MAINTENANCE OF WEIGHT LOSS

An abstract of a Thesis by
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The problem. Behavioral weight control programs have been successful in creating short-term weight losses for obese clients. When the client-therapist relationship is ended, clients quickly regain weight lost during training. Teaching clients those skills necessary for continued or maintained weight loss is imperative. These skills need to be identified and taught to all people with the problem of obesity.

Procedure. A total of 28 clients were divided into four classes. Each class was presented with an instructional program based upon current behavioral weight control strategies. In addition, all clients were instructed in techniques necessary for the maintenance of weight losses occurring during treatment. One class did not practice these techniques and three did during treatment. Compliance to the therapists' instructions was rewarded with the return of a monetary rebate from therapy fees during training. Clients were contacted and weighed at random intervals during the three months following the end of training.

Findings. There were no differences between those clients who did not practice the maintenance skills (diet group) and those that did (maintenance group) at the end of training. At the end of the follow-up period slight differences were observed between each group in the mean number of pounds lost.

Conclusions. No statement can be made identifying the significance of practicing maintenance skills during treatment on follow-up performance. Intragroup differences, individual differences, and small group size do not allow conclusive statements to be made.

Recommendations. Investigations should continue which attempt to clarify solutions to the problem of clients gaining back weight lost during training. Two crucial variables to consider are the steps an individual must follow to lose or maintain weight and secondly how is society going to be changed such that these steps are followed and made unnecessary for later generations. Both are enormous tasks and should be dealt with in all due haste.
MAINTENANCE OF WEIGHT LOSS

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Master of Arts

by
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CHAPTER I

INTRODUCTION

Obesity is a serious medical and/or social problem for an estimated 35 to 65 million Americans today (Kolata, 1977). Medically, obesity increases the probability of heart and renal diseases and arteriosclerosis (Langley, Telford, & Christensen, 1974; Mahoney & Mahoney, 1976) as well as causing physical discomfort and decreased mobility. Obesity can also cause adverse psychological effects by jeopardizing social, sexual, and occupational activities (O'Leary & Wilson, 1975). The gravity of the problems associated with obesity have led to the development of a number of treatment strategies. Of those strategies in use today (i.e., drugs, surgery, fasting, hypnosis, etc.) behavioral techniques seem to have produced the most significant and permanent weight changes with the fewest complications (e.g., Bray, Haimes, & Lindner, 1977; Hall & Hall, 1974; Leon, 1976; Leon & Roth, 1977; Mahoney & Mahoney, 1976).

Among the earliest investigations involving behaviors leading to obesity were those conducted by Stunkard (1958; 1959a; 1959b; 1959c). The primary emphasis of this research was to describe eating behaviors and to identify factors related to obesity. In 1962 the first application of operant techniques for changing eating behaviors was
reported by Ferster, Nurnberger, and Levitt.

Ferster, Nurnberger, and Levitt (1962) described to clients how they could identify the reinforcers maintaining their behavior, how to change these reinforcers and how to come into contact with the delayed aversive effects of overeating. Clients were also reinforced by the therapist for performing behaviors that would result in weight loss (e.g., the elimination of stimuli common to problem eating situations, the disruption of behavioral chains which ultimately led the client to overindulgence, etc.).

A number of studies utilizing various behavioral strategies were published following Ferster et al. These studies investigated aversive conditioning (Cautela, 1966; Meyer & Crisp, 1964; Stollak, 1967), contingency contracting (Harris & Bruner, 1971; Stuart, 1971), and self-control (Goldiamond, 1965). Each of these techniques has been shown to be effective in furthering weight losses (Leon, 1976).

Most therapists have used several behavioral techniques at once. Stuart (1967) replicated, with minor modifications, Ferster et al. (1962) requiring self-recording of weight and food consumed daily by all clients. Clients were given feedback for performing behaviors targeted by the therapist and as changes were made in these behaviors, specific reinforcers were made available to the client. The frequency of therapy sessions was eventually faded to zero as clients neared their weight goal. Reported
weight losses for the twelve month treatment period ranged from 47 to 26 pounds. Harris (1969) combined changing eating habits, self-awareness, successive approximations, stimulus control, and self-reinforcement to teach college students how to control the problem of overeating. Stuart and Davis (1972) suggest the use of a program based upon a combination of stimulus control techniques, nutritional information, contingency contracting, and self-monitoring. Martin and Sachs (1973) outlined a program with fourteen steps identifying appropriate behaviors to promote self-control based upon self-rewards, self-monitoring, changing eating habits, and a contingency contract with the therapist. Reviews of research involving obesity report that the most effective studies in the literature, in terms of weight loss, are those that have utilized similar combinations of behavioral strategies (Abramson, 1977; Hall, Hall, Borden, & Hanson, 1975; Leon, 1976; Leon & Roth, 1977).

At the termination of formal weight loss programs each client must decide whether to continue losing weight or to maintain the weight loss attained during the program. Although behavioral programs have generally been successful in bringing about weight loss, weight losses have not always been either continued or maintained over time (e.g., Christensen, 1976; Joachim, 1977; Leon, 1976; Stollack, 1967). Those programs which show weight loss at the end of training and again at long-term follow-up contacts have
used a combination of long-term contingency contracting with the therapist and booster sessions with the therapist after the discontinuation of the formal weight control program (Abramson, 1977; Hall et al., 1975; Mann, 1972; Romanczyk, Tracey, Wilson, & Thorpe, 1973). Continuance or maintenance of weight loss by continued but less frequent therapist contact does not insure continuance or maintenance of weight loss after the contact is terminated (Abramson, 1977), as it must inevitably be. Weight control programs must be developed which will help clients maintain weight losses at follow-up in the absence of continued therapist contact.

The little follow-up data reported in the behavioral literature is liable to several criticisms. Criticism centers upon the lack of long-term follow-up (i.e., months or years rather than weeks) and the practice of informing clients of upcoming follow-up sessions in advance of those sessions, allowing clients to take actions to lose weight immediately prior to contact with the therapist (Christensen, 1976; Leon, 1976). Reports have indicated that clients will starve themselves, go thirsty, take diuretics, induce vomiting, etc., in order to meet follow-up goals (Stuart, 1971).

A brief tentative analysis of factors reducing the probability of continued weight loss after the termination of client-therapist contact could include the loss of
reinforcers administered by the therapist, the loss of peer models (if the client was in a group program), the reduction of social reinforcers available through recruitment (e.g., the client can no longer comment to friends or family about participation in a formal weight control program), and, as the client nears his/her goal, there is a reduction in the negative properties of excess weight (i.e., escape responses are less probable). Problems associated with maintaining a stable weight after the termination of client-therapist contact may include, a change in the reinforcers maintaining a weight loss (i.e., from negative reinforcers with clear antecedents, to positive reinforcers with no clear discriminative properties), there is a reduction in the number of reinforcers for behavior related to food consumption (e.g., weight loss is usually noticed and commented on, while maintaining a stable weight is not), clearly identified models are lost, and the client's behavior must be changed in topography (e.g., formerly the client had to refuse all second helpings at dinner, now he/she may accept a limited number of second helpings).

All of these factors taken together may account for the poor results many successful weight loss programs have encountered during follow-up.

The exact behaviors in which clients engage during weight loss programs are usually not known to the therapist. Weight loss programs suggest specific behaviors which should
produce weight loss, provide the opportunities for practice of those behaviors, and deliver reinforcers for weight loss. If maintenance of weight losses obtained during weight loss programs is desired then behaviors for weight maintenance, opportunities for practice, and reinforcers for doing so should also be provided. In the present study self-control techniques (Stuart & Davis, 1972) were taught to all clients. In addition, clients in the program practiced weight maintenance procedures in an attempt to facilitate stabilization of weight at any particular client goal. Long term follow-up data were taken.
CHAPTER II

METHOD

Clients

Clients were recruited through an advertisement placed in several local Des Moines newspapers. Respondents were interviewed over the telephone by the therapists. Respondents were told that the program emphasized nutrition and the behavioral control of eating and that a fee was required which could be earned back as course requirements were met. Only those respondents who agreed to attend all class sessions and to provide follow-up data were selected as clients. Clients selected the class they wished to attend on the basis of the convenience of the class meeting times. All clients were female.

Setting and Therapists

Each of four classes met with a therapist approximately one hour a week in a classroom equipped with a large standing medical scale. Therapists for the program were two second year graduate students at Drake University who had had previous experience with weight control programs. Therapists alternated classes each week: i.e., on week one, classes A&B met with therapist X and classes C&D met with therapist Y; on week two, classes A&B met with therapist Y and classes C&D met with therapist X, etc. Classes AB&C met fifteen times and class D met eleven times.
Procedures

**Instructional Package.** A major portion of the material presented to each class followed the format developed by Stuart and Davis (1972). Material from the Stuart and Davis text was divided into five sections including: a) food diaries which involved self-monitoring of daily caloric intake and the noting of stimuli common to the situations under which consumption took place, b) food exchange plans which emphasized a balanced nutritional diet, c) exercise suggestions, d) stimulus control suggestions for problem situations, and e) behavioral contracting. In addition, clients were encouraged to identify situations in which refusing food or drink was difficult, e.g., visiting family members, eating at restaurants, parties, etc. Later, class members decided upon appropriate responses to each in role-playing situations. Other class activities included recipe exchanges and involvement of family members in the home. Suggestions were made by the therapists to individual clients with specific problems not shared by other members of the class.

**Weekly Goals.** Each week the therapists assigned the members of each class a weight loss or a weight maintenance goal. Successful weight loss was defined as a minimum of a 1½ pound weight loss from one week to the next. Successful weight maintenance was defined as a fluctuation of no more than ± ¼ pound in weight from one
weekly meeting to the next. All clients were shown how to calculate the number of calories they should consume either to lose weight or to maintain their current weight. The formula used to calculate caloric intake for weight loss was weight in pounds multiplied by 15 minus 1000 (Mahoney & Mahoney, 1976). The formula used to calculate caloric intake for maintenance was weight in pounds multiplied by 15. Although the constant in the formula varies from 18 for those who are very active to 14 for those who are sedentary, fifteen was used for all clients based on anecdotal reports of their exercise patterns. After determining caloric intake for the next week, clients chose an appropriate food exchange plan from those offered by Stuart and Davis. If that caloric intake did not result in appropriate weight loss or maintenance clients adjusted their intake during the next opportunity to lose or maintain.

Clients in classes A, B & C deposited $60 with the therapists; clients in class D deposited $45. Five dollar refunds were contingent upon meeting weekly weight loss goals (classes A, B, C, & D) or weight maintenance goals (classes A, B, & C). Clients were weighed prior to each class meeting and given refunds if the goal for that week had been met.

All classes had two introductory sessions during which no weight goals were assigned. Class A was then alternately assigned two weeks of weight loss and one week
of maintenance for thirteen weeks. Class B was assigned two weeks of maintenance followed by four weeks of weight loss, one week of weight maintenance, four weeks of weight loss, one week of weight maintenance and one week of weight loss. Class C was assigned eight weeks of weight loss followed by two weeks of maintenance, one week of weight loss, and two weeks of weight maintenance. Class D was assigned weight loss goals for nine successive weeks. Only classes A and D matched the schedules originally planned by the therapists. Classes B and C were scheduled to practice all of the diet weeks in succession and all of the maintenance weeks in succession. Schedules for classes B and C were modified at the request of group members. (Table 1.)

Follow-Up. At the conclusion of training clients were simply encouraged to continue using the procedures discussed during the program. Clients were contacted for follow-up, by someone other than the therapists, approximately one month, two months, and three months after the last class meeting. At the time of contact the client had the option of either coming to the treatment setting to be weighed or weighing at home on the therapists' scale. Either option had to be utilized within two hours of the initial contact. Clients who had not met the two hour deadline were recontacted at a later date. The exact dates for follow-up contacts were not specified in advance to the clients.
TABLE I

Patterning of weeks during which the weight loss or the weight maintenance contingency was in effect during training

<table>
<thead>
<tr>
<th>CLASS</th>
<th>TRAINING WEEKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1  2  3  4  5  6  7  8  9  10 11 12 13 14 15</td>
</tr>
<tr>
<td>A</td>
<td>I I D D M D D M D D M D D M D</td>
</tr>
<tr>
<td>B*</td>
<td>I I M M M M D D D D D D D D D</td>
</tr>
<tr>
<td>C*</td>
<td>I I D D D D D D D D D M M M M</td>
</tr>
<tr>
<td>D</td>
<td>I I D D D D D D D D D D D D</td>
</tr>
</tbody>
</table>

*classes which did not adhere to the above schedule during actual training, deviations were due to client requests

1 Introductory meeting, no contingencies in effect.
2 D Week during which the weight loss contingency was in effect.
3 M Week during which the weight maintenance contingency was in effect.
Dependent Variable

The dependent variable used to assess the relative effectiveness of the instructional package was the mean number of pounds lost during training by each of the classes. The dependent variable used to assess performance during follow-up was the difference between clients' weight at the last class meeting and at follow-up contacts.
CHAPTER III

RESULTS

Thirty-two percent (9) of the clients dropped out of the program during training. Fourteen percent (4) refused to allow the therapists to obtain follow-up data. The mean number of pounds lost by these clients at the point contact was terminated is shown in the lower portion of Table 2. The mean number of pounds lost by those clients not finishing training (dropped) was 4.8 pounds; the mean number of pounds lost by those clients not available for follow-up, but who did finish training, was 13.1 pounds (clients in these groups came from all 4 classes). The remaining clients in all four classes were divided into two groups to facilitate comparisons between maintenance training and no maintenance training on follow-up performance. The diet group was composed of the five clients in class D whose weight goal was always weight loss. The maintenance group was composed of ten clients from classes A, B, & C whose weight loss goals alternated (in different patterns) between weight maintenance and weight loss. Mean pounds lost during training and follow-up are shown in Table 2 for both the diet (8.1 pounds) and maintenance (8.0 pounds) groups. As expected, mean weight losses for the two groups did not differ significantly at the end of training ($t=.0275$, $p>.05$, $df=13$; see Table 3).
<table>
<thead>
<tr>
<th>GROUP</th>
<th>GROUP SIZE</th>
<th>MEAN STARTING WEIGHT</th>
<th>MEAN NUMBER OF POUNDS LOST AT THE END OF TRAINING</th>
<th>MEAN NUMBER OF POUNDS LOST AT THE END OF FOLLOW-UP</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIET</td>
<td>5</td>
<td>174</td>
<td>8.1</td>
<td>3.5</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>10</td>
<td>166</td>
<td>8.0</td>
<td>8.3</td>
</tr>
<tr>
<td>NO FOLLOW-UP</td>
<td>4</td>
<td>154.6</td>
<td>13.1</td>
<td>*</td>
</tr>
<tr>
<td>DROPPED</td>
<td>9</td>
<td>173.3</td>
<td>4.8</td>
<td>*</td>
</tr>
</tbody>
</table>

*data not available*
## TABLE 3
STUDENTS' t-test BETWEEN GROUPS

### COMPARISON BETWEEN THE DIET AND MAINTENANCE GROUPS ON PERFORMANCE FROM THE FIRST TO LAST WEEK DURING TRAINING

<table>
<thead>
<tr>
<th>DIET</th>
<th>MAINTENANCE</th>
<th>( t = \frac{X_D - X_M}{\sqrt{\frac{(s^2)}{N_D} + \frac{(s^2)}{N_M}}} )</th>
<th>( H_0: D = M ) confirmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=5</td>
<td>N=10</td>
<td>( \frac{91.9 - 91.7}{\sqrt{\frac{160.2}{5} + \frac{2122.6}{10}}} )</td>
<td>( p &gt; .05 )</td>
</tr>
<tr>
<td>( X=91.9^* )</td>
<td>( X=91.7^* )</td>
<td>( \frac{91.9 - 91.7}{\sqrt{175.6(1.3)}} )</td>
<td>( p &gt; .05 )</td>
</tr>
<tr>
<td>( s^2=160.2 )</td>
<td>( s^2=2122.6 )</td>
<td>( s=46.07 )</td>
<td>( s=12.66 )</td>
</tr>
</tbody>
</table>

*constant of 100 added to each score in order to compute positive values needed for t-test solution*
The success of each group during training in matching the contingencies specified by the therapists is shown in Table 4. Each of the groups demonstrated similar performance in the average number of weeks each client successfully met the weight loss contingency, i.e. four of the nine weeks during which weight loss was required by the therapists. During the four weeks when clients in the maintenance group were required to maintain their weight each client, on the average, maintained their weight 2.7 weeks. For those clients who dropped or for whom no follow-up data were available the average number of weeks during which they successfully maintained their weight were 1.1 weeks out of 1.6 and 1 week out of 4 respectively.

Mean differences between weight at the end of training and the end of follow-up are shown in Table 2. The diet group mean weight increased 4.6 pounds from the last day of training and the maintenance group mean weight decreased .3 pounds from the last day of training. Differences between the groups in the total number of pounds lost during the follow-up period were not significant (t=1.423, p>.05, df=13; see Table 3). Weight losses for each group during weeks when the class goal was weight loss and weight losses or gains at each of the follow-up contacts are shown in Figure 1.

Since individual data within each group were quite variable, each client in the diet group was matched with a
TABLE 4
The average number of weeks each group met the contingencies specified by the therapists

<table>
<thead>
<tr>
<th>GROUP</th>
<th>AVERAGE NUMBER OF WEEKS CLIENTS SUCCESSFULLY MET THE WEIGHT LOSS CONTINGENCY ¹</th>
<th>AVERAGE NUMBER OF WEEKS CLIENTS SUCCESSFULLY MET THE WEIGHT MAINTENANCE CONTINGENCY ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIET</td>
<td>4/9 = 44%</td>
<td>*</td>
</tr>
<tr>
<td>MAINTENANCE</td>
<td>4/9 = 44%</td>
<td>2.7/4 = 68%</td>
</tr>
<tr>
<td>NO FOLLOW-UP</td>
<td>4/9 = 44%</td>
<td>1/4 = 25%</td>
</tr>
<tr>
<td>DROPPED</td>
<td>1.6/3.6 = 44%</td>
<td>1.1/1.6 = 68%</td>
</tr>
</tbody>
</table>

¹No maintenance contingency in effect

¹Weight loss ≥ \( \frac{1}{2} \) lbs.; \( X \geq \frac{1}{2} \) lbs. loss

²Weight gain ≤ \( \frac{1}{2} \) lb. and weight loss ≤ \( \frac{1}{2} \) lb.; \( \frac{1}{2} \) lb. gain ≥ \( X \leq \frac{1}{2} \) lb. loss
Figure 1. Comparisons between the maintenance and diet groups during training as a function of contingent monetary rebates and the instructional program. Follow-up data points were collected through unannounced contacts with no contingencies in effect for any client behavior. (Note: only those weeks during which weight loss goals were assigned during training for each group are shown).
client from the maintenance group. Only those clients from the maintenance group who were successful in meeting the weight maintenance contingency three or more times were compared to clients in the diet group. Clients were matched on the similarity of weight losses during training, the total number of pounds lost during training, and age. One client in the diet group could not be matched with any client from the maintenance group, these data are presented separately. Individual data for all comparisons between members of the diet and maintenance groups are shown in Figures 2 and 3.

The upper left panel of Figure 2 shows that Jane (maintenance group) and Beth (diet group) had both lost approximately 13 pounds during training, however Jane regained less weight (½ pound) than did Beth (2.5 pounds) during the follow-up period. The upper right panel of Figure 2 shows that June (maintenance group) and Norma (diet group) ended training with gains of approximately one pound; both June and Norma gained weight during the follow-up period but June gained less (8 pounds) than Norma (17 pounds). June and Norma were teenaged girls and both registered height increases of approximately 3/8 inches from the first to last contact (from the beginning of training to the end of the follow-up period). The lower left panel of Figure 2 shows that Heather (maintenance group) and Kay (diet group) lost approximately six pounds during training, and both ended the follow-up period with an overall weight loss of approximately
Figure 2. Comparisons between individual clients selected from the diet and maintenance groups during training and follow-up. All diet clients (except Ella) are shown. Clients from the diet group were matched with those from the maintenance group based upon the similarity in weight loss patterns during training, the total number of pounds lost, and age. Open data points indicate weeks during which the maintenance contingency was in effect for the maintenance group.
Figure 3. Changes in weight for Ella (diet group) during training and follow-up.
ten pounds. The lower left panel of Figure 2 shows that Janet (maintenance group), Chris (maintenance group), and Carmen (diet group) lost between ten and thirteen pounds during training. Carmen and Chris continued to lose weight (6 pounds) during the follow-up period, however Janet gained weight (3 pounds) by the last follow-up contact.

Ella (diet group) showed extreme variations in weight losses and gains and therefore was not matched with any other client. Figure 3 shows Ella gained twenty-one pounds during the follow-up period. In general, those clients from the maintenance group ended the follow-up period with more consistent weight losses (i.e., more group members lost weight or lost more) than did those in the diet group.
Contingencies placed upon practicing weight maintenance as well as weight loss during training did not produce significant results in reducing weight gains during follow-up. Differences that were observed between individuals in each group were in the expected manner (i.e., less weight gain during follow-up for those clients in the maintenance group) but were not as extreme as expected.

The ability of clients to perform those skills necessary to continue losing or to maintain their weight was shown in the average number of times each client did so during the training period. Each group demonstrated that they could in a limited manner control their weight during training according to demands made by the therapists. During the follow-up period even this relatively minor control was not clearly shown. When all contingencies were removed from client behavior the general trend in weight was a gain rather than a loss of excess pounds.

Procedural difficulties that might have reduced the differences in weight loss between the groups can be divided into four general categories. First the sample size was small due to clients dropping out of the program. Dropouts cited scheduling difficulties (how to take care of children at home), problems with the therapists (too young, too
unsympathetic, or too academic) and other group members, and disliking the procedures as the major reasons for leaving the program. Maintenance weeks acted as an aversive event for many of these clients as they objected to a weight maintenance goal when they had signed up for a "weight loss class". Those clients who did not complete follow-up simply stated time and distance constraints as their major objection to follow-up contacts.

Secondly, requiring clients to practice maintaining weight at arbitrarily determined points may have been in error. It may have been more appropriate to have given maintenance training when behavior (or the client's weight) had reached the desired level or at the end of treatment when clients were faced with imminent release from a formal program. Teaching generalization so that treatment gains are continued after the therapist's contact with the client ends is crucial to effective clinical relationships. If the client shows an inability to maintain weight losses this should prompt the therapist to engage in a remedial program.

Contributing to the results were differences between reinforcers available to each client in the home and the manner in which these reinforcers were contingent. During training one consistent contingency across all classes was the monetary rebate for individual performance. After termination of training there was no longer even this
superficial negative reinforcer consistently in effect for all class members. The degree to which clients continued to lose weight or to maintain their previous weight losses or to gain weight during follow-up is likely to be directly related to reinforcers unique to each client in the home environment. The therapists have no knowledge of the degree of similarity between the clients' reinforcer pools. Consequently how much of the data can be ascribed to the procedures and how much to the individual's home environment is unknown.

The final procedural problem involves consequences controlled by the therapists. Monetary rebates were contingent upon following the therapists' instructions (i.e., by losing or maintaining weight) not upon actual consumatory behaviors. To insure that all clients follow instructional programs in their entirety reinforcers should be available only when these instructions are correctly complied with.

A closely related problem was that of the type of data recorded. Weight is a permanent product and as such is an indirect result of client performance. When a contingency is placed upon an outcome measure, behaviors responsible for that outcome may vary in unknown patterns. Compliance to specific instructions can only be guessed at. A possible solution would be to monitor all client behavior at all times. However, this seems to be an unrealistic solution due to the structure of American society and the
more logistical problems of intrusiveness and time requirements.

The final solution to the problem of obesity is hinted at in all of the weight control studies conducted to this point; that is, a change in the contingencies responsible for overconsumption of food can change a client's weight. The research conducted to this point has been unsuccessful in producing permanent weight changes. Rather than continuing attempts to change the individual (as in the present research) our efforts might be better spent in changing society (the environment as a whole) so that problems such as obesity, cigarette smoking, drug addiction, etc., do not occur. The end solution seems to be to control society, and through society the individual (Skinner, 1953).
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