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Comparison of diet and exercise versus diet alone in relapse of obesity

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Comparison of diet and exercise versus diet alone in relapse of obesity

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San Jose State University, 1990

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COMPARISON OF DIET AND EXERCISE VERSUS
DIET ALONE IN RELAPSE OF OBESITY

A Thesis

Presented to

The Faculty of the Department of Nursing
San Jose State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

By

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August 1990

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ABSTRACT

COMPARISON OF DIET AND EXERCISE VERSUS DIET ALONE IN RELAPSE OF OBESITY

by Carolyn I. Smith

The National Health and Nutrition Examination Survey estimates 26% of adult Americans, or 34 million Americans, are overweight with increased risk for many diseases (Bray, 1989). This research investigated the effect of exercise on the outcome and maintenance of weight loss using Orem's Self Care Model (1980) as the conceptual framework. Prior body fat measurement and weight of 25 subjects (n=17 exercise plus diet, n=8 diet alone) were compared for maintained body fat and weight loss after six month intervals. Questionnaire information regarding the quantity and quality of exercise performed before the program and at present and general feelings regarding health were collected. Differences between the two groups is significant and show a greater weight loss for those who exercise and diet than for those who use diet alone [$t(23) = 2.44, p < .05$]. Implications for nursing are that this research reinforces the need to emphasize the role of exercise in decreased weight and decreased body fat.

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Chapter 1
INTRODUCTION
The Problem

The problem of dieters regaining lost weight, as well as added weight, by one year after weight loss is well documented (Beaulieu, 1987; Bennett & Jones, 1986; Brownell, Marlatt, Lichtenstein, & Wilson, 1986; Epstein, Wing, Penner, & Kress, 1985; "Exercise Beats", 1987; Hagan, Upton, Wong, & Whittam, 1986; Lampman, Schteingart, & Foss, 1986; Stephenson, Levy, Sass, & Mc Garvey, 1987; Wadden, 1986). Regaining lost weight is clearly a depressing and frustrating situation for the 1/4 of the U.S. population which is obese (Stephenson et al., 1987). Any means which would increase the possibility of achieving a permanent weight loss would be a definite health benefit not only to the dieter but to the health of the nation (Stephenson et al., 1987; Lampman et al., 1986; Blackburn & Kanders, 1987).

The Purpose and Need

It is the purpose of this research to demonstrate the importance of exercise in planned weight reduction by studying the effects of exercise on weight control. When dieters establish an exercise program during and following weight loss, it enables them to achieve a more permanent success over regaining weight. It is equally important for the counselor of dieters to reinforce the need of incorporating an exercise pattern as well as a diet program

into one's lifestyle. Also important is the fact that a reduction in the numbers of obese persons would result in financial savings to the individual and the government by lessening the need for programs and health services associated with the complications of obesity.

Research ("Exercise Beats", 1987) has shown that exercise is a major contributor to the ability of a person in maintaining weight loss. Physiologic changes enable actively exercising people to burn more calories on a daily basis due to an increase in lean body mass (Belko, Van Loan, Barbieri, & Mayclin 1987). An objective of diet and exercise research is to obtain some significant statistics which can be used in the future when counseling diet patients. Significant findings reinforce the need to exercise to insure success against relapse and add fact to the supposition that exercise is crucial to weight maintenance and decreased body fat achievement. The results add concrete evidence to show that one can change his/her daily caloric metabolic requirements (Blackburn & Kanders, 1987; Pi-Sunyer, 1989).

The Question and Hypothesis

Question

Is there a difference in maintaining a weight loss, or decreased body fat, for persons who have dieted and are now on a weight maintenance diet if they exercise or if they do not?

Hypothesis

The dieter who implements an exercise program which incorporates aerobic exercise will maintain a greater weight loss or decreased body fat after six months versus those who do not exercise.

Definition of Terms

For the purpose of this study, the following definitions apply:

1. Diet is a reduced calorie diet of 1200 calories per day for female patients and 1500 calories per day for male patients as a baseline. The diets are personalized for each patient by a registered dietitian based upon the patient's food likes, dislikes and social habits in order to increase the likelihood of compliance. The diets are planned to allow for a one pound per week weight loss for each patient.
2. Weight maintenance is that state where caloric intake and energy expenditure are approximately even so that there is no state of weight gain or weight loss.
3. Exercise program is any form of exercise which achieves aerobic target heart rate for age (see Appendix A) for the minimum time needed for that form of exercise (see Appendix B). The exercise is practiced 5 times per week while becoming aerobically conditioned and 3 times per week once aerobic conditioning has been achieved (Bailey, 1977).
4. Relapse of obesity is an outcome where there is the "recurrence of symptoms of a disease after a period of

improvement" (Brownell et al., 1986). Lapse is considered to be the process which may or may not lead to a relapse. It is defined as "the act or instance of backsliding, worsening or subsiding" (Brownell et al., 1986). The rates which define relapse are 50 to 90 percent of lost weight being regained.

5. Overweight is a weight which is 10-40 pounds above that recommended as normal for height (see Appendix C) as taken from the Tables of "Desirable" Weight, or a Body Mass Index of >30 from the BMI Index (see Appendix D).

6. Overfat is a body fat exceeding 22% for women and 19% for men.

7. Obesity is a weight above 40 pounds as recommended as normal for height, or a Body Mass Index of >35 (see Appendix E).

8. Body Mass Index (BMI) is a measure of weight which compares weight to height squared, and is considered to be a more accurate measure of obesity than the Metropolitan Weight Tables. The BMI measures fat and fat free mass and is an index of weight and not fatness (Van Itallie, 1989).

9. Maintenance of weight loss is a continued reduced weight or a decrease in body fat over a 6 month period after weight loss or end of program.

Research Design

The design of the study was a cross-sectional survey. The researcher compared dieters' data at graduation from a diet and exercise program offered at a medical center in

the San Francisco East Bay Area of California and at least⁵
6 months after graduation, as to the existence of an
exercise regime and weight relapse. The subjects were
contacted by mail, screened by telephone, and if they met
the research criteria were invited to participate and
scheduled for an office interview. Program records from
participation in the diet and exercise class supplied
previous medical history for height, weight and body fat
measurements. Interviews were conducted in the office of a
private physician in Concord, California. The subjects
were weighed, height was measured and a current body fat
was obtained at the time of the interview appointment. They
were questioned as to the existence of a regular exercise
program, their attitudes towards their weight problem and
state of wellness before and after weight loss. Because
this program used body fat measurements either calculated
or determined by electrical impedance, body fat
measurements were conducted at this time and were compared
with the previous results. The body fat measurement was
designed to better understand any weight gain which may
have occurred due to muscle building. The body fat
measurement was determined to be the best determinant of
success, especially in the presence of a slight weight
gain. In the presence of a weight gain of as much as 10
pounds or more, a stable or decreased body fat indicated
maintenance of weight loss (Van Itallie, 1989b).

Limitations

One of the limitations of this research was a small sample of 25 clients studied over a 6 month period. A larger sample or replication of the study at several intervals would supply more data. Subjects were lost due to attrition. A second limitation was that some of the data collected were self-reported and may have reflected bias or exaggeration by the client (Evans, 1989). A third limitation was that the sample was not randomly selected and may not have represented a normal cross-section of the population.

Data Analysis

Two groups of subjects were identified depending upon whether the subjects were exercising or not at the time of the interview. The differences in weight between the two groups was analyzed by means of the t-test. It was demonstrated that those who exercised maintained a greater weight and body fat reduction than those who did not.

Chapter 2

CONCEPTUAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

Conceptual Framework

The nursing theory proposed by Orem (1980) states that healthy people require the ability to care for themselves in order to maintain their state of health. This ability is defined by Orem as self-care agency. Self-care is used in the sense of meaning the whole person caring "for oneself" (Orem, 1980). The person delivering the care to an individual who is unable to care for him or herself either temporarily or permanently, is called the dependent-care agent. Agency also implies action; agent implies one taking action. Self care has direction and requires purpose, is practical and involves a decision or choice (Orem, 1980). The purpose of self-care is to fulfill self-care requirements or purposes called requisites. Orem (1980), defines these requisites as being of three types: (a) universal or those requirements for health that all persons need such as food, oxygen, and a place to live, to name a few. (b) The second type of requisite is called developmental. These are needs elemental to normal physical and emotional growth and/or development over the period of the life cycle. (c) The third requisite or need deals with health-deviation. This requisite allows for an individual or the dependent-care agent to utilize his or her agency, or ability, to deal with situations which involve deviations from a normal

healthy state, defined as self-care deficit (Orem, 1980).

Therapeutic self-care demand is a humanly developed concept with an objective of identifying what an individual needs structurally, functionally and developmentally to restore that individual to a state of health (Orem, 1980). Designing a self-care plan requires cognitive awareness of one's needs, understanding of what can be accomplished to meet those needs, and initiating the plan to meet the needs. Self-care involves a choice to act, and is practical in that it responds to an innate demand to attend to oneself.

Nursing systems serve two purposes according to Orem (1980). They function to assist others to achieve and maintain self-care agency and serve to effectively assist others meet self-care deficits. Nursing systems are of three types; wholly compensatory, partly compensatory and supportive-educative. In wholly compensatory nursing systems the patient cannot meet his or her own needs to regain self-care agency and is dependent upon the nurse to supply this function until no longer needed. In the second type of nursing system, partly compensatory, the patient and nurse each perform some of the required measures for the patient. Thirdly, in the supportive-educative type, the patient is capable of performing the task, but because of a lack of knowledge of the import or implications of the requisite the nurse acts as educator and stimulus for change (Orem, 1980).

A reduction in obesity has been shown to improve one's cardiovascular, metabolic and psychological health (Lampman et al., 1986). Clearly the positive health advantages of reduced obesity are a requisite of self-care. Thus when an overweight individual embarks on a weight reduction program, and incorporates an exercise program, he/she is implementing self-care. The health benefits achieved when exercise is combined with weight reduction can change the deprivation of a diet into an active way to personally improve the human condition. Exercising reduces appetite, raises the metabolic rate for a period of time after it is performed, and promotes a feeling of well-being thus setting up a new means of dealing with appetite (Lampman et al., 1986). The choice to make this lifestyle change is clearly compatible with Orem's nursing theory of self-care; the nurse's role under the supportive-educative nursing system is to assist the client to recognize and initiate change.

Literature Review

Historically it has been stressed that a reduced calorie diet where caloric intake is less than energy expenditure was the accepted method alone for achieving weight loss (Belko et al., 1987). Weight reduction has been followed by weight gain primarily because people use diet as a means to achieve weight loss but fail to recognize that once one's size is reduced, a new lower level of caloric intake is necessary. Persons accustomed

to eating large quantities of calories daily tend to return to these eating patterns after diet (Hill, Sparling, Shields, & Heller, 1987). What is needed is a maintenance level of calories which is less than the old caloric intake in order to maintain the smaller body but higher than needed for weight reduction (Beaulieu et al., 1987).

Recent studies of the past several years document the fact that caloric reduction alone is insufficient in overcoming the problem of obesity (Beaulieu et al., 1987; Belko et al., 1987). Diets work; they are the easy part. How many times has one heard of a person losing an enormous amount of weight only to gain it back again and more? This new reduced body needs fewer calories per day to maintain itself. A person who has been overweight for an extended period of time has become used to a certain quantity of food or number of calories to maintain that weight. If you take calories away from that individual for a period of time and his/her weight reduces and then he/she returns to old eating patterns, the weight will go back up rapidly. Thus a person must make major changes in eating and exercise in order to maintain a smaller body weight (Belko et al. 1987). The new reduced form needs fewer calories per day to maintain itself (Hill, Sparling, Shields, & Heller, 1987). New knowledge of nutrition and adding weekly exercise to one's lifestyle, in the form of calories burned or expended, will allow this maintenance caloric

level to be higher and thus more achievable (Belko et al.,¹¹ 1987).

Where it was once thought that basic metabolic requirements were fixed and unchangeable (Lennon, Nagle, Stratman, Shrago, & Dennis, 1984), it is now known that exercise conditioning increases metabolic rate because it increases muscle mass. Muscle mass metabolizes calories at a faster rate than fat mass thus increasing the daily basal metabolic requirements (Lukaski, 1987).

No one eats the same everyday. It is the balance of overeating one day with undereating another day that makes for the status quo of weight maintainance. Some people just do this better than others. But this behavior can be learned and the more it is practiced the more natural a part of one's repertoire it becomes (Wadden, 1986).

More recent studies have discovered new methods of maintaining weight loss or avoiding the relapse of obesity (Brownell et al., 1986; Wadden, 1986). Most of these projects have exhibited the need to combine exercise with calorie reduction both for weight reduction and maintenance of weight loss (Brownell et al., 1986; Epstein et al., 1985; "Exercise Beats", 1987; Lampman et al., 1986; Stephenson et al., 1987). Exercise is the key to maintenance. Through exercise a person can manipulate the finite number of calories he/she can consume in a day without exceeding energy expenditure and still not gain weight. Exercise burns calories. A small amount of

exercise daily in the form of increased energy usage in the body means the body can consume more fuel without increasing body weight. This premise is based upon recent knowledge that exercise temporarily increases the basic metabolic requirements of the body and, thus, increases its energy utilization for as long as 4 hours, in some cases, after aerobic exercise (Hagan et al., 1986; Lennon et al., 1984). All increased activity in the form of work burns calories, but for this study exercise means a formal aerobic plan of exercise. With this option a reduced-weighted person has a means to counteract the occasional excess of calories he/she consumes.

It is now believed that calorie reduction, behavior modification for learning new responses to the cues for eating and incorporating an exercise regime into one's lifestyle greatly increases the likelihood of avoiding the relapse of obesity (Bennett et al., 1986; Brownell et al., 1986; Epstein, Valoski, Koeske, & Wing, 1986; Saris, 1989; Pavlou et al., 1989). A recent study published by researchers at Stanford University, CA., noted that if nothing else, increasing exercise allows people to eat more while maintaining their weight ("Exercise Beats", 1987). In addition to being a means of balancing over consumption of calories, exercise increases the total body composition of muscle mass. Muscle mass has a higher metabolic rate than fat mass and thus one can see that the muscular body will have a faster basic energy need on a daily basis than

the fat body. Thus the inactive reduced body can maintain its goal weight by becoming active and increasing its maintenance caloric level (Saris, 1989; Pavlou et al., 1989).

As a result of ongoing research and findings the Public Health Service conducted the National Health Interview Survey with the purpose of obtaining information on the health, nutrition and lifestyle of the American population. The response to the survey led the Public Health Service in the early 1980's to change its objectives to state that by 1990, 50 percent of the United States population should adopt weight reduction programs which balance diet and exercise (Stephenson et al., 1987).

Chapter 3

THE METHOD

Research Design

The study design was a cross-sectional survey which examined the relationship between a diet program versus a diet and exercise program and the relapse of obesity defined by percent body fat. The hypothesis was that the dieter who implemented an exercise program where one had not previously existed would have a greater chance of not regaining weight or body fat (Epstein et al., 1985). The author predicted that a dieter who began an exercise program and made it a part of his or her lifestyle would be making a change in his or her life which would enable them to overcome the relapse of obesity.

Subjects

The subjects were 29 persons who completed a diet reduction program offered at a community hospital in the San Francisco East Bay Area. Although 30 individuals were initially scheduled, 29 were the total number of respondents interviewed and tested after two separate mailings to the same sample of 125 program graduates. The first mailing to the 125 graduates elicited 15 respondents and 12 candidates. The second mailing to the remaining 79 persons from the entire list who did not respond the first time, elicited the other 17 participants. Of the 29 who were tested, only the data obtained from 25 subjects were usable. The four lost were due to lack of prior records

which the clients were unable to supply after the interview.

Diet Program

The diet reduction program was offered on an outpatient basis to residents of the community. The classes were held at the hospital complex in their classrooms and gymnasium. With permission from the San Jose State University Human Subjects Institutional Review Board (Appendix F) and the hospital (Appendix G), 125 candidates were notified of a research project by two mailings (see Appendix H). Those interested in participating were asked to call or write and give their names and phone numbers. Subjects were screened over the telephone for entry criteria of: (a) age (over 25 years of either sex), (b) the ability to read and write English, and (c) completion of one of the qualifying programs. At this time subjects were informed of the nature of the project. If interested in participating, subjects were then scheduled to be interviewed.

Setting

The interview was conducted in a private office in a medical office where the researcher was employed. At that time consent (see Appendix I) was obtained. A copy of the consent was given to each participant. The subjects completed forms containing demographic data (Appendix J) and a written questionnaire (Appendix K) which asked for their status regarding weight loss and maintenance.

Data Collection

The demographic data obtained included: (a) initials, (b) age, (c) height, (d) weight and (e) sex. Questions asked of the subject included: (a) the date the diet and exercise program was completed in order to meet the six-month criteria, (b) educational level achieved, (c) occupation, and (d) a rating of financial status. The question regarding educational level was included in order to obtain data as to whether the subject could read and comprehend English. Occupation data was obtained to add knowledge to subjective reporting about active or inactive lifestyle. A rating of financial status was asked in order to assess the status of the sample in relation to the overall population.

The questionnaire asked for information from the subjects about their feelings regarding exercise and health, as well as the type, frequency, intensity and duration of present exercise performed. The interviewer also asked whether the present exercise was different in any way from the exercise performed in the past and since the conclusion of the program. This qualitative data was reviewed to determine whether exercise was perceived as a way to enhance health and lifestyle.

A current body fat analysis was obtained by measurement of electrical impedance using the RJL Body Composition Analyzer. Body fat is measured as a percent of total weight. For this procedure the person was asked to lie

down on a patient table and two electrodes were attached to both the right hand and right foot. The electrodes were then attached to a mini-computer which measured the impedance of electrical impulse through body tissue. The more the lean body mass, which is high in fluid, the less the electrical impedance. Therefore, the more fat tissue, the more resistance to electrical conduction. This test can then be used to measure percent of body fat (Van Itallie, 1989a). Because certain conditions can negatively affect this measurement, the patients were instructed at the time of phone interview of the necessity to have consumed at least 8-8 ounce glasses of non-caffeinated fluid in the 24 hours prior to the test. Dehydration can falsely affect the results. Additionally, they were asked to avoid strenuous exercise during this time for the same reason. And finally they were asked to consume an average breakfast or lunch prior to the appointment. These measures were necessary to insure as stable a metabolic status as possible. This procedure was neither painful nor unknown to the subject as this test was conducted during their prior diet and exercise program. A copy of the body fat measurement was given to the client and compared to prior results. There was no cost to the subject for this test. Current body weight and height were measured at the interview as well. At this point the subjects' involvement was complete.

The age of 25 was chosen as the minimum for subjects in

order to avoid inclusion of the age group 14-25, which now¹⁸ displays in greater numbers the eating disorders of anorexia nervosa and bulimia. The author felt that inclusion of this age group would possibly have given erroneous results and affected the statistical calculations (Brownell et al., 1986). Those contacted were at a point 6 months or more after completion of the comprehensive diet and educational programs recommending diet and exercise as a means of enhancing health and lifestyle.

The diet programs were a variety of classes which meet for 8 week periods or more and were conducted by: (a) nutritionists, (b) registered nurses, (c) behaviorists experienced in weight loss and behavior modification therapy, and (d) fitness experts. The focus was on teaching clients how to make improvements in diet and exercise habits. There was also a fitness club which the clients could enroll in to practice the newly begun exercise lifestyle. The common ideas throughout the wellness program were to emphasize diet restriction where appropriate, nutritional counseling, behavior modification and exercise.

The variable of continued weight loss maintenance in the absence of an exercise program because of behavior modification alone could have been significant at the 6 month interview. Brownell et al. (1986) propose that behavior modification by itself is an insignificant factor in the maintenance of weight loss at the 1 year point and,

based upon past statistics, 18 months to two years is better measure for lasting success (Brownell et al. 1986). If able to do a longitudinal followup, the results would have been more conclusive.

Chapter 4

DATA ANALYSIS AND INTERPRETATION OF THE DATA

Data Analysis

The 2 groups were compared for similar means and variances of their "before" weights. A two-tailed t test showed that the groups were not significantly different in respect to mean before weights [$t(23) = .804$, $p > .20$]. The variances were shown to be equal [$F(7,16) = 3.02$, $p > .05$]. Relative weight changes in percentages were calculated and body fat measurements were taken and compared to prior measurements. It was expected that the lean body mass would increase as the fat cell mass decreased because the body is composed of lean mass, fat mass, bone and water. Changes occur in fat and lean tissue but bone and water are relatively stable entities (Lukaski, 1987). It could be true that a subject could gain weight on a scale while decreasing body fat because lean tissue weighs more than fat tissue. This in fact accounted for an increase in weight but did not signify relapse in two cases. A decrease of body fat in the presence of a regain of weight could be accounted for by an increase in lean body mass in the absence of a regain of fat (Lukaski, 1987).

The sample was divided into two groups based upon whether they exercised more now than they did before the program. Then these two groups were compared as to differences in body fat and weight. Figure 1 shows the

Figure 1. Distribution of Change in Relative Weights for Exercising and Non-exercising Groups (N=25).

individual differences in relative weight change between the exercising and non-exercising groups. The exercising group showed a greater decrease in relative weight than the non-exercising group. The range of relative weight change in the exercising group was a loss of 15.9 percent (32 pounds) to a gain of 4.3 percent (9 pounds). And the range of relative weight change in the non-exercising group was loss of 3.2 percent (4 pounds) to a loss of 0.2 percent (0.5 pounds).

For body fat measurements see Figure 2. The exercising group demonstrated a change of body fat in a range from a decrease of 8.1 percent to an increase of 4.1 percent. The non-exercising group had a range from a loss of 1.9 percent to a gain of 5.2 percent. The figure shows a greater decrease in body fat for exercisers overall.

Statistical information was analyzed by using the t test and compared the changes in relative weight of the sample divided into two groups of 17 exercisers and 8 non-exercisers. The t statistic for relative weight change was 2.44, $p < .05$, which was significant, indicating that there was a difference in the relative weight change between the two groups and that the group which exercised more lost more relative weight.

Figures 3 and 4 show the before and after weights of the two groups. The graphs demonstrate that although all of the non-exercising group lost weight, the loss was much smaller.

Figure 2. Distribution of Change in Body Fat for Exercising and Non-exercising Groups (N=25).

Figure 3. Comparison of Before and After Weights for Exercising Group (N=17).

Figure 4. Comparison of Before and After Weights for Non-exercising Group (N=8).

Next, the qualitative data obtained from the interviews were analyzed. These data were interpreted from the responses of the subjects to questions asked about their attitudes regarding their success in the program and their feelings about any effect this may have had to their overall health. The questions asked included inquiries about what diet and exercise program was attended with the date of completion. Also asked was: (a) what exercise was presently performed, (b) at what frequency and duration, (c) whether it was aerobic or not, (d) what heart rate was achieved during exercise, and (e) if the heart rate was target for that individual. In addition there were questions as to whether the amount of exercise performed now was the same, less or more than performed before entering the diet and exercise program. The subjects were also asked to rate their present overall activity level or lifestyle as light, moderate or active. The questions were asked during the personal interview or appointment with the subject and can be viewed in Appendix K, the questionnaire.

Interpretation of the Findings

The age range of the 25 participants was from 25 to 71 (see Table 1). There were 6 males and 19 females. There were 5 high school graduates, 12 who had attended some college (1-3 years), 3 college graduates and 4 who had attended graduate school. The range in financial status included one who reported a poor financial level and one who reported a low financial state. Fourteen persons

Table 1

Demographic Data

<u>Characteristics</u>	<u>n</u>	<u>%</u>
Group 1 (exercisers)	17	--
<u>Sex</u>		
Male	5	29
Female	12	71
<u>Age</u>		
30-39	3	18
40-49	2	12
50-59	6	35
60-69	4	23
70+	2	12
<u>Education</u>		
High School Graduate	3	18
Some College	7	40
College Graduate	2	12
Graduate College	4	24
Graduate Degree	1	6
<u>Financial Status</u>		
Poor	0	-
Low	1	6
Moderate	9	53
Moderately High	3	18
High	4	23
Group 2 (non-exercisers)	8	--
<u>Sex</u>		
Male	1	13
Female	7	87
<u>Age</u>		
30-39	2	25
40-49	1	13
50-59	1	13
60-69	2	25
70+	2	25
<u>Education</u>		
High School	2	25
Some College	5	63
College Graduate	1	12
Graduate School	0	-
Graduate Degree	0	-
<u>Financial Status</u>		
Poor	1	12
Low	0	-
Moderate	3	38
Moderately High	4	50
High	0	-

stated they had moderate incomes with 5 reporting moderate to high and 4 reporting high financial status.

There was no apparent difference between the groups who lost or gained weight in relation to education. Of the 22 subjects whose weight decreased or stayed the same, 4 had graduated from high school, 15 had attended college (3 of these earned college degrees), 3 had attended graduate school and 1 had earned a graduate degree. Of the 3 subjects who gained weight, 2 had attended graduate school and 1 had attended some college.

Similarly there was no apparent relationship between weight loss and income level among these subjects. Of the 22 subjects whose weight decreased or stayed the same, 11 reported their income as moderate, 7 as moderate-to-high, 3 high and 1 as poor. And of the 3 subjects who gained weight, 1 reported high income, 1 reported moderate income and the other described himself as having low income.

Of the entire 25 person sample, 17 persons were presently exercising. Their weight change ranged from 32 pounds lost, which represented a 15.9 % relative weight loss, to a gain of 9 pounds, which represented 4.3% relative weight increase. The average weight change in pounds for this group was a -8.46 pounds (see Figure 5). Of the subjects who were exercisers, there were 14 persons whose weight decreased, 2 whose weight increased and 1 whose weight remained the same. Of the two who exercised but did gain weight, one had a body fat decrease by 0.3%

Figure 5. Comparison of Weight Loss of Exercising to Non-exercising Groups (N=25).

and the other had a body fat increase of 3.1%. The subject whose body fat increased only gained 2.5 pounds. This small increase may represent a difference in scales, clothes and time of day the weight was obtained. And further, although he claimed to be exercising aerobically he had lost muscle mass and, therefore, was either ineffectively exercising or not exercising as reported.

There were 8 persons who were not exercising at the time of interview. Their weight change ranged from -5 pounds, which represented a 3.2 % relative weight loss, to -0.2 pounds, which is a 0.1 % relative weight loss. The average weight change for the non-exercising group was - 3.22 pounds (see Figure 5). These data demonstrate the ability of the exercising group to maintain a greater weight loss than the non-exercisers.

Change in body fat for the 17 person group, which was presently exercising, ranged from a 7.2% decrease to a 4.1% increase (see Figure 2). Of the 17 subjects, 13 had decreased body fat, 3 had increased body fat and 1 did not change. For the 8 who did not exercise, the range was a 5.2% increase to a 2.8% decrease. These changes in body fat for those who exercise demonstrate a greater loss of body fat than for those who did not exercise.

It was found that there was a significant decrease in weight, which was substantiated by the t test, and change in body fat for those who exercised. A person was considered successful at overcoming relapse if he/she:

(a) finished the program, (b) continued an exercise program, and (c) maintained weight at the reduced level or if, in the presence of a weight gain, maintained decreased body fat. Of the 25 subjects only three had gained weight and all three of these persons reported the presence of an exercise program. Only one of these experienced an increase in body fat. It is significant to note that a person can be considered successful in overcoming relapse at the 6 month point, but due to the short time span between measurements, they will not demonstrate a great change in weight or body fat. Recontacting these persons or studying participants at 18 and 24 months after these programs finished would supply more conclusive data.

Of the subjects who participated, all felt the same or better about their state of health now than they did before the program, except for 3. One of these three had been ill recently and was recovering from an illness which interfered with her ability to exercise. The other two reported that they were exercising less now than before. The rest of the sample felt good or better about their general health, and 21 of them were exercising the same or more than before. The interview data suggests that there may also be a feeling of well-being associated with exercise which affects a person's overall outlook on his/her health. Prior research documents the positive mental effect of exercising (Foreyt, 1989).

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

This study suggests that exercise influences weight loss maintenance. It is no longer a choice not to exercise for a dieter who wants to keep lost weight off. In the interest of good health, the desire to lose weight must be accompanied by the desire to maintain that weight loss after the diet is begun. Taking up an exercise program will promote maintenance of weight loss and a continued feeling of accomplishment over what has often been a life-time health concern. Exercise also produces an improved feeling of well-being. This positive feeling can help promote the practice of continuing to exercise. The cycle will perpetuate itself with a little effort on the part of the individual. Since prevention of poor health is in part controlled by the individual, believing in the need to care for oneself, as described by Orem's theory of self-care, is integral to this exercise cycle. In addition, a behavior change practiced repeatedly becomes a foundation of a new lifestyle. The effort to sustain the behavior decreases as it becomes a natural part of ones routine, increasing the likelihood of success.

Health professionals who instruct and care for patients with weight problems must be knowledgeable about the effect of exercise on weight loss as well as on maintenance of weight loss. Health professionals need to understand and communicate to patients ways they may improve their

exercise habits which are not only realistic and personal but efficient aerobically.

Certainly with all the means available for testing of body fat and all the strides being made to better understand physiology, there is the need for more research on the valuable contribution that exercise makes to weight maintenance.

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APPENDIX A
Target Heart Rates

Recommended Heart Rates During Exercise

Age	Maximum Heart Rate	85% of Max. (Athlete- Training Rate)	80% of Max. (Recom- mended Training Rate)	75% of Max. (Ht. Dis. History)
				Not to exceed
20	200	170	160	150
22	198	168	158	148
24	196	167	157	147
26	194	165	155	145
28	192	163	154	144
30	190	162	152	143
32	189	161	151	142
34	187	159	150	140
36	186	158	149	140
38	184	156	147	138
40	182	155	146	137
45	179	152	143	134
50	175	149	140	131
55	171	145	137	128
60	160	136	128	120
65+	150	128	120	113

Source: Bailey, C. (1977). Fit or Fat?

APPENDIX B
Aerobic Exercises

Aerobic Exercises			
I Required Minimum Time 12 Minutes	II Required Minimum Time 15 Minutes	III Required Minimum Time 20 Minutes	
Jumping Rope	Jogging	Walking	
Running in Place	Running	Outdoor Bicycling	
Jumping Jacks	Cross-Country Skiing	Stationary Bike	
Chair Stepping	Rowing	Ice Skating	
	Dancing	Roller Skating	
	Mini-trampoline	Swimming	
Aerobic		Non-Aerobic	
	Stop and Go	Short Duration	Low Intensity
Running/Jogging	Tennis	Weight Lifting	Golf
Cross-Country	Downhill	Sprinting	Canasta
Skiing	Skiing	Isometrics	
Jumping Rope	Football	Square Dancing	
Running in Place	Calisthenics		
Cycling Outdoors	Handball		
Stationary Bike	Racquetball		
Rowing			
Mini-trampoline			
Source: Bailey, C. (1977). <u>Fit or Fat?</u>			

APPENDIX C
Table of "Desirable" Weight

Tables of "Desirable" Weight

Height	Metropolitan Life Ages 25-29		Gerontology Research Center Men and Women by Age (Years)				
	Men	Women	25	35	45	55	65
ft-in					pounds		
4-10	...	100-131	84-111	92-119	99-127	107-135	115-142
4-11	...	101-134	87-115	95-123	103-131	111-139	119-147
5-0	...	103-137	90-119	98-127	106-135	114-143	123-152
5-1	123-145	105-140	93-123	101-131	110-140	118-148	127-157
5-2	125-148	108-144	96-127	105-136	113-144	122-153	131-163
5-3	127-151	111-148	99-131	108-140	117-149	126-158	135-168
5-4	129-155	114-152	102-135	112-145	121-154	130-163	140-173
5-5	131-159	117-156	106-140	115-149	125-159	134-168	144-179
5-6	133-163	120-160	109-144	119-154	129-164	138-174	148-184
5-7	135-167	123-164	112-148	122-159	133-169	143-179	153-190
5-8	137-171	126-167	116-153	126-163	137-174	147-184	158-196
5-9	139-175	129-170	119-157	130-168	141-179	151-190	162-201
5-10	141-179	132-173	122-162	134-173	145-184	156-195	167-207
5-11	144-183	135-176	126-167	137-178	149-190	160-201	172-213
6-0	147-187	...	129-171	141-183	153-195	165-207	177-219
6-1	150-192	...	133-176	145-188	157-200	169-213	182-225
6-2	153-197	...	137-181	149-194	162-206	174-219	187-232
6-3	157-202	...	141-186	153-199	166-212	179-225	192-238
6-4	...	...	144-191	157-205	171-218	184-231	197-244

Heights and weights are given for people without shoes or clothing.

Sources: Metropolitan "Height and Weight Tables", 1983.
Statistical Bulletin, January-June 1983.
Gerontology Research Center Table, 1983

APPENDIX D
Nomogram for Body Mass Index

NOMOGRAPH FOR BODY MASS INDEX (KG/M²)

Developed by G. Bray, M.D., 1978, Los Angeles, CA.

APPENDIX E
Medical Classification of Obesity

MEDICAL CLASSIFICATION OF OBESITY USING BODY MASS INDEX (B.M.I.)

Grade of Obesity:		1	2	3	4	5	6
Definition:	Overweight	Obesity		Significant Obesity	Marbid Obesity	Super Obesity	Super Marbid Obesity
Height:	B.M.I. 25	30	35	40	45	50	
4' 10"	120	144	167	191	215	239	
4' 11"	124	149	174	198	223	248	
5' 0"	128	153	179	205	230	256	
5' 1"	132	159	185	212	238	265	
5' 2"	137	164	191	219	246	273	
5' 3"	141	169	198	226	254	282	
5' 4"	146	175	204	233	262	291	
5' 5"	150	181	211	241	271	301	
5' 6"	155	186	217	248	279	310	
5' 7"	160	192	224	256	288	320	
5' 8"	164	197	230	263	296	329	
5' 9"	169	203	237	271	305	338	
5' 10"	174	209	244	279	313	348	
5' 11"	179	215	251	287	322	358	
6' 0"	185	222	259	295	332	369	
6' 1"	190	228	265	303	341	379	
6' 2"	195	233	272	311	350	389	
6' 3"	200	240	280	320	360	400	
6' 4"	206	247	288	329	370	411	

Developed by Robert E.T.Stark, M.D., Phoenix, Arizona, 1987

APPENDIX F
Human Subjects Permission Letter

SAN JOSE STATE UNIVERSITY FOUNDATION

December 7, 1988

Ms. Carolyn Smith
185 Donalceen Court
Martinez, CA 94553

Dear Ms. Smith:

Your human subjects protocol, number #7363 has received final approval from the Human Subjects Institutional Review Board. Attached is a copy of the final approval form with the signatures of the Chairman of the Human Subjects Institutional Review Board, Dr. Robert Hyde, and the Associate Academic Vice President for Graduate Studies and Research, Dr. Serena Stanford.

Although she approved your protocol, Dr. Stanford did request that you replace the "EXPERIMENTAL SUBJECTS BILL OF RIGHTS" statement with the updated version. I have made this substitution to your copy on file at the Foundation, but you will need to replace this page in your copy. I have enclosed a copy of the revised statement for this purpose. (Please note the difference in telephone numbers.)

Congratulations and good luck with your research!

Sincerely,

Jerelyn Cockriel
Contracts and Grants Coordinator

Attachment

SAN JOSE STATE UNIVERSITY
GRADUATE STUDIES AND RESEARCH

HUMAN SUBJECTS INSTITUTIONAL REVIEW BOARD
PROJECT PROPOSAL REVIEW

51

I, the undersigned member of the San Jose State University Human Subjects Institutional Review Board, have reviewed the following proposal submitted to the Committee on October 3, 1988 by:

PRINCIPAL INVESTIGATOR: Carolyn Smith
PROTOCOL #: 7363 DEPT.: Nursing
PROJECT TITLE: "THE RELATIONSHIP OF DIET, EXERCISE, AND THE REGAINING OF WEIGHT."

I recommend the following action (indicate one):

1. Approved for clearance as involving minimal risk to Human Subjects. ☒
2. Approved for clearance with risk to Human Subjects. ☐
3. Approved for clearance when the following conditions are met: ☐

4. Not Approved (return to principal investigator for following reasons): ☐

5. Expedited Review (specify condition[s] that merit expedited review): ☐

Robert J. Latta, M.D. 10/5/88
Signature of IRB-HS member Date

OFFICIAL SIGNING FOR INSTITUTION

[Signature] 11/27/88
Chair, Human Subjects Institutional Review Board Date

Serena Stanford 12/2/88
Serena Stanford, Ph.D. Date
AAVP for Graduate Studies & Research

APPENDIX G
Medical Center Permission Letter

Michael L. Wall
President & Chief Executive Officer

BOARD OF DIRECTORS

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25 July 1988

To Whom It May Concern:

This is to confirm that Callie Smith has been granted permission to contact participants of the Diet and Exercise, and Be Trim programs at Mt. Diablo Medical Center. She may have access to our mailing lists and telephone records to recruit interviewees for her thesis project on weight loss.

Sincerely,

Carol Akiyama, R.D.
Coordinator, Health Promotion

CA:mc

APPENDIX H
Letter to Subjects

Apr. 28, 1989

Dear Diet and Exercise Participant,

I am contacting you in hopes that I can enlist your help with a project I am conducting in connection with my Nursing Masters Thesis. I am greatly interested in talking with you briefly (for about 15 minutes) seeking answers to the connection between diet, exercise and regaining lost weight.

I will be conducting a brief interview, weighing and performing a body fat analysis on you. This is free.

If you think you could spare me a few minutes please call me at 682-0397 (work) or 228-8426 (home). I have message machines on both lines and if I am not available, I will return your call as soon as possible.

There is no cost to you to participate if you so choose and I'll be pleased to share my results with you should you so desire.

Thank you for your time in considering this matter.

Sincerely,

Callie Smith, R.N.

APPENDIX I
Informed Consent

Informed Consent

You are being asked to participate in a research project conducted by Callie Smith, R.N., a graduate student at San Jose State University. The purpose of this research is to determine if there is a relationship between diet versus diet and exercise and the relapse of obesity. You were selected as a possible participant in this project because of your affiliation with the Mt. Diablo Hospital Wellness Programs.

If you decide to participate, I will be reviewing your diet and weight loss records from the programs at Mt. Diablo Hospital and conducting an interview with you at 6 months after you achieve your weight loss.

You may be asked to undergo a body composition measurement if you had one at the beginning of the weight loss program. This is a test which can be performed in a few minutes and which requires the placement of electrodes upon your finger and toe while the electrical impedance of your body is measured. There is no pain associated with this test.

The information that will be obtained from you will be used as statistics for my Masters Thesis. Your name and any information obtained will remain confidential.

By participating in this project, you will possibly benefit from the knowledge that you will be furthering the available data regarding successful weight reduction and exercise. This information may make it easier for others

and you to maintain weight loss in the future. You will also benefit from any information gained in the body composition analysis. 58

There will be no cost to you for any part of your participation in this study and no risk is involved to you for your participation.

Whether you decide to participate in this project or not will not effect your future or continued care at Mt. Diablo Hospital Medical Center or in the Wellness programs. Should you decide to participate you may withdraw your consent at any time.

I am available to answer any questions you may have regarding this project. My telephone number is 415-228-8426 (home) and 415-682-0397 (work). You may also inquire about this research project to San Jose State University, Department of Nursing Chairman Virgil Parsons, Ph.D., at 408-924-3130 For questions or complaints about a research subject's rights, or in the event of research-related injury, contact Serena Stanford, Ph.D. (Associate Academic Vice President for Graduate Studies & Research) at 408-924-2480.

You may receive a copy of this consent form if you so desire.

Your signature on this form will indicate that you have reviewed this information and constitutes your decision to participate in this research project.

Date:_____ Name, printed:_____

Signature:_____

Witness:_____

APPENDIX J
Demographic Data Form

Patient Initials_____ Patient #_____
Date_____ Age_____
Height_____ Weight_____ Sex_____
Date maintenance weight attained_____
Education_____ Occupation_____
_____Financial Status_____

APPENDIX K
Interview Questionnaire

Interview Questionnaire

1. What weight loss program did you attend?_____
2. Prior Body Fat if available._____
3. Exercise performed._____
4. How often per week exercise is performed?_____
5. How long is exercise performed per session?_____
6. Heart rate achieved during exercise?_____
7. Is this target heart rate for you?_____
8. Is this exercise more, same or less than your level
of exercise practiced at attainment of goal weight?
(circle one).
9. How do you feel generally about your state of health
now?_____
11. Is this the worse, same or better than you felt about
your health before your weight loss and exercise?
12. Would you rate your activity level as light,
moderate or active (circle one)?