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COMPARISON OF BEHAVIOR MODIFICATION AND A FOOD EXCHANGE SYSTEM
AS METHODS OF WEIGHT REDUCTION

by

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INTRODUCTION

The number of obese individuals in the United States has increased to the point that obesity can accurately be considered a national problem, and perhaps, a national obsession (1). Behavior modification offers a relatively new avenue for treatment of obesity (2,3).

Behavioral methods for treating obesity are based on the premise that excessive overeating is an inappropriately learned habit that responds to many stimuli and environmental events unrelated to physiological cues of hunger. Behavior modification procedures attempt to change the individual's eating pattern by reducing the number of inappropriate stimuli that are responded to with food intake (4). If these changed habits can be incorporated into the daily routine and life style of the patient the chances of long-term treatment success are greatly increased. Through the process of daily record keeping, weekly analysis, and gradual change in both eating behavior and physical activity, the patient assumes responsibility for his own behavior, which must remain the ultimate goal of the treatment program (5).

In addition to behavior modification techniques, successful weight reduction has been achieved by individuals utilizing the food exchange system. The objective of this system is to provide calorie modifications with the attempt to provide a dietary regimen suitable to the individual's life style (6). Sloan et al. (7) found that a combination of behavioral and diet therapy techniques may be applied to weight reduction with success.

A pilot study was conducted at Kansas State University to determine the efficacy of Behavior Modification and the American Dietetic Association Food Exchange List as methods of weight reduction. Participating in this study were basic nutrition students and individuals from the university community. Those two groups of subjects were selected to determine if nutrition knowledge gained from a basic nutrition course is a critical factor involved in successful weight reduction. To evaluate the influence of formal nutrition education and the success of two approaches to weight reduction, four groups were designated which are as follows:

- Group 1: Behavior Modification - Basic Nutrition Students (BM,BN)
- Group 2: Behavior Modification - University Community (BM,UC)
- Group 3: ADA Food Exchange List Diet - Basic Nutrition Students (ADA,BN)
- Group 4: ADA Food Exchange List Diet - University Community (ADA,UC)

The purpose of this study was to determine which of the four groups would have the lowest attrition rate and which of the four groups would achieve the greatest total weight loss.

REVIEW OF LITERATURE

Why traditional treatment fails. Obesity is not a singular phenomenon nor a simple matter of controllable gluttony. It is an addictive behavior disorder, and it is complex and resistant to change. Eating disorders are learned behaviors, practiced and strengthened over a period of years until overeating, in many cases, becomes an autonomic or reflexive act. Furthermore, eating provides immediate/positive reinforcement by satisfying taste, relieving hunger pangs and temporarily alleviating anxiety.

For many obese individuals, eating-related activities provide the major source of life's gratification and it is around eating rituals that the obese structure their time. Deprived of these activities, they may experience a "void" or depression. Unfortunately, as the obese individual continues to feel more uncomfortable, he increases his isolation from normal social and physical activities. Thus, he reduces the opportunity to receive gratification or positive reinforcement for behavior antagonistic to eating.

The cycle of withdrawal, inactivity, loneliness, boredom and frustration due to obesity is perpetuated and the obese continue to eat in response to these situations. Routine medical management often fails, since it demands that patients follow dietary modifications amounting to drastic changes in life style. To expect a person to forget long-established, highly gratifying, habitualized responses is unrealistic without teaching him alternative reinforcing responses that are incompatible with eating (8).

Success of behavior modification. Success in behavior modification for weight control generally is measured in weight loss or weight maintenance. Murray (9) found empirical evidence of a tendency for those individuals with the highest initial weight to lose the most weight. Additional factors

such as age of onset of obesity (10), age of the patient (11), and teamwork (12) have been studied to determine the correlation of successful achievement of weight loss with behavior modification techniques.

There is limited information available on behavioral treatment programs for obese adolescents. However, results from a ten-week study by Gross et al. (10) indicate the feasibility of using group behavior modification procedures with young adolescents in need of weight control. In this study, ten adolescents achieved a total weight loss of 73.5 pounds. Four subjects maintained or gained a total of 9.5 pounds. Changing eating patterns and the conditions of eating seemed the major factors in inducing weight losses, and these continued after the program was formally over. Success (as defined by a loss of 15% or more of the original percentage overweight) was more frequent among adolescents with good academic performance. Five of the six subjects who achieved a weight loss received above average grades in school, whereas, average grades were reported by two of the three subjects who gained weight. The four subjects who failed to make significant progress had early onset of their obesity. A weight loss was achieved by four subjects whose obesity began after infancy and by two subjects known to be obese since infancy. Success was always associated with family support, whereas, lack of family support and failure to lose weight were associated in all but one instance. This suggests that parental reinforcement and encouragement are critical to successful weight reduction (13). The factors of good academic performance, age of onset of obesity, and family support can be assessed prior to treatment and may provide an indication of probable treatment success (10).

The medically referred, older obese patients represent the group at greatest health risk from conditions such as hypertension, cardiovascular disease, bone and joint disease. Therefore, Currey et al. (11) believes that this group should be regarded as the yardstick for measuring the efficacy of any weight reduction treatment. Most studies of behavior modification as a treatment for obesity have shown strong positive results. However, data indicate that medically referred, older obese persons with numerous health problems may experience no greater success with behavioral techniques than with traditional methods such as fad diets, diet pills, and the general medicine's authoritarian-physician-dependent-patient who loses weight to please the doctor (11,14). An additional method emphasized in the past was insight therapy with its focus on inner drives, motives and conflicts. In contrast to the behavior modification treatment, insight therapy generally ignores environmental factors in the control of food intake (3).

Wells (12) stated that teamwork is important in the success of a program. The psychologist, nurse, and family should be objective, adaptive, and realistic in setting goals. The team needs to be consistent in their approach to the patient and use the information obtained from base-line data about the obese individual's pattern of food intake to develop a specific behavior management program for that person (4).

Another factor involved in the success of a weight reduction program is the differential effect of preferred or nonpreferred treatment. The general public is becoming increasingly sophisticated about psychological treatment methods. Therefore, patients are likely to have knowledge about and preferences for the method of treatment they may receive.

A pilot study was conducted by Murray (15) to determine if individuals receiving their preferred treatment would have greater success in weight loss than those receiving their nonpreferred treatment. The two treatment methods were "self-control training" and "determination-raising." In the self-control group specific techniques for changing eating habits were introduced. The determination-raising group emphasized developing the determination to reduce eating sufficiently to lose weight. Half of each treatment group had expressed a preference for the type of treatment they received and half for the other type of treatment. No evidence indicated that either type of treatment or receiving one's preferred type of treatment was related to weight loss.

A major problem in the treatment of obesity has been the high drop out rate and, thus, the low probability of success. Therefore, a critical aspect of the weight loss program should deal with keeping the patients involved. Brightwell (16) found that the attrition rate was lower in behavior modification than in traditional weight loss methods. In addition, every patient remaining in the program continued to lose weight at varying rates. The steady weight loss of the obese serves as a reinforcement and encourages them to continue the treatment. Generally, patients in a weight loss group appear to be more consistent in weight loss than those in individual treatment (17,18).

Self-help organizations for weight control are growing in numbers. Some of these organizations are combining patient self-help and behavior modification to provide an effective weight reduction treatment. Levitz and Stunkard (19) investigated the effectiveness of behavior modification in TOPS (Take Off Pounds Sensibly). TOPS is a 29-year-old self-help

organization for the obese with 320,000 members in more than 12,000 chapters nationwide. Most of the members are female.

Sixteen chapters of TOPS, with a total of 234 members participated in the study conducted by Levitz and Stunkard (19). Each of the 16 chapters was assigned to one of four treatment conditions, with four chapters in each group. The four treatments were: behavior modification conducted by a professional therapist, behavior modification conducted by a TOPS leader, nutrition education conducted by a TOPS leader, and the continuation of the usual TOPS program. The usual TOPS program includes a weigh-in, an announcement of weight gains and losses, rewards and sometimes punishments, group singing, and a general discussion of weight-related topics.

A major therapeutic problem in the treatment of obesity is the attrition rate. During the three months of active treatment fewer TOPS members dropped out of the two behavior modification groups than out of the nutrition education and control groups. Only 38 and 41 percent had dropped out of the behavior modification groups conducted by a professional therapist and a TOPS leader respectively, compared to the 55 percent for the nutrition education and 67 percent for the control groups ($\chi^2=12.35$, $P < .01$).

For those subjects remaining in the weight loss program, behavior modification groups lost significantly more weight than those in the control groups ($F=10.7$, $P < .001$). The mean weight loss for subjects in the TOPS chapters utilizing behavior modification conducted by a professional therapist was 1.92 kg (-4.2 lb). This was significantly more ($P < .001$) than the mean weight loss for subjects in the nutrition

education group (-0.11 kg or -0.2 lb) or the TOPS control group in which subjects actually gained 0.32 kg (+0.7 lb). The subjects in the TOPS chapters utilizing behavior modification conducted by professionals lost significantly more weight ($P < .05$) than those receiving the same treatment instructed by the TOPS chapter leaders (-0.86 kg or -1.9 lb).

Leadership was provided by the TOPS chapter leaders in three conditions. Results from these chapters indicate the behavior modification program produced significantly greater weight loss ($P < .05$) than did the continuation of the usual TOPS program. The difference between the behavior modification and nutrition education programs was not statistically significant, although the results favored the behavior modification program. Behavior modification kept more persons in TOPS during treatment and produced greater weight losses.

Self-control and "eating style." The purpose of an effective and permanent program of weight control is the development of self-control of eating and related daily activities. Weight loss followed by stable weight control should occur as a consequence of the adaptive behaviors resulting from self-control (1,20).

Two assumptions in the behavioral treatment of obesity are (a) obese and non-obese individuals display distinctive "eating styles," and (b) the obese can reduce by adopting the eating style of the non-obese person. The "obese eating style" is characterized by a few large bites, rapid eating pace, short meal duration, and an exaggerated sensitivity to external stimuli such as the sight or aroma of food, a television advertisement, or the time of day. The overweight person is more likely to respond to external stimuli or cues to eat rather than responding

to internal cues for eating like hunger. Therefore, recommendations for weight control typically include instructions to slow the pace of eating, take smaller bites, lengthen meal duration, and exert stimulus control by altering the cues associated with eating (21).

Epstein et al. (22) found that bite rate, the pace of eating, is an easily modifiable response. Therefore, since the reduction in bite rate is associated with a decrease in total food consumption, the obese individual by converting to the lower bite rate of the non-obese person should lose weight.

However, Mahoney (21) does not support the eating style distinction between obese and non-obese individuals. A series of studies were designed to explore the eating styles of obese and non-obese persons. Studies I and II examined overweight and normal subjects and three eating style parameters: total number of bites, rate of eating (bites/minute), and meal duration. Each subject ate a standardized experimental meal in solitude on two separate days. Subjects' eating responses were monitored via a closed circuit television. In Study I the 14 male subjects averaged 18.7 bites with a meal duration of 11.3 minutes and an eating rate of 1.8 bites per minute and the six female subjects averaged 34 bites with a meal duration of 15.1 minutes and an eating rate of 2.26 bites per minute. Correlations were performed between the degrees of obesity and the three eating style parameters. None of the correlational data reached statistical significance, although meal duration appeared to be negatively correlated with obesity in the six females observed.

The second study involved a field experiment in a quick foods restaurant. Obese and non-obese male patrons were observed for eating patterns with a meal similar to the standard experimental meal. Study II

found males consumed almost twice as many bites (32), took half as much time (4-9 minutes), and ate at a rate three and a half times faster than in the laboratory (5-6 bites per minute). This data suggest that eating style may be a situation specific behavior pattern.

Study III investigated the relationship between daily bite frequency and degree of obesity. Each of the 62 subjects were asked to count their bite frequency for a 24 hour period. A bite was defined as a single ingestive response involving a solid or semi-solid food (one requiring mastication). The pooled correlation between degree of obesity and daily bite frequency was 0.08. For males, $r=-0.17$, and for females $r=0.23$. None of these correlations were statistically significant.

In Study IV, the role of "belief" versus "behavior change" was examined by crossing the factor of altered eating pace (fast/slow) with instructions regarding the probable effects of this alteration on total food consumption (increase/decrease). Each of the 46 subjects were asked to eat a piece of chocolate covered candy (M&M's) at the ring of a bell until they felt comfortably "full." Results indicated that those subjects who were told that their eating pace (fast/slow) would increase food consumption ate an average of 38.0 pieces of candy as compared with 25.8 on the part of those subjects who were told that their eating pace would decrease consumption. The finding that expectancy (or belief) exerted a much stronger influence on food consumption than did eating pace suggests the need for a critical examination of the active ingredients in popular treatment strategies. However, one cannot conclude from this study that the rate of eating has no effect on quantitative consumption. This data simply questions the critical values of pacing. Is such pacing less

helpful in slow-eating obese clients than fast-eating clients? Do its effects interact with such factors as food consistency, mastication frequency, or number of swallows?

The present data on eating style are far from conclusive. They do not demonstrate the absence of differences in obese and non-obese eating styles. However, they do raise serious questions about several fundamental assumptions underlying contemporary behavioral treatments of obesity. Further research needs to refine the apparent inconsistency with these assumptions.

Role of the therapist. In the treatment of obesity, the role of the therapist is to teach the client how to analyze his own behavior patterns and how to devise suitable techniques for changing them (23). The results of several studies using self-control techniques suggest that the need for therapist contact and control is minimal (2,13,24-26).

Brightwell and Clancy (14) initiated a self-devised and self-directed minimally structured system to allow each patient to develop a program that was appropriate to their needs. In this way the patients could administer their own program with minimal involvement from a therapist. This is important because any treatment to be successful for the large number's of obese patients seen in a general physician's office, must not be overly time consuming. In this study, eight patients were seen individually over a two week period for five sessions lasting twenty minutes each and then followed monthly. During the first session, the physician explained to the patient the basic principles of behavioral treatment. Desired new eating behavior was described and discussed in the remaining sessions. The number of pounds lost during the one year

treatment period was expressed as a percent of excess weight loss. The range was from 18.3% to 41.3% for the six patients who remained in treatment. Attempts to contact the two non-completers were unsuccessful. However, these results indicate that an approach as such offers the hope that a behavioral program can be used by the general physician for the treatment of obesity.

The role of the therapist has been associated with the patients' ability to maintain treatment weight loss. Carter et al. (27) found that if meetings with the therapist were "faded out" over the duration of the ten-week treatment period, subjects lost significantly more weight compared to subjects who met with the therapist on a regular basis. Six months after therapy, subjects who had regularly met with the therapist during the treatment period had gained back all the weight they had lost during treatment; they no longer differed from controls. Subjects who had the therapist "faded out," however, maintained their weight losses. These results indicate the important role of the therapist in the development of self-control and suggest that failure to maintain weight loss may be due to a failure to "fade out" the therapist. These data pose an embarrassing question: "Are you hurting your clients by seeing them too much?"

Hall et al. (28) conducted a study to determine the effectiveness of brief booster sessions following the termination of formal treatment. Fifty-one overweight adult subjects participated in a 12-week course in self-management training and fourteen were assigned to a no-treatment control. The self-management subjects were randomly divided into three 12-week follow-up groups: booster (continued therapist contact plus

monitoring), monitoring-only, and no-contact. Booster sessions consisted of meetings with the therapist every two weeks for 20 to 30 minutes. The booster treatments were compared to no-contact controls and a monitoring-only group designed to control for the effects of weight and food monitoring alone without continued therapist contact. The monitor-only group had no contact with the therapist except for the exchange of food intake records and body weight charts. Mean Weight Reduction Index Scores (initial wt/ideal wt X lb lost/lb above ideal wt X 100) at post-treatment were -36.55, -33.66, -23.88 and +3.58 for booster, monitoring-only, no-contact and no-treatment groups, respectively. Results suggest that brief booster sessions following termination of formal treatment enhance the probability of continued self-monitoring on the part of the subject. Continued treatment contact may be critical for successful weight loss by self-control subjects (29).

Role of financial contingencies, treatment contracts and rewards.

Self-control techniques used in conjunction with therapist controlled reinforcement serve an important role in stimulating weight loss during treatment (30,31). However, results of most studies indicate that weight loss rarely continues after treatment and when it does, it occurs at a reduced rate.

The use of financial contingencies is a procedure which may be incorporated into the behavioral treatment of obesity. Subjects in financial contingency groups are typically required to leave a financial deposit with the therapist at an initial session. The money is then returned or forfeited in fixed amounts contingent on weight loss or changes in eating habits. The contingencies can either be therapist-managed or self-managed (23).

Rozensky and Bellack (32) conducted a study to examine the relationship between self-reinforcement (SR) and success in treatment. Subjects were classified as high or low on the tendency to administer SR from results of a SR testing procedure similar to that employed by Bellack and Tillman (33). Subjects were then assigned to a weight reduction program that emphasized either self-control (SC) or external (therapist) control. The program consisted of three components: establishment of a negative energy balance, stimulus control, and self-monitoring (SM). The program was designed to generate moderate weight losses (1-2 lb/week) and modify eating habits. The SM procedure involved pre-eating monitoring, for example, subjects were instructed to make a written record of intended food intake immediately prior to eating. This SM procedure was designed to facilitate self-evaluation (SE) and SR of behavior by increasing subjects awareness of their intended behavior. The external control (EC) program involved therapist administered financial contingencies (FC) for weight loss. A significant interaction was found between the SR group and treatment group. High SR subjects lost weight at the rate of 1.49 pounds/week in the SC group and only 0.37 pounds/week in EC. Low SR subjects lost at the rate of 1.06 and 1.01 pounds/week respectively in SC and EC. The self-control program was effective for both high and low SR subjects. These results suggest that the pre-behavior monitoring technique can be a powerful tool to a basic stimulus control program. However, financial contingencies had either neutral or negative effects.

Rozensky and Bellack (32) offer two modifications of the FC procedure employed in this study for the future success of the use of financial contingencies in weight reduction. First, an effort should be

made to insure that the size of the monetary reinforcer is adequate. Secondly, reinforcement (or some representative such as tokens or points) should be administered on an immediate basis following a loss in weight or preferably, a behavior change which may result in weight loss.

A factor which enhances continued weight loss and weight loss maintenance is the treatment contract made by the client and the therapist (34). A 30 pound weight loss was obtained by a bright, emotionally disturbed 10-year-old boy with the aid of an ongoing contractual agreement with the therapist. Contracts, specifying goals and rewards were written after each loss of 10 pounds (35). Contracts may motivated the patient to lose weight during the treatment process (35,36). Harris and Hallbauer (36) suggest extending the contract length to motivate subjects to continue to lose weight or maintain the weight loss between the end of the defined treatment and the follow-up weigh-in.

In general, self-reward strategies may provide an effective incentive component in weight loss attempts (37). Non-material, short-term rewards have been used successfully (5). Mahoney (38) and Malcolm et al. (39) found that obese individuals who provided self-reward for habit change showed more pronounced improvement than persons who provided self-reward specifically for weight loss. This suggest that discussion with the therapist should be oriented around eating pattern changes, rather than number of pounds lost.

Maintenance of weight loss. Behavior modification techniques have shown more promising results in maintaining weight loss than traditional weight reduction procedures (40,41). However, results from behavioral treatment of obesity do not indicate long-lasting effects (42,43).

One hypothesis offered is that treatment success and subsequent maintenance of weight loss are governed by partially different processes (18). Jordan and Levitz (44) suggest that initial weight loss may be due to the introduction of a novel program and not to the specific techniques of behavior modification. At the beginning of the program, subjects have to learn effective methods of losing weight. Once these skills have been acquired weight loss becomes predominately a function of whether or not skills are implemented in the natural setting. In contrast, failure to obtain lasting results may reflect a deficiency in a particular program in which the specific techniques for weight loss and self-management were not learned (43).

Maintenance of treatment produced change may hinge on the subjects' motivation. Kingsley and Wilson (18) found that the subjects' motivation was superior in group therapy as compared with individual therapy with respect to maintenance. However, Stuart (45) stated that successful treatment depends upon the effectiveness with which environmental stimuli are brought under control rather than depending on motivational or other personal characteristics of the overeater.

METHODS AND PROCEDURES

A pilot study was conducted at Kansas State University to determine the efficacy of two weight reduction methods with two groups of subjects. The two weight loss methods being evaluated were:

- (a) Subject calculation of own weight reduction diet using the American Dietetic Association Food Exchange Lists (46). Guidance was provided by a nutritionist, R.D.
- (b) Student manual of Learning to Eat: Behavior Modification for Weight Control (47). The therapist was a nutritionist, R.D., using the leader manual.

An advertisement soliciting volunteers for a weight reduction study was placed in the student newspaper, Kansas State Collegian. Subjects were selected from the university community and the Basic Nutrition course. The 20 subjects selected from each group satisfied the following criteria: at least 15 pounds overweight according to the Metropolitan Height and Weight Tables, nonpregnant, and willingness to participate for the full time of the experiment. The university community volunteers were selected from the applications which indicated individuals lack of formal nutrition education.

A signed consent form was obtained from each subject. The importance of completing the study and attendance at the weekly meetings was emphasized. Information was collected on the individual's age, height, and wrist circumference. Subjects were then weighed on a Detecto Scale¹ and were measured using Lange Skinfold Calipers.² Each subject was weighed weekly and measured with skinfold calipers biweekly. Skinfold measurements

¹Detecto Scale, Detecto Scale Inc., Brooklyn, New York.

²Lange Skinfold Caliper, Cambridge Scientific Industries, Inc., Cambridge, Maryland.

obtained for women were the triceps and suprailiac crest. Skinfold measurements obtained for men were the triceps, abdominal, and pectoral.

A weight loss of one pound/week was considered a reasonable expected weight loss over the ten week study period. The statistical analysis used for this study was an unpaired t-test (48).

To evaluate the influence of formal nutrition education and the success of the two methods of weight reduction four groups were designated which are as follows:

- Group 1: Behavior Modification - Basic Nutrition Students (BM,BN)
- Group 2: Behavior Modification - University Community (BM,UC)
- Group 3: ADA Food Exchange List Diet - Basic Nutrition Students (ADA,BN)
- Group 4: ADA Food Exchange List Diet - University Community (ADA,UC)

ADA Food Exchange List Diet Group. The objective of the diet group was to lose weight by reducing the number of calories consumed. At the first meeting, the diet group received the "ADA Exchange Lists for Meal Planning" booklets (45). This exchange list provided subjects with a guideline to assist them in designing their personal dietary regimen which was to be followed throughout the study period. The subjects were asked to practice their usual eating patterns for the following week and to keep a four day food intake record. This baseline period provided an opportunity for subjects to observe their usual eating pattern and gain experience with the exchange system by converting their food intake record to food exchanges. An estimate was made of the total kilocalories consumed on each day. The Home and Gardern Bulletin Number 72, Nutritive Value of Foods (49) was used for estimations of kilocalories for those foods not included in the exchange list.

At the second meeting the subjects calculated their individual kilocalorie requirement considering their basal metabolic rate, energy

expenditure, and specific dynamic action. A sample 1500 kilocalorie Menu Guide was distributed. Each subject was asked to prepare an individualized exchange diet which supplied adequate protein and a 500 kilocalorie deficit/day of the total daily kilocalorie requirement previously calculated. Dietary guidance was given throughout the ten week period.

Behavior Modification Group. The intent of the behavior modification was to teach subjects how to lose weight and maintain their weight loss through reduced consumption of food without the help of a special, restrictive diet. Emphasis was on developing proper eating habits rather than following a specific diet pattern.

At each meeting the subjects were weighed and weight changes were reported to the group. The therapist gave verbal approval to subjects who lost weight. Those who failed to lose weight were asked to review their behaviors that lead to their inappropriate eating and to identify modifications that would lead to proper eating habits, thus, weight loss. New material was presented verbally by the therapist. With the presentation of each new behavior modification technique, subjects were asked how they planned to apply the technique. The following week each subject was asked how they had applied the technique and its outcome.

Weekly homework assignments were given which were recorded in the students manuals (47). At each meeting the assignments were checked for completion. Following are a few examples of the assignments: keeping a food diary, preparing an eating place record, preplanning food consumption, identifying a behavior chain which leads to overeating, and defining alternate activities.

In the student manual (47), a five-week maintenance period is included which serves as a practice period for reinforcing the new techniques learned. However, due to the lack of time available for this study, the maintenance period was reduced to a one week lesson. This was the only deviation from the programmed manual incorporated into the behavior modification section of the study.

RESULTS AND DISCUSSION

A number of people who had agreed to participate in the study failed to complete the full ten weeks resulting in unevenly sized groups. At the initiation of the study each group contained ten subjects. No attrition resulted in the experimental Groups 1 and 3 (BM,BN; ADA,BN) where the subjects were selected from students enrolled in the Basic Nutrition course. Skuja (34), Dinoff et al. (35) and Harris and Hallbauer (36) found that a treatment contract developed by the subject and the therapist may motivate the subject to lose weight during the treatment process. Those contracts included specified goals and rewards for weight loss. In contrast, the basic nutrition subjects signed a contract to complete this study without an agreement concerning weight loss. Therefore, those subjects were motivated highly to remain in the study for its duration since they received academic credit for their participation in place of writing the required term paper. The contract was successful in the achievement of a zero attrition rate, however, weight loss was not enhanced. Results suggest that subjects may have achieved a higher weight loss with a contract which included a specification for a required weight loss rather than the original contract which required only the completion of the study to receive academic credit. Brightwell (16) and Levitz and Stunkard (19) found that behavior modification treatment programs result in a lower attrition rate than traditional weight loss methods. In the study conducted by Levitz and Stunkard, a drop out mean of 40% resulted from the two behavior modification groups, whereas, the nutrition

education and control groups experienced a 55 and 67 percent attrition rate, respectively. The present investigation reaffirmed this conclusion. For the two experimental groups drawing subjects from the university community, two dropped out of the behavior modification group (Group 2) and seven dropped out of the ADA diet exchange group (Group 4). The subjects with premature termination rates were considered "non-completers." The seven "non-completers" in Group 4 (ADA,UC), and one "non-completer" in Group 2 (BM,UC) were not achieving the expected weight loss. An additional premature termination resulted in Group 2 (BM,UC) from a subject who was unable to attend because of an illness in the family.

The mean weight loss for the four groups during the ten weeks of the study is presented in Table 1. The high drop out rate seriously biased the results for Group 4 (ADA,UC) since those remaining for the duration of the program were considered "completers" and were expected to achieve weight loss. Levitz and Stunkard (19) reported that the mean weight loss for subjects in the behavior modification groups (-1.92 kg or -4.2 lb) was significantly more than the nutrition education group (-0.11 kg or -0.2 lb). In the present study, results indicate that the behavior modification techniques were successful in producing weight loss. Group 2 (BM,UC) lost the most weight of the four groups. Group 2 (BM,UC) lost significantly more weight than Group 3 (ADA,BN) ($P < .10$). Two factors which may be responsible for this result are subject motivation and program structure. Kingsley and Wilson (18) stated that motivation to lose weight is a key factor in the treatment of obesity. The findings of this study reaffirm this motivation theory. The basic nutrition subjects' primary motive

TABLE 1
Average weight loss during the
ten week study period

Group ¹	n	Total weight change for each group	Average weight change for each group ²
		1b	1b
1 (BM,BN)	10	-33.50	-3.35±4.48 ^a
2 (BM,UC)	8	-55.50	-6.90±5.74 ^b
3 (ADA,BN)	10	-50.00	-5.00±3.77 ^a
4 (ADA,UC)	3	-12.00	-4.00±4.36 ^{a,b}

¹Group 1 (BM,BN) indicates the Behavior Modification - Basic Nutrition Students; Group 2 (BM,UC) indicates the Behavior Modification - University Community; Group 3 (ADA,BN) indicates the ADA Exchange List Diet - Basic Nutrition Students; Group 4 (ADA,UC) indicates the ADA Exchange List Diet - University Community.

²Means±SD in a column followed by the same superscript letter are not significantly different, $P < .10$.

for completing the study was to receive academic credit rather than to lose weight. Academic credit was earned by the subject by attending each meeting regardless of weight loss. In contrast, the university community subjects motivation to complete the study was to achieve weight loss. Results from this study agree with Leon (30) and Abramson's (31) suggestion that weight loss during treatment may be enhanced when self-control techniques are used in conjunction with therapist controlled reinforcement. The behavior modification program was more structured than the ADA diet program. Each day behavior modification subjects were required to complete written assignments, such as a food diary, which assisted them in analyzing and changing eating habits. This type of structure provided daily reinforcement and motivation for the subjects to continue the program. Blake (17) and Kingsley and Wilson (18) suggest that subjects in a weight loss group tend to lose weight more consistently than those in individual treatment programs. In the present study, behavior modification subjects participated in weekly group discussions concerning behavioral "achievements" and "failures" in terms of weight control. This treatment method promoted more of a "group atmosphere" than the ADA diet group which consisted of communication primarily between the therapist and the subject. The ADA diet program consisted of a weekly weigh-in and a brief question-answer period for subjects with dietary problems, such as a failure to lose weight or questionable kilocalorie content of foods in their diet. During the once-a-week weigh-in, subjects who lost weight received reinforcement and were motivated

to continue the program. Little motivation was experienced by those subjects who failed to lose weight. Group 2 (BM,UC) lost a mean of 6.9 pounds more ($P < .10$) than the weight loss in Group 1 (BM,BN) (-3.35 lb). The difference between Groups 1 (BM,BN) and 3 (ADA,BN); 1 (BM,BN) and 4 (ADA,UC); 2 (BM,UC) and 4 (ADA,UC); 3 (ADA,BN) and 4 (ADA,UC) was not statistically significant.

Figure 1 shows the total weight change of each subject who completed the study. In the early stages, participants were told that a desirable weight loss would be about one pound/week which would result in a ten pound weight loss by the end of the study period. This goal was accomplished by two in Group 1 (BM,BN), three in Group 2 (BM,UC), two in Group 3 (ADA,BN) and one in Group 4 (ADA,UC). A comparison of the four groups revealed that subjects in Group 2 (BM,UC) had a greater number reaching the set goal, had the highest individual weight loss (-19 lb), and the highest mean weight loss (-6.9 lb). All subjects in Groups 1 (BM,BN) and 3 (ADA,BN) "learned to manipulate" the ADA Food Exchange List to fulfill an objective of the Basic Nutrition course. Of these two groups, only subjects in Group 1 (BM,BN) gained experience with behavior modification techniques. A study conducted by Sloan et al. (7) found that behavior modification techniques used in conjunction with diet therapy techniques may enhance weight loss. The present study demonstrated contrasting results. All subjects in Groups 2 (BM,UC), 3 (ADA,BN) and 4 (ADA,UC) showed a weight loss at the end of the study, whereas, four subjects in Group 1 (BM,BN) failed to lose weight. However, this result may reflect a greater motivation by these subjects to obtain academic credit than to achieve a weight loss.

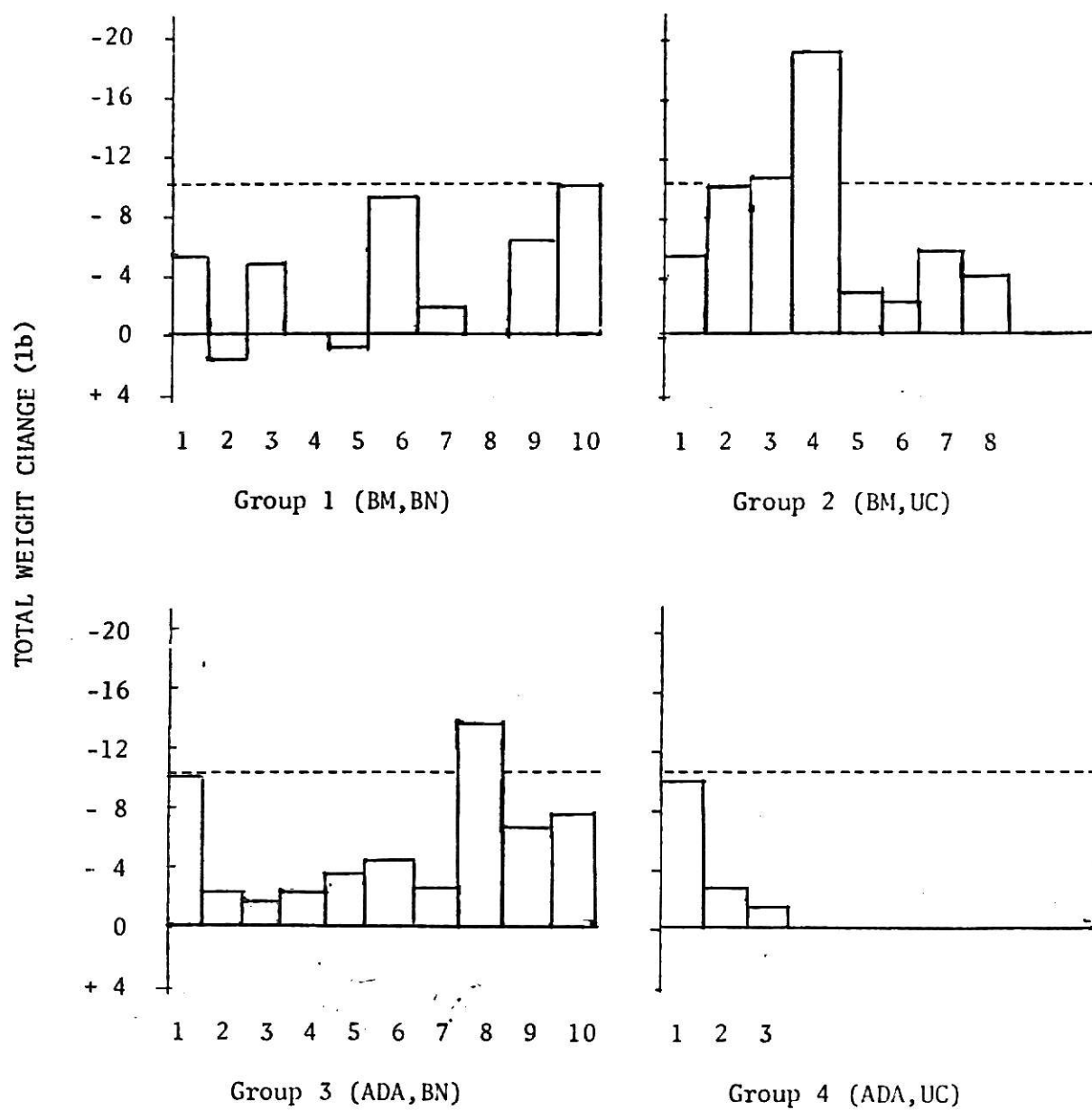


Fig. 1 Total weight change of each subject

---Expected weight loss (-10 lb)

Figure 2 presents cumulative mean weight changes by group. Each group showed a net gain in weight at some point during the ten week period. During the Thanksgiving vacation (between weeks 8 and 10), the subjects in the behavior modification group were expected to continue to lose weight, whereas, no weight loss was expected for those subjects in the diet group. This prediction was based on the assumption that the behavior modification subjects had learned to modify their eating habits and had developed skills to control their consumption pattern, whereas, the diet subjects had not. Contrary to the prediction, the results indicate a weight loss in Groups 1 (BM,BN) and 4 (ADA,UC), and a weight gain in Groups 2 (BM,UC) and 3 (ADA,BN). This suggests that neither method of weight loss nor the group of subjects involved can serve as a valid predictor of success of weight loss during the holiday periods.

Gross et al. (10) found that probable treatment success may be indicated by assessing the subjects academic performance, age of onset of obesity, and family support. Behavior modification emphasizes the need for support and praise from family and friends. Family support was never emphasized in the ADA diet group. However, this does not conclude that the ADA diet group subjects were receiving less support and praise than the behavior modification group subjects.

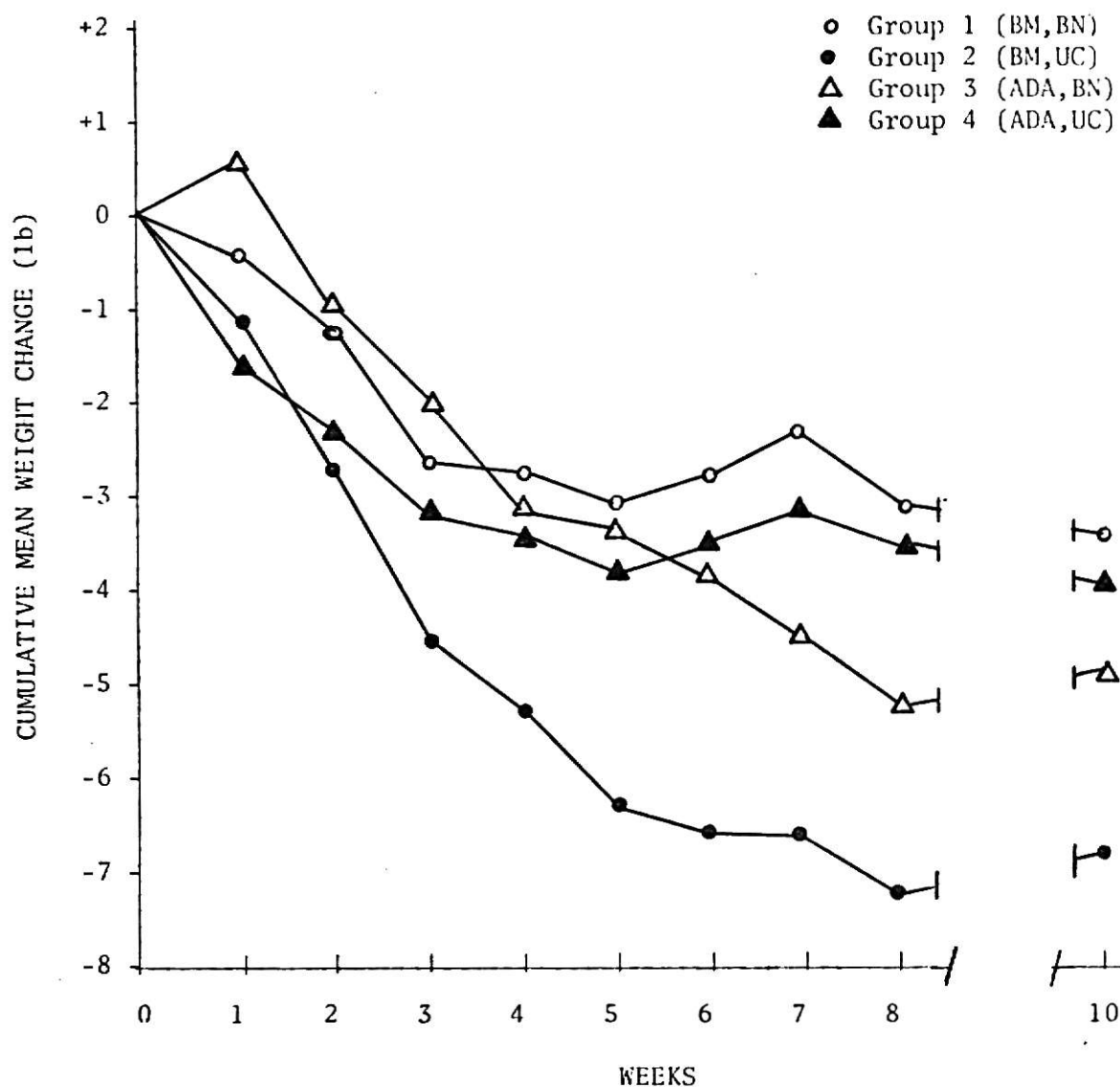


Fig. 2 Cumulative mean weight change by group

-/ /- Thanksgiving vacation

- Group 1: Behavior Modification - Basic Nutrition Students (BM, BN)
- Group 2: Behavior Modification - University Community (BM, UC)
- Group 3: ADA Food Exchange List Diet - Basic Nutrition Students (ADA, BN)
- Group 4: ADA Food Exchange List Diet - University Community (ADA, UC)

SUMMARY AND CONCLUSIONS

Obesity generally is recognized as a major health hazard of both a physical and emotional nature. Behavior modification represents an effective approach to the treatment of obesity. Behavioral methods for treating obesity are based on the premise that excessive overeating is an inappropriately learned habit that responds to many stimuli and environmental events unrelated to physiological cues of hunger.

In addition to behavior modification techniques, successful weight reduction has been achieved by individuals utilizing the food exchange system. A pilot study was conducted at Kansas State University to evaluate methods of weight reduction and the influence of formal nutrition education on weight loss. Following are the four experimental groups:

- Group 1: Behavior Modification - Basic Nutrition Students (BM,BN)
- Group 2: Behavior Modification - University Community (BM,UC)
- Group 3: ADA Food Exchange List Diet - Basic Nutrition Students (ADA,BN)
- Group 4: ADA Food Exchange List Diet - University Community (ADA,UC)

The success of the treatment was measured by the attrition rate and total weight loss in each group. All the basic nutrition students completed the study and received academic credit for their participation. The attrition rate of the university community subjects was lower in the behavior modification group than in the ADA food exchange list diet group. A comparison of the four groups revealed that subjects in Group 2 (BM,UC) had a greater number reaching the set goal (weight loss of 10 lb), had the highest individual weight loss (-19 lb), and the highest mean weight loss (-6.9 lb). This study demonstrated that behavior modification is a more efficient method of weight reduction than the use of a food exchange system. In addition, this study revealed that subject motivation to lose weight is a critical

factor in weight reduction. Although nutrition knowledge may be important in a weight reduction program, the university community subject's motivation to lose weight was greater than the basic nutrition student's motivation to lose weight.

The present study was limited in certain aspects. For example, the influence of nutrition knowledge on weight loss was assessed poorly. The relationship of nutrition knowledge and weight loss would be evaluated more accurately if academic credit was not included as a motivation factor for the basic nutrition subjects. This would allow the basic nutrition subjects to complete the study for personal weight loss rather than for academic credit, similar to the university community subjects. Only then could the influence of nutrition knowledge on weight loss be determined. Additionally, this study may have been strengthened if percent body fat would have been assessed prior to and following the treatment period. Ideally, underwater weighing would be employed along with skinfold measurements. Further programs should be directed to determine the efficacy of behavior modification in combination with a food exchange system. Follow-up procedures should be developed which will enhance the long-term effectiveness of the program.

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APPENDIX

APPLICATION FOR PARTICIPATION IN WEIGHT REDUCTION EXPERIMENT

Name _____ Phone _____

Age _____ Sex _____ Marital Status _____

Living Arrangement (apartment, dormitory, home, roommates? etc.)

Height _____ Frame Size (S,M,L) _____

Present Weight _____ Desired Weight _____

Have you "dieted" before? _____ How frequently? _____

What is your activity level (sedentary, mild, moderate, active?)
_____University community persons: Have you taken or are you taking a
nutrition course? _____

Basic nutrition students: In order to get any credit to replace the term paper, you must participate for the full time of the experiment (11 weeks). Participation includes attendance at a weekly meeting (approximately one hour, although perhaps longer for the first couple of meetings) and some keeping of records.

Are you willing to participate fully? _____
And with complete honesty ? _____

INFORMED SUBJECT CONSENT FORM

Subject name _____

Address _____

All persons who take part in this study of weight reduction methods must sign this consent form. The signing of this form means that you are taking part in the study on a voluntary basis.

In the study, subjects will be given guidance either in planning a calorie-restricted diet or in learning methods for observing and altering behaviors which might ordinarily lead one to eat when not hungry. In neither group will subjects be told specific foods or categories of foods to eat or to avoid.

Full participation is expected of those who begin this study. "Full participation" includes:

1. Attendance at a specified one-hour meeting each week for 11 weeks.
2. Submission to measurements of height, weight, and skinfold measurements (for women, triceps and suprailiac crest; for men, triceps, abdominal, and pectoral).
3. Maintenance of own records.

For those subjects concurrently enrolled in Basic Nutrition, this study upon completion, will provide credit in substitution for the term paper (10% of final grade). Partial credit will not be given for those who select to drop out before the end of the study, and a term paper may not replace the credit lost by dropping out. That is to say, the choice of either writing a term paper or participating in this study will have been made at the time of signing this form.

Should a subject be unable to attend a session (eg., because of illness), the subject must inform the group leader in advance.

By signing this form you do not waive any of your legal rights nor does it release Kansas State University or any of its agents from liability for negligence. It simply means that you are volunteering to take part in this study, that you know what it is about, and that you understand the conditions.

I have read the above points and I am willing to take part in this study.

Signed: _____
Subject's signature Date

Witness Date

WEIGHT AND SKINFOLD CHART

Name _____ Phone _____

Weight reduction group: BEHAVIOR MODIFICATION DIET

Age _____ Height _____ Wrist circumference _____

[illegible]

CALCULATION OF INDIVIDUAL'S DAILY KILOCALORIE REQUIREMENT

1. Energy expenditure for basal metabolic rate (BMR)

Estimation procedure ³

$$(A) \text{ kcal/sq meter/hr} \times (B) \text{ sq meters} = (C) \text{ kcal/hr}$$

To find the daily kcal expenditure for BMR, multiply (C) by 24 hours.

$$(C) \text{ kcal/hr} \times 24 \text{ hr} = (D)$$

2. Energy expenditure for activity

Estimation of activity energy

Sedentary	20% of BMR
Light activity	30% of BMR
Moderate activity	40% of BMR
Heavy activity	50% of BMR

Select the appropriate activity level and calculate the number of kcal you devote to activity:

$$\text{_____ \% of _____ (D) = (E) _____}$$

3. Energy expenditure to metabolize food (Specific Dynamic Action or Specific Dynamic Effect)

Estimation of SDA

$$10\% \text{ of } [(D) \text{ _____} + (E) \text{ _____}] = (F) \text{ _____}$$

4. Total daily energy expenditure

$$(D) \text{ _____} + (E) \text{ _____} + (F) \text{ _____} = \text{TOTAL } \text{_____}$$

³Whitney E. & Hamilton, M. (1977) Understanding Nutrition. pp. 529-530. West Publishing Co., U.S.A.

1500 CALORIE MENU GUIDE

<u>Exchanges</u>	<u>Sample Menu</u>
Breakfast:	
1 lean meat	1 poached egg
1 bread	1 slice toast with butter (1 t.)
2.5 fat	coffee with cream (1 T.)
1 sugar	and sugar (1 t.)
1 fruit	.25 cantaloupe
Lunch:	
2 bread	cheese sandwich
2 lean meat	(2 slices of whole wheat bread,
2 fat	2 oz. of cheese)
2 fruit	large peach
1 vegetable	cucumbers in vinegar (.5 C.)
Dinner:	
3 lean meat	3 oz. ground beef, broiled
2 bread	2 small potatoes, 1 t. butter
1 fruit	small baked apple
3 fat	
1 sugar	
2 vegetable	sliced tomatoes (.5 C.)
Snack:	
1 skim milk	1 C. 2% milk
1 fat	
1 bread	2 graham cracker squares

COMPARISON OF BEHAVIOR MODIFICATION AND A FOOD EXCHANGE SYSTEM
AS METHODS OF WEIGHT REDUCTION

by

Penny McMillan Caldwell

B. S., Kansas State University, 1974

M. S., Kansas State University, 1976

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Foods and Nutrition

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1978

A pilot study was conducted at Kansas State University to evaluate two methods of weight reduction and the influence of formal nutrition education on weight loss. Following are the four experimental groups:

- Group 1: Behavior Modification - Basic Nutrition Students (BM,BN)
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The success of treatment was measured by the attrition rate and total weight loss in each group. All the basic nutrition students completed the study and received academic credit for their participation. The attrition rate of the university community subjects was lower in the behavior modification group than in the ADA food exchange list diet group. A comparison of the four groups revealed that subjects in Group 2 (BM,UC) had a greater number reaching the set goal (-10 lb), had the highest individual weight loss (-19 lb), and the highest mean weight loss (-6.9 lb). This study demonstrated that behavior modification is a more efficient method of weight reduction than the use of a food exchange system. In addition, this study revealed that subject motivation to lose weight is a critical factor in weight reduction. Although nutrition knowledge may be important in a weight reduction program, the university community subject's motivation to lose weight was greater than the basic nutrition subject's motivation to lose weight.