descriptive statistics were calculated for source of article by use of control group. Results showed that treatments reported in published articles utilized a control group 16% of the time, and treatments as part of a thesis or dissertation employed the use of a control groups 76% of the time. The higher MR in studies using control groups may be a direct result of the larger percent of graduate papers represented in this group. Graduate studies employed shorter follow-up periods (M=21 weeks) allowing less time for weight to be gained back compared to published studies (M= 49 weeks), which usually have a minimum follow-up period of one year.

A higher MR was found in studies written by graduate students (M=1.14) compared to those written by Ph.D.'s (M=.67). This was a strong relationship according to the omega^2 value of .234 which suggests that of the total variability in the dependent measure 23% can be explained by the status of the author. Participants involved in graduate research showed better maintenance than those in studies authored by Ph.D's. In fact, with the maintenance ratio higher than 1 it is expected that participants lost some additional weight during the follow-up period. This affect again could be due to the shorter time frame in which the

graduate students conducted their research (average follow-up period of 21 weeks compared to 49 weeks by Ph.D's).

Significant and practical differences were found between the dependent variable MR and the independent variable recruitment method used. Less posttreatment weight was maintained by those recruited through the media (M=.78) compared to those recruited through a combination of methods (M=1.34).

Nonsignificant Maintenance Ratios. Independent variables not statistically significant in relation to the dependent variable MR were: group assignment, self-reported weight loss, use of dropouts, and treatment setting. All means across the above independent variables did not differ enough to warrant rejecting the null hypotheses. It is interesting to note that those treatments which used self-reported weight loss (M=1.09) showed a slightly higher MR than those not using self-reported weight loss (M=.90).

While not significant, a higher MR was reported in those treatments which excluded dropouts from the final weight loss results (M=.91) compared to treatments which included dropouts in the final statistical analysis (M=.50). Those participants who reported weight loss figures themselves, appeared to maintain a larger amount of their initial weight lost.

Treatment Characteristics

Significant Mean Posttreatment Weight Loss.

Study characteristics that significantly affected the dependent variable MPWL were: exercise, diet, therapist experience, therapist profession, use of anorectic drugs, competition, and gender of treatment and follow-up group. The means across independent variables were significantly different from each other indicating that the null hypothesis was rejected.

Exercise conducted during the treatment sessions resulted in significantly more weight loss ($\underline{M}$=20.05) than when no exercise recommendations were made ($\underline{M}$=11.67). While statistically significant, the overall effect is small (omega^2=.067). Of the total variability in the dependent measure (MPWL), only 7% can be explained by the use of exercise. MPWL reported for treatments which made recommendations for participants to increase activity was 12.99. Increased weight loss was reported with increasingly rigorous exercise regimens.

TABLE 8
ONE-WAY ANOVAS OF POSTTREATMENT WEIGHT LOSS
ACROSS TREATMENT CHARACTERISTICS

Treatment characteristics	Posttreatment Weight Loss Mean	SD	n	Omega^2
Exercise				
None	11.67$^+$	6.35	30	
Recommended	12.99	10.45	79	
Practiced	20.05$^+$	8.69	21	
	p=.004*			.067
Diet				
None	15.96$^+$	8.26	38	
Recommended	10.86$^+$	7.28	83	
>1000 kcals/day	32.24$^+$	13.16	9	
	p=.000*			.312
Family support				
None	13.04	9.08	79	
Any	15.27	12.16	46	
	p=.212			
Peer support				
None	13.19	9.08	79	
Any	14.82	10.67	51	
	p=.353			
Therapist experience				
Professional	16.29	10.52	60	
Non-professional	10.69	8.36	47	
	p=.004*			.069
Therapist profession				
Professional	16.66	10.68	56	
Non-professional	10.69	8.36	47	
	p=.002*			.078
Treatment contact				
Group therapy	14.54	10.05	100	
Other	10.80	7.24	27	
	p=.0731			
Anorectic drugs				
None	13.41	9.31	125	
Any	24.21	14.97	5	
	p=.014*			.038

TABLE 8 (Continued)
ONE-WAY ANOVAS OF POSTTREATMENT WEIGHT LOSS
ACROSS TREATMENT CHARACTERISTICS

Treatment characteristics	Posttreatment Weight Loss Mean	SD	n	Omega^2
Hypnotherapy				
None	13.65	9.78	123	
Any	16.96	8.88	7	
	p=.383			
Competition				
None	14.34	9.67	120	
Any	7.72	8.69	10	
	p=.038*			.025
Monetary incentive				
None	13.39	9.84	57	
Any	14.17	9.69	73	
	p=.650			
Treatment gender				
All female	11.25$^+$	6.32	51	
90% female	15.70	9.75	20	
Mixed genders	17.54$^+$	11.92	47	
	p=.005*			.072
Follow-up gender				
≥ 90% female	11.78$^+$	6.63	39	
Mixed genders	20.90$^+$	11.39	12	
No follow-up	9.02$^+$	5.77	39	
	p=.000*			.209
Follow-up contact				
Structured	18.21	11.41	22	
Assessment	14.53	9.46	63	
Combination	24.21	15.99	4	
	p=.094			

* $p < .05$
$^+$ Denotes significant pairwise Scheffe' contrasts

The effect the independent variable "dietary advice" had on the dependent variable MPWL was strong. The omega^2 value of .312 suggests that 31% of the total variability in MPWL scores can be explained by the degree of dietary intervention employed in the treatment. Scheffe's post hoc test showed significant differences between all three categories of dietary guidelines. Those treatments that used a strict diet of $\leq$1000 kcalories per day showed the greatest mean weight loss at the end of treatment ($\underline{M}$=32.24), followed by no dietary advice given ($\underline{M}$=15.96) and recommendations to reduce kcalorie intake ($\underline{M}$=10.86). Interestingly, the MPWL was higher in treatments recommending no dietary changes compared to treatments recommending a decrease in food intake.

A small, yet statistically significant effect was reported for the independent variables therapist profession and therapist experience across the dependent variable MPWL. Treatments using professional therapist ($\underline{M}$=16.29 for therapist experience, and $\underline{M}$=16.66 for therapist profession) appeared to have higher weight loss at posttreatment than did treatments utilizing non-professional therapists ($\underline{M}$=10.69 for therapist experience, and $\underline{M}$=10.69 for therapist experience). It appeared that participants involved in treatments which were led by a professionals, such as Ph.D's

and psychologists, lost about five pounds more at posttreatment than did participants involved in treatments utilizing non-professionals such as students and lay-leaders.

A statistically significant but weak effect was found for use of anorectic drugs and MPWL. Treatments using appetite suppressants ($\underline{M}$=24.21) showed a higher MPWL than those treatments which did not ($\underline{M}$=13.41).

Mean posttreatment weight loss was significantly affected by the use of competition. Treatments not using competition had almost double the weight loss ($\underline{M}$=14.34) of those using competition ($\underline{M}$=7.72). These results may be related to significance found between MPWL and treatment setting and recruitment. Additional statistics calculated for competition by treatment setting showed half of the worksite treatments employed competition and only one treatment from a hospital or clinic setting used competition. Also, mean weight loss in studies conducted at the worksite were lowest of all weight losses by treatment setting.

The dependent variable MPWL was significantly affected by the two independent variables gender of treatment and gender of follow-up groups. A moderate effect for treatment gender was found with mixed gender groups losing significantly more weight at posttreatment ($\underline{M}$=17.54) than groups of all women ($\underline{M}$=11.25). Treatment genders of 90% or

more female fell between these figures at 15.70. A stronger effect was found for MPWL and follow-up gender. Scheffe's post hoc test showed the following pairs of groups significant at the .01 level: mixed genders and no follow-up, and mixed genders and all female. MPWL of treatments with mixed genders showed higher weight losses ($\underline{M}$=20.90) than groups with at least 90% women ($\underline{M}$=11.78).

Nonsignificant Posttreatment Weight Loss. Independent treatment variables not statistically significant in relation to the dependent variable MPWL were: family support, peer support, treatment contact, hypnotherapy used, use of monetary incentives, and follow-up contact. All means across the above independent variables did not differ enough to warrant rejecting the null hypotheses.

While statistically non-significant, the use of family and peer support showed slightly higher MPWL (M=15.27, M=14.82) than when treatments make no mention of family or peer support (M=13.04, M=13.19).

Treatments employing group sessions reported a somewhat higher MPWL (M=14.54) compared to those treatments using individual, or bibliotherapy treatments (M=10.80).

As pointed out earlier, monetary incentives are often attached to attendance, especially at follow-up therefore may not provide additional motivation early on in the treatment process.

Significant Mean Follow-Up Weight Loss. Study characteristics that significantly affected the dependent variable MFWL were: type of dietary component, hypnotherapy, and monetary incentive. The means across the above independent variables were significantly different from each other indicating that the null hypothesis was rejected.

A strong effect was found between MFWL and all three of the dietary components: "none described" (M=13.09), "recommendations to increase activity" (M=10.55), and "strict guidelines with energy intake $\leq$1000 kcalories per day" (M=31.38). Similar results, reported previously, were found between MPWL and the dietary components. For both dependent variables (MPWL and MFWL), more weight loss occurred in groups not specifying dietary recommendations as opposed to groups recommending a decrease in intake.

Consistent across both indices are the higher weight losses associated with strict kcalorie diets. The overall effect of diet on MFWL is slightly lower than its effect on MPWL.

The independent variable hypnotherapy appeared to have a moderate affect on MFWL. The use of hypnotherapy in treatments resulted in a 15 pound difference at follow-up (no hypnotherapy used $\underline{M}$=12.06, any hypnotherapy used $\underline{M}$=27.21). It should be pointed out that the numbers on which these statistics were calculated on were very different. No hypnotherapy was used in 78 of the total 83 treatments calculated in this ANOVA.

Where as monetary incentives did not significantly affect MPWL, there appeared to be an effect of this independent variable on MFWL. Treatments not using monetary incentives resulted in higher weight losses at follow-up ($\underline{M}$=16.98) than did those treatments using a monetary incentive ($\underline{M}$=10.19).

This is in agreement with earlier data reported which showed the higher the monetary incentive and refund the lower amount of weight loss maintenance. Again, this could be related to the incentives being linked to attendance rather than to weight loss.

TABLE 9
ONE-WAY ANOVAS OF FOLLOW-UP WEIGHT LOSS
ACROSS TREATMENT CHARACTERISTICS

Treatment characteristics	Follow-Up Weight Loss Mean	SD	n	Omega^2
Exercise				
None	12.27	7.38	19	
Recommended	12.67	11.83	46	
Practiced	14.50	6.90	18	
	p=.761			
Diet				
None	13.09$^+$	7.54	30	
Recommended	10.55$^+$	7.58	47	
>1000 kcals/day	31.38$^+$	17.88	6	
	p=.0000*			.263
Family support				
None	12.09	10.07	53	
Any	14.54	9.74	30	
	p=.284			
Peer support				
None	12.18	10.44	52	
Any	14.31	9.12	31	
	p=.349			
Therapist experience				
Professional	15.42	11.78	41	
Non-professional	11.02	7.38	29	
	p=.080			
Therapist profession				
Professional	15.57	12.14	38	
Non-professional	11.02	7.38	29	
	p=.080			
Treatment contact				
Group therapy	12.47	8.56	69	
Other	16.48	15.94	12	
	p=.199			
Anorectic drugs				
None	12.95	10.06	81	
Any	13.92	6.82	2	
	p=.893			

TABLE 9 (Continued)
ONE-WAY ANOVAS OF FOLLOW-UP WEIGHT LOSS
ACROSS TREATMENT CHARACTERISTICS

Treatment characteristics	Follow-Up Weight Loss Mean	SD	n	Omega^2
Hypnotherapy				
None described	12.06	9.39	78	
Any described	27.21	8.35	5	
	p=.0007*			.120
Competition				
None described	12.77	9.85	82	
Any described	29.86	0	1	
	p=.088			
Monetary incentive				
None described	16.98	12.66	34	
Any described	10.19	6.34	49	
	p=.0018*			.102
Treatment gender				
All female	12.84	12.11	35	
90% female	10.42	5.35	18	
Mixed genders	16.22	8.63	24	
	p=.163			
Follow-up gender				
≥ 90% female	13.04	11.87	37	
Mixed genders	14.42	7.84	11	
No follow-up	--	--	--	
	p=.720			
Follow-up contact				
Structured	13.94	8.02	20	
Assessment	12.61	10.75	58	
Combination	9.09	6.13	3	
	p=.710			

* $p < .05$
+ Denotes significant pairwise Scheffe' contrasts

Nonsignificant Follow-Up Weight Loss. Independent treatment variables not statistically significant in relation to the dependent variable MFWL were exercise, family support, peer support, therapist experience and profession, use of anorectic drugs, competition, treatment and follow-up gender, and follow-up contact. All means across the above independent variables did not differ enough to warrant rejecting the null hypotheses. Among all the nonsignificant means across the independent variables, only a few reported appreciably different values. About a four and a half pound higher MFWL was reported in treatments utilizing professionals as opposed to treatments using non-professional leaders. Higher weight loss at follow-up was reported by those in a structured follow-up program (M=13.94) compared to follow-up treatments that used a combination of structured meetings and assessment only meetings (M=9.09). Falling between these two groups in terms of MFWL are the follow-up treatments where only assessments are made, and no further treatment is given after initial treatment ends (M=12.61).

Significant Maintenance Ratios. Statistical significance was found for the dependent variable MR across the following study characteristics: treatment contact, the use of hypnotherapy, and monetary incentives. The means

across independent variables were significantly different from each other indicating that the null hypothesis was rejected.

Consistent with results from the MPWL and MFWL, the use of hypnotherapy ($\underline{M}$=1.80) resulted in higher maintenance of weight loss than in treatments not using hypnotherapy ($\underline{M}$=.86). The omega^2 value (.222) suggests that 22% of the total variance in the dependent variable can be explained by the use of hypnotherapy. This is a relatively strong effect.

Monetary incentives significantly affect the maintenance of weight loss. More weight loss is maintained when no monetary incentives are used in treatment ($\underline{M}$=1.16) compared to treatments using monetary incentives ($\underline{M}$=.76). Again, this is in agreement with previously reported results from this present study which indicated a statistically significant negative relationship showing less weight loss maintenance occurred with higher amounts paid to participate and higher amounts refunded.

TABLE 10
ONE-WAY ANOVAS OF MAINTENANCE RATIO
ACROSS TREATMENT CHARACTERISTICS

Treatment characteristics	Maintenance Ratio Mean	SD	n	Omega^2
Exercise				
None	1.06	.60	19	
Recommended	.95	.45	45	
Practiced	.70	.24	18	
	p=.052			
Diet				
None	.83	.54	30	
Recommended	.94	.40	46	
>1000 kcals/day	1.18	.52	6	
	p=.240			
Family support				
None	.90	.51	52	
Any	.96	.30	30	
	p=.554			
Peer support				
None	.91	.52	51	
Any	.94	.37	31	
	p=.802			
Therapist experience				
Professional	.97	.53	41	
Non-professional	.93	.42	29	
	p=.782			
Therapist profession				
Professional	.96	.54	38	
Non-professional	.93	.42	29	
	p=.846			
Treatment contact				
Group therapy	.86	.43	69	
Other	1.26	.56	12	
	p=.007*			.077
Anorectic drugs				
None	.93	.47	80	
Any	.52	.12	2	
	p=.229			

TABLE 10 (Continued)
ONE-WAY ANOVAS OF MAINTENANCE RATIO
ACROSS TREATMENT CHARACTERISTICS

Treatment characteristics	Maintenance Ratio Mean	SD	n	Omega^2
Hypnotherapy				
None described	.86	.40	77	
Any described	1.80	.59	5	
	p=.000*			.222
Competition				
None described	.92	.47	81	
Any described	.99	--	1	
	p=.879			
Monetary incentive				
None described	1.16	.46	33	
Any described	.76	.40	49	
	p=.000*			.173
Treatment gender				
All female	1.04	.46	35	
90% female	.83	.56	17	
Mixed genders	.84	.32	24	
	p=.142			
Follow-up gender				
≥ 90% female	1.09	.51	37	
Mixed genders	.83	.29	11	
No follow-up	--	--	--	
	p=.111			
Follow-up contact				
Structured	.97	.36	20	
Assessment	.92	.50	57	
Combination	.35	.03	3	
	p=.102			

* $p < .05$
+ Denotes significant pairwise Scheffe' contrasts

Nonsignificant Maintenance Ratios. Independent variables not statistically significant in relation to the dependent variable MR were exercise, diet, family and peer support, therapist experience and profession, anorectic drugs, competition, gender of treatment and follow-up group and type of follow-up contact. All means across the above independent variables did not differ enough to warrant rejecting the null hypotheses. An interesting result, while not significant, is that more weight loss was maintained for those who did not receive any exercise recommendations during treatment (M=1.06) compared to those receiving recommendations to exercise (M=.95), and those practicing exercise during the treatment sessions (M=.70). Treatments which employed exercise as part of the treatment session reported significantly higher weight loss at posttreatment than the other two categories, and higher but not significant results at follow-up compared to the other two categories. In agreement with results from MPWL and MFWL, treatment groups using diets of $\leq$1000 kcalories per day maintained a higher weight loss (M=1.18) than when no dietary advice was given (M=.83) or when recommendations to reduce intake were given (M=.94).

Chapter 5

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents a discussion of relevant results, followed by conclusions and recommendations.

Weight Loss

A pooled mean posttreatment weight loss of 12.89 pounds (n=6351), and a follow-up weight loss of 12.96 pounds (n=2965) were found. These weight losses were achieved in treatments conducted for an average of 16 weeks and follow-up treatments continuing an average of 43 weeks after initial treatment. Average weight losses per week was .80 pounds at posttreatment and .22 pounds from the beginning of initial treatment to the end of follow-up.

Average weight loss found in this study is comparable to other findings in the literature. Bennett's (1986) reported an overall weight loss of 12.44 pounds in 11.35 weeks for a weight loss per week of 1.09 pounds. Data from five review studies (Murray, 1975, Jeffery, Wing and Stunkard, 1978, Foreyt and Kondo, 1984, Brownell and Wadden, 1986, and Brownell and Jeffery, 1987), showed average weight losses per week in a range of .9 to 1.4 pounds. The average weight loss per week of .86 pounds, reported in the present study falls at the low end of the range for studies in general.

Literature reviews, from which comparable weight loss figures were obtained, included only published articles. Brownell and Jeffery (1987) suggested there is publication bias where studies reporting low weight loss may not be accepted for publication. This, along with the knowledge that reviews cited in this paper did not include results from unpublished research, may explain the slightly lower weight loss per week reported in the present study.

Another reason for the lower weight loss per week in this study may be due to the studies which included dropouts in the final data analysis. Inflated treatment results may occur when dropouts are not included in the final statistics. A majority of the time weight loss is calculated on the completers only. In this meta-analysis 14 treatments included all subjects' data in the final analysis. While this is a relatively small number compared to the total treatments not including dropouts (n=96) (20 treatments had no dropouts), it may contribute to the lower figure for weight loss per week.

Correlation Analysis

Significant Mean Posttreatment Weight Loss Correlations

A positive relationship was found between MPWL and treatment duration in weeks (r=.457, n=125, p=.000). A similar relationship (r=.64, n=191, p=<.001) was reported by Bennett (1986). Perri, Nezu, Patti and McCann (1989)

studied the effects of treatment duration on weight loss and found that subjects in treatment lasting 40 weeks lost a significant amount of weight, and those receiving the same treatment in a 20 week period gained a nonsignificant amount of weight. Thirty-two weeks later both groups had gained weight, however, subjects in the extended group maintained a significantly greater amount of weight loss than the 20 week group. While studies show weight loss per week remains relatively stable, it appears that the longer participants are exposed to behavioral treatment the more overall weight they will lose and maintain for a longer period.

A positive association was found between MPWL and number of treatment contact hours (r=.55, n=82, p=.000). Similarly, Bennett (1986) found a positive and equally strong correlation between these two variables (r=.56, n=148, p<.001). The higher hours are more a result of increased treatment duration in weeks than more hours per treatment session. It is generally accepted that most treatments meet in groups lasting one to two hours per session (Jeffery, Wing, & Stunkard, 1978; Kalodner & DeLucia, 1990; Stunkard & Berthold, 1985).

The amount of dollars clients paid to participate was positively associated with MPWL. The strength of this relationship was moderate (r=.37, n=128, p=.000). Jeffery, Gerber, Rosenthal, and Lindquist (1983) studied weight loss between individual and group treatments employing monetary

contingencies of varying sizes. While not statistically significant, those receiving higher refunds lost more weight at posttreatment. Jeffery, Bjornson-Benson, Rosenthal, Kurth and Dunn (1984) found significant differences in weight losses between a control group which refunded money contingent on weight loss. Percentage weight change was greater in both groups employing monetary contracts compared to the no monetary control group. Forster, Jeffery, Sullivan and Snell (1985) studied worksite weight control programs using financial incentives deducted from employee's payroll. Treatment types differed by group or individual contact, refund contingent on weight loss, attendance or weigh in, and optional or required attendance. All participants, regardless of treatment type selected between $5 and $30 to be deducted from their monthly paychecks. For the six month program, overall average weight loss was 12.2 pounds while average attrition overall was 21.4%. While not statistically significant, highest weight losses were achieved by those in the self-instructional treatment and those receiving no monetary reward for attendance at weigh-ins.

A weak relationship was found between highest potential refund and MPWL (r=.25, n=128, p=.000). Results from Jeffery, Gerber, Rosenthal, and Lindquist (1983) showed that MPWL was greater for individuals receiving higher refunds. One reason for this weak relationship may be that refunds

are often given for behaviors other than weight loss, i.e. completing required work such as self-monitoring forms or refunds, or attending follow-up sessions. Refunded money given late in the program may have more effect on attendance and an indirect effect on weight loss because people are staying in the program to receive their monetary reward.

As expected, MPWL was positively associated with follow-up weight loss (r=.65, n=83, p=.000). This fairly high correlation suggests that subjects losing high amounts of weight during treatment will show a higher weight loss at follow-up. Brownell and Kramer (1989) suggested that individuals who lose higher amounts of weight initially, may have increased motivation to keep the weight off longer than those experiencing minimal initial weight losses. The authors also stated that higher initial weight losses increase the likelihood for maintenance over a longer period of time.

Significant Follow-Up Weight Loss Correlations

The strength of the relationship between MFWL and treatment duration in weeks (r=.27, n=83, p=.007), and hours of treatment contact (r=.31, n=58, p=.008) are both somewhat weak. This suggests that more weeks of treatment does not affect weight loss at follow-up to any large degree. The relationship for both these independent variables was stronger with MPWL suggesting that more contact during

treatment, while it increases initial weight loss, does not have a strong affect on follow-up weight loss.Bennett (1986) also found that MFWL was associated with these two variables but at a lesser degree than was MPWL. Likewise, the present study showed treatment duration in weeks and contact hours to have had a weaker association to follow-up than to treatment weight loss. The relationship between follow-up weight loss and MPWL has been discussed previously.

Significant Maintenance Ratio Correlations

There was a weak negative relationship between MR and year in which the study was published (r=-.25, n=82, p=.012) and follow-up duration in weeks (r=-.27, n=82, p=.006). Evidence to support lower maintenance with longer follow-up durations comes from a review by Brownell and Jeffery (1987) which reported follow-up weight loss from behavioral interventions with follow-up durations of one or more years. Follow-up results obtained from one to five years posttreatment showed a tendency towards gradual weight gain at each subsequent yearly follow-up assessment. As is commonly known, weight gain occurs after most treatments end. Brownell and Jeffery (1987), and Brownell and Wadden (1986) reported a marginal increase in mean posttreatment weight loss per week between the years 1974 and 1986 coupled with an increase in follow-up weight loss for these same years. The fact that these two sets of values have changed

and that the trend is toward longer follow-up periods, (Brownell & Wadden, 1986; Westover & Lanyon, 1990) may explain the lower MR in more recent years. It is difficult, however, to substantiate this reasoning without knowing if these increased weight losses happened at the same rate. Also, MR is not calculated in other studies which makes the MR results from this study difficult to compare across studies. Bennett (1986) did not find a relationship between follow-up duration in weeks and MR.

The dependent variable MR was negatively related to the independent variables treatment contact hours per week (r=-.33, n=58, p=.006) and to a lesser degree treatment duration in weeks (r=-.21, n=82, p=.028). These relationships suggested that the more contact time, in both hours per week and weeks of treatment, the less weight loss was maintained during a follow-up period. This result was opposite of the effect that contact hours had on MPWL. It appears that more contact is beneficial in producing higher weight losses during the initial treatment phase but does not help to continue the weight loss trend through follow-up. Individuals may get accustomed to contact with their group and therapist. When contact continues over a longer period of time the participant may have a harder time adjusting to maintaining the weight loss after program termination.

Likewise, those who had lower amounts of contact may be better able to adjust once treatment has ended. Bennett (1986) also reported MR affected by contact hours.

A negative correlation was found between MR and dollars paid to participate, and the highest potential refund given. One reason for these negative relationships may be that monetary refunds are often given for treatment goals other than weight loss. A study to support or refute this negative relationship was not found.

There appears to be a weak negative relationship between MR and the mean age of the treatment group (r=-.29, n=61, p=.011). An explanation for this may be in the demographics of the overweight population in the U.S.. Van Itallie (1985) reported that for both genders body weight increased with age, and for women it occurred at a faster rate than for men. Men made up a small overall percent of the total population of subjects included in the present study. The average participant in this study was a 40 year old woman, who, according to Van Itallie's report, are naturally subject to weight gain.

ANOVA

Study Characteristics

Significant Mean Posttreatment Weight Loss Results.

Statistical significance was found between MPWL and the type of treatment setting. Groups held in a hospital or

clinical setting reported the highest average weight loss (M=16.63). Worksite settings reported the lowest amount of weight loss (M=6.61).

Additionally, significant differences were found between those recruited through the media (M=15.93) and those in workgroups (M=6.95). Studies utilizing the media for recruitment showed a greater weight loss than studies recruited within workgroups.

A study by Brownell, Stunkard and McKeon (1985) supports this finding of lower weight loss and noted higher attrition in these groups. Studies conducted by Hermann-Nickell and Baker (1989), Nelson, Sennett, Lefebvre, Loiselle, McClements and Carleton (1987), and Peterson, Abrams, Elder and Beaudin (1985) found weight loss at worksite programs comparable to results from clinical investigations.

Nonsignificant Mean Posttreatment Weight Loss Results. No statistical significance was found between the dependent variable MPWL and the following independent variables: source of article, group assignment, self-reported weight loss, and author status.

Brownell and Jeffery (1987) suggested a publication bias may exist due to reviewers not accepting studies with low weight loss. This present study showed no difference in weight loss between MPWL and articles from published refereed journals (M=14.64), published unrefereed journals

(M=12.07), and dissertations and theses (M=14.06). Additionally, weight loss per week from graduate papers was higher than weight loss per week reported in published papers.

Self-reported weight loss did not show any affect on the outcome of mean posttreatment weight loss. A review on the accuracy of self-reports by Cameron and Evers (1990) reported that self-reports of weight and food intake may not be accurate and using this type of reporting may results in an overestimated treatment effect. Cash, Counts, Hangen and Huffine (1989) found similar results in regard to inaccuracy of self-reported weight loss.

A higher MR was found in studies written by graduate students (M=1.14) compared to those written by Ph.D.'s (M=.67). Participants involved in graduate research reported better maintenance than those in studies authored by Ph.D's. This affect again could be due to the shorter time frame in which the graduate students conducted their research (average follow-up period of 21 weeks compared to 49 weeks by Ph.D's). As the literature points out, studies that do not employ a follow-up period of at least one year are not accepted. Therefore, most researchers conduct longer follow-up periods. Previous studies reported in the literature suggested that the longer individuals are followed after termination of initial treatment, the more weight they gain back.

Treatment Characteristics

Significant Mean Posttreatment Weight Loss. Exercise conducted during the treatment sessions resulted in significantly more weight loss (M=20.05) than when no exercise recommendations were made (M=11.67). The effect of exercise and its benefits on those trying to lose weight is well documented in the literature reviews (Brownell & Jeffery, 1986; Rock & Coulston, 1988; Weinsier, Wadden, Rittenbaugh, Harrison, Johnson & Wilmore, 1894). While many report better long-term weight than short-term weight loss effects from exercise Perri, McAdoo, McAllister, Lauer, and Yancey (1986) found a statistically significant effect for exercise during the treatment phase versus the follow-up phase of a behavioral intervention for weight loss.

The type of dietary advice given had a strong affect on MPWL. Treatments that used a strict diet of $\leq$1000 kcalories per day showed the greatest mean weight loss at the end of treatment (M=32.24), followed by no dietary advice given (M=15.96) and recommendations to reduce kcalorie intake (M=10.86). Interestingly, the MPWL was higher in treatments recommending no dietary changes compared to treatments recommending a decreased in food intake.

Even though no stated recommendations to reduce intake were reported, many of the strategies employed in behavioral interventions deal indirectly with eating. An example of this is the self-monitoring of daily foods eaten. While the

purpose of this exercise is to increase awareness, it may have an indirect effect on food intake. A majority of the treatments in the category "strict diet of ≤1000 kcalories per day" used very low calorie diets (VLCD) as part of the treatment regimen. In a series of three studies (Wadden, Sternberg, Letizia, Stunkard and Foster, 1989, Wadden & Stunkard, 1986; Wadden, Stunkard, & Liebschutz, 1988), the effects of three treatment types (behavior therapy alone, VLCD alone and a combination of the two) were followed to a five year follow-up period. Posttreatment weight loss showed the combined treatment to have a statistically significant higher weight loss than the other two conditions. This result was also found for follow-up results taken at 1 year. At three years follow-up no significance was found between any of the three groups, however, the combination treatment maintained a higher weight loss. At five years the VLCD group showed higher, though not statistically significant, weight loss than either of the two other groups. Results found at follow-up period in this present study are supported by the early results from Wadden and Stunkard (1988).

A statistically significant weak effect was found for use of anorectic drugs and MPWL. Treatments using appetite suppressants ($\underline{M}$=24.21) showed a higher MPWL than those treatments which did not ($\underline{M}$=13.41). Marcus, Wing, Ewing, Kim, McDermott, and Gooding (1990) and Weintraub, Ginsberg,

Stern, Sundaresan, Schuster, O'Connor, and Byrne (1986) reported statistically significant weight loss in groups using behavior therapy in combination with an anorectic drug compared to behavior therapy and a placebo.

Nonsignificant Posttreatment Weight Loss. Treatments that utilized family and peer support showed slightly higher MPWL (M=15.27, M=14.82) than treatments that made no mention of family or peer support (M=13.04, M=13.19). Brownell (1982) reviewed results from studies employing spouse support and found results to be conflicting. A more recent article by Brownell and Kramer (1989) reported similar equivocal results in weight loss with the involvement of spouses. Bennett (1986) found MPWL affected by family support.

Significant Mean Follow-Up Weight Loss. A strong effect was found between MFWL and all three of the dietary components. For both dependent variables (MPWL and MFWL), more weight loss occurred in groups not specifying dietary recommendations as opposed to groups recommending a decrease in intake. Consistent across both indices are the higher weight losses associated with strict kcalorie diets. The overall effect of diet on MFWL is slightly lower than its effect on MPWL. Bennett (1986) found dietary advice to affect both MPWL and to a lesser degree MFWL. Different from this present study, Bennett (1986) found weight loss in

groups giving no dietary advice to be lower than in groups making recommendations to reduce intake.

The independent variable hypnotherapy appears to have a moderate affect on MFWL. The use of hypnotherapy in treatments resulted in a 15 pound difference at follow-up. Limited literature on the results of hypnosis on weight control suggests that in isolated cases respondents respond well to hypnotherapy in the short-term and to a lesser degree in the long-term (Cochrane, 1985). Bolocofsky, Spinler and Coulthard-Morris (1985) reported results from two behavioral groups - one receiving hypnotherapy - one not. At the end of treatment, no statistical significance was found between groups. However, at a 2 year follow-up, the hypnosis subjects reported a statistically significant weight loss compared to the behavior therapy alone group.

Nonsignificant Follow-Up Weight Loss. The present study found therapist profession, therapist experience, family support, exercise and the use of anorectic drugs not statistically different in terms of MFWL. Conversely, Bennett (1986) found therapist experience, family support, exercise, and the use of anorectic drugs to be statistically significant in relation to MFWL. Concerning therapist experience and profession, a study by Brownell et al., (1985) utilized lay leaders in worksite programs and found both attrition and weight loss in professional and lay led

groups to be similar. They reported no statistical difference between these two groups for weight loss and maintenance.

Significant Maintenance Ratios. Statistical significance was found for MR across the following study characteristics: treatment contact, the use of hypnotherapy, and monetary incentives. Bennett (1986) did not report any of these as significantly affecting the MR.

Consistent with results from the MPWL and MFWL, the use of hypnotherapy (M=1.80) resulted in higher maintenance of weight loss than in treatments not using hypnotherapy (M=.86). This result is in agreement with a study by Bolocofsky, Spinler and Coulthard-Morris (1985), who reported statistically significant weight loss at a two year follow-up in a behavioral group employing hypnotherapy compared to a group receiving behavior therapy without hypnotherapy.

Summary and Conclusions

The purpose of this study was to conduct a meta-analysis using a modified version of Bennett's (1986) procedures to determine which components of behavioral weight loss interventions were most indicative of weight loss and maintenance. An extensive search of published and unpublished literature written between the dates January 1, 1985 through March 1, 1991 resulted in 77 articles which met

the inclusion criteria. From these articles, 130 individual treatments were coded. Data were analyzed using ANOVA and Pearson Product Moment Correlations across three dependent variables - mean posttreatment weight loss (MPWL), mean follow-up weight loss (MFWL) and maintenance ratio (MR). Independent variables were 30 treatment and nine study characteristics.

The results of this study were as follows:

1. Average posttreatment weight loss was 12.89 pounds in treatments lasting 16 weeks for an average weight loss per week of .83 pounds per week.
2. Average weight loss from the beginning of initial treatment to the completion of follow-up was 12.96 pounds. Follow-up periods lasted and average of 43 weeks after the completion of initial treatment. Total average weight loss from the beginning of initial treatment to the end of follow-up was .22 pounds per week.
3. Average attrition rates were high; 49% at the end of posttreatment and 32% from the beginning of treatment through the end of the follow-up period.
4. Treatment characteristics positively related to weight loss at posttreatment were: treatment duration in weeks, treatment contact hours, and dietary advice.

5. Treatment characteristics which appeared to have little influence on weight loss were: treatment group size, and age.
6. Treatment characteristics which had the most positive influence on weight loss at follow-up were: hours of treatment contact, weight loss at the end of treatment,adhering to a strict diet of $\leq$1000 kcalories, use of hypnotherapy, and the use of a monetary incentive.
7. Treatment characteristics which appeared to have little influence on follow-up weight loss were: follow-up duration in weeks, hours of follow-up contact, amount paid and refunded as an incentive, group size and age, use of exercise, social support and anorectic drugs.
8. Treatment characteristics which had a negative effect on weight loss maintenance were: higher amounts of dollars paid to participate, higher monetary refunds given, and age of the treatment group. Also, treatment contact other than group settings, the use of hypnotherapy, and monetary incentives resulted in higher maintenance.
9. Treatment characteristics which appeared to have the least affect on the maintenance of weight lost at

posttreatment were: hours of follow-up contact, size and age of the follow-up group, social support, therapist used, and competition.

10. Study characteristics that most positively affected posttreatment weight loss were: treatment setting in a hospital or clinic, and recruitment of participants through the media.
11. Study characteristics negatively related to weight loss at posttreatment included: year in which the study was published, source of article, group assignment, and use of self-reported weight loss.
12. No study characteristics showed statistical significance with follow-up weight loss.
13. Study characteristics most indicative of maintenance of posttreatment weight loss were: year the study was published, source of the article, and recruitment method used.

Based upon these findings the following conclusions were warranted:

1. Behavioral weight loss programs contributed to moderate (approximately 13 lbs) reductions in weight.
2. Treatment duration and number of contact hours appeared to be the primary determinants of posttreatment weight loss, while diet ($\leq$1000 kcalories/day), exercise, monetary incentives, treatment setting (hospital or

clinic), higher level of therapist training, and hypnotherapy have a positive but relatively weaker effect.

3. Competition between groups of participants adversely affected posttreatment weight loss and weight loss maintenance.
4. Bibliotherapy or individual treatments appeared to be more effective than group treatments in maintaining weight loss.
5. High attrition rates occurred during initial treatment.
6. Monetary incentives, while effective during the treatment phase, negatively effected follow-up weight loss.
7. Higher monetary incentives coupled with high potential refunds negatively affected follow-up weight loss, with the net effect of lowering the maintenance ratio.
8. Studies employing control groups reported lower average posttreatment weight losses, however, they reported significantly high maintenance ratios indicating that use of a control group may be more efficacious in treatment outcome.
9. Weight loss results reported in thesis and dissertations were higher than those reported in published studies.

Recommendations for Further Study

The results of this study represent an exploration of potential study and treatment characteristics that may be associated with initial and long-term weight loss. Recommendations based on the conclusions from this study are as follows:

1. Further research is needed to determine factors (e.g., locus of control) contributing to the apparent equivocal effects of competition and monetary incentives on weight loss.
2. Further research on the use of hypnotherapy is needed to determine its effectiveness when used in conjunction with behavioral weight loss strategies.
3. Increased efforts are needed to reduce attrition rates during the initial phase of behavioral weight loss interventions.
4. To avoid inflated weight loss results, individuals who drop out of an intervention prior to completion should be included in the final weight loss calculation.
5. When feasible, control groups should be employed in weight loss research.
6. Future reviews of weight loss research should include the findings from unpublished theses and dissertations.

7. Researchers reporting results of behavioral weight loss programs should look indepth at the innate characteristics (e.g., physiological, psychological, metabolic) of their subjects to help explain why or why not various programs are effective.

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APPENDICES

APPENDIX A

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Wadden, T.A., Sternberg, J.A., Letizia, K.A., Stunkard, A.J. & Foster, G.D. (1989). Treatment of obesity by very low calorie diet, behavior therapy, and their combination: A five-year perspective. International Journal of Obesity, 13(supp 2), 39-46.

Wade, J.B., Hart, R.P., Kirby, D.F., & Mills, P.R. (1988). An evaluation of the Garren-Edwards diet and behavior modification program. GROUP, 12(3), 172-178.

Wing, R.R., Jeffery, R.W. (1984). Sample size in clinical outcome research: The case of behavioral weight control. Behavior Therapy, 15, 550-556.

APPENDIX B

Inclusive Journals

INCLUSIVE JOURNALS

Addictive Behaviors

Advances in Behavior Research and Therapy

American Journal of Clinical Nutrition

American Journal of Health Promotion

American Journal of Public Health

Annual Review of Public Health

Behavior Modification

Behavior Therapist

Behavior Therapy

Behavior Modification

Behavior Research and Therapy

Health Education Journal

Health Education Quarterly

Health Education Research

Health Promotion

Health Psychology

International Journal of Eating Disorders

International Journal of Obesity

Journal of Behavioral Medicine

Journal of Consulting and Clinical Psychology

Journal of Obesity and Weight Regulation

Journal of the American Dietetic Association

Journal of the American Medical Association

Psychological Bulletin

Psychological Record

Psychological Reports

Psychological Review

Public Health Reports

APPENDIX C

Letter to Professionals

Professional
Address
City, State Zip

Date

Dear :

As a graduate student in Public Health at Oregon State University I am conducting my graduate research on behavioral interventions used in the treatment of obesity. More specifically, I am conducting a meta-analysis of behavioral interventions to identify components that appear to be most indicative of successful weight loss and maintenance. As part of the meta-analytic process it is necessary to collect an exhaustive list of published and unpublished research from which results are quantified.

Thus far my search has included several computer data bases, and a hand search of journals not included in the computer data bases. To ensure that I have thoroughly covered the literature I an contacting nationally recognized experts in the field of behavioral interventions for weight loss and asking for their help in providing me with a bibliography of published and unpublished papers on the subject of behavioral interventions for weight loss. I recognize this task could take considerable time and have provided two options which I hope will expedite the process. First, I have included my current bibliography which can be reviewed and added to. A second option is to send an existing bibliography of related research. I am mainly interested in articles from January 1, 1985 to the present; however any list available need not be edited to include only those years. References can be mailed to me at: 4400 NW Walnut #50, Corvallis, OR 97330.

I greatly appreciate any help you can give me. Let me thank you for your time by offering to send you a summary of my research. Please indicate if you are interested, and upon completion I will gladly send you a copy of my summary. Thank you again for your time.

Respectfully,

Nadine M. Schneider Wood

APPENDIX D

Coding Sheet
Code Book

IDENTIFICATION CODE _____ _____ _____

TREATMENT NUMBER _____

YEAR STUDY WAS WRITTEN/PUBLISHED _____ _____

AUTHOR STATUS

PhD	1
MD	2
RN	3
RD	4
other	5
student	6
unknown	9

SOURCE OF ARTICLE

published refereed	1
published unrefereed	2
unpublished, dissertation/thesis	3

TREATMENT SETTING

hospital/clinic	1
worksite	2
community center/site	3
home	4
unknown	9

RECRUITMENT

media/newspaper ads	1
existing weight loss group	2
workgroup	3
referred	4
combination	5
other	6
unknown	9

CONTROL GROUP USED

yes	1
no	2

GROUP ASSIGNMENT

random	1
matching	2
non-equivalent	3
none/not applicable	4
unknown	9

THERAPIST EXPERIENCE

graduate or post graduate student	1
qualified professional	2
lay leader	6
unknown	9

THERAPIST PROFESSION

psychologist	1
dietitian	2
physician/medical practitioner	3
social worker	4
student	5
lay leaders	6
unknown	9

TREATMENT CONTACT

bibliotherapy	1
group therapy	2
individual treatment	3
unknown	9

TREATMENT DURATION IN WEEKS

____ ____

FOLLOW-UP DURATION IN WEEKS

____ ____ ____

HOURS OF TREATMENT CONTACT

____ ____ ____

HOURS OF FOLLOW-UP CONTACT

____ ____ ____

EXERCISE COMPONENT

none described	1
recommendations to increase activity	2
recommendations and exercise conducted/treatment sessions	3

DIETARY COMPONENT

none described 1
recommendations to decrease intake 2
strict guidelines w/energy intake < 1,000 kcals per day 3

FAMILY SUPPORT

none described 1
any described 2

PEER SUPPORT

none described 1
any described 2

ANORECTIC DRUGS PRESCRIBED

none 1
any 2

Hypnotherapy

none 1
any 2

COMPETITION

none 1
any 2

MONETARY INCENTIVE

none 1
any 2

AMOUNT PAID TO PARTICIPATE

$ ____ ____ ____.

HIGHEST POTENTIAL REFUND

$ ____ ____ ____.

MEAN AGE OF TREATMENT GROUP

____ ____ . ____

MEAN AGE OF FOLLOW-UP GROUP

____ ____ . ____

GENDER OF TREATMENT GROUP

all female	1
all male	2
at least 90% female	3
mixed genders	4
unknown	9

GENDER OF FOLLOW-UP GROUP

all female	1
all male	2
at least 90% female	3
mixed genders	4
no follow-up treatment	5
unknown	9

NUMBER ENTERING TREATMENT

____ ____ ____

NUMBER COMPLETING TREATMENT

____ ____ ____

NUMBER ENTERING FOLLOW-UP

____ ____ ____

NUMBER COMPLETING FOLLOW-UP

____ ____ ____

SELF-REPORTED WEIGHT LOSS

yes	1
no	2
follow-up only	3
unknown	9

USE OF DROPOUTS

included in final statistics	1
excluded from final statistics	2
not applicable	3

NUMBER ON WHICH POSTTREATMENT WEIGHT LOSS IS BASED

____ ____ ____

MEAN POSTTREATMENT WEIGHT LOSS

____ ____ . ____ ____

MEAN FOLLOW-UP WEIGHT LOSS

____ ____ . ____ ____

FOLLOW-UP CONTACT

structured program	1
assessment only	2
combination	3
no follow-up	8
unknown	9

NUMBER ON WHICH FOLLOW-UP WEIGHT LOSS IS BASED

____ ____ ____

CODE BOOK

Follow-up duration in weeks
888 = No follow-up
999 = Unknown

Hours of follow-up contact
000 = Assessment only
888 = No follow-up
999 = Unknown

Highest potential refund
999 = Unknown

Mean age of follow-up group
888 = No follow-up group
999 = Unknown

Number entering follow-up
888 = No follow-up
999 = Unknown

Number completing follow-up
888 = No follow-up
999 = Unknown

Mean follow-up weight loss
888 = No follow-up
999 = Unknown

Number on which follow-up weight loss is based
888 = No follow-up contact
999 = Unknown

If 'social support' is mentioned anywhere in the methods code family and peer support as 'any'.

If they do not specify who discontinued treatment do not make assumptions on gender and age of the posttreatment group.

Kg = 2.205lbs

APPENDIX E

SPSS/PC Program Control Statements

```
DATA LIST FILE = 'g:FAT.DAT' FREE/V1 TO V41.
VARIABLE LABELS v1 'Identification code' /v2 'Treatment
number' /v3
'Year study was written/published' /v4 'Author status'
/v5 'Source of article' /v6 'Treatment setting' /v7
'Recruitment'
/v8 'Control group used' /v9 'Group assignment'
/v10 'Therapist experience' /v11 'Therapist profession' /v12
'Treatment contact' /v13 'Treatment duration in weeks'
/v14 'Follow-up duration in weeks'
/v15 'Hours of treatment contact' /v16 'Hours of follow-up
contact'
/v17 'Exercise component' /v18 'Dietary component'
/v19 'Family support' /v20 'Peer support'
/v21 'Anorectic drugs prescribed' /v22 'Hypnotherapy'
/v23 'Competition' /v24 'Monetary incentive'
/v25 'Amount paid to participate' /v26 'Highest potential
refund'
/v27 'Mean age of treatment group'
/v28 'Mean age of follow-up group' /v29 'Gender of treatment
group'
/v30 'Gender of follow-up group' /v31 'Number entering
treatment'
/v32 'Number completing treatment' /v33 'Number entering
follow-up'
/v34 'Number completing follow-up' /v35 'Self-reported
weight loss'
/v36 'Use of dropouts' /v37 'Number for posttreatment weight
loss'
/v38 'Mean posttreatment weight loss'
/v39 'Mean follow-up weight loss' /v40 'Follow-up contact'
/v41 'Number for follow-up weight loss'.
VALUE LABELS v4 1 'PhD' 2 'MD' 3 'RN' 4 'RD' 6 'Student' 5
'Other'
9 'Unknown' /v5 1 'Published refereed' 2 'Published
unrefereed' 3
'Dissertation/thesis' 4 'Article under review' /v6 1
'Hospital/clinic' 2 'Worksite' 3 'Community center/site' 4
'home'
9 'Unknown' /v7 1 'Newspaper ads/media'
2 'Existing weight loss group' 3 'Workgroup' 4 'Referred' 5
'Combination' 6 'Other' 9 'Unknown' /v8 1 'Yes' 2 'No' /v9 1
'Random' 2 'Matching' 3 'Non-equivalent' 4 'None/not
applicable' 9
'Unknown' /v10 1 'Student' 2 'Professional' 3 'Lay leaders'
9
'Unknown' /v11 1 'Psychologist' 2 'Dietitian' 3 'Physician'
4
```

```
'Social Worker' 5 'Student' 6 'Lay leaders' 9 'Unknown'/v12
1
'Bibliotherapy' 2 'Group therapy' 3 'Individual treatment' 9
'Unknown' /v17 1 'None described' 2 'Increase activity'
3 'Conduct in treatment' /v18 1 'None described'
2 'Decrease intake' 3 'Intake <1000 cal/day'
/v19 1 'None described' 2 'Any described' /v20 1 'None
described'
2 'Any described' /v21 1 'None' 2 'Any' /v22 1 'None' 2
'Any' /v23
1 'None' 2 'Any' /v24 1 'None' 2 'Any' /v29 1 'All female'
2 'All male' 3 'At least 90% female' 4 'Mixed genders' 9
'Unknown'
/v30 1 'All female' 2 'All male' 3 'At least 90% Female'
4 'Mixed Genders' 5 'No follow-up' 9 'Unknown' /v35 1 'Yes'
2 'No'
3 'Follow-up only' 9 'Unknown' /v36 1 'included in stats' 2
'excluded from stats' 3 'Not applicable' /v40
1 'Structured program' 2 'Assessment only' 3 'Combination'
8 'No follow-up' 9 'Unknown'.
Missing Value v13(99)/v14 to v16,v31 to v34,v37,v41(999)/
   v25,v26(999.)/v27,v28(99.9)/v38 to v39(99.99).
Compute RATIO=v39/v38.
SAVE outfile = 'dat.sys'.
```