Factors Associated with Successful long-term Weight Loss Maintenance in Women

Renie Del Ponte

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FACTORS ASSOCIATED WITH SUCCESSFUL LONG-TERM WEIGHT LOSS MAINTENANCE IN WOMEN

by

Renie Del Ponte

A Dissertation in Partial Fulfillment of the Requirements for the Degree of Doctor of Public Health in Preventive Care

June 1995
Each person whose signature appears below certifies that this dissertation in his/her opinion, is adequate in scope and quality as a dissertation for the degree Doctor of Public Health.

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ABSTRACT OF THE DISSERTATION

Factors Associated with Successful Long-Term Weight Loss Maintenance in Women

by

Renie Del Ponte

Doctor of Public Health in Preventive Care

Loma Linda University, Loma Linda California, 1995

Dr. Glen Blix, Chairman

Abundant literature exist on interventions for weight loss documenting the existence of a weight loss maintenance problem (Wadden & Bell, 1990; Kayman et al., 1990; Wadden et al., 1989). Very few individuals are successful at maintaining their weight loss for at least two years for reasons that are not clearly understood. This retrospective study examined factors, identified in a review of the scientific literature, shown to be associated with weight loss maintenance. A screening questionnaire was presented to all female patients (n=271) entering physician offices for routine health maintenance care from February 1, 1994 through June 30, 1994. Fifty-three females who had maintained an intentional weight loss of at least 20 pounds for two years within the past 10 years were identified. A comparison group of 45 females who had lost, and then regained at least 20 pounds in the past 10 years was also identified. Study questionnaires were mailed to the 98 eligible females. The
study was based on 56 responses to a questionnaire designed to assess differences in women who were successful at maintaining long-term weight loss (n=29) and those who regained their weight loss (n=27). The overall questionnaire return rate was 57.1 percent: 54.7 percent for maintainers and 60.0 percent for regainers. The two groups were comparable based on demographic and descriptive variables.

Women who were successful at maintaining their weight loss differed significantly from women who regained their weight loss in the following areas: 1. maintainers currently weigh less than regainers and considered their ideal weight to be lower; 2. maintainers attended fewer formal weight loss programs and received less weight loss instruction, received instruction at a commercial program less often, and were more likely to have attended a support group after weight loss; 3. maintainers performed more aerobic activity after weight loss; and 4. maintainers were more likely to have eaten meals at regular times, consumed fewer servings per day of "junk food", snacked less between meals, and snacked less on items such as chips, candy, cookies, and diet soda.

Based on the findings of this study, it appears that successful weight loss maintenance is the result of a multicomponent process which includes perception of ideal weight, a self-help approach to weight loss and attending a support group, regular aerobic exercise, and specific diet-related behaviors.
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CHAPTER 1

Introduction

Statement of the Problem

The prevalence rate of overweight adults has increased from 26 percent in the National Health and Nutrition Examination Survey (NHANES II), conducted between 1976 and 1980, to 34 percent in NHANES III, conducted between 1988 and 1991 (HIH, 1994). Increased body weight is associated with several chronic diseases such as hypertension, diabetes, coronary artery disease, cancer, gout, and gallbladder disease (NIH, 1992; NIH, 1985; Feinleib, 1985), which have been estimated to cost our nation $40 billion yearly (Colditz, 1992). According to Blackburn (1987), health risks related to obesity can be reduced with a modest weight reduction of 10 to 15 percent of body weight.

The National Center for Health Statistics has defined mild obesity as 20-40 percent above desirable body weight, moderate obesity as 41-100 percent above desirable body weight, and severe obesity as 100 percent or more above desirable body weight. According to NIH (1985), an increased body weight of 20 percent or more above desirable body weight constitutes an established health risk. In addition to the increase in overweight individuals, there has also been an increase in the amount of money spent on weight loss. It is estimated that Americans spend $30 billion per year on diet books, programs, videos, foods, pills, devices, and more in an attempt to lose weight (Brownell & Rodin, 1994b).
Despite the high prevalence of obesity and its serious health implications, the success of most weight loss programs appears to only be effective for one year or less for individuals who complete the program (Wadden, Sternberg, Litizia, Stunkard, & Foster, 1989; Goodrick, 1991; Foreyt, 1981). Blackburn et al. (1989) found that the majority of individuals who are successful at losing weight return to their starting weight within two years and Wadden (1989) estimates that within five years almost 100 percent regain all their weight and many regain and exceed their original pre-loss weight.

Many individuals experience repeated bouts of weight loss and regain, known as weight cycling. While there has been no consistent demonstration that weight cycling makes subsequent weight loss more difficult or regain more rapid, it is possible that this does occur under some conditions or in particular individuals (Brownell & Rodin, 1994a). There are more consistent links between body weight variability and negative health outcomes, particularly all-cause morbidity and mortality from coronary heart disease. Weight cycling may also have negative psychological and behavioral consequences; studies document increased risk for psychopathology, life dissatisfaction, and binge eating (Wing, 1992; Blackburn et al., 1989). To assist in decreasing the incidence of weight cycling, increasing our understanding and promotion of weight loss maintenance is an important priority.

The problem, for most individuals, does not necessarily lie in the methods used for initial weight loss, but instead in the maintenance of weight loss. The scientific literature abounds with interventions for weight loss documenting the existence of
weight maintenance problems (Wadden & Bell, 1990; Wadden et al., 1989; Stalones, Perri, & Kerzner, 1984). Effective methods of weight loss maintenance need to be better understood and applied to weight loss and maintenance programs to improve long-term success rates. It is clear that research is needed on methods for successful long-term maintenance of weight loss (NIH, 1992).

**Purpose of the Study**

The purpose of this retrospective study was to examine factors associated with women who were successful at long term (at least two years) weight loss maintenance compared to women who were unsuccessful in maintaining their weight loss. A specific aim of this study was to compare the differences between maintainers and regainers in regards to professional contact, exercise, social support, behavior modification, and diet-related factors.

**Definition of Terms**

For the purpose of this paper the following terms are defined.

**Body mass index (BMI)**

Weight (kilograms) divided by height squared (meters\(^2\)).

**Booster session**

Additional scheduled and structured sessions that take place after the formal program, with a health care professional intended to review and reinforce behaviors learned during the weight loss program (Whisman, 1990).
Change behavior parameters

Directly altering target behaviors related to weight loss (e.g., slow down eating speed, self-regulate exercise).

Cognitive-behavior modification

Changing thinking patterns of the client related to the target behavior of weight loss maintenance (e.g., shift thinking patterns away from thoughts such as “I’ll never be able to do this” to “I can do this if I make the appropriate changes”).

Commercial program

A commercial program was defined for the subjects as a program such as Weight Watchers’ or Jenny Craig.

Contingency management

Rewarding desirable behavioral patterns, or punishing existing undesirable ones, leading to weight loss or maintenance (e.g., receiving a prize for achieving weight loss goals).

Junk Food

Junk food was defined for the subjects as fast food, cookies, cakes, pastries, candy, sodas, chips, french fries, etc.

Long-term weight loss

Maintaining at least 20 pounds of an individual’s initial weight loss for at least two years or more.
Maintenance support

The continuance of therapeutic contact (usually via a phone call or post card) and/or peer support following the conclusion of a formal behavior change program. This differs from booster sessions in that maintenance support does not necessarily include scheduled or structured sessions.

Obesity

Excessive accumulation of body fat for the individual’s age, sex, and height. Typically, 20 percent or more above ideal body weight (Nieman, 1990).

Relapse

A breakdown or setback in a person’s attempt to change or modify a target behavior or a set of behaviors related to weight loss maintenance (e.g., discontinuing an exercise program and/or returning to one’s previous high fat diet).

Self-monitoring

Recording target behaviors and factors associated with those behaviors, their antecedents and consequences (the ABC’s of behavior change) in order to prevent undesirable behaviors from occurring (e.g., food and exercise records, mood and environment associated with overeating).

Stimulus control

Restricting social and/or physical environmental factors associated with undesirable behaviors (e.g., avoiding high fat foods, eating at specific times and places).
Very low calorie diet (VLCD)

A diet typically consisting of 400 to 800 calories per day, providing less than 10 kcal per day per kilogram of ideal body weight (based on the Metropolitan Life Insurance Company, 1983) as compared to the norm of approximately 30 kcal per day per kilogram of ideal body weight. Adequate levels of protein, vitamins, and minerals are included in the VLCD (Atkinson, 1992).

Strengths and Limitations of the Study

This study contains several limitations such as a problem with study design, evaluation apprehension, and generalizability. Attempts to reduce these limitations were incorporated into the study where possible. In spite of these limitations, this study contains several strengths such as cost effectiveness, similar groups, and a good response rate from both groups.

Study Design

This study followed a retrospective design which has several inherent biases. The two main biases are casual influence and subject recall.

Casual Influence. The data in this study was collected after the weight loss and maintenance period; therefore, it is not necessarily clear whether long-term weight loss maintenance was the result of the factors examined in this study or the factors examined in this study were the result of long-term weight loss maintenance. Some behavior changes must have taken place or the maintainers would not have been successful at maintaining their weight loss. However, it is unclear whether the behavior changes that occurred changed the maintainers attributions and perceptions
of their weight loss maintenance or if the maintainers attributions and perceptions of
their weight loss maintenance changed their behaviors.

Subject Recall. Subjects may not accurately recall events that occurred several
years prior to completing the questionnaire (Klein & Rubovits, 1987; Myers, Klesges,
Eck, Hanson, & Klem, 1988). Subjects were asked to recall weight loss that had
occurred up to 10 years prior to the study. The length of time between when subjects
lost or regained their weight and participated in this study varied from two years to 10
years ago (M=2.26 years ±1.96 years). Many study questions referred to the time
period before weight loss, during weight loss, and after weight loss in an effort to
distinguish each time period to assist in clarifying past experiences of the subjects.
The subjects may not have accurately recalled the events that occurred during these
time periods. The subjects memory of the time periods before and during weight loss
may be distorted based on if they were a maintainer or a regainer. The subjects
memory of the time period after weight loss may be somewhat more accurate because
it is more recent but may still be influenced by being a maintainer or regainer. This
limitation however, cannot be completely resolved in any retrospective study. A
retrospective study design does, however, allow for the evaluation of associations
between a single condition, weight loss maintenance, and several possibly related
factors.

Evaluation Apprehension

Subjects may have attempted to present themselves in the manner in which they
think the researcher would like them to appear, especially in reporting "desirable"
behaviors such as eating and exercise habits. Subjects being a maintainer or a regainer may have also influenced the way in which the subjects reported their behaviors. Maintainers may have reported more "desirable" behaviors because they were successful at maintaining their weight loss. An attempt was made to reduce this limitation by informing the subjects that their identity and all information was confidential. Subjects were informed that their results would be entered into the computer as a number only and that their names would not be used. However, this bias cannot totally be overcome in a study such as this.

Generalizability

Results may not be generalizable to a larger population of women due to the overall response rate of 57.1 percent (n=56) and the population from which the sample was drawn, which consisted of women from a clinical practice at a university who have insurance and may therefore have access to better or more health care than the general population. There are also possible differences in characteristics between persons who choose or volunteer to participate in a study and those who do not. Individuals who returned the study questionnaire may differ in characteristics and/or personal habits related to weight loss and maintenance from the individuals that chose not to return the study questionnaire. Due to limited questions on the screening questionnaire, it is unclear how the responders differ from the non-responders. Additionally, differences in characteristics between persons willing to share information about themselves for study purposes and those who are not may affect the results. Individuals that willingly share information on their weight loss maintenance
ability and habits may be different from individuals that are not willing to share. Therefore, there results may not be appropriately applied to the general population. This study looked only at women and therefore cannot be generalized to the male population.
CHAPTER 2

Review of the Literature

Introduction

Abundant literature exists on interventions for weight loss documenting the existence of a weight loss maintenance problem. For example, in a review of behavioral treatment studies for obesity conducted from 1985-1987, Wadden and Bell (1990) found that during the year following treatment, individuals regained an average of 37 percent of the weight they had lost in treatment. Studies with a five-year follow-up suggest that the majority of patients relapsed to their pretreatment weights (Stalonas et al., 1984; Andersen, Stokholm, Backer, & Quaade, 1988; Wadden et al., 1989). Andersen et al. (1988) reported that at a five-year follow-up, only 17 percent of patients maintained 10 kg or more of an original 22 kg weight loss. Wadden et al. (1989) revealed that at a five-year follow-up of a very-low-calorie diet program, subjects had regained all of their weight loss and 55 percent of the subjects had enrolled in a new weight loss program. Fewer studies have been conducted on individuals who have tried to lose weight on their own but the general consensus appears to be that self-treatment is more successful, possibly because 1) individuals in formal programs are likely to be those who are unable or unwilling to help themselves and therefore are more likely to seek professional help; 2) evaluations of formal programs assess success at a single weight loss attempt, whereas lifetime retrospective reports reflect success on any of multiple attempts made over the years; and 3) formal program interventions may be ineffective, making any alternative, such
as self-help, appear to be a relatively successful approach (Schachter, 1982; Colvin & Olson, 1983; 1984; Rzewnick & Forgays, 1987). Very few individuals are successful at maintaining their weight loss for at least two years for reasons that are not clearly understood.

Current weight loss maintenance interventions and methods to enhance long-term weight loss maintenance need to be assessed. This chapter will examine theoretical models related to weight loss maintenance and relapse prevention and provide an overview of several weight loss maintenance interventions. These interventions include: long-term professional contact, exercise, social support, behavior modification, relapse prevention training, self-help intervention, and diet composition.

**Theoretical Models**

Although research on weight loss is rarely based on theory, research on weight loss maintenance has recently been slightly more influenced by theory. The fact that theory is beginning to be applied to the weight loss maintenance area indicates a change in the field of weight loss and maintenance research. This positive change needs to continue as researchers look to theory in designing and assessing interventions. Two theories that have been applied with some success to weight loss maintenance are the Transtheoretical Model and the Relapse Prevention Model.

The Transtheoretical Model proposes that behavior change occurs in a series of specific stages and that common processes of change within each stage transcend a variety of behavioral changes for addictive disorders, including smoking cessation, weight control, and substance abuse management (Prochaska, DiClemente, &
Norcross, 1992; Prochaska, Norcross, & DiClemente, 1994; DiClemente et al., 1991). The stages of change describe when particular shifts in attitudes, intentions, and behaviors are most likely to occur. The processes of change include any activity that an individual initiates to modify their thinking, feeling, or behavior in order to modify their target behavior. This model focuses on the behaviors of individuals (e.g., exercise and diet-related habits) rather than the outcome (e.g., weight control or weight regain) of the behaviors.

The Relapse Prevention Model regards addictive behaviors as over-learned habit patterns and focuses on changing these patterns through the use of self-management and self-control techniques (Marlatt & Gordon, 1985). This theory has stimulated further theoretical development (Brownell, Marlatt, Lichtenstein, & Wilson, 1986), investigations for predictors and determinants of relapse (Kayman, Bruvold, & Stein, 1990), and intervention programs designed to improve weight loss maintenance (Brownell & Rodin, 1990; Perri, Shapiro et al., 1984).

Transtheoretical Model

The Transtheoretical Model proposes that two interrelated dimensions are needed to adequately assess behavior modification in addictive behaviors. The first dimension is called the stages of change and describes how individuals modify addictive behaviors by moving through a series of six stages (Prochaska et al., 1994). These stages are defined by Prochaska et al. (1992) as follows.
Precontemplation. This is a stage at which there is no intention to change behavior in the foreseeable future. This is displayed as lack of recognition of the problem or modification of behaviors associated with an individual’s weight problem.

Contemplation. This is a stage in which people are aware that a problem exists and are seriously thinking about overcoming it within the next six months but have not yet made a commitment to take action. An individual in the contemplation stage would acknowledge they have a weight control problem and begin to think seriously about dealing with it and seek information on how to deal with their weight control problem.

Preparation. This stage combines intention and behavior. Individuals in this stage usually intend to take action to change their behavior within the next month. An individual in the preparation stage may announce "I will stop overeating Monday", and may have already started cutting back on their dietary fat intake.

Action. This is the stage in which individuals take direct action to modify their behavior, experiences, or environment in order to overcome their problem. This stage involves the most overt behavioral changes. An individual in the action stage might remove all desserts from the house and start exercising to address their weight control problem.

Maintenance. This is the stage in which people work to prevent relapse and consolidate the gains attained during action. Maintenance can last for six months to as long as a lifetime. An individual in the maintenance stage might continue diet and
exercise habits that help control their weight problem or may join an ongoing support group to assist them in their efforts.

Termination. This stage is the ultimate goal for the individual. It is when the former problem no longer presents any temptation or threat, the behavior will never return, and the individual has complete confidence that they can cope without the fear of relapse. Some problems can be terminated and others may require a lifetime of maintenance, such as behaviors related to weight loss maintenance. Weight loss maintenance is the individual’s goal, the outcome of the behaviors. The wide range of possible behaviors related to achieving this goal is the focus of this model.

Each stage represents a period of time as well as a set of tasks, related to the processes of change, needed for movement to the next stage. Although the time an individual spends in each stage varies, the tasks to be accomplished are assumed to be consistent. Several studies (DiClemente et al., 1991; Norcross, Prochaska, & DiClemente, 1995; Prochaska & DiClemente, 1984) demonstrate commonalities in how people modify their behaviors, regardless of the type of behaviors that are targeted, and an integration between the stages of change and processes of change.

The second major dimension of the Transtheoretical Model is the processes of change. These processes are related to the stages of change and focus on activities and events that create successful modification of a problem behavior and help move people successfully to the next stage. Each process is a broad category encompassing multiple techniques, methods, and interventions. The following is a list of the nine
major processes of change and a brief definition of each (Prochaska et al., 1994; Prochaska et al., 1992; DiClemente et al., 1991).

**Consciousness raising.** Increasing information about one’s self and one’s problem behavior (e.g., Learning about proper exercise and nutrition for weight loss maintenance).

**Social liberation.** Increasing alternatives for behaviors that are not problematic (e.g., Selection of low fat menu items at a restaurant).

**Emotional arousal.** Experiencing and expressing feelings about one’s problems and solutions (e.g., Role playing to increase awareness and depth of feelings associated with the individuals struggle with weight control).

**Self-reevaluation.** Assessing feelings and thoughts about self with respect to a problem (e.g., The individual deals with how their problem with weight control conflicts with their personal values).

**Commitment.** Choosing and committing to act, belief in ability to change (e.g., The individual acknowledges that they are the only one who is able to control their weight problem and commits, privately and/or publicly, to changing).

**Countering.** Substituting alternatives for problem behaviors (e.g., Start exercising instead of snacking when bored).

**Environment control.** Avoiding stimuli that elicit problem behaviors (e.g., Eating a healthy meal to reduce hunger prior to attending a party where you know there will be a lot of tempting high fat foods).
Reward. Rewarding self, or being rewarded by others, for making desired changes (e.g., Allow self to get a new exercise outfit for reaching a dietary goal).

Helping relationships. Enlisting the help of someone who cares (e.g., Attending a weight loss support group).

Table 2.1 represents the integration occurring among the processes most often used by successful self-changers at different stages of change.

<table>
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<tr>
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<th>Preparation</th>
<th>Action</th>
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<td>Helping</td>
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Most individuals move through the stages of change in a spiral pattern, progressing through the stages then relapsing and regressing to an earlier stage and starting over at that stage. For example, an individual may be in the maintenance stage and doing well with an exercise and diet program and then experience a relapse, stop exercising and begin eating calorically dense foods. This individual may have
regressed to the contemplation stage and will need to progress through this, the preparation, and action stage to get back to the maintenance stage. It is helpful to understand this process in order to appropriately assess individuals in their weight loss maintenance efforts and apply the necessary interventions.

The Transtheoretical Model integrates the stages and processes of change to assist in the understanding of how individuals modify addictive behaviors. This model is potentially helpful in the weight loss and maintenance area because it may help explain the large variation in response to treatment and may permit interventions to be targeted to individuals (Brownell & Wadden, 1992; Rimer, 1990). Individuals are generally at different stages of readiness for weight loss. In a study predicting smoking cessation, Gottleib, Galavetti, McCuan, and McAlister (1990) found that 10 percent to 15 percent of individuals are prepared for action, approximately 30 percent to 40 percent are in the contemplation stage, and 50 percent to 60 percent are in the precontemplation stage. Therefore, a program that is appropriate for an individual in the contemplation stage would not be advisable for an individual in the action stage, as they would be addressing different issues. An effective program developed for an individual in the contemplation stage would address the processes of emotional arousal and self-reevaluation whereas a program for individuals in the action stage would address rewards, helping relationships, countering, and environmental control. Programs should be developed for and targeted to individuals in each stage of change to provide the most benefit to each individual.
One problem in applying this model to weight loss maintenance is that the behaviors that are associated with weight loss maintenance are not a discrete set of behaviors, they tend to vary across individuals and may be difficult and too numerous to assess. This model stresses the importance of assessing the stage of an individual’s readiness for change and tailoring interventions accordingly, building a strong foundation for long-term weight loss maintenance.

Relapse Prevention Model

According to Marlatt and Gordon (1985), relapse prevention is a generic term that refers to a wide range of strategies designed to prevent relapse in the area of addictive behavior change. The Relapse Prevention Model proposed by Marlatt focuses on the use of self-management and self-control techniques and emphasizes the role of beliefs about the course of treatment outcome and the causes of lapses. The goals of the Relapse Prevention Model are to 1) anticipate and prevent the occurrence of a relapse after the initiation of a habit change attempt and 2) to help the individual recover from a slip or lapse before it escalates into a full-blown relapse. Relapse prevention methods are generally applied toward effectively refraining from engaging in the problematic behaviors.

In the relapse process, Marlatt and Gordon (1985) assume that the individual experiences a sense of perceived control (self-efficacy) while maintaining abstinence from the undesirable behavior. The behaviors involved in weight loss maintenance are “under control” as long as behaviors that would contradict these do not occur. The longer the period of success, the greater the individual’s perception of self-
efficacy. This perceived control will continue until the person encounters a high-risk situation. A high-risk situation is defined broadly as any situation that poses a threat to the individual’s sense of control and increases the risk of potential relapse. According to Cummings, Gordon, & Marlatt (1980), three of the most common high risk situations that increase relapse rates are as follows: 1) negative emotional states, which are defined as situations in which the individual experiences a negative, or unpleasant, emotional state, mood, or feelings such as frustration, anger, anxiety, depression, or boredom, prior to or at the time the first lapse occurs; 2) interpersonal conflict, defined as situations involving an ongoing or relatively recent conflict associated with any interpersonal relationship, such as marriage, friendship, family members, or employer-employee relations; and 3) social pressure, which includes situations in which the individual responds to the influence of another person or group of people who exert pressure on the individual to engage in the undesirable behavior.

If a proper coping response to the high risk situation does not occur, the relapse process will begin with a slip, an episode in which the abstinence rule is violated. If an effective coping response occurs, the slip is seen as only a temporary setback. If appropriate coping responses do not occur, the slip may become a full-blown relapse. A relapse occurs when the individual stops trying to follow the abstinence rule and results in failure to lose additional weight and potentially regain weight (Brownell et al., 1986; Perri, McAdoo et al., 1984).

Brownell and Rodin (1990) developed an adaption to long-term weight control based on Marlatt and Gordon’s work (Figure 2.1). The model begins with an
individual's exposure to a high risk situation in which overeating is likely to occur. The individual can then follow one of two paths, depending on whether coping skills have been learned to deal with the risk. Path 1 in the model shows a positive outcome. The individual has the necessary skills to avoid overeating; this prevents a lapse, which in turn increases confidence, which leads to long-term control. Path 2 shows a different outcome. In this case, the individual does not possess the skills and thus lapses; this decreases confidence and leads to more eating. Relapse is usually the final result.

Figure 2.1 THE PROCESS OF LAPSE AND RELAPSE

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<th>No Skills</th>
<th>Initial Eating</th>
<th>Decreased Confidence</th>
<th>Loss of Control</th>
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The Relapse Prevention Model has an important impact in the weight loss maintenance area. It highlights the fact that relapse occurs as a process, that there are both cognitive and behavioral components to the process, and that coping skills form the key junction determining whether a person follows a path with a positive or
negative outcome. This model is helpful in weight loss maintenance, it shows clients that high risk situations do not mean inevitable failure and that learning new coping skills is the key to successful long-term weight control. Practitioners can apply these concepts and develop weight loss maintenance programs that assist clients in learning new coping skills and enhance their effectiveness in weight loss maintenance.

Weight Loss Maintenance Interventions

Many different interventions for weight loss maintenance exist. This section will address several weight loss maintenance strategies which include long-term professional contact, exercise, social support, behavior modification, relapse prevention training, self-help interventions and diet-related factors.

Long-Term Professional Contact

Following formal treatment, many weight loss maintenance strategies include long-term professional contact in order to improve long-term maintenance success. These methods include: booster sessions, therapist contact, and increasing the length of treatment.

In a booster session, the individual returns for additional sessions with a health care professional during the follow-up period to review and reinforce the behavioral changes accomplished during treatment. Additional techniques to assist in the maintenance process are usually not addressed. Booster sessions typically last for one to three years. Whisman (1990) found that booster sessions were successful in helping individuals maintain weight lost during treatment. It appears that, while attending booster sessions, individuals are more likely to continue to practice the
skills learned during therapy. The longer individuals remained in booster sessions, the longer they seemed to adhere to the behaviors recommended by their therapists (Bennett, 1986). However, after the booster sessions ended, most individuals discontinued the use of skills learned during therapy and regained their weight (Bennett, 1986; Whisman, 1990).

In a study that examined the use of booster sessions, Bjorvell and Rossner (1985) conducted a study in which treatment for severe obesity (BMI > 29 for women and > 30 for men) included a combination of techniques such as behavioral modification, exercise, nutrition counseling, and booster sessions. Weight loss treatment lasted for six weeks and was followed by booster sessions which continued for a period of four years. At the end of the four year follow-up period the mean sustained weight loss for 68 severely obese subjects was 12.6 kg or 27 percent of the mean overweight before treatment. In a long-term follow-up (10-12 years) of this study, Bjorvell and Rossner (1992) were able to contact 72 percent of the initial participants. They found that the mean weight loss for this group was 10.6 kg. This was not significantly different from the results at the end of the four year program. The subjects, therefore, were successful at long-term maintenance of their weight loss during treatment. The researchers feel that the sustained period of booster sessions made the subjects feel responsible for their weight and eating behavior which led to the long-term success with weight loss maintenance.

Studies show that individuals who were contacted by a health professional either in person or by telephone lost more weight and sustained the weight loss compared to
those not contacted (Jeffery & Wing, 1979; Spevak, 1981). Perri, Shapiro et al. (1984) found that a posttreatment contact strategy of having patients mail weight-related monitoring data to their therapists, and having the therapists telephone patients to discuss continued efforts at weight control, enhanced the maintenance of weight loss in groups that received behavior therapy and relapse prevention education but did not improve maintenance in groups that only received behavior therapy. This finding led researchers to conclude that relapse prevention education (training in coping strategies and supervised practice in application of those strategies) is a necessary component of a weight loss maintenance program. In another study, Perri et al. (1987) found that a seven month posttreatment program of biweekly therapist-led problem-solving sessions produced significantly greater maintenance of weight loss compared with a peer-support program and a no-contact condition. This posttreatment progress was, however, limited to the time period during which the subjects were under therapist supervision. Following the conclusion of the maintenance program, the subjects regained weight and experienced the same pattern of relapse as the subjects in the peer-support and control conditions. These results imply that successful weight loss maintenance only lasts as long as there is continued therapist supervision.

In a review of 105 obesity treatment studies, Bennett (1986) found that the duration of treatment was the most important factor associated with weight loss. Bennett speculated that the longer a treatment continues, the longer its participants adhere to the behaviors necessary for weight loss. Studies conducted by Wadden et
al. (1994) and Perri et al. (1988) had similar results. These researchers found that subjects who lost weight on a 1,200 kcal per day diet generally maintained their weight losses while they continued to attend treatment sessions. However, subjects regained their weight after treatment. In their study, Perri, Nezu, Patti, and McCann (1989) found that extending the length of treatment from 20 to 40 weekly sessions significantly improved weight loss. Individuals in the 40 week group increased their weight loss by 35 percent. At a 72-week follow-up both the 20-and 40-week groups had begun to regain their weight. The 40-week group however, had maintained a significantly greater net weight loss than the 20-week group did. These results indicate that after individuals conclude their active involvement in obesity treatment, they typically abandon weight loss strategies and begin to regain weight.

Long term professional contact such as booster sessions, therapist contact, and increasing the length of treatment appear to have beneficial effects on weight loss and maintenance. These beneficial effects, however, tend to last only as long as the interventions. Such findings suggest that obesity should be conceptualized and treated as a chronic condition requiring ongoing long-term care (Jeffery, 1987).

Exercise

Exercise is associated with long-term weight loss maintenance (Haus, Hoerr, Mavis, & Robison, 1994; Kayman et al., 1990; Calvin & Olson, 1984; Marston & Criss, 1984; Pavlou, Krey, & Steffee, 1989). Vigorous exercise was one of the main behaviors related to weight maintenance reported by a group of 54 individuals who had lost at least 20 percent of their body fat and had successfully maintained the loss
for two years (Colvin & Olson, 1983). Kayman et al. (1990) found that 90 percent of individuals who had reduced their initial weight by 20 percent or more and maintained the loss exercised regularly (at least three times a week for $\geq 30$ minutes), as compared with only 34 percent of relapsers. A study conducted by Pavlou et al. (1989) determined that individuals on a calorie-restricted diet and exercise program had an initial weight loss similar to a calorie-restricted diet only group. However, at a 6, 18- and 36-month follow-up the diet-only group had returned to their pretreatment weight whereas the diet and exercise group had maintained their initial weight loss. Sikand, Kondo, Foreyt, Jones, and Gotto (1988), in a two-year follow-up of a very-low-calorie diet program, found that people in an exercise group had less weight regain (58.2% regain) as compared with a non-exercise group (95.8% regain). A study by vanDale, Saris, and tenHoor (1990) found that all subjects who maintained their exercise program or began one during follow-up were successful in sustaining weight loss at 26 months. Over 70 percent of those who had not exercised during treatment or who had ceased to exercise during follow-up regained at least 75 percent of their lost weight.

King and Tribble (1991) reviewed several studies on long-term weight loss and maintenance after exercise alone, diet alone, or diet plus exercise. The researchers found that average weight losses over follow-up intervals of from six months to three years were 4.9 kg in five exercise studies, 4.0 kg in four diet studies, and 7.2 kg in three diet-plus-exercise studies, suggesting that exercise in addition to diet may be more effective than diet or exercise alone in weight loss and maintenance. However,
one study (Perri et al., 1988) found that high-frequency exercise (180 min/week) was not maintained at 12- and 18-month follow-ups. The researchers felt this was due to the program's stringent exercise requirements. At the 12- and 18-month follow-up, these participants also reported a significant decrease in overall adherence to the weight loss maintenance program, possibly due to negative feelings about their inability to maintain the exercise requirement.

Foreyt and Goodrick (1984) found that obese individuals who were allowed to self-regulate the intensity of their exercise sessions, maintained their exercise habit longer than obese individuals that were asked to exercise at a prescribed intensity. Self-regulated intensity makes exercise a self-reinforcing behavior. Bailor, McCarthy, and Wilterdink (1990) found that the effects of high-intensity (80-90% of peak VO₂) and low-intensity (40-50% of peak VO₂) exercise on the magnitude and composition of calorically induced body mass loss were not different. However, the subjects in the low-intensity group tolerated the exercise much better than the high-intensity group. The researchers concluded that the level of exercise intensity to include in an exercise and diet program should be decided by the dieter, but suggested that low-intensity exercise may be more appropriate.

Substantial evidence shows that a program of regular exercise is a key factor to promoting sustained weight loss (Pavlou et al., 1989; vanDale et al., 1990; Haus et al., 1994; Kayman et al., 1990) and self-regulating the intensity of exercise may increase exercise adherence (Foreyt & Goodrick, 1984; Ballor et al., 1990).
Social Support

Social support appears to play an important role in long-term weight loss maintenance. Perri, McAdoo et al. (1984) reported that structured social support through peer self-help maintenance groups enhanced the maintenance of weight loss at a 21-month follow-up. Participants in the self-help maintenance groups were instructed to monitor each other’s weight, to use praise to encourage weight loss progress, and to utilize group problem solving when an individual was experiencing difficulties in their weight loss efforts. Another study (Kayman et al., 1990) found that individuals who were successful in keeping weight off after participating in a behavior modification treatment program were more likely to have a strong sense of social support. These investigators found that more maintainers sought support or help in dealing with their problems from family, friends, and professionals than did relapsers. Additionally, more relapsers reported that they had fewer people available for support or help with their problems than did maintainers. Brownell and Wadden (1986) found that family interactions were important in the long term success of obesity treatment. Patients who were supported by their families tended to experience fewer temptations to overeat, be protected from emotional upset, and practiced weight control behaviors more regularly. However, studies involving a spouse as social support have had contradictory results (Black, Gleser, & Kocyers, 1990; Jeffery, Bjornson-Benson, Rosenthal, Lindquist, Kurth, & Johnson, 1984; Dubbert & Wilson, 1984). On the one hand, patients treated in several studies by a conventional reducing diet and spouse involvement lost more weight and kept it off than those
treated with diet alone (Pearce, LeBow & Orchard, 1981; Rosenthal, Allen, & Winter, 1980). However, later replications of these studies (Brownell & Stunkard, 1981; Wing, Marcus, Epstein, & Jawad, 1991) did not reveal a significant difference between groups with spousal support and groups without spousal support.

In a meta-analytic evaluation of 13 studies of couples weight loss programs, researchers found that couples programs were significantly (p < .05) superior to subject-alone programs at posttreatment (Black et al., 1990). In the meta-analysis, a nearly statistically significant (p = .06) superiority for couples programs versus subject-alone programs was also found across studies at a three month follow-up, but not thereafter. Black et al. (1990) felt that partners can reinforce skills acquired during treatment, listen to concerns, help in problem solving, and support the weight reducer in resisting pressures to deviate from a therapeutic regimen. In support of findings by Black et al. (1990) studies by several researchers (Brownell et al., 1978; Israel & Saccone, 1979; Murphy et al., 1982) found that couples groups were superior to standard behavioral therapy groups in maintaining weight loss at a 12 month follow-up. Murphy et al. (1982) reported that their couples group had maintained their weight losses at a two year follow-up, whereas the behavior modification only group had not. The results of these studies indicate that the length of time that couples programs are effective varies greatly.

Social support has been shown to play an important role in long-term weight loss maintenance (Perri, McAdoo et al., 1984; Kayman et al., 1990). However, the exact mechanisms and details for the role social support plays in maintenance of long-term
weight loss have yet to be defined and need to be investigated further. Support from family members has also been shown to improve weight loss maintenance (Brownell & Wadden, 1986). However, support from spouses has revealed conflicting results (Black et al., 1990; Wing et al., 1991; Pearce et al., 1981). Couples programs appear to have great promise for aiding in weight loss maintenance efforts, but this potential has not yet been realized or demonstrated consistently and further study is needed to determine the most effective use of couples programs.

Behavior Modification

The goal of behavior modification in obesity management is to help obese individuals identify and modify inappropriate eating, exercise, and thinking habits that contribute to their weight problem (Wadden & Bell, 1990). Behavior modification has several key characteristics. First, it is goal-directed. The individual specifies clear goals that are easily measured. Second, treatment focuses on changing behaviors as opposed to the dynamics underlying behavior. For example, treatment would emphasize recording food intake rather than exploring unresolved conflicts. Third, treatment is process-oriented, helping individuals to determine what they want to accomplish as well as how to accomplish it (Wadden & Foster, 1992). A variety of treatment components such as self-monitoring, stimulus control, contingency management, social influence, changing behavior parameters, cognitive-behavioral modification, and maintenance support are incorporated into many behavior modification programs (Wadden & Goodrick, 1993). Behavior modification encompasses a wide variety of interventions applied to several different eating and
exercise regimens. It is, therefore, difficult to assess the unique effect of behavior modification on weight loss and maintenance (Foreyt et al., 1981).

Behavior therapy in combination with a very-low-calorie-diet (VLCD) has been extensively studied. In an effort to improve VLCD maintenance results, several researchers have included behavior therapy as part of their programs (Wadden & Stunkard, 1986; Kirschner, Schneider, Ertel, & Gorman, 1988; Kern, Trozzolino, Wolfe, & Purdy, 1994). The combination of various behavioral treatment techniques and VLCD has had some success. Wadden et al. (1989) conducted a study in which they found that 32 percent of the subjects in a VLCD and behavior therapy treatment maintained their end-of-treatment weight losses at a one year follow-up as compared to only five percent of subjects receiving VLCD only. At a five-year follow-up, however, the majority of subjects in both groups had returned to their baseline weight. Hovell et al. (1988) assessed weight loss maintenance for 400 subjects at 18 to 30-months following treatment with both behavior therapy and a VLCD. The subjects who completed the program (45%) lost a mean of 83.9 percent of their weight but regained an average of 59 to 82 percent of their initial weight loss by the 30-month follow-up.

Kirschner et al. (1988) conducted a study of the use of VLCD combined with behavior therapy with 4,026 (2,876 women, 1,150 men) severely obese patients. Analysis revealed that 25 percent dropped out within the first three weeks. Of the remaining patients in the program, 68 percent lost considerable weight, but did not reach their goal; of this group, only 5-10 percent maintained their weight loss after 18
months. Thirty-two percent of the subjects successfully reached their goal weight, and 30 percent of the successful women and 58 percent of the successful men maintained their weight loss for a minimum of 18 months. Kern et al. (1994) found similar results. In a retrospective analysis of long-term weight maintenance of obese patients in a program consisting of a VLCD and behavior modification, Kern et al. (1994) determined that 61 percent of patients were able to keep off at least 50 percent of the weight lost in the weight control program at an 18 month follow-up.

Nunn, Newton, and Faucher (1992) reported on the "Weight Control for Life!" program, a behavior modification program which integrates several components: nutrition education; physical activity; stress management; cognitive-restructuring; relapse prevention; social support; intensive, on-going maintenance; self-monitoring; and the use of a medically supervised VLCD. Their findings indicated that individuals on the "Weight Control for Life!" program appear to do better in maintaining their losses at 2.5 years post weight loss than those in other published studies (e.g., Wadden et al., 1989; Hovell et al., 1988). In their study, men and women regained an average of 25 percent of their losses at one year and 48 percent at 2.5 years after treatment. Flynn and Walsh (1993) found that a program combining diet, exercise, behavioral modification, and a VLDC was initially effective and lead to a maintained weight loss of 10 percent or more in 33 percent of patients at 30 months after program entry. They observed that longer attendance and regular exercise helped to maintain the weight loss.
Individuals who maintain their weight losses are more likely than relapsers to continue to monitor their weight and food intake and to engage in other behaviors typically taught in behavior modification programs (Kayman et al., 1990; Perri et al., 1986, 1988). Kayman et al. (1990) found that 57 percent of maintainers compared to 29 percent of controls had changed to good eating habits and 57 percent of maintainers and 38 percent of controls had reduced their intake of high-fat foods. In the same study, 87 percent of maintainers and 76 percent of controls monitored their body weight.

Behavior modification is intended to help obese individuals identify and modify inappropriate eating, exercise, and thinking habits. It is an effective way to produce modest weight losses and possibly maintain the losses. Behavior modification also appears to be a useful adjunct to VLCD treatments. Obesity is increasingly seen as a chronic condition; behavior modification will play an important role in the continuing care model for obesity by helping individuals to modify their inappropriate behaviors (Foreyt & Goodrick, 1991).

Relapse Prevention Training

Relapse prevention, according to Marlatt and Gordon (1985), is "a self-management program designed to enhance the maintenance stage of the habit-change process" (p. 3). The goal of relapse prevention is to teach individuals, who are trying to change their behavior, how to anticipate and cope with the problem of relapse.

Marlatt and Gordon (1985) recommend several strategies to include in relapse prevention training. First, individuals need to be trained to recognize and identify
situations that pose a high risk for relapse. Second, individuals need training in
problem solving as a means of generating coping strategies for high risk situations.
Third, individuals need practice in coping with actual high risk situations. Finally,
individuals need to be trained in cognitive strategies to overcome guilt feelings and
the sense of failure often associated with slips.

Kayman et al. (1990) found that weight regain (relapse) was frequently attributed
to negative emotional states and unexpected or unpredictable stressful life events.
Researchers applying the relapse model have shown that relapses are induced by high
risk situations. Cummings et al. (1980) evaluated 311 relapse episodes in individuals
treated for alcohol and drug abuse, compulsive gambling, and overeating. High risk
situations were found to involve negative emotional states, such as depression and
anxiety, and interpersonal situations, such as watching others engage in the forbidden
behavior. In a study conducted by Schlundt, Sbracco, and Bell (1989) three basic
categories of high-risk situations which lead individuals to either overeat or eat an
unexplained meal emerged. These high risk situations include: positive social
interactions (meals with friends, social events), negative emotions (loneliness,
anxiety), and physiological craving (hunger). There were individual differences in
determinants of relapse such as the likelihood to overeat or exposure to various high
risk situations, suggesting that relapse prevention programs must be individualized to
meet each person’s needs.

Rogers and Hill (1989) found that simply being exposed to the sight and smell of
palatable food was sufficient to cause a loss of motivation for dieting in many
individuals; and felt that the anxiety produced by the temptation may cause a loss of self-control and interfere with any attempts to use rational, cognitive methods of relapse prevention.

There are numerous behaviors related to relapse in weight loss maintenance which makes it difficult to determine as compared to the more discrete behaviors of smoking or drinking. Relapse prevention training helps to establish the development of posttreatment strategies that enhance individuals long-term coping skills. During the posttreatment period, virtually all individuals will experience some form of lapse. With the proper training, individuals will be prepared with appropriate coping techniques to view their slips as learning experiences and be able to avoid them through appropriate coping responses in the future.

Self-Help Interventions

Relatively little is known about individuals who change their personal behavior without the aid of a formal program. Schachter (1982) attempted to address the self-help issue in a study of individuals who had stopped smoking and/or had lost weight and kept it off. He interviewed the entire membership of two groups (83 members of the Department of Psychology at Columbia University, and 78 entrepreneurs and working people from a resort community on Long Island) to avoid subject self-selection. These groups reported substantially higher rates of success with both smoking cessation and weight loss than that found in the literature. Among men, 67 percent of those who tried to lose weight were successful and after 13.4 years, were 39.1 pounds lighter than when they began their weight loss regimen. Among women,
58 percent were successful with their weight loss and are on average 29.0 pounds lighter than when they started their weight loss program 8.3 years earlier. Schachter concluded that the self-cure rate was two to three times higher than that reported for formal programs.

Three explanations were given by Schachter for the presumed superiority of a self-help approach. First, persons in formal programs are likely to be individuals who are unable or unwilling to help themselves and therefore seek help. Second, evaluations of formal programs assess success at a single attempt, whereas lifetime retrospective reports reflect success on any of multiple attempts made over the years. Finally, formal program interventions may be ineffective, making any alternative, such as self-help, appear to be a relatively successful approach. In a replication of Schachter's study with 92 members of the Department of Psychology at the University of Vermont, similar results were reported by Rzewnicki and Forgays (1987).

Schachter's methods of data collection, sample selection, and methods have been criticized by several researchers (Jeffery & Wing, 1983; Osberg, 1983; Prochaska, 1983). One researcher (Osberg, 1983) commented that the subjects examined by Schachter were not comparable to treated groups nor representative of the obese population at large. A majority of Schachter's subjects were male (59%) and most subjects in treatment outcome studies are female (approximately 90%). Also, Schachter studied only employed persons or psychology students, omitting a substantial portion of the population that does not work outside the home. Jeffery and Wing (1983) felt that Schachter's estimates of the frequency of successful weight loss
appeared to overestimate the success of self-treatment when compared with data from larger and more general population bases.

In support of Schachter's findings, a study conducted by Levy and Williamson (1988) determined that more than one-half of the people who lost weight were able to do so without the aid of an organized program. Colvin and Olson (1983) also found that over one-half of their subjects who were successful at weight loss did so without the help of a structured program. Among 4,000 employed people in the Midwest, Jeffery, Adlis, and Forster (1991) found that 47 percent of the men and 75 percent of the women had dieted but that only 6 percent of the men and 31 percent of the women had ever done so in an organized weight loss program. Brownell and Roden (1994b) report that in a survey of more than 20,000 readers of Consumer Reports magazine, of those who reported losing a significant amount of weight and maintained the loss, 72 percent had done so on their own, compared with 20 percent who used commercial programs, 3 percent using diet pills, and 5 percent in hospital- or university-based programs. These results may be biased, however, due to the type of individuals who respond to this type of questionnaire and may not reflect behavior of the general population. Data on the effectiveness of weight loss and maintenance approaches other than hospital- or university-based programs virtually do not exist. Therefore, to generalize from the small percentage of people who participate in randomized trials in hospital or university settings to all dieters is highly questionable.

Several studies examined the characteristics of individuals who seek treatment for obesity and those who do not. Fitzgibbon, Stolley, and Kirschenbaum (1993)
examined behavioral and psychological differences in obese individuals seeking treatment, obese individuals not seeking treatment, and non-obese individuals. 

Subjects had to be a minimum of 20 percent over ideal body weight to be included in the obese category. The groups differed on degree of obesity: the group seeking treatment averaged 63 percent overweight compared with 46 percent overweight of the individuals not seeking treatment. Compared with obese individuals not in treatment, obese individuals seeking treatment had higher binge-eating (5% and 25-50%, respectively) and borderline-personality scores (Bruce & Agras, 1992), which itself can interfere with treatment. These differences suggest that those who seek treatment are more distressed and may have more difficulty in standard behavioral and commercial weight-loss treatments than would be anticipated (Fitzgibbon et al., 1993), they are generally a more difficult group to deal with which may be why they seek help in the first place rather than implementing a self-help intervention. These results were similar to those reported by Fitzgibbon and Kirschenbaum (1991) who found that individuals seeking treatment had higher distress levels than those not seeking treatment. It is possible that individuals who do not seek formal treatment may be more successful at weight loss and maintenance due to the fact that they are less overweight, have lower distress levels, and display less of a problem with binge eating.

Relatively little is known about why self-help interventions may be more successful than formal programs in weight loss maintenance. It appears that many individuals are successful at maintaining their weight loss on their own and that
individuals who seek help through a formal program tend to display differences in personality and behaviors compared to individuals who do not seek help. These differences were not a focus of my study. However, these characteristics should be considered when researching and reporting on weight loss maintenance.

**Diet Composition**

Diet composition can play a role in weight loss and weight loss maintenance. The greatest potential effect of diet composition occurs not during weight reduction but during maintenance of a reduced body weight. In a study conducted by Haus et al. (1994) researchers found, at a 42 month follow-up, weight loss maintainers consumed less total fat and had a lower percentage of energy from fat than regainers. The researchers concluded that fat intake was inversely proportional to relative weight changes. This study was consistent with findings from a longitudinal study by Klesges, Klesges, Hadock, and Eck (1992) in which the most consistent predictor of body mass and body weight change in both men and women was the percent of calories from fat in the diet. Prewitt et al. (1991) determined that the consumption of a low-fat, high-carbohydrate diet for 20 weeks resulted in small but significant reductions in body weight and fat and a small increase in lean body mass. Another study (Dreon, Frey-Hewitt, Ellsworth, Williams, Terry, & Wood, 1988) found that the consumption of total fat, saturated fatty acids, and monounsaturated fatty acids was positively related to body fatness whereas the intake of total carbohydrate, fiber, and plant protein was negatively correlated.
A study by Thomas et al. (1992) was designed to determine whether alterations in the fat-carbohydrate ratio of the diet produced measurable changes in total energy expenditure, the composition of fuel oxidized by the body, and the total amount of energy consumed. The results of this study suggest that a high fat diet, when compared to a high carbohydrate diet, promotes obesity in humans. This may be due to the fact that there was a greater total energy intake on a high fat diet than on a high carbohydrate diet. Additionally, human's ability to increase fat oxidation in response to increased fat intake is less than their ability to increase carbohydrate oxidation in response to increased carbohydrate intake (Thomas et al., 1992). Horton et al. (1993) found that under conditions of positive energy balance, the amount of body fat stored is proportional to the fat content of the diet. The researchers suggest that this condition occurs because dietary fat does not promote its own oxidation, as do protein and carbohydrate, and because the efficiency of storage of dietary fat as body fat is very high (> 95%). These results provide evidence that high fat diets promote obesity in humans and that lowering an individual's intake of dietary fat will have a beneficial effect on weight loss maintenance.

Hill, Drougas, and Peters (1993) conducted a review of current literature to investigate how diet composition can influence body weight regulation. They concluded that the effect of diet composition is likely to be greatest after the weight-loss phase of obesity treatment. After weight reduction, maintenance energy requirements are reduced due to a reduction in body mass. A successful weight loss regimen results in a disproportionate loss of fat (compared with lean) mass, therefore,
the composition of the maintenance diet must be lower in fat. Less dietary fat is required to maintain a reduced body fat mass. Prevention of weight regain requires permanently reduced total energy intake to match the new maintenance energy requirement and reduced fat intake to match the reduced fat oxidation due to the decrease in body fat mass.

Diet composition appears to play a role in weight-loss maintenance. Decreased levels of fat in the diet are associated with decreased levels of body fat (Haus et al., 1994; Klesges et al., 1992; Prewitt et al., 1991; Horton et al., 1993). Hill et al. (1993) reported that diet composition most likely plays a greater role in weight-loss maintenance as opposed to weight-loss. Therefore, individuals who are aware of and control the composition and quantity of their dietary intake, to include reduced levels of dietary fat, will most likely be successful with long-term weight loss maintenance.

Conclusion

Although the data on various weight loss interventions are not very encouraging in terms of factors that predict weight loss maintenance, work on multicomponent and long-lasting maintenance programs have begun to show some positive results (Perri et al., 1988; Jeffery, 1987). Wolfe (1992) stated that weight goal attainment should be thought of more as a beginning point than an end point in the weight management process. While the dieter may diet successfully by following a well-defined set of rules, maintenance requires the individual to effectively cope with the infinite variety of situations which comprise a lifetime. Obesity has typically been treated as if it were an acute illness. It may, however, be more appropriate to view obesity as a
chronic condition similar to cardiovascular disease or diabetes which require continuous monitoring by individuals and their health care provider. After reviewing numerous studies on weight loss and maintenance, Perri, Sears, and Clark (1993) concluded that "obesity should be viewed as a disease that, similar to diabetes or essential hypertension, may never be cured. Rather, obese individuals must seek to keep their condition under control through active efforts at self-management for the rest of their lives" (p. 207). With this in mind, efforts to treat obesity should include not only individual interventions but also interventions such as lowering community and national levels of fat consumption through education and attitude change (Kramer, Jeffery, Forster, & Snell, 1989).

The fact that most people attempt to lose weight on their own, with books, or in self-help programs as opposed to participating in formal weight loss programs should be kept in mind when interpreting results and attempting to generalize to the general population. It also appears that the types of individuals seeking treatment vary from those who do not seek treatment in many aspects, such as the degree to which they are overweight, binge-eating behavior and borderline personality scores (Fitzgibbon et al., 1993). This implies that individuals that seek treatment are generally a more difficult group to deal with which may be why they seek help in the first place rather than implementing a self-help intervention.

Foreyt and Goodrick (1991) conducted an overview of several studies to determine factors common to successful treatment of obesity. They found that individuals who regain their weight cite eating for emotional reasons, lack of exercise,
and inadequate social support. Individuals who were successful felt their success was due to a continuing sense of well being, emotional satisfaction, changes in body shape, perceived improvements in health, weight loss, satisfaction of self-accomplishment, enjoyment of group meetings, and support of family and friends. These findings should be considered in research and program development in weight loss and maintenance in hopes of increasing successful weight loss maintenance rates.

More research needs to be conducted to determine the effectiveness of commercial and self-help weight loss programs and to determine successful weight loss maintenance strategies. Several authors suggest that further assessment of individuals who maintain weight loss over long periods of time needs to be conducted to determine whether their behavior differs from those who regain their weight (Hoiberg, Berard, Watten, & Caine, 1984; Wadden et al., 1989; Hovell et al., 1988; Brownell & Wadden, 1992; Wolfe, 1992). The knowledge gained from this type of research can be used to evaluate different weight loss and maintenance treatments, and offer innovative and more effective treatments.

Long-term maintenance of weight-loss appears to be a difficult achievement for most overweight individuals. Many individuals, however, are successful. Factors that appear to play a role in long-term weight-loss maintenance include: long-term professional contact, exercise, social support, behavior modification, relapse prevention training, self-help interventions, and diet modification.

The research presented in this paper examines factors that appear to be associated with long-term weight loss maintenance, based on past research, and to determine
differences between weight loss maintainers and regainers. This was done by
surveying women who had lost at least 20 pounds in the past 10 years and comparing
the results of women who had maintained at least 20 pounds of their initial weight
loss for at least two years with those who were not successful at maintaining their loss
(regainers).
CHAPTER 3

Method

Subjects

A screening questionnaire (Appendix A) was presented to 271 female patients entering physician offices (Family Practice and OB-GYN Loma Linda University Faculty Medical Group) for routine health maintenance care from February 1, 1994 through June 30, 1994. The screening questionnaire was used to identify 53 females who had maintained an intentional weight loss of at least 20 pounds for two years within the past 10 years. A comparison group of 45 females who had lost but not maintained (regained) at least 20 pounds of their initial weight loss in the past ten years was also identified. Individuals who lost weight associated with illness or pregnancy were excluded from the study. Individuals that did not speak English were also excluded from the study.

Development of Study Questionnaire

The study questionnaire (Appendix B) was developed and pilot tested as a project of a Health Survey Methods class at Loma Linda University School of Public Health. Class members were asked to develop two to three questions pertaining to topics given to them by the researcher. The questions were refined for clarity after discussing them in class. The questionnaire focused on different facets of personal practices, social factors, and life experiences thought to be associated with success or failure in weight loss and maintenance based on a review of current literature. Class members pilot tested the questionnaire on 65 individuals. Pilot subjects were non-
randomly selected and consisted of family and friends of the class members who were known to be overweight or known to have been overweight in the past. The questionnaire was then reviewed by the researcher and revised based on comments made by the pilot testing subjects. Subsequently the revised questionnaire was pretested on 15 individuals who were or had been participating in a weight loss program to further determine clarity and validity.

Consent and Ethics

The Institutional Review Board for Human Studies (IRB) approved the study on January 4, 1994 (Appendix C). Informed consent was incorporated as part of the screening questionnaire. The Loma Linda University Guidelines for Written Consent were followed to assure that all necessary information was given to participants.

Data Collection

Addresses for subjects that were successful at maintaining their weight loss and those that regained their weight were obtained from the screening questionnaires. After receiving the screening questionnaire and determining subject eligibility, the study questionnaire was mailed to both groups. Ninety-eight individuals were deemed eligible for the study and were mailed a questionnaire (53 maintainers, 45 regainers). Table 3.1 shows the response rates for study participants. The overall questionnaire return rate was 57.1 percent. The questionnaire return rate was 54.7 percent for maintainers and 60.0 percent for regainers. Eighteen successful maintainers and 15 regainers completed and returned the questionnaire in direct response to the initial mailing. If the study questionnaire was not returned within one month of mailing the
non-respondents received a phone call to urge them to complete and return the questionnaire. A second study questionnaire was mailed if necessary. After the first phone call, nine maintainers and eight regainers returned their questionnaire. The remaining 48 non-respondents received a second phone call to prompt them to return the questionnaire. An additional two maintainers and four regainers returned their questionnaire after the second phone call.

Table 3.1. Response Rates of Study Participants

<table>
<thead>
<tr>
<th>Contact</th>
<th>Maintainers</th>
<th>Regainers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questionnaires mailed out</td>
<td>53</td>
<td>45</td>
</tr>
<tr>
<td>Initial mailing</td>
<td>18 (33.9%)</td>
<td>15 (33.3%)</td>
</tr>
<tr>
<td>First phone call/mailing</td>
<td>9 (16.9%)</td>
<td>8 (17.8%)</td>
</tr>
<tr>
<td>Second phone call/mailing</td>
<td>2 (3.8%)</td>
<td>4 (8.9%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>29 (54.7%)</td>
<td>27 (60.0%)</td>
</tr>
</tbody>
</table>

The non-respondents consisted of 24 maintainers and 18 regainers. Ten individuals (10.2%) who were non-respondents refused to participate (5 maintainers and 5 regainers), 10 (10.2%) could not be reached by phone (6 maintainers, 4 regainers), and the remaining 22 (22.4%) individuals (13 maintainers, 9 regainers) simply did not return their questionnaire. Returned questionnaires were coded numerically to assure anonymity.

Data Analysis

Analysis was done comparing two groups (maintainers and regainers) to determine key variables that distinguish between them. Data were entered into a computer using the Statistical Package for the Social Sciences (SPSS) with double
entry to assure accuracy. Frequencies were run for each of 222 variables. Comparisons were first made on demographic characteristics to determine comparability between maintainers and regainers, and possible factors to control for in further analyses. T-tests for independent samples were done on interval-level data, Chi-square tests were performed on categorical variables, which are nominal data and the non-parametric Mann-Whitney tests were done on ordinal data comparing maintainers and regainers for all variables. Mann-Whitney is a non-parametric test used to compare two independent groups when the observations are ranked. The actual data values are replaced with a rank. The mean rank is the sum of the ranks divided by the number of cases. The Bonferoni correction factor controls overall error rate by setting the error rate for each test to the experimentwise error rate divided by the total number of tests and was used where appropriate. A standard statistical significance level of $p \leq .05$ was used for all initial analyses prior to the Bonferoni correction factor.
CHAPTER 4

Results

This chapter presents the findings of this study. Descriptive data will be presented first followed by factors that distinguish maintainers from regainers.

Descriptive Data

Descriptive data for the maintainers and regainers are presented in Table 4.1. Maintainers and regainers did not differ on most of the descriptive variables. Maintainers were slightly older (42 years) than regainers (38 years). Maintainers had lost slightly more weight (37.6 lbs) than regainers (31.5 lbs). A statistically significant difference was found between maintainers and regainers for current weight and for the percent of weight loss was regained. This was expected since subjects were categorized as maintainers or regainers based on these variables. The maintainers regained an average of 39.5 percent of their weight loss and regainers gained back 107.5 percent of their initial weight loss making them heavier on average than their initial weight.

Maintainers and regainers differed in terms of what they thought their ideal weight should be. Maintainers perceived their ideal weight to be significantly less (129.8 lbs) than regainers (141.2 lbs). Ideal weight was determined by taking the midpoint of the weight range established by the Metropolitan Life Insurance Company weight tables (1983). Actual ideal weights for the maintainers and regainers were 121.7 pounds and 123.3 pounds respectively. This indicates that the difference in

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perceived versus actual ideal weight was 8.1 pounds for maintainers and 17.9 pounds for regainers, demonstrating that both groups over-estimated their ideal weight.

There were no significant differences between maintainers and regainers in the areas of education level, household income, smoking (13.8% vs. 14.8%, respectively), alcohol consumption (33.3% vs. 17.2%, respectively), hours of television watched (group total of 49 hrs/day vs. 50 hrs/day, respectively), and dependence on God for weight loss or maintenance (65.5% vs. 66.7%, respectively). The maintainers and regainers were similar in terms of the amount of weight lost, the number of months since the end of their weight loss period to the time the study questionnaire was completed, and number of overweight household members. Maintainers reported losing 20 pounds or more fewer times than the regainers: 6.9 percent of the maintainers lost 20 pounds five or more times compared to 25.9 percent of the regainers. Maintainers lost their initial 20 pounds more slowly than the regainers: 20.7 percent of maintainers took more than six months as opposed to 11.1 percent of the regainers. Maintainers paid slightly less for their weight loss program than regainers. However, the median value for both maintainers and regainers in relation to the amount of money spent on their weight loss program was a range from $250 to $499. The occurrence of stressful life events after weight loss was greater for maintainers (1.45/person) than for regainers (1.04/person). The differences in all of the above areas, however, were not significant.
Table 4.1. Descriptive Data for Maintainers and Regainers.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Maintainers (n=29)</th>
<th>Regainers (n=27)</th>
<th>Test Statistic (d.f.)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M age</strong></td>
<td>38 yrs. (10.81)</td>
<td>42 yrs. (7.75)</td>
<td>t(54)=1.52</td>
<td>0.134</td>
</tr>
<tr>
<td><strong>M height</strong></td>
<td>64.40 in. (2.31)</td>
<td>64.76 in. (2.90)</td>
<td>t(54)=0.52</td>
<td>0.605</td>
</tr>
<tr>
<td><strong>M starting weight</strong></td>
<td>179.9 lbs. (39.9)</td>
<td>181.7 lbs. (38.5)</td>
<td>t(54)=0.17</td>
<td>0.869</td>
</tr>
<tr>
<td><strong>M lowest weight</strong></td>
<td>139.7 lbs. (32.2)</td>
<td>150.2 lbs. (29.2)</td>
<td>t(54)=1.27</td>
<td>0.208</td>
</tr>
<tr>
<td><strong>M current weight</strong></td>
<td>155.8 lbs. (34.9)</td>
<td>183.2 lbs. (39.8)</td>
<td>t(54)=2.74</td>
<td>.008*</td>
</tr>
<tr>
<td><strong>M weight loss</strong></td>
<td>37.6 lbs. (23.8)</td>
<td>31.5 lbs. (16.9)</td>
<td>t(54)=-1.09</td>
<td>0.279</td>
</tr>
<tr>
<td>Number of times lost 20 lbs or more (mean rank)</td>
<td>25.41</td>
<td>31.81</td>
<td>U=302.0</td>
<td>0.133</td>
</tr>
<tr>
<td>Months since end of wt loss</td>
<td>29.9</td>
<td>27.1</td>
<td>t(54)=-.37</td>
<td>0.714</td>
</tr>
<tr>
<td>Time to lose first 20 lbs (mean rank)</td>
<td>29.26</td>
<td>27.69</td>
<td>U=369.5</td>
<td>0.687</td>
</tr>
<tr>
<td><strong>M % of weight loss regained</strong></td>
<td>39.5%</td>
<td>107.5%</td>
<td>t(54)=-5.50</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>Overweight household members</td>
<td>0.793</td>
<td>1.259</td>
<td>U=297.0</td>
<td>0.102</td>
</tr>
<tr>
<td>Considers ideal weight to be</td>
<td>129.8 lbs.</td>
<td>141.2 lbs.</td>
<td>t(54)=2.67</td>
<td>.010*</td>
</tr>
<tr>
<td><strong>M education level</strong></td>
<td>3 yrs. college</td>
<td>1.5 yrs. college</td>
<td>$\chi^2$(1,55)=1.9</td>
<td>0.164</td>
</tr>
<tr>
<td><strong>M household income</strong></td>
<td>$45,000/yr.</td>
<td>$53,000/yr.</td>
<td>U=322.5</td>
<td>0.254</td>
</tr>
<tr>
<td>Occurrence of stressful life events after wt loss (mean rank)</td>
<td>30.78</td>
<td>26.06</td>
<td>U=325.5</td>
<td>0.26</td>
</tr>
<tr>
<td>Cost of wt loss program (mean rank)</td>
<td>19.71</td>
<td>21.09</td>
<td>U=182.0</td>
<td>0.704</td>
</tr>
</tbody>
</table>

Note. Values enclosed in parentheses, in the first two columns, represent standard deviation. Mann-Whitney (U) is used for ordinal data, actual data values are replaced with a rank. Mean rank is the sum of the ranks divided by the number of cases. Bonferoni correction factor = .003.

*Statistically significant at $\leq .05$ level.
Factors Related to Weight Loss Maintenance

This section addresses findings in the areas of professional contact, exercise, social support, behavior modification, and diet-related factors.

Professional Contact

Table 4.2 presents information related to professional contact for maintainers and regainers. For the purposes of this study professional contact included contact with a physician, nurse, dietitian/nutritionist, or a commercial weight loss program counselor. No differences were found in the number of times maintainers and regainers were advised by their doctors to lose weight (31 vs. 34, respectively). Weight loss instruction or formal program attendance differed between maintainers and regainers. The maintainers attended a program or received instruction for weight loss from a health professional less often than the regainers (58.6% vs. 81.5%, respectively). Maintainers received weight loss instruction from commercial programs less often than regainers (24.1% vs. 70.4%, respectively), which suggests that maintainers were more likely to have lost weight on their own rather than relying on formal programs. Of those who attended a formal program, maintainers attended more sessions than regainers (32.6 vs. 13.6, respectively), but this difference was not significant, due in part to the large standard deviation in formal program attendance. The median cost range of the formal programs attended by the maintainers and regainers was $250 to $499 for both groups. The maintainers, however, paid slightly less for the programs they attended (approximately $337.00 vs. Approximately $387.00, respectively).
### Table 4.2. Professional Contact Related to Weight Loss Maintenance

<table>
<thead>
<tr>
<th>Variable</th>
<th>Maintainers (n=29)</th>
<th>Regainers (n=27)</th>
<th>Test Statistic (d.f.)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attend program or receive instruction (mean rank)</td>
<td>23.76</td>
<td>33.59</td>
<td>( U = 254.0 )</td>
<td>.017*</td>
</tr>
<tr>
<td>Percent of individuals that received instruction from commercial program</td>
<td>24.1%</td>
<td>70.4%</td>
<td>( \chi^2(1,39) = 7.38 )</td>
<td>.006*</td>
</tr>
<tr>
<td>( M(s.d.) ) number of group sessions attended</td>
<td>32.6(44.2)</td>
<td>13.6(13.2)</td>
<td>( t(24) = -1.62 )</td>
<td>.118</td>
</tr>
<tr>
<td>Cost of program (mean rank)</td>
<td>19.71</td>
<td>21.09</td>
<td>( U = 182.0 )</td>
<td>.704</td>
</tr>
</tbody>
</table>

Note. Numbers in parentheses, in the first two columns, indicate standard deviation. Mann-Whitney \( (U) \) is used for ordinal data, actual data values are replaced with a rank. Mean rank is the sum of the ranks divided by the number of cases. *Statistically significant at \( \leq .05 \) level.
Exercise

There was no difference in strength training and/or weight lifting exercise activities of the maintainers and regainers. Strength training activities were performed two to three times per week by 27.6 percent of the maintainers and 22.2 percent of the regainers. Also, no differences were found in the time of day that subjects usually engaged in exercise activities, which was between the first and last meal of the day for both groups. The maintainers engaged in significantly (U=229.0, p=.006) more aerobic exercise, such as brisk walking, jogging, or bicycling for at least 15 to 20 minutes per session, after weight loss than did the regainers. More maintainers engaged in aerobic exercise at least two times per week than regainers (86.2% vs. 59.2%, respectively), as well as at the level of three times per week or more (65.5% vs. 44.4%, respectively).

Social Support

Items related to social support and weight loss maintenance are presented in Table 4.3. The maintainers and regainers did not differ significantly in the support they reported they received from their spouse, children, parents, friends, or support groups during or after weight loss. Both groups reported they received support from at least three persons. To determine the amount of support each individual received, a total support score was created. This was done by assigning a value to each response when asked how much support the individual received from each of five categories of social support. A response of “none” was set at zero points, “moderate” equaled one point, and “a lot” was assigned a value of two points. The
values for each person were summed to create their total support score. A paired t-test determined that a significant difference did not exist between the total support score within the maintainer and regainer groups.

After weight loss, the maintainers attended a support group more often than did the regainers (21% vs. 4%, respectively). The majority of both maintainers and regainers attended weight loss programs or received instruction without the support of their spouse or significant other (76.5% and 65.2%, respectively). Perceived acceptance of the study participant’s weight, from their spouse or significant other, did not differ for maintainers or regainers. When asked if their spouse or significant other accepted their weight, the study participants responded by indicating “not well”, “somewhat”, “well”, or “very well” (80.4% vs. 72.2% indicated well or very well, respectively). Their responses were given a rank and a mean rank for each group was determined.
Table 4.3. Social Support and Weight Loss

<table>
<thead>
<tr>
<th>Variable</th>
<th>Maintainers (n=29)</th>
<th>Regainers (n=27)</th>
<th>Test Statistic (d.f.)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>M total support score during weight loss</td>
<td>3.58(2.92)</td>
<td>3.29(1.96)</td>
<td>t(54) = -.43</td>
<td>.667</td>
</tr>
<tr>
<td>M total support score after weight loss</td>
<td>3.03(2.67)</td>
<td>2.88(2.21)</td>
<td>t(54) = -.22</td>
<td>.825</td>
</tr>
<tr>
<td>Support group attendance after weight loss (mean rank)</td>
<td>30.88</td>
<td>25.94</td>
<td>U = 322.5</td>
<td>.048*</td>
</tr>
<tr>
<td>Acceptance from spouse (mean rank)</td>
<td>20.11</td>
<td>20.82</td>
<td>U = 191.0</td>
<td>.861</td>
</tr>
</tbody>
</table>

Note. Values enclosed in parentheses, in the first two columns, indicate standard deviation. Mann-Whitney (U) is used for ordinal data, actual data values are replaced with a rank. Mean rank is the sum of the ranks divided by the number of cases.
*Statistically significant at the ≤ .05 level.

Behavior Modification

No significant differences were found between the maintainers and regainers in their keeping record of diet, exercise, and caloric intake during (31.0% and 40.7%, respectively) or after (13.8% and 0.0%, respectively) weight loss. There was a significant difference between the amount of record keeping done during and after (31% to 13.8% and 40.7% to 0.0%, respectively) weight loss within the maintainers (U=227.0, p=.047) and the regainers (U=332.0, p = <.001) groups. Both maintainers and regainers indicated that they changed the way they ate (100% and 92.6%, respectively) and increased their physical activity (82.8% and 88.8%, respectively) during their weight loss. However, differences between maintainers and
regainers were not statistically significant.

Diet-Related Factors

Diet-related information is presented in Table 4.4. There were several significant findings on diet-related factors. Maintainers (79.3%) ate more meals at a regular time after weight loss than regainers (51.8%). The maintainers ate fewer servings of "junk food" per day after weight loss compared to the regainers (1.8 servings vs. 2.3 servings, respectively). Prior to weight loss the maintainers consumed 3.8 servings of “junk food” per day compared to the regainers who consumed 2.8 servings. Although both groups decreased the number of servings of “junk food” they consumed per day, the maintainers decreased more (3.8 servings to 1.8 servings vs. 2.8 servings to 2.3 servings, respectively) than the regainers. After weight loss, the maintainers snacked between meals less often than the regainers (1.5 snacks/day vs. 2.2 snacks/day, respectively). The maintainers snacked less often than the regainers on the following foods: chips, candy, cookies, and diet soda. There was no difference between maintainers and regainers in the amount of snacking on fruit and vegetables (62.0% vs. 55.6%, respectively). No difference between the maintainers and regainers in their perception of the average number of calories they consumed per snack (177.8 vs. 203.8, respectively) existed. There were very few respondents in either the maintainer (n=7) or regainer (n=5) groups who followed a VLCD for weight loss or maintenance (overall = 21.4%) making it difficult to detect a significant difference, if any, between the two groups.

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Maintainers (n=29)</th>
<th>Regainers (n=27)</th>
<th>Test Statistic (d.f.)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular meal times after weight loss (mean rank)</td>
<td>33.07</td>
<td>23.59</td>
<td>U = 259.0</td>
<td>.023*</td>
</tr>
<tr>
<td>Junk food consumption before weight loss (mean rank)</td>
<td>31.40</td>
<td>25.39</td>
<td>U = 307.5</td>
<td>.139</td>
</tr>
<tr>
<td>Junk food consumption after weight loss (mean rank)</td>
<td>23.45</td>
<td>33.93</td>
<td>U = 245.0</td>
<td>.006*</td>
</tr>
<tr>
<td>Snack between meals after weight loss (mean rank)</td>
<td>23.38</td>
<td>34.00</td>
<td>U = 243.0</td>
<td>.006*</td>
</tr>
<tr>
<td>Snacked on chips, candy, cookies after weight loss</td>
<td>34.5%</td>
<td>66.6%</td>
<td>$\chi^2(1,55) = 5.79$</td>
<td>.016*</td>
</tr>
<tr>
<td>Snacked on diet soda before weight loss</td>
<td>20.7%</td>
<td>48.1%</td>
<td>$\chi^2(1,55) = 4.70$</td>
<td>.030*</td>
</tr>
<tr>
<td>Snacked on diet soda after weight loss</td>
<td>44.8%</td>
<td>59.2%</td>
<td>$\chi^2(1,55) = 3.72$</td>
<td>.053*</td>
</tr>
<tr>
<td>Snacked on fruit &amp; vegetables after weight loss</td>
<td>62.1%</td>
<td>55.5%</td>
<td>$\chi^2(1,55) = .245$</td>
<td>.620</td>
</tr>
<tr>
<td>Perceived average calories per snack</td>
<td>177(131)</td>
<td>203(107)</td>
<td>t(54) = 0.81</td>
<td>.388</td>
</tr>
<tr>
<td>Followed a VLCD</td>
<td>24.1%</td>
<td>18.5%</td>
<td>$\chi^2(1,55) = .262$</td>
<td>.608</td>
</tr>
</tbody>
</table>

Note. Values enclosed in parentheses, in the first two columns, indicate standard deviation. Mann-Whitney (U) is used for ordinal data, actual data values are replaced with a rank. Mean rank is the sum of the ranks divided by the number of cases. Bonferroni correction factor = .005.

*Statistically significant at $\leq .05$ level.
CHAPTER 5

Discussion

A major problem faced by individuals who succeed in losing weight is that the majority cannot maintain these losses (CSA, 1988). Very few are successful at maintaining their weight loss for two years or more for reasons that are not clearly understood. The purpose of this retrospective study was to investigate factors associated with long-term weight loss maintenance by comparing responses to a questionnaire in women who maintained their weight loss with women who regained their weight. This chapter will discuss the results of this study, as well as the implications for the field of preventive care. Areas that will be addressed include a description of the study sample and differences between maintainers and regainers in the areas of professional contact, exercise, social support, behavior modification, diet-related factors and stressful life events.

Description of Study Sample

For the purpose of this study, maintainers were defined as women who had maintained a weight loss of at least 20 pounds of their initial weight loss for at least two years; regainers were women who lost at least 20 pounds or more but did not maintain the loss for at least two years. The maintainers and regainers were comparable in all areas of demographic data examined. The comparability of the maintainers and regainers was striking, indicating that differences found on the main study variables were likely not due to demographic differences between the two groups.
There was a significant difference between the current weight of maintainers (155.8 lbs) and regainers (183.2 lbs), which was expected as subjects were categorized into the two groups based on whether they maintained their weight loss and since initial weights were similar in both groups. Starting weight and the lowest weight achieved between the maintainers (181.7 lbs and 150.2 lbs, respectively) and regainers (179.9 lbs and 139.7 lbs, respectively) were also quite similar. The maintainers lost more weight than regainers on average (37.6 lbs vs. 31.5 lbs) but this difference was not significant. The difference in the percent of weight lost that was gained back by the maintainers and regainers was significant, as expected. The maintainers regained 39.5 percent of their weight lost and the regainers gained back 107.5 percent of their weight loss, indicating that most individuals will gain back some weight and that regainers may gain back additional weight, beyond their starting weight. Only three (10.3%) of the maintainers did not gain back any of their initial weight loss. This is consistent with the findings of Wadden and Bell (1990), who found that during the year following treatment, individuals regained an average of 37 percent of the weight they had lost. Studies with a five year follow-up suggest that the majority of individuals relapsed to their pretreatment weights and in many cases gained additional weight (Anderson, Stockholm, Backer, & Quaade, 1988; Wadden et al., 1989).

These studies support the findings of my study for the regainers but not the maintainers. In my study, 51.2 percent of the subjects were successful at maintaining their weight loss for at least two years. This difference may be due to the fact that
the weight loss maintenance criteria for this study was for individuals who were successful for two years as opposed to the more stringent criteria of five years, and/or the population looked at in this study was derived from a clinical practice at a university. Perhaps subjects in my study were not followed for a long enough time after their initial weight loss; the average length of time since weight loss to the study period for the maintainers was 2.5 years. There were, however, seven maintainers (25.9%) in my study who had maintained their weight loss for at least five years.

The only descriptive variable in which a significant difference existed between maintainers and regainers was their perception of what their ideal weight should be. The maintainers thought their average ideal weight was 129.8 pounds and the regainers thought their average ideal weight was 141.2 pounds. Actual ideal weight for the maintainers was 121.7 pounds and 123.3 pounds for the regainers. This indicates a difference of 8.1 pounds for the maintainers and 17.9 pounds for the regainers. It is unclear whether the subjects perception of their ideal weight influenced their weight loss maintenance/regain, or if their weight loss maintenance/regain influenced their perception of what their ideal weight should be. This difference may also be due in part to the regainers attempting to rationalize their weight regain and allowing themselves to weigh more.

Factors Related to Weight Loss Maintenance

Many factors were hypothesized to be related to weight loss maintenance based on past research. This section discusses the results of this study in the areas of
professional contact, exercise, social support, behavior modification, and diet-related factors.

The Influence of Professional Contact

Fewer maintainers (44.8%) than regainers (51.8%) reported that their doctors had advised them to lose weight, though this difference was not significant. Maintainers increased their length of treatment by reportedly attending more group sessions, during weight loss, with other overweight individuals than did the regainers (M = 32.6 vs. M = 13.6, respectively). This difference was not statistically significant, in part due to a large standard deviation. Fewer maintainers (34.5%) attended these group sessions compared to regainers (59.3%), but the fact that the maintainers who attended group sessions also attended a greater number of sessions probably influenced their ability to maintain their weight loss. Several studies (Whisman, 1990; Bennett, 1986; Bjorvell & Rossner, 1992) report that continued participation in group sessions after weight loss increases success at long-term weight loss maintenance. My study did not determine if the group sessions attended by maintainers and regainers were part of a formal or informal. This information would be helpful in determining which type of program and what characteristics of these programs were beneficial in aiding long-term weight loss maintenance. My study also did not inquire about the nature of the group sessions attended. It is unknown if the group sessions attended were similar to a booster session in which behaviors learned during weight loss are reviewed and reinforced or if new information related to the individuals coping skills and/or the appropriate processes of change were addressed.
Maintainers (24.1%) received weight loss maintenance instruction from commercial programs significantly less often than the regainers (70.4%). Maintainers also were less likely to attend a program (58.6%) or receive instruction for weight loss from a health professional than regainers (81.5%). Maintainers tended to seek weight loss and maintenance advice from physicians and dietitians (34.5% of maintainers vs. 22.2% of regainers) as opposed to commercial programs, the latter of which was the preferred choice of the regainers. These results imply that maintainers are more likely to lose weight and maintain their losses on their own compared to regainers who rely more heavily on health professional and commercial programs. My results support findings of Schachter (1982), who found that individuals were two to three times more likely to lose weight and maintain the loss on their own as compared to participating in a formal program. My results were also similar to results reported by Kayman et al. (1990) who found that most maintainers (83%) reported that they did not want help, that help from others for their weight-control efforts was not an issue for them, and that weight control and food intake were their own concerns. In contrast, only 36 percent of regainers did not want help. Results of Kayman et al. (1990) imply that maintainers may have higher self-efficacy for weight loss maintenance to begin with and may make fewer external attributions (e.g., their doctors, a program) for their success at losing and maintaining their weight. This issue will need further research to clarify the role of self-efficacy in weight loss maintenance.
When working with individuals to enhance weight loss maintenance, it appears that extending the length of the program would be beneficial in increasing the chances for successful weight loss maintenance (Whisman, 1990). Maintainers apparently prefer to deal with their weight loss and maintenance on their own, as opposed to participating in a commercial program or seeking advice from a health professional (Kayman et al., 1990). This implies that individuals who maintain their weight loss may have higher self-efficacy and may attribute their weight loss and maintenance to personal factors under their control and to fewer external attributions such as their doctors or a weight loss program.

The Importance of Regular Aerobic Exercise

Past research demonstrates that aerobic exercise is an important part of a weight loss maintenance program and results from my study support those findings. Maintainers performed significantly more aerobic exercise after weight loss than did regainers: 86.2 percent of maintainers and 59.3 percent of regainers reported that they engaged in aerobic exercise at least two times per week; 65.5 percent of maintainers and 44.3 percent of regainers reported engaging in aerobic exercise at least three times per week. This result is similar to findings by Kayman et al. (1990) who found that among individuals who had reduced their weight by 20 percent or more, 90 percent of weight maintainers performed aerobic exercise regularly (at least three times a week for ≥ 30 minutes), compared to only 34 percent of regainers. Another study (vanDale, Saris, & tenHoor, 1990) found that participants who maintained their exercise program or began one during follow-up were successful in
sustaining weight loss at 26 months. Over 70 percent of those who had not exercised during treatment or who had ceased to exercise during follow-up regained at least 75 percent of their lost weight.

The strength training activities of the maintainers and regainers did not differ significantly. Strength training activities were performed two to three times per week by 27.6 percent of the maintainers and 22.2 percent of the regainers. Nearly all the research done on weight loss maintenance and exercise has concentrated on aerobic exercise as opposed to strength training exercises (Haus et al., 1994; Kaymen et al., 1990; King & Tribble, 1991). Weight loss and maintenance programs typically do not include a strength training component. This may be due to the fact that little research has been conducted in this area and therefore whether or not a strength training program is beneficial in weight loss maintenance is yet undetermined. Further research in this area would help clarify the relationship, if any, between strength training and weight loss maintenance.

My study is consistent with current literature, underscoring the importance of aerobic exercise in sustaining long-term weight loss maintenance, and reinforces the belief that health care professionals need to promote changes in exercise habits which aid in long-term maintenance of weight loss.

The Effects of Social Support on Weight Loss Maintenance

There was no significant difference in the amount of support the maintainers and regainers reported that they received from their spouse or significant other, children, parents, friends, or support groups during (3.58 vs. 3.29, respectively) or after (3.03
vs. 2.88, respectively) weight loss. The maintainers did, however, indicate that they received slightly more social support overall than the regainers but statistical significance was not found, possibly due to the small sample size. Though the difference was not significant, maintainers consistently indicated, in all categories (on a scale including the following choices: “does not apply”, “none”, “moderate”, and “a lot”), that they received “a lot” of support from their spouse or significant other, children, parents, or friends. The regainers, on the other hand, consistently indicated that they received “moderate” support from the same individuals (38.9% and 46.1%, respectively), implying that the maintainers had a stronger sense of support than regainers. The amount of support maintainers and regainers reported receiving from the time during weight loss compared to the time after weight loss decreased slightly.

Kayman et al. (1990) found that individuals who were successful in keeping weight off after participating in a behavioral treatment program were more likely to have a strong sense of social support. My study however, measured “how much” support individuals received from others and Kayman et al. measured the “sense” of support received from others. An important differentiation in the area of social support is the number of available others to whom individuals believe they can turn to in a time of need and the degree of satisfaction with the support that is received (Sarason, Sarason, & Pierce, 1990). This can be measured using the Social Support Questionnaire (SSQ) which allows individuals to determine both the size of the social support network and the perceived quality of the relationships (Sarason et al., 1990). Adding the SSQ to the questionnaire used in my study would provide valuable
information. However, the additional questions would increase the length of the questionnaire and may affect the return rate.

Maintainers attended a support group significantly more often than regainers, which may have contributed to their weight loss maintenance success. This is consistent with results found by Perri, Shapiro et al. (1984) who found that individuals attending structured support groups enhanced the maintenance of weight loss at a 21 month follow-up. In my study however, the subjects were not asked if the support group they attended was a formal or informal group. There may be differences in weight loss maintenance outcomes based on whether an individual attends a formal or an informal support group. This is an interesting question and should be further researched.

The results of this study support current literature on the importance of attending support groups for weight loss maintenance and showed a trend toward the benefits of receiving “a lot” of support from a spouse or significant other, children, parents, or friends in long-term weight loss maintenance. Support for individuals attempting to maintain weight loss appears to be an important factor for success. However, whether that support comes from a spouse or significant other, family, friends or a formal or informal support group most likely differs with each individual and the specific factors which lead to success have not been clearly determined. Also, the aspects of social support that are important such as the quantity and/or quality of social support received needs further research. Social support or helping relationships is an important process of change in the action and maintenance stages of the
Transtheoretical Model. Many aspects of social support and their impact on weight loss maintenance warrant further investigation.

**Weight Loss Maintenance and Behavior Modification**

Behavior modification is intended to help obese individuals identify and modify inappropriate eating, exercise, and thinking habits that contribute to their weight problem. Slightly more maintainers compared to regainers indicated that they had made changes in their eating habits (100% vs. 92.6%, respectively) and increased their physical activity (93.1% vs. 88.9%, respectively) for the purpose of weight loss and maintenance, though these differences were not statistically significant.

No significant differences between maintainers and regainers were found in the amount of record keeping of diet, exercise, and caloric intake during or after weight loss. The amount of record keeping of diet, exercise, and caloric intake changed dramatically within the maintainer and regainer groups from the time during weight loss to the time after weight loss. Approximately one-half of the maintainers stopped keeping records after weight loss, decreasing from 31.0 percent to 13.8 percent and all the regainers stopped keeping records after weight loss, decreasing from 40.7 percent to 0.0 percent. These differences of record keeping over time within each group were significant ($p = .047$ and $p < .001$, respectively) and imply that maintainers may be better able to continue behavior modification techniques after weight loss that supports the maintenance of desirable behaviors.

Women in this study were not asked to indicate whether or not their behavior modification activities were part of a formal program or self-initiated. This
information would be helpful in order to make appropriate comparisons with studies such as Nunn et al. (1992) who found that individuals who participated in a behavior modification program do better at maintaining their weight losses at 2.5 years post weight loss than individuals not in such a program. Differences in the results of Nunn’s study and my study may be due in part to the fact that Nunn’s findings were based on a multicomponent behavior modification program, whereas my study only looked at record keeping behavior, and the combination of several behavior modification components may have a greater impact than a single component (e.g., record keeping). Additionally, Nunn et al. (1992) examined individuals 2.5 years post weight loss and I looked at individuals who ranged from two to 10 years post weight loss.

Behavior modification encompasses a wide variety of interventions such as nutrition education and counseling, exercise, stress management, relapse prevention, self-monitoring, and social support. It is important to note that each of the various aspects of behavior modification may have a unique effect on weight loss maintenance and it is difficult to assess the contribution of each individual component in my study.

It appears that multicomponent behavior modification programs are more beneficial than single method approaches in weight loss maintenance. Foreyt and Goodrick (1993) reviewed a series of five studies which showed that maintenance of weight loss can be achieved by using combinations of behavior modification strategies during the post-treatment period. Similarly, The Relapse Prevention Model (Marlatt & Gordon, 1985) supports the concept of applying multiple self-management and self-
control techniques during the weight loss maintenance stage to prevent the occurrence of a lapse or relapse. Health care professionals may be more effective in assisting their clients in weight loss maintenance by teaching individuals to apply a greater number of behavior modification techniques throughout the maintenance period.

Diet Related Factors in Weight Loss Maintenance

Maintainers ate more meals at regular times, ate fewer servings of "junk food" overall, snacked less often in general, and also snacked less on "junk food" items such as chips, candy, cookies, and diet soda than regainers. The differences in these areas between maintainers and regainers were all statistically significant. Both groups in my study, however, had approximately the same number of individuals (18 maintainers and 15 regainers) who snacked on fruit and vegetables. These results are similar to findings by Kayman et al. (1990) who found that regainers ate significantly more snacks each day when compared to maintainers. Regainers also snacked on more candy and chocolate than maintainers and the consumption of fruits and vegetables were similar for regainers and maintainers in the study by Kayman et al. (1990). Although the average number of calories per snack in my study was higher for regainers, the difference was not significant. This value was self-reported, based on the individual’s perception of how many calories their snacks contained and may not have accurately reflected the true number of calories in these foods.

The difference in "junk food" consumption varied greatly for maintainers and regainers. Maintainers consumption of "junk food" went from a mean rank of 31.40 before weight loss to a mean rank of 23.45 after weight loss, indicating their
consumption had decreased. The regainers on the other hand, had a mean rank of 25.39 before weight loss which increased to a mean rank of 33.93 after weight loss. This translates into a decrease from 3.8 servings per day to 1.8 servings per day for the maintainers and a decrease from 2.8 servings per day to 2.3 servings per day for the regainers. Before weight loss, 3.4 percent of the maintainers and 3.7 percent of the regainers indicated that they did not consume “junk food”, after weight loss, 27.6 percent of maintainers and 7.4 percent of regainers indicated they did not consume “junk food”. These results imply that maintainers and regainers consumed approximately the same amount of “junk food” prior to weight loss but after weight loss the maintainers consumed significantly less “junk food” than they originally had whereas the regainers did not. My study consisted of self-reported data, more accurate information about foods eaten, serving size, and number of calories consumed would be obtained through the use of tools such as a standardized food frequency questionnaire, 24 hour diet recall, or a diet history (Hill et al., 1993). Although these tools would provide more complete and accurate results they would also greatly increase the length of the study questionnaire, which might compromise response rate and hence generalizability.

With the results of my study in mind, it appears that health professionals should encourage individuals to establish more appropriate dietary habits to aid in long-term weight loss maintenance. Education in the areas of nutritional components (fat, protein, carbohydrates), proper portion sizes, cooking methods, and strategies for changing eating behaviors would be an appropriate intervention in a weight loss
maintenance program (Haus et al., 1994). Nutritional counseling to guide appropriate decision making regarding eating behaviors may facilitate weight loss maintenance.

Weight Loss Maintenance and Stressful Life Events

Weight regain (relapse) is frequently attributed to the occurrence of stressful life events (Kayman et al., 1990). My study, however, failed to find a relationship between stressful life events and weight regain. Maintainers experienced a greater number of stressful life events after weight loss than the regainers, though this difference was not significant. This contradicts the results of Kayman et al. (1990) who found that, compared with maintainers, regainers report more stressful life events during the same period of time. In her study, maintainers believed themselves capable of handling their problems and used problem-solving skills to cope with their difficulties. In contrast, relapsers did not deal with their problems directly and reported that they used food to make themselves feel better when upset. The lack of support for these findings by my study could be due to factors such as a sample size which may not have been great enough to detect a relationship between stressful life events and weight regain. Also, the fact that the majority of the stressful life events experienced by the maintainers were a new job and a change in residence, which are generally thought to create more positive rather than negative stress, whereas regainers experienced more death of loved ones, which is considered a negative stress, influenced the results. It has been argued that undesirable or negative events may have a very different, and possibly a more detrimental, effect on individuals than positive events (Sarason, Johnson, & Siegel, 1978). Individuals, with a wide
variation of coping skills, vary in how they perceive and are affected by stressful life events and this should be taken into consideration for more accurate results.

Another factor that must be considered is the stressful life events scale that was used in this study. The scale consisted of selected items, not the entire scale, from the Social Readjustment Rating Scale by Holmes and Rahe (1967) and therefore would not provide thorough and accurate results. The scale does not take into consideration possible differences in perception (positive or negative) about the stressors or the individuals’ feelings about the changes that have taken place. Therefore, results and their interpretation may be limited. The scale used in this study provided a quantitative measure of overall stressful life events, but may not reflect the actual amount of stress resulting from the experiencing of specific events.

**Theoretical Models in Relation to Weight Loss Maintenance**

An area that was not directly addressed in this study that should be considered in future research is theoretical models (Kaymen et al., 1990; Brownell & Roden, 1994b).

The Transtheoretical Model proposes that behavior change happens in a series of specific stages and that common processes of change within each stage occur. The stages of change describe when particular shifts in attitudes, intentions, and behaviors are most likely to occur. The processes of change include any activity that an individual initiates to modify their thinking, feeling, or behavior in order to modify their target behavior. This model focuses on the behaviors of individuals (e.g., exercise and diet-related habits) rather than the outcome (e.g., weight control or
weight regain) of the behaviors. The Transtheoretical Model identifies appropriate processes of change for the maintenance stage, which would include commitment; helping relationships; countering; and environmental control. This model also suggests that before individuals achieve long-term maintenance they will most likely recycle through the stages of change several times. This model is helpful in the weight loss maintenance area because it focuses on activities and events that create successful modification of problem behaviors related to weight loss maintenance and can be helpful in building a strong foundation for long-term weight loss maintenance. The Relapse Prevention Model states that the ability of an individual to execute the appropriate coping skills, when faced with a high-risk situation, will determine whether a person will relapse or not. This model suggests that high-risk situations do not mean inevitable failure and that learning new coping skills is the key to successful long-term weight control. Relapse prevention training, which includes many self-management and self-control techniques, helps to establish the development of post treatment strategies that enhance individuals long-term coping skills and therefore increases their ability to maintain their weight loss. Further research is needed to determine the aspects of relapse prevention training that are most beneficial in the weight loss maintenance field and the most effective methods of relaying that information to maintainers and regainers. This information, once determined, must be incorporated into weight loss maintenance programs.
Self-help Interventions and Weight Loss Maintenance

Another area that was not directly addressed in my study and should be considered in future research is self-help interventions. Self-help interventions appear to be beneficial in assisting individuals with long-term weight loss maintenance. A few studies (Colvin & Olson, 1983; Levy & Williamson, 1988) have shown that over one-half of individuals who are successful at weight loss and maintenance have done so without the help of a structured program. My study, which found that the maintainers attended a commercial program or received instruction from a health care professional less often than the regainers tends to support these finding. It also appears that individuals who seek help through a formal program tend to display differences in personality and behaviors such as being more overweight, having higher distress levels, and display more of a problem with binge eating compared to individuals who do not seek help. These characteristics need to be considered when researching weight loss maintenance. Methods used by individuals who are successful with long-term weight loss maintenance need to be determined and made available to individuals that are attempting to maintain their weight loss in an effort to increase their success. However, relatively little is known about self-help interventions in weight loss maintenance and further research is needed.
CHAPTER 6
Summary, Conclusions, and Recommendations

Summary of Findings

The purpose of this study was to examine factors associated with women who are successful at long term weight loss maintenance compared to women who are unsuccessful in maintaining their weight loss (regainers). The subjects consisted of 29 women who had maintained a weight loss for at least two years and 27 women who were unsuccessful (regainers) at maintaining their weight loss. Data on different facets of personal practices, social factors, and life experiences thought the be associated with success or failure in weight loss maintenance were collected by the use of a questionnaire. The questionnaire return rate was 54.7 percent for maintainers and 60.0 percent for regainers with an overall return rate of 57.1 percent. Descriptive data were used to determine the comparability of the two groups.

The results of this study indicate a statistically significant difference between the maintainers and regainers in the following areas:

1. As expected, maintainers weighed less than regainers, even though their starting weight was the same.
2. Maintainers had a lower percent of weight loss regained.
3. Maintainers considered their ideal weight to be less, and both maintainers and regainers over-estimated their true ideal weight.
4. Maintainers attended fewer weight loss programs and received less weight loss instruction.
5. Maintainers were less likely to receive instruction at a commercial program.

6. Maintainers performed more aerobic activity after weight loss.

7. Maintainers were more likely to attend a greater number of support groups after weight loss.

8. Maintainers were more likely to eat meals at regular times.

9. Maintainers consumed fewer servings per day of "junk food" after weight loss.

10. Maintainers snacked less often between meals.

11. Maintainers snacked less on "junk food" items such as chips, candy, cookies, and diet soda.

**Conclusions**

Within the limitations of this study the following conclusions appear warranted:

1. **Perceptions.** Women who maintained at least 20 pounds of their initial weight loss considered their ideal body weight to be approximately 11.4 pounds lighter than women who were unsuccessful at maintaining their weight loss (regainers). This implies that women who maintain their weight loss perceive their ideal weight to be less and see themselves as lighter individuals. However, it is not clear which comes first: weight loss maintenance or the perception of a lower ideal weight.

2. **Professional contact.** Women who maintained their weight loss attended fewer weight loss programs and received less weight loss instruction from commercial programs than women who regained their weight. This implies that weight loss programs, as they currently exist, may not be as effective with regards to weight loss maintenance, as self-help interventions.
3. **Exercise.** Women who maintained their weight loss performed more aerobic exercise after weight loss than regainers. This reinforces the importance of aerobic exercise in the weight loss maintenance process.

4. **Social support.** Women who maintain their weight loss attended more support groups after weight loss and reported receiving slightly more support from their spouse or significant other, children, parents, or friends both during and after weight loss than did regainers. Based in previous literature and the trend towards maintainers reporting receiving more social support in my study, social support appears to be an important component of the weight loss and maintenance process.

5. **Diet-Related Factors.** Women who maintained their weight loss were more likely to eat meals at regular times, consumed less "junk food" after weight loss, snacked less between meals, and snacked less on chips, candy, cookies, and diet soda than women who regained their weight. Based on these findings, important aspects of a weight loss maintenance program would include educating and counseling individuals in nutrition and behavior modification. Areas that should be included are realistic portion sizes, the composition (fat, protein, carbohydrate) of food items, establishing healthier eating habits, what triggers individuals to eat, effective coping skills, and what needs are being met (e.g., hunger, stress reduction, comfort) with food (Haus et al., 1994).

Based on the results of this research, weight loss maintenance appears to be the result of a multicomponent process which needs to be better understood in order to offer more innovative and effective treatments for overweight individuals.
Recommendations for Future Research

Based on the methods and results of this study, the following recommendations are made to enhance future research addressing weight loss maintenance.

1. **Questionnaire development.** One recommendation involves improvement in certain items of the questionnaire used in my study. The questionnaire needs to be modified to better assess each individual content area (professional contact, exercise, social support, diet-related factors) addressed. When researching weight loss maintenance, questions should be specific to the weight loss maintenance phase instead of the entire weight loss and maintenance process. Weight loss and the maintenance of weight loss are two separate events and should be studied separately to aid in clarity and understanding of each specific time period. Questions should be presented in a consistent manner (use of the same scales for answers and use of the same format for questions) throughout the questionnaire to reduce reader confusion and increase ease in responding. The use of standardized scales to assess each area would provide more accurate results, however, the questionnaire length would then increase and may result in a lower response rate.

2. **Replication.** This study needs to be replicated with a larger number of subjects, subjects from different sources, and male subjects to increase the generalizability of the results. It would be beneficial to conduct a study with a prospective design instead of a retrospective design to eliminate any concerns related to the ability of subjects to recall events accurately over time, but this would obviously increase the cost and effort involved on the parts of both the investigators and subjects.
3. **Theory-based research.** Theory-based research is needed to expand our understanding in the areas of how a lapse and/or relapse effects different overweight individuals, determinants and predictors of relapse in overweight persons, and the prevention of lapses and relapses in overweight individuals. Theory-based research will help in the design and evaluation of weight loss maintenance interventions.

4. **Exercise.** There is a strong relationship between aerobic exercise and weight loss maintenance consistently found across most studies that examined this issue. The relationship between weight loss maintenance and strength training on the other hand, has only recently been examined and is an area that deserves further research.

5. **Support groups.** Differences between formal and informal support group sessions would be an important distinction to make. Both formal and informal support groups have different characteristics and understanding what each type of group entails will increase the likelihood of referring individuals to the type of program that would be most appropriate for them.

6. **Social support.** Measures of not only the quantity of an individuals social support network is important to assess, but the quality of that network also needs to be assessed. In doing this, more accurate information on the individual and their social support network can be assessed and the need for more and/or better quality support can be determined.

**Implications for Preventive Care Specialists**

These results have several implications for preventive care specialists. First, there are numerous areas in which research is needed in the weight loss maintenance
field. Second, the education and background of a preventive care specialist makes them an appropriate health care professional to assess individuals desiring a weight loss and maintenance program to determine the appropriate intervention and the optimal time to begin such a program. When working with individuals in the area of weight loss maintenance a multicomponent approach, including extending the program length, incorporating exercise and healthful eating habits, building appropriate social support networks, and several behavior modification techniques, would improve the potential for success. And finally, preventive care specialists are in a unique position to assist their clients in understanding and recognizing that the weight loss maintenance process is a comprehensive lifestyle change and not a short-term program. A fundamental principle of weight loss and subsequent maintenance is that it requires a life-long commitment to a permanent change in lifestyle, behavioral responses, and dietary practices, preventive care specialists are well suited to assist in this process.
References


Colvin, R.H., & Olson, S.B. (1983). A descriptive analysis of men and women who have lost significant weight and are highly successful at maintaining the loss. Addictive Behaviors, 8, 287-295.


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Appendix A

Screening Survey
**Loma Linda University-School of Public Health**

**Weight Loss Survey**

Please read the following explanation and answer the questions below.

Loma Linda University School of Public Health is performing a scientific study to help us understand what makes people successful at losing weight and keeping it off. If you have lost more than 20 pounds any time in the last ten years you may be a candidate for this study.

If you are selected you will be asked to answer a questionnaire that may take about 1 hour of your time. Once the questionnaire is returned you may be contacted by mail or phone for clarification. There will be no payment for your participation but you may receive a summary of the findings if you request. All personal information will be held in strict confidence and any published document will not disclose your personal identity.

Participation in this study is voluntary. If you choose to participate at this time but change your mind at any time during the testing you are free to do so. There are no penalties for refusing to participate in this study.

If you have any questions you may call (909) 824-4598 during regular business hours.

You may contact an impartial third party not associated with this study regarding any complaint you may have about this study. You may contact Jean Fankhanel, Patient Representative, Loma Linda University Medical Center, Loma Linda, CA 92354, phone (909) 824-4647.

George Guthrie MD, MPH  
Nutrition Department, School of Public Health  
Loma Linda University

Renie Del Ponte, MS  
DrPH Student, School of Public Health  
Loma Linda University

The following information is necessary in order to identify if you are a candidate for the study:

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you lost 20 pounds or more within the last ten years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did you maintain at least 20 pounds of weight loss for at least 2 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was your weight loss planned or intentional?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was your weight loss associated with pregnancy?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was your weight loss associated with an illness or accident?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please indicate which medications you presently use or have used within the past 10 years.

- [ ] birth control pills
- [ ] thyroid pills
- [ ] fertility medications
- [ ] vitamins (including iron)
- [ ] others: please list on back.

What is your race:
- [ ] Black (non-hispanic)
- [ ] Asian/Pacific Islander
- [ ] White
- [ ] Indian
- [ ] American/Alaskan native
- [ ] Hispanic
- [ ] Other

What is your age in years? ___

How many children have you delivered? ___

What was your maximum weight (excluding pregnancy)? ___

What is your present weight ___

Are you willing to participate in this study? yes no ___

If yes, please fill in the following (thank you for printing legibly):

Name: __________________________

Mailing address __________________________

City __________________________ Zip ______

Home Phone: __________________________ Best time to call __________________________

It is important to return this form even if you are not willing to participate. Please return it to the office receptionist or the designated collection box.

#
Appendix B

Weight Loss Questionnaire
WEIGHT - LOSS QUESTIONNAIRE

1. Have you lost 20 or more pounds during the last 10 years (for reasons other than illness, or end of pregnancy)?
   [ ] No (Please return the questionnaire)
   [ ] Yes (Please continue)

2. Did you maintain at least 20 lbs of weight loss for at least 2 years:
   [ ] No
   [ ] Yes

3. How many times in your lifetime have you intentionally lost 20 or more pounds, including the most recent time? (Do not count weight lost due to illness or end of pregnancy.)
   [ ] 1
   [ ] 2
   [ ] 3
   [ ] 4
   [ ] 5
   [ ] 6 or more times

4. When did the most recent time period of weight loss end?
   [ ] Still going on, has not ended yet
   [ ] Ended
   _________ months OR _________ years ago.

5. During your most recent period of weight loss of 20 or more pounds, how long did it take you to lose the first 20 pounds?
   [ ] Less than 1 month
   [ ] 1-2 months
   [ ] 3-6 months
   [ ] 7-12 months
   [ ] More than 12 months

For the rest of the questions please consider ONLY the most recent time period in which you lost 20 or more pounds.

Many of the questions below will refer to three (3) time periods, namely, "The 12 months prior to the most recent time you lost 20 or more pounds, referred to as "1 yr. Before Weight Loss;" during the most recent time period in which you lost 20 or more pounds, referred to as "During Weight Loss;" and after the most recent time period during which you lost 20 or more pounds, referred to as "After Weight Loss."

Consider your weight loss time period as beginning at the first moment you did something for the purpose of losing weight. This could include enrolling in a weight loss program, changing your diet, increasing your exercise, taking diet pills, etc. Consider the weight loss time period as ending when you stopped losing weight. If you are still losing weight consider the end of the weight loss time period as current.

6. How many total pounds did you lose during this time period?
   ___________ pounds

Please answer the questions on the back side of this page
7. In relation to your most recent weight loss, what was your weight in pounds during the following time periods? (If you don’t remember, please approximate.)

<table>
<thead>
<tr>
<th>Just before start of weight loss</th>
<th>Lowest Achieved weight</th>
<th>What is your current weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>a________ lbs.</td>
<td>b________ lbs.</td>
<td>c________ lbs.</td>
</tr>
</tbody>
</table>

8. Some people eat meals at the same time every day. Others eat their meals at different times every day. How would you characterize your eating habits? (please check one answer for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] Rarely or never have regular meal times</td>
</tr>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] Occasionally have regular meal times</td>
</tr>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] Usually have regular meal times</td>
</tr>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] Always or almost always eat meals at regular times</td>
</tr>
</tbody>
</table>

9. During your most recent weight loss period were you on a diet that had less than 1000 calories per day, commonly called a very low calorie diet (eg Optifast, Medifast)?

<table>
<thead>
<tr>
<th>[ ] No</th>
<th>[ ] Yes</th>
</tr>
</thead>
</table>

10. Did you use program supplements (eg. Optifast, Medifast) after your weight loss period for the purpose of weight loss maintenance?

<table>
<thead>
<tr>
<th>[ ] No</th>
<th>[ ] Yes</th>
</tr>
</thead>
</table>

11. On the average, approximately how many servings per day did you have of "JUNK FOOD" BEFORE, DURING, and AFTER your weight loss? "Junk food" includes fast food, cookies, cakes and pastries, candy, sodas, chips, french fries, etc. Examples of ONE serving size include: 1 candy bar, 1 pastry, 2 medium sized cookies, 1 slice of cake, 1 soda, 1 item from a fast food menu. (please check one answer for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] None</td>
</tr>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] 1-2 servings per day</td>
</tr>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] 3-4 servings per day</td>
</tr>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] 5-8 servings per day</td>
</tr>
<tr>
<td>[( ]</td>
<td>[( ]</td>
<td>[( ] 9 or more servings per day</td>
</tr>
</tbody>
</table>
12. On average, how many times per day, did you snack in between meals? Snacks include any food or drink, including diet products, except water. (each Optifast or Medifast supplement is considered a meal, not a snack)
(please check one answer for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE</th>
<th>DURING</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT. LOSS</td>
<td>WT. LOSS</td>
<td>WT. LOSS</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Never</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Less than daily</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 1-2 times per day</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 3-4 times per day</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 5 or more times per day</td>
</tr>
</tbody>
</table>

13. Please check which specific types of snacks you usually had during each time period.
(please check all that apply for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE</th>
<th>DURING</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT. LOSS</td>
<td>WT. LOSS</td>
<td>WT. LOSS</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Never snacked</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Fruits or vegetables</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Chips, candy, chocolate, cookies, pies, etc.</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Diet products (cottage cheese, yogurt, etc.)</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Diet sodas or diet drinks</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Regular sodas</td>
</tr>
</tbody>
</table>
| [ ]          | [ ]    | [ ] Other, (please specify _______________________________)

14. Approximately how many calories does your average snack contain?

1

15. Did you purposely modify your intake of any macronutrients (protein, carbohydrates, fat) during your most recent weight loss period?

<table>
<thead>
<tr>
<th>Protein</th>
<th>Carbohydrate</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Increase</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Decrease</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Stayed the same</td>
</tr>
</tbody>
</table>

Please answer the questions on the back side of this page
16. Which meal of the day was/is usually your largest? (Optifast, Medifast supplements are considered meals) (please check one answer for each time period)

<table>
<thead>
<tr>
<th></th>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Breakfast/morning meal</td>
<td>Lunch or noon meal</td>
<td>Evening meal</td>
</tr>
</tbody>
</table>

17. Did you use diet pills (prescription or non-prescription) for the purpose of weight loss and/or maintenance? (please check one answer for each time period)

<table>
<thead>
<tr>
<th></th>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

18. Did you use diet supplements, other than diet pills, (e.g., Slim Fast, Sweet Success, protein drinks, etc.) for the express purpose of weight loss and/or maintenance? (please check one answer for each time period)

<table>
<thead>
<tr>
<th></th>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

19. Indicate how many times you usually engage in strength-training and/or weight-lifting exercises. (please check one answer for each time period)

<table>
<thead>
<tr>
<th></th>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 times per week</td>
<td></td>
<td>1 time per week</td>
<td>2 times per week</td>
</tr>
<tr>
<td>2 times per week</td>
<td></td>
<td>3 times per week</td>
<td>4 times per week</td>
</tr>
<tr>
<td>4 times per week</td>
<td></td>
<td>5 or more times per week</td>
<td></td>
</tr>
</tbody>
</table>
20. Indicate how many times per week you engage in regular aerobic activities, such as brisk walking, jogging, bicycling, etc., for at least 15-20 minutes? (please check one answer for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1[ ]</td>
<td>1[ ]</td>
<td>1[ ] 0 times per week</td>
</tr>
<tr>
<td>2[ ]</td>
<td>2[ ]</td>
<td>2[ ] 1 time per week</td>
</tr>
<tr>
<td>3[ ]</td>
<td>3[ ]</td>
<td>3[ ] 2 times per week</td>
</tr>
<tr>
<td>4[ ]</td>
<td>4[ ]</td>
<td>4[ ] 3 times per week</td>
</tr>
<tr>
<td>5[ ]</td>
<td>5[ ]</td>
<td>5[ ] 4 times per week</td>
</tr>
<tr>
<td>6[ ]</td>
<td>6[ ]</td>
<td>6[ ] 5 or more times per week</td>
</tr>
</tbody>
</table>

21. Indicate the time of day that you usually engage in exercise activities. (please check all answers that apply for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1[ ]</td>
<td>1[ ]</td>
<td>1[ ] Did not engage in exercise activities</td>
</tr>
<tr>
<td>2[ ]</td>
<td>2[ ]</td>
<td>2[ ] Exercised in the morning before first meal</td>
</tr>
<tr>
<td>3[ ]</td>
<td>3[ ]</td>
<td>3[ ] Exercised between first and last meal of the day</td>
</tr>
<tr>
<td>4[ ]</td>
<td>4[ ]</td>
<td>4[ ] Exercised after the last meal of the day</td>
</tr>
</tbody>
</table>

22. Have you experienced any of the following significant life events? (check all that apply for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1[ ]</td>
<td>1[ ]</td>
<td>1[ ] Death of a loved one</td>
</tr>
<tr>
<td>2[ ]</td>
<td>2[ ]</td>
<td>2[ ] Marriage</td>
</tr>
<tr>
<td>3[ ]</td>
<td>3[ ]</td>
<td>3[ ] New Job</td>
</tr>
<tr>
<td>4[ ]</td>
<td>4[ ]</td>
<td>4[ ] Foreclosure on mortgage or loan</td>
</tr>
<tr>
<td>5[ ]</td>
<td>5[ ]</td>
<td>5[ ] Pregnancy</td>
</tr>
<tr>
<td>6[ ]</td>
<td>6[ ]</td>
<td>6[ ] Change of residence</td>
</tr>
<tr>
<td>7[ ]</td>
<td>7[ ]</td>
<td>7[ ] Divorce</td>
</tr>
<tr>
<td>8[ ]</td>
<td>8[ ]</td>
<td>8[ ] Assault to yourself or your property</td>
</tr>
<tr>
<td>9[ ]</td>
<td>9[ ]</td>
<td>9[ ] Other,(pleasespecify________________________)</td>
</tr>
</tbody>
</table>
23. How many hours on the average did you sit and watch T.V. per day?
(please check one answer for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[]</td>
<td>[]</td>
<td>[ ] None</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Less than 1 hour</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 1-2 hours</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 3-4 hours</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 5-6 hours</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 7 or more hours</td>
</tr>
</tbody>
</table>

24. How many cigarettes did/do you smoke on the average per day?
(please check one answer for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[]</td>
<td>[]</td>
<td>[ ] None</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] Less than 10</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 1/2 pack</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 1 pack</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 1 1/2 packs</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 2 packs</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] More than 2 packs</td>
</tr>
</tbody>
</table>

25. How many days per week do you normally drink alcoholic beverages?
(please check one answer for each time period)

<table>
<thead>
<tr>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>[]</td>
<td>[]</td>
<td>[ ] None (Skip to question #27)</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 1-2 day (Continue)</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 3-4 day (Continue)</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 5-6 day (Continue)</td>
</tr>
<tr>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ] 7 days (Continue)</td>
</tr>
</tbody>
</table>
26. On the days you drank, what was your average alcohol consumption in drinks? (A drink is defined as 12 oz. of beer, 4 oz. of wine, or 1-1/2 oz. of liquor).
(please check one answer for each time period)

<table>
<thead>
<tr>
<th></th>
<th>1 YR. BEFORE WT. LOSS</th>
<th>DURING WT. LOSS</th>
<th>AFTER WT. LOSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>3-4</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>5-6</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>7 +</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

27. Please indicate if you had children, in each age group, that were living in your home during your weight loss.
(please check a box for each age group)

<table>
<thead>
<tr>
<th></th>
<th>0 - 5 yrs</th>
<th>6 - 11 yrs</th>
<th>12 - 17 yrs</th>
<th>18 or over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>No</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

28. How many individuals are currently living in your household?

29. How many individuals live with you now whom you would consider to be overweight?

30. For each question below, check a box to indicate how much support for your weight loss you received from each source during your weight loss time period.
(Please check a box for each item, if item does not apply check "does not apply")

<table>
<thead>
<tr>
<th></th>
<th>Does not Apply</th>
<th>None</th>
<th>Moderate</th>
<th>A lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spouse or significant other</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Children</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Parents</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Friends</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Support groups</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Other</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Please answer the questions on the back side of this page
31. For each question below, check a box to indicate how much encouragement to maintain your weight loss you received from each source after your weight loss time period.

(please check a box for each item, if item does not apply check "does not apply")

<table>
<thead>
<tr>
<th>Does not Apply</th>
<th>None</th>
<th>Moderate</th>
<th>A lot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Spouse or significant other</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Children</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Parents</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Friends</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Support groups</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Other, (please specify)</td>
<td>![ ]</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
</tbody>
</table>

32. Did your doctor ever advise you to lose weight?

- ![ ] No
- ![ ] Yes → Approximately how many times?
  - ![ ] 1-2 times
  - ![ ] 3-5 times
  - ![ ] 6 or more times

33. How much have you depended on God or a higher power for weight loss and/or maintenance?

- ![ ] Did not depend at all
- ![ ] Slightly depended
- ![ ] Moderately depended
- ![ ] Strongly depended

34. Do you feel that your most recent weight loss was the result of:

- ![ ] Entirely your own effort
- ![ ] Mostly your own effort
- ![ ] Equal efforts of both self and other people
- ![ ] Mostly efforts of other people
- ![ ] Entirely efforts of other people

35. How often during your most recent weight loss period did you keep a written record about diet, exercise, or caloric intake?

- ![ ] Not at all
- ![ ] Occasionally
- ![ ] Several times per week
- ![ ] Daily

36. How often after weight loss did you keep a written record about diet, exercise, or caloric intake?

- ![ ] Not at all
- ![ ] Occasionally
- ![ ] Several times per week
- ![ ] Daily
37. Did you have a spouse or significant other before the time you lost weight?
   If [ ] No (Skip to question #39)
   If [ ] Yes (Continue)

38. How well do you feel your spouse or significant other accepted your weight before your weight loss?
   If [ ] Not well
   If [ ] Somewhat
   If [ ] Well
   If [ ] Very well

39. Did you have a spouse or significant other during the two years after your weight loss?
   If [ ] No (Skip to question #41)
   If [ ] Yes, but not now (Continue)
   If [ ] Yes, I still have one (Continue)

40. How well do you feel your spouse or significant other accepted your weight during the two years after your weight loss?
   If [ ] Not well
   If [ ] Somewhat
   If [ ] Well
   If [ ] Very well

41. What changes did you make for the purpose of losing weight during your most recent weight loss?
   (please check No or Yes for each type of activity)
   * If [ ] No [x] Yes I made changes in the way I ate
   * If [ ] No [x] Yes I increased my physical activity
   * If [ ] No [x] Yes I took diet pills
   * If [ ] No [x] Yes I made other changes, (please specify ____________________________)

42. How old were you when you first thought you had a problem with being overweight?
   If [ ] Never thought I had a problem
   If [ ] Before puberty
   If [ ] Puberty - 15 years of age
   If [ ] 16 - 19
   If [ ] 20 - 29
   If [ ] 30 - 39
   If [ ] 40 - 49
   If [ ] 50 or more

43. Did you experience any of the following stressful situations before age 19?
   (please check No or Yes for each category)
   * If [ ] No [x] Yes Divorce or separation of parents
   * If [ ] No [x] Yes Death of a close family member
   * If [ ] No [x] Yes Physical abuse
   * If [ ] No [x] Yes Sexual abuse
   * If [ ] No [x] Yes Pregnancy
   * If [ ] No [x] Yes Other, (please specify ____________________________)

Please answer the questions on the back side of this page
HOW IMPORTANT WERE EACH OF THE FOLLOWING FACTORS IN YOUR DECISION TO LOSE WEIGHT? (Questions 44-50)

(Please circle a number for each item. If item does not apply circle "does not apply.")

1 = does not apply
2 = not important
3 = somewhat important
4 = important
5 = very important

44. 1 2 3 4 5 To improve chances of success in your work setting.
45. 1 2 3 4 5 To improve chances of success in your social (non-work) setting.
46. 1 2 3 4 5 My Physician's advice
47. 1 2 3 4 5 Friends/Family pressure
48. 1 2 3 4 5 I just wanted to
49. 1 2 3 4 5 For health reasons
50. 1 2 3 4 5 Other, (please specify ______________________)

Do you feel your decision to lose weight was made:

i] Entirely because others wanted me to
s] Mostly because others wanted me to
s] A balance of myself and others wanting me to
s] Mostly because I wanted to
s] Entirely because I wanted to

Do you think that your initial weight loss was:

i] Entirely under your control
s] Mostly under your control
s] Equally under your control and control of others
s] Mostly under control of others
s] Entirely under control of others

Within the last 10 years, has there ever been a period of two months or more when you could not walk, or your ability to walk was limited?

i] No (Skip to question #55)
s] Yes (Continue)

Please indicate the time periods during which your ability to walk was limited by checking "Yes" or "No" for each item.

i] No s] Yes Before weight loss
i] No s] Yes During weight loss
i] No s] Yes After weight loss

What do you consider your ideal weight to be?

___________ lbs.
56. How many times did you attend a weight loss program or receive weight loss instructions from a health professional (physicians, nurses, dietitians, etc.) in conjunction with your most recent loss of 20 or more pounds? (please check only one)
   □ None (Skip to question #63)
   □ 1 or 2 times (Continue)
   □ 3 to 5 times (Continue)
   □ 6 or more times (Continue)

57. What type of individual did you receive weight loss instructions from (check all that apply)?
   □ Physician
   □ Dentist
   □ Nurse
   □ Dietitian/Nutritionist
   □ Chiropractor
   □ Weight Watchers', or other commercial program, Counselor
   □ Other, (please specify ______________________)

58. When did you receive instruction about dieting? (please check only one)
   □ Only before starting diet
   □ Only after starting diet
   □ Both before and after starting to diet

59. What was the total cost of your weight loss program or instructions? (please check only one)
   □ Nothing (please skip to question #61)
   □ $1-$49
   □ $50-$249
   □ $250-$499
   □ $500-$999
   □ $1000-$1999
   □ $2000 or more

60. How much of this cost did you have to pay? (please check only one)
   □ 0%
   □ 1-25%
   □ 26-50%
   □ 51-75%
   □ 76-99%
   □ 100%

61. In this most recent weight loss program, did you attend groups sessions where other overweight individuals also attended?
   □ No
   □ Yes
   → Approximately how many sessions? ________

Please answer the questions on the back side of this page
62. Did your spouse or significant other attend the weight loss program or receive instructions with you?
   | [ ] No
   | [ ] Yes
   | [ ] Not applicable

63. How many times did you meet with a support group after your weight loss?
   | [ ] None
   | [ ] 1-5 times
   | [ ] 6-10 times
   | [ ] 10 or more times

64. Which of the following best describes your current education level?
   | [ ] 8th grade or less
   | [ ] Some high school
   | [ ] High school graduate
   | [ ] Some college or trade school
   | [ ] Two year degree
   | [ ] College graduate (Bachelor’s degree)
   | [ ] Masters degree
   | [ ] Doctoral degree

65. Which of the following best describes your type of usual employment before, during or after your weight loss?
   (Check as many as apply)

<table>
<thead>
<tr>
<th>1 YR. BEFORE</th>
<th>DURING</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>WT. LOSS</td>
<td>WT. LOSS</td>
<td>WT. LOSS</td>
</tr>
<tr>
<td>1[ ]</td>
<td>1[ ]</td>
<td>1[ ]  Secretarial/clerical</td>
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<td>2[ ]</td>
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<td>2[ ]  Administrative</td>
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<td>3[ ]</td>
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<td>3[ ]  Technical</td>
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<td>4[ ]  Professional</td>
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<td>5[ ]</td>
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<td>5[ ]  Service occupations</td>
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<td>6[ ]</td>
<td>6[ ]</td>
<td>6[ ]  Manufacturing</td>
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<td>7[ ]</td>
<td>7[ ]</td>
<td>7[ ]  Banking/finance</td>
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<td>8[ ]</td>
<td>8[ ]</td>
<td>8[ ]  Managerial</td>
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<td>9[ ]</td>
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<td>9[ ]  Sales</td>
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<td>10[ ]</td>
<td>10[ ]</td>
<td>10[ ] Student</td>
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<tr>
<td>11[ ]</td>
<td>11[ ]</td>
<td>11[ ] Homemaker</td>
</tr>
<tr>
<td>12[ ]</td>
<td>12[ ]</td>
<td>12[ ] Other, (please specify ____________________)</td>
</tr>
</tbody>
</table>
66. What is your current household income per year?
   [ ] Less than $20,000
   [ ] $20,000 to $24,999
   [ ] $25,000 to $29,999
   [ ] $30,000 to $34,999
   [ ] $35,000 to $39,999
   [ ] $40,000 to $44,999
   [ ] $45,000 to $49,999
   [ ] $50,000 or $59,999
   [ ] $60,000 to $69,999
   [ ] $70,000 to $89,999
   [ ] $90,000 or more

67. What is your current height without shoes?
   _____ ft. _____ inches.

68. What is your present age?
   _____

69. What is your present weight without shoes?
   _____ lbs.

70. What is your race?
    1. Asian/Pacific Islander
    2. African-American
    3. Hispanic
    4. Indian American/Alaskan Native
    5. Caucasian
    6. Other, (please specify __________________________)

71. In your opinion, what was the most important factor responsible for your weight loss?
    ______________________________________________________
    ______________________________________________________
    ______________________________________________________
Appendix C

IRB Letter
George Guthrie, M.D.
Department of Nutrition
School of Public Health
Loma Linda University

Dear Dr. Guthrie:

LLU Project ID# 93172

Your proposal for a study entitled “Weight Loss and Maintenance Survey” was reviewed administratively on behalf of the Institutional Review Board of Loma Linda University on January 4, 1994.

The actions of the review are as follows:

• The subjects are at no risk.
• The protocol is approved from January 4, 1994 to January 3, 1995.

If there are modifications to the proposed research protocol or problems arising from the study, please notify the Board in writing. If you have any questions, please feel free to contact us.

You are required to provide a progress report on this study in one year indicating the number of subjects enrolled.

Sincerely yours,

G. William Saukel
Chairman
Institutional Review Board

/j
Encl.