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AN ABSTRACT OF THE THESIS OF Albert Blake Davidson for the Master of
Science in Psychology presented June 9, 1975.

Title: Obesity: Two Behavioral Approaches to Weight Reduction

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

Gerald D. Guthrie, Chairman

Walter G. Klopfer

Pamela Osborne Munter

Much of the research on obesity has been designed to explore its relationship to the behavior of overeating. Although a number of physiological, societal, cultural and family background variables have been detailed, researchers have sought an approach that does not rely heavily on these considerations. Most weight reduction programs fail to recognize and concentrate on empirically demonstrated differences between obese and normal subjects. Researchers have shown that obese subjects seem to be more sensitive to external than internal stimuli. A behavioral approach to weight reduction that emphasizes and uses these

external stimuli was hypothesized to be the treatment of choice. A Self-Modification program was designed to maximize the use of external stimuli. An Aversion Therapy approach that utilized electrostimulation was the alternative treatment procedure. The two treatment procedures were compared with a Control approach. Each of the two treatment approaches and the Control approach consisted of twelve subjects.

All subjects were weighed at the beginning and end of the ten-week program. The net weight changes were recorded and a mean weight change was computed for each group. The Self-Modification group elicited a mean weight loss of 8.59 pounds with a standard deviation of 2.38 pounds. The Aversion Therapy group elicited a mean weight loss of 7.7 pounds with a standard deviation of 6.09 pounds. The Controls displayed a mean weight gain of 0.42 pounds with a standard deviation of 1.15 pounds. Both treatment groups displayed a significantly higher mean weight loss than the Controls. Although the Self-Modification group failed to elicit a significantly higher mean weight loss than the Aversion Therapy group, the Self-Modification approach was the preferred treatment method based on its ethical, monetary and humanistic advantages over the Aversion Therapy procedure as well as providing techniques that could be easily adapted to produce behavior changes other than eating behaviors which the Aversion Therapy approach could not.

A follow-up study is presently planned in an effort to assess the long-term differences between the effectiveness of the two treatment groups.

OBESITY: TWO BEHAVIORAL APPROACHES
TO WEIGHT REDUCTION

by

Albert Blake Davidson

A thesis submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE
in
PSYCHOLOGY

Portland State University
1975

TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:

The members of the Committee approve the thesis of
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I. INTRODUCTION

Much of the research on obesity has been designed to explore its relationship to the behavior of overeating. The consensus derived from the literature is that, excluding some infrequent glandular malfunctions, the basic cause of obesity is a combination of overeating and insufficient activity. Although a number of physiological, societal, cultural and family background variables have been detailed, researchers have sought an approach that does not rely heavily on these considerations. Based on this attitude, many treatment efforts have been solely directed towards the undesirable behavior of overeating.

It may be that the failure of most weight reduction programs is that they fail to recognize and concentrate on empirically demonstrated differences between obese¹ subjects and normals who may be overweight. One such difference is the subject's responses to internal versus external stimuli.

In this study, external stimuli are defined as cues outside the individual. For example, the properties of the food itself are defined as external stimuli. Internal stimuli are defined as either physiological states (ie. hunger) or the internal responses to external stimuli. The operational definitions of what constitutes an internal or external stimulus have been unclear in the literature. This problem remains a central one in these studies. As defined here, the external stimuli (properties of the food itself) lead to the emergence of internal

1. "Obese" will be defined as body weight exceeding Metropolitan Life Insurance Company recommended weights by at least 10%.

responses. These responses become the internal stimuli that lead to overt behavioral responses.

A concept of response chains is central to the understanding of the external/internal dimensions. A given stimulus (S_1) leads to a response (R_1). This R_1 may then become the discriminative stimulus (S_2) for another response (R_2). The chain may continue on and both responses and stimuli may vascillate across the external/internal dimensions.

Below is a brief review of studies that specifically deal with the external/internal dimensions of stimuli and the differential reactions to these stimuli by normal and obese Ss.

A. J. Stunkard (1964) conducted a study concentrating on the differences between normal and obese subjects in reporting the effect of stomach contractions upon self-reports of hunger. Subjects were asked to report when they felt hunger "pangs" after swallowing a gastric balloon. In 37 normal Ss, the self-reports of hunger were concurrent with stomach contractions while 37 obese Ss showed a significantly lower degree of correlation between contractions and self-reported hunger. Stunkard concluded that obese Ss are less sensitive to internal physiological hunger states than normal Ss.

Schachter (1971 PT) reports a study in which sated states affected amounts of food ingested by normal and obese Ss. His obese Ss ate as much, and in some cases more, when they reported themselves "full" than when "not full". Normal Ss ate less in the "full" state than in the "empty" state. Schachter concluded that obese Ss are less sensitive to internal physiological hunger states than normal Ss.

In another study, Schachter (1971 PT) concentrated on the effects of fear and adrenalin on the eating behavior of normal and obese Ss. The

study was conducted as follows: All subjects were assigned to one of two test conditions. Half of the Ss were involved in a sham fear condition and the other half were involved in a drug administration procedure. Normals' hunger states were lessened in intensity in the fear condition while obese Ss showed that fear increased hunger. In the second half of the study, normals' hunger states were decreased more when injected with adrenalin than when injected with a placebo. Adrenalin injections had no significant effect upon the appetites of obese Ss. Schachter again concluded that normal Ss were more sensitive to internal stimuli (physiological states) than were obese Ss.

The above studies indicate that normal Ss are more affected by internal stimuli than obese Ss. The next logical question seems to be how do the two groups compare with respect to external stimuli.

E. Decke (Schachter 1971a) compared the effects of taste (defined by Decke as an external stimulus) upon intake quantities among obese and normal Ss. (The problem of operational definitions arises when we define taste as an external stimulus. This researcher would claim that taste is a combination of external and internal stimuli. The external stimuli are the chemical composition of the food, while internal stimuli are judgemental reactions to the food's chemical make-up.) Decke prepared two types of milkshakes; one was made from ice cream and milk and a second was made from ice cream, milk and quinine. When taste was defined by the Ss as "good", the 9 obese Ss consumed almost 40% more than the normal Ss did. When taste was defined as "bad", the obese Ss consumed almost 69% less than the 5 normal Ss did. Decke concluded that the external stimulus of taste had a greater effect on the eating behavior of obese Ss than it did on normal Ss.

R. E. Nisbett(1968) conducted a study to determine the effect of amount of food presented upon amounts of food ingested by normal and obese Ss. All subjects were asked to skip lunch in order to perform a series of tests. The bogus experiments were scheduled for late afternoon. At the end of the experiments, he offered all subjects roast beef sandwiches as a partial compensation for their efforts. Within each of the two groups, he either presented one or three sandwiches with the added note that "there is a refrigerator across the room that has dozens more, so eat all you want". He found that the 28 normal Ss consumed a mean of 1.96 sandwiches when presented with one sandwich and 1.88 when presented with three sandwiches. The mean number of sandwiches consumed by the 21 obese Ss was 1.48 in the one sandwich condition and 2.32 in the three sandwich condition. Obese Ss ate 57% more in the three sandwich condition than in the one sandwich condition. No significant difference was found for normal Ss ($p < .05$). Nisbett concluded that the external stimulus (amount of food presented) affected the eating behavior of obese Ss significantly more than it did normal Ss.

Gross and Schachter (1971 PT) conducted a study in which all Ss were asked not to eat lunch and come to the experiment during the dinner hour. After completing the bogus experiment, Ss were led into a room to evaluate the experiment. The E brought in a box of crackers and offered them to the Ss. The two groups of Ss were then placed at a desk in an otherwise bare room. A clock hung on the wall and was the only indicator of time available. The subjects were then subjected to one of three situations: 1) A clock that moved at twice normal speed. 2) A clock that moved normally. 3) A clock that moved at half normal

speed. The idea was to see how perceived time (defined as an external situation) affected eating behavior. The obese Ss ate twice as many crackers in the fast clock situation as in the normal clock situation. Normal Ss showed no significant difference across the three situations. Gross and Schachter concluded that the external stimulus of perceived time had a greater effect on the eating behavior of obese Ss than it did on normal Ss.

The above studies indicate that obese Ss are more sensitive to the effects of food taste, food amount and perceived time than normal Ss. All of these studies indicate that normal Ss are more affected by internal than external stimuli while obese Ss are more affected by external than internal stimuli.

The difference between obese and normal Ss with respect to the relative influence of external and internal stimuli referenced above may be related to the poor success rate of the typical weight reduction program. It was felt that a Self-Modification approach and an Aversion Therapy approach that concentrated on the differences between obese and normal subjects with respect to the influence of external and internal stimuli would be effective in eliciting significant weight loss by obese Ss.

A Self-Modification approach was utilized to train obese Ss to:

- 1) Manipulate external stimuli in an effort to decrease maladaptive eating behaviors.
- 2) Become more sensitive to and learn to affect changes in internal stimuli that lead to maladaptive eating behaviors.

The E trained the Ss in the use of eight self-modification techniques. The Ss themselves chose the most effective ones to use. An emphasis in the Self-Modification approach was that the Ss set their own goals,

design their own behavior modification techniques, affect environmental changes, and set their own reinforcement schedules. Ss utilized a series of techniques that they had designed, implemented and evaluated.

The first technique utilized in the Self-Modification approach was Manipulation of Emotional Responses. This technique emphasized the internal stimulus dimension. Thorsen and Mahoney (1974a) discuss the internal/external dimensions of this procedure and hypothesize that the internal stimuli are originally responses to external stimuli. This technique concentrates on affecting changes in internal stimuli by pairing an initially positive image (subjective reaction to food taste) with a noxious image (negative emotional consequence of overeating). This is then followed by a positive emotional response (positive emotional result of not overeating) and a reward (ie. feeling good about weight loss).

The next technique utilized was Manipulation of Discriminative Stimuli. Thorsen and Mahoney (1974a) and S. M. Hall (1972) state that this technique is oriented along the external dimension. It is designed to affect the kinds and quality of external stimuli impinging on the S by prearrangement of response consequences. During the eating process, the Ss avoided external stimuli that triggered internal responses which became stimuli leading to maladaptive eating behaviors. The thrust of this technique was to break the stimulus chains that elicited overt eating responses.

Thorsen and Mahoney (1974a) and S. M. Hall (1972) discuss the Chaining technique. The objective of this technique was to lengthen the chain of events that led to maladaptive eating behaviors in an effort to weaken the chain and consequently the probability of the

target behavior. This changed the external stimuli which led to internal stimuli that affected maladaptive eating behaviors.

S. M. Hall (1972), R. B. Stuart (1967) and Thorsen and Mahoney (1974a) discuss the technique of Activity Substitution or Orgasmic Reconditioning. The procedure vascillated across the external/internal dimension in that Ss learned to substitute external stimuli that elicited more adaptive internal responses that were as satisfying to the Ss as those produced by stimuli leading to maladaptive eating behaviors.

The Snap technique as discussed by Thorsen and Mahoney (1974a, 1974b) and Mahoney (1971) utilized external consequences for internal maladaptive stimuli. It operated much like a self-administered aversion therapy approach in that the Ss paired noxious external stimuli (rubber band snaps) with maladaptive external and internal stimuli to affect changes in the resultant internal responses that ultimately elicited the maladaptive eating behaviors. Ss utilized this technique over a two day period so constant negative pairings were possible.

Relaxation techniques as discussed by Stuart and Davis (1972), Stuart (1967) and Thorsen and Mahoney (1974a) were utilized. Ss were trained to affect internal stimuli as antecedents for resultant behavioral change. The Ss utilized internal relaxation states to avoid maladaptive external stimuli and as a substitute for internal stimuli that elicited maladaptive eating behaviors. Avoidance of maladaptive external stimuli as well as internal stimuli changes are essential components of this technique.

Self Rewards techniques are discussed by Thorsen and Mahoney (1974b) in terms of external reinforcers mediated via internal behavioral changes. These techniques include contingency contracting where Ss set reward

schedule contingent upon adaptive behavioral changes in lieu of maladaptive behaviors. Ss utilized external stimuli to affect positive internal responses.

As discussed by Cautella (1966) and Thorsen and Mahoney (1974a), the Covert Sensitization technique is totally an internal dimension approach. The covert responses are consequences of covert stimuli (imagery of maladaptive behaviors). In a Pavlovian sense, these internal responses paired aversive stimuli (vomiting imagery) with formerly positive internal stimuli (maladaptive eating behavior imagery) that evoked adaptive behavioral change. The alternate responses (avoidance of vomiting) were negative reinforcers enhancing the adaptive behavioral change. Thorsen and Mahoney (1974b) discuss this technique in terms of a self-punishment paradigm.

An Aversion Therapy technique was used that concentrated on the external/internal dimensions of stimuli. In this approach, the Ss took a much more passive role than they did in the Self-Modification approach. The E controlled the behavior modification technique utilized. The Ss in this treatment method learned to affect stimuli changes via pairing initially positive external stimuli (sight, taste and amounts of food presented) and internal stimuli (physiological states and internal responses to external stimuli) with a noxious external stimulus (electric shock). The resultant pairings decreased the positive nature of the maladaptive stimuli so that the chances of adaptive behavioral change were enhanced.

Other rationale were considered when formulating the two treatment approaches. Meyer and Crisp (1964) conducted a study utilizing aversion therapy to treat obese Ss. They encountered a 50% failure rate in that

one of the two Ss dropped out of the study due to her reactions to the high intensity of the aversive stimulus (80-90 volts). Other attempts at treating obesity through aversion therapy, and specifically high electrostimulation, have proven equally ineffective. Thorpe and Schmidt (1964); Thorpe, Schmidt, Brown and Castell (1964); and Thorpe, Schmidt and Castell (1964) suggest that the main problem with the high electrostimulation approach is that these high levels of stimulation often lead to extreme anxiety reactions and withdrawal of the patient from therapy. The above three studies by Thorpe et al can claim a 50% success rate and cite a 50% drop-out rate. Electrostimulation in this study was concentrated at a significantly lower level than the above studies in an effort to avoid the extremely high drop-out rate.

Skinner (1971) states, "The most common objection to behavior modification is that we have left the organism itself in a particularly helpless position". He maintains (1953) that during any behavior modification approach, of which aversion therapy is usually the least effective, the S can not affect external stimuli. In the Self-Modification approach, the S has covert control of the internal stimuli but also overt control of the external stimuli. He may utilize a more varied approach to affect changes along the external/internal dimensions than is possible in the Aversion Therapy approach. It was this researcher's hypothesis that an approach that provided a wide range of techniques would be more effective than the traditionally narrow Aversion Therapy approach.

Differences between obese and normal Ss have been referenced above and may be related to a poor success rate for the typically employed weight reduction programs. This study emphasizes the differences between normal and obese subjects along the external/internal stimulus dimensions.

The thrust of the study was toward utilizing the differences between normal and obese Ss along these dimensions to design a program that emphasized the differences and utilized the external/internal dimension to affect behavioral change.

The following was hypothesized: 1) Both Aversion Therapy and Self-Modification will prove more effective than the Control Group.
2) The Self-Modification approach will prove significantly more effective in eliciting behavioral changes resulting in weight loss than the Aversion Therapy approach.

II. METHODS

I. Subjects

Ss for this study were recruited through two advertisements in a college newspaper and several announcements in college undergraduate psychology classes. Of the total of 67 people responding, 36 met the following requirements: 1) Less than 45 years of age. 2) At least 10% over recommended body weight according to the Metropolitan Life Insurance Company. 3) Willing to invest a total of ten weeks in the program. Ss were contacted by the E by mail and/or by telephone and informed of the initial group meetings. The 36 Ss were evenly divided into two Experimental Treatment groups and one Control Group. The Controls Ss were selected from a second solicitation six weeks after the Ss that composed the two treatment groups. All Ss that were assigned to the two treatment groups were assigned randomly.

II. Procedure

The Experimental Treatment groups were designated as an Aversion Therapy (AT) group and a Self-Modification (SM) group. The AT group was exposed to electrostimulation on a varied schedule. The SM group consisted of Ss that learned a series of eight self-modification techniques. The Control group Ss were provided with the same basic introductory information as the two treatment groups. They were informed that they would be a "post-study" group that would receive the treatment procedure that proved most effective.

In the first meeting, all the Ss (except the controls) were provided with the following by the E: 1) Weight Data Sheets (see Appendix A) on which the Ss were to record their weight at a fixed time of day every two days. 2) Food Intake Data Sheets (see Appendix A) on which

each S was to record the following: Type of food eaten, amount, time eaten, and circumstances surrounding the eating behavior with an emphasis on emotions prior, during and subsequent to all eating behavior.

3) A general information questionnaire (see Appendix A) that included:

- 1) S name.
- 2) Address.
- 3) Height and weight.
- 4) Size of body frame.
- 5) Subjective definition of obesity.
- 6) Subjective assessment of problem areas connected with maladaptive eating behaviors.
- 7) A list of favorite activities.
- 8) Long and short-term weight loss goals.
- 9) Three emotional problems with being overweight and three emotional advantages in not being overweight.

The meeting was concluded with a question and answer period.

The second group meeting consisted of the E reviewing the baseline data procedures (Weight Data Sheets & Food Intake Data Sheets) with the Ss. A Registered Dietician provided dietary information and guidelines along with information about the dangers of specific "crash diets".

The meeting was concluded with a weigh-in and announcement of assignment to specific groups. The Ss then signed up for individual treatment schedules. The controls, who were solicited at a later date, underwent the same meeting procedure. They were selected at a later date due to time limitations placed on the E by the treatment schedules.

III. Aversion Therapy Procedure

The AT group was scheduled as follows:

- 1) Week III: Three individual therapy sessions of one half hour each.
- 2) Weeks IV & V: Two one half hour therapy sessions per week.
- 3) Weeks VI-X: One therapy session per week at a half an hour per session.

This totaled twelve individual therapy sessions and six hours of individual therapy in addition to the two group meetings. In each individual therapy session,

35mm slides of 70 stimulus words (taken from the questionnaires) were projected on a wall. Four electrostimulations, well below the painful level, were delivered concurrently with each stimulus word presentation. Electrostimulation was delivered from the machine (Lafayette Instrument Company Model A 615 A of Lafayette, Indiana) through an electrode attached to the S's wrist or lower arm by an elastic band. Ss were instructed to inform the E when electrostimulation felt like static electricity. This insured most optimal stimulation levels and avoided the intense anxiety reactions discussed in the Thorpe studies. The Ss sat at a table with their backs to the E during the slide presentations. This avoided any contamination by E reaction or feedback from the meter on the machine.

AT Ss were also asked to bring in particular problem foods for sessions 2, 3, 5, 6, and 9 during the program. Each "problem food session" consisted of the S picking up the food and smelling it and then placing it down. The E instructed the Ss in this procedure so that each repetition was accompanied by four electrostimulations. See Figure 1 for the AT group therapy schedule.

<u>Session</u>	<u>Week</u>	<u>Treatment Procedure (preceded by weigh-in each session)</u>
1	3	Two stimulus word sessions.
2	3	One stimulus food session followed by a stimulus word session
3	3	One stimulus word session followed by a stimulus food session.
4	4	Two stimulus word sessions.
5	4	One stimulus food session followed by a stimulus word session.
6	5	One stimulus word session followed by a stimulus food session.

<u>Session</u>	<u>Week</u>	<u>Treatment Procedure (preceded by weigh-in each session)</u>
7	5	Two stimulus word sessions.
8	6	Two stimulus word sessions.
9	7	One stimulus word session followed by one stimulus food session.
10	8	Two stimulus word sessions.
11	9	Two stimulus word sessions.
12	10	One stimulus word session followed by a final weigh-in.

Figure 1. Aversion Therapy treatment schedule.

IV. Self-Modification Group

The SM group followed this schedule: 1) Weeks III through V: Two therapy sessions per week of one half hour each. 2) Weeks VI through X: One half hour session per week. This totaled eleven therapy sessions and $5\frac{1}{2}$ hours of individual therapy in addition to the two group meetings. In the SM group, each therapy session consisted of introducing a self-modification technique and reviewing the technique presented in the previous session. Handouts were distributed at the sessions (see Appendix A) and the techniques were discussed at length.

The first Self-Modification technique utilized was Manipulation of Emotional Responses. In this technique Ss were to picture the three negative emotional consequences of being overweight. This was contrasted with the three positive outcomes, as listed in the questionnaire, of not being overweight.

Manipulation of Discriminative Stimuli was the next technique used. Ss were trained to minimize stimuli that "cued" eating behaviors. This was achieved by limiting all eating behaviors to the kitchen and by not

doing anything else while eating.

In the Chaining technique, Ss were trained to lengthen the chain of events that ultimately led to eating behaviors. The hypothesis was that the longer the chain becomes, the weaker the resultant target behavior becomes.

In the Activity Substitution approach, Ss were instructed to substitute activities that they liked, as listed in the questionnaires, in lieu of the maladaptive eating behaviors. Highest priority activities were those best liked by the Ss and those whose interruption was aversive.

The Snap technique as referenced by Mahoney (1971) was much like a self-administered aversion therapy. Ss were instructed to snap a rubber band that was on their wrist every time they either came in contact with problem foods, exhibited maladaptive eating behaviors or imagined eating forbidden foods. The hypothesis is that the Ss began to pair an external aversive stimulus (rubber band snap) with either a positive external stimulus (food) or internal stimulus (food imagery).

The Relaxation technique involved training Ss to practice attaining a relaxed internal state. The technique provided a way to: 1) Avoid maladaptive external stimuli and their influence. 2) Enhance adaptive internal stimulus changes. 3) Have a S reward himself for avoiding maladaptive overt eating behaviors.

The Covert Sensitization technique trained Ss to use relaxation techniques to produce vivid visual imagery. The Ss imagined maladaptive eating behaviors leading to aversive consequences (vomiting). This was alternated with each S imagining behavioral changes resulting in avoidance of aversive consequences.

See Figure 2 for SM group therapy schedule.

<u>Session</u>	<u>Week</u>	<u>Treatment Procedure (preceded by weigh-in at each session)</u>
1	3	Manipulation of emotional responses. Manipulation of discriminative stimuli techniques.
2	3	Review of above techniques and introduction of chaining techniques.
3	4	Review of chaining technique and introduction of activity substitution technique and Snap technique.
4	4	Review activity substitution and Snap techniques and introduction of relaxation and self reward techniques.
5	5	Review of relaxation and self reward techniques and introduction of covert sensitization technique.
6	5	Review and practice of covert sensitization technique.
7-11	6-10	Review of all techniques and concentration on problem areas and problem techniques. Session 11 concluded with final weigh-in.

Figure 2. Self-Modification treatment schedule.

In an effort to control E bias, the E was assisted by one volunteer therapist who was unaware of the E's treatment preferences. The volunteer (Therapist 2) was selected because she had prior aversion therapy training experience. She worked with 7 of the AT Ss for a total of three sessions each and with 5 SM Ss for a total of 3 sessions per subject. The same room and table were utilized for both treatment groups but the slide projector and Lafayette machine were absent during the SM therapy sessions.

III. RESULTS

In the Aversion Therapy (AT) group, of the 12 Ss who began the study only 10 finished the 10 weeks. The two Ss who dropped out of the study are not included in any of the following calculations. The mean weight change of the 10 Ss in the AT group was a weight loss of 7.7 pounds with a standard deviation of 6.09 pounds. Table I shows the number of subjects in the AT group associated weight changes. Ideal weights represent the mid-points of ideal weight ranges as determined by the Metropolitan Life Insurance Company.

TABLE I

AVERSION THERAPY SUBJECTS'
WEIGHT CHANGES (IN POUNDS)

Subjects	Beginning Weight	Ideal Weight	Ending Weight	Net Change
S ₁	120.0	108.0	116.0	- 4.0
S ₂	145.5	134.0	132.0	-13.5
S ₃	149.5	114.0	142.0	- 7.5
S ₄	176.0	153.9	170.0	- 6.0
S ₅	143.0	121.0	139.0	- 4.0
S ₆	168.0	132.5	172.0	+ 4.0
S ₇	189.0	150.0	174.5	-14.5
S ₈	156.0	128.0	143.5	-13.5
S ₉	238.5	173.5	222.5	-16.0
S ₁₀	177.5	124.0	175.0	- 2.5
*S ₁₁	139.5	108.0	XXXXX	XXXX
*S ₁₂	145.5	121.0	XXXXX	XXXX

$$\mu_1 = -7.7 \quad SD = 6.09 \text{ lbs.}$$

* These Ss dropped out of the study prior to completion & will not be included in the computations.

Of the 12 Ss who began the study in the Self-Modification group (SM), 11 of them completed the program. The S who dropped out of the study is not included in any of the resulting computations. Subsequent to the completion of the program, 4 of the 11 Ss in the SM group reported that they did not utilize any of the eight self-modification techniques provided by the E. The mean weight change of the 11 Ss completing the program was a weight loss of 8.59 pounds with a standard deviation of 2.38 pounds. Table II shows the number of Ss in the SM group with associated weight changes.

TABLE II
SELF-MODIFICATION SUBJECTS'
WEIGHT CHANGES (IN POUNDS)

Subjects	Beginning Weight	Ideal Weight	Ending Weight	Net Change
S ₁₃	160.0	128.0	148.0	-12.0
S ₁₄	138.5	121.0	130.0	- 8.5
S ₁₅	144.0	131.0	133.0	-11.0
S ₁₆ ^{**}	188.0	139.0	184.0	- 4.0
S ₁₇	179.5	151.5	170.0	- 9.5
S ₁₈	195.5	131.0	187.0	- 8.5
S ₁₉ ^{**}	160.0	140.0	162.0	- 7.0
S ₂₀	332.0	177.0	321.0	-11.0
S ₂₁ ^{**}	156.0	131.0	150.0	- 6.0
S ₂₂ ^{**}	160.5	121.0	154.0	- 6.5
S ₂₃	180.0	146.0	169.5	-10.5
S ₂₄ [*]	198.0	139.0	XXXXX	XXXXX
$\mu_2 = 8.59$ SD = 2.38 lbs				

* Ss who dropped out of study & will not be included in computations

** Ss who reported not using any self-modification techniques subsequent to study completion.

All 12 of the Ss who began the study in the Control group completed the study. The mean weight change of these Ss was a net weight gain of 0.42 pounds with a standard deviation of 1.15 pounds. Table III shows the number of Ss in the Control group with their associated weight changes.

TABLE III
CONTROL SUBJECTS'
WEIGHT CHANGES (IN POUNDS)

Subjects	Beginning Weight	Ideal Weight	Ending Weight	Net Change
S ₂₅	177.0	131.0	180.5	+ 3.5
S ₂₆	159.0	131.0	160.0	+ 1.0
S ₂₇	144.0	124.0	144.0	0.0
S ₂₈	217.5	182.0	217.0	- 0.5
S ₂₉	136.5	124.0	137.0	+ 0.5
S ₃₀	155.5	124.0	156.0	+ 0.5
S ₃₁	150.0	131.0	150.0	0.0
S ₃₂	168.0	131.0	168.0	0.0
S ₃₃	195.0	128.0	195.0	0.0
S ₃₄	167.0	139.0	166.0	- 1.0
S ₃₅	148.0	128.0	147.0	- 1.0
S ₃₆	175.0	151.0	176.0	+ 1.0
$\mu_3 = 0.42$ SD = 1.15 lbs				

With the subjects grouped into treatment groups versus control procedures, an analysis of variance was performed to determine if there was a significant difference in effectiveness of the two treatment groups versus the controls. The result ($F = 18.917$) indicates that the two treatment

groups were significantly more effective in eliciting weight loss than the control group approach ($p < .01$). The summary of this analysis is presented in Table IV.

TABLE IV
ANALYSIS OF VARIANCE
SUMMARY TABLE

Source of Variation	Sum of Squares	d.f.	Mean Square	F
<u>Between Groups</u>				
Differences in treatments between 2 treatment groups (AT & SM) and control group approach.	566.756	2	283.378	18.917*
<u>Error</u>	449.426	30	14.98	

* $p < .01$

A t-test for the difference between two independent means was conducted to ascertain if there was a significant difference in mean weight loss between the AT and SM groups. The result ($t = 0.412$) indicates that there was no significant difference in mean weight loss between the two treatment groups ($p < .05$).

A t-test for the difference between two independent means was conducted to see if there was a significant difference in the mean weight losses attained between the AT subjects and those Ss in the SM group that reported utilizing at least one of the eight self-modification techniques. The result ($t = 0.981$) indicates that there was no significant difference in the two mean weight losses ($p < .05$).

A t-test for independent means was conducted to ascertain if there was a significant difference in mean weight loss between subjects of

Therapist 1 and subjects of Therapist 2. The result ($t = 0.152$) indicates that no significant difference in mean weight losses were attributable to therapist influence ($p < .05$).

An analysis of variance of planned comparisons was conducted to determine if there was a significant difference in mean weight loss between: 1) AT and AM groups. 2) The average of AT and SM mean weight losses and the mean weight change of the Control group. The result in Comparison #1 ($F = 0.486$) indicates that there was no significant difference in mean weight loss between the two treatment groups, ($p < .05$). The result of Comparison #2 ($F = 37.348$) indicates that the average of mean weight losses of the two treatment groups was significantly higher than the mean weight loss of the Control group. Table V represents the summary of this analysis of variance of planned comparisons.

TABLE V
PLANNED COMPARISONS ANALYSIS OF VARIANCE

Source of Variation	Sum of Squares	d.f.	Mean Square	F
<u>Between Groups</u>	566.756	2	283.378	18.917*
#1 - Mean weight losses of two treatment groups are equal	7.285	1	7.285	0.486
#2 - Average of mean weight losses of two treatment groups are equal to mean weight loss of Controls.	559.471	1	559.471	37.348*
<u>Error</u> (within Groups)	449.426	30	14.98	

* $p < .01$

A t-test for the difference between two independent means was conducted to ascertain if there was a significant difference in the mean weight loss of the Ss in the SM group that reported not utilizing any of the self-modification techniques and the Control group Ss mean weight change. The result ($t = 2.624$) indicates that the Ss in this classification showed a significantly higher mean weight loss than the Control group Ss ($p < .01$).

A t-test was conducted to ascertain if there was a significant difference in mean weight loss between the Ss who utilized the self-modification techniques and those Ss who reported that they did not. The result ($t = 6.093$) indicates the Ss who utilized the self-modification techniques showed a significantly higher mean weight loss than those Ss who reported failure to utilize the self-modification techniques ($p < .01$).

IV. DISCUSSION

Excluding some infrequent glandular malfunctions, societal, cultural and family variables, most researchers in the area of obesity suggest that obesity results from a combination of overeating and insufficient activity. These factors have suggested that a behavioral approach to weight reduction is possible. A treatment technique that emphasizes and concentrates on the difference between obese and normal subjects with respect to the influence of external and internal stimuli has been designed and implemented in this study.

The literature indicates that one difference between normal and obese subjects is the effect of external and internal stimuli on eating behaviors. Normal subjects seem to be more sensitive to internal than external stimuli. Obese subjects are: 1) More sensitive to external than internal stimuli. 2) More sensitive to external stimuli than are normal subjects. The reported research concerning weight reduction programs for obese subjects often fails to concentrate on the importance of external stimuli with obese subjects. This researcher speculated that a failure to emphasize the importance of external programs to be effective in eliciting behavioral changes that may result in weight loss by obese subjects.

Based on the apparent importance of external stimuli upon obese subjects, this study assumed that an effective treatment program would utilize an approach that focused on training subjects to affect changes in the external stimuli that elicit maladaptive eating behaviors. Since the Self-Modification approach concentrated on training subjects to affect external stimuli without neglecting the internal stimulus dimension, it was hypothesized that this approach would be more effective in

eliciting weight loss than the Aversion Therapy approach. The Self-Modification approach also provided techniques to enhance the subject's sensitivity to internal stimuli. The Aversion Therapy approach provided no such technique.

The proposed hypothesis was that the Self-Modification approach would prove significantly more effective in eliciting behavioral change resulting in weight loss than the Aversion Therapy approach. The data comparing mean weight losses of the Self-Modification and Aversion Therapy groups as well as comparing the Self-Modification subjects who reported utilizing the self-modification techniques with the Aversion Therapy subjects did not support the claim that the Self-Modification approach would elicit a significantly higher mean weight loss than the Aversion Therapy approach. Although the data fails to support a significant difference between the effectiveness of the two approaches, the Self-Modification group did yield a mean weight loss of 0.89 pounds more than the mean weight loss of the Aversion Therapy group.

There is the possibility that a "therapist effect" could influence the findings between the two treatment groups. In an effort to minimize experimenter bias, a volunteer worked with twelve of the subjects. The remaining subjects worked solely with the experimenter. The results indicate that there appears to be no significant therapist effect within the two treatment groups.

There is also the possibility that meeting with a therapist on a regular basis may in itself elicit weight loss. In an effort to assess this factor the subjects in the Self-Modification approach that reported failure to use any of the self-modification techniques were compared with

subjects in the Control group. The results indicate that the Self-Modification subjects who failed to utilize the self-modification techniques showed a significantly higher weight loss than the Controls. This seems to support the idea that there is a significant therapeutic effect in meeting with a therapist on a weekly basis.

It is noted that in the Aversion Therapy approach, two subjects dropped out (see Table I). As evidenced in Table II, one subject dropped out of the Self-Modification procedure. However, four of the eleven final Self-Modification subjects reported that they failed to use any of the suggested self-modification techniques. Are these four subjects "drop-outs"? The definition of what constitutes a drop-out in the Self-Modification approach is much less clear. These four subjects did elicit a weight loss significantly higher than the Controls. As suggested above, the higher weight loss for these four subjects may be due to meeting with a therapist on a regular basis.

While it seems that weekly therapy meetings may have some effect, the subjects who used the suggested self-modification techniques should have elicited a mean weight loss significantly higher than the four Self-Modification subjects who used no self-modification techniques. The results indicate that the subjects in the Self-Modification group who utilized the suggested self-modification techniques did significantly better than those who did not. It is noted that the four subjects in the Self-Modification approach who did not utilize the self-modification techniques elicited the four lowest weight losses within the Self-Modification group. This finding supports the assumed effectiveness of the specific self-modification techniques, independent of non-specific therapy factors (ie. weekly meetings).

Although there was no significant mean weight loss difference between the two treatment groups, the Self-Modification approach seems ethically more acceptable than utilizing electrostimulation, even at low intensity levels, to elicit behavioral change. This experimenter is not comfortable with subjecting anyone to such an aversive condition as electrostimulation because of the quality of the stimulus itself.

B. F. Skinner (1971) states, "the most common objection to behavior modification is that we have left the organism itself in a particularly helpless position". The Self-Modification approach teaches the subject how to affect changes in his own behavior. In this approach, the experimenter became a teacher and not simply a manipulator. The subjects utilized the techniques to design their own behavioral changes and were in control of their own behavior. If one views self-image as a subjective assessment of one's own abilities, an approach that enhances a subject's abilities and produces self-control of the environment leads to an improved self-image. This option is lacking in the Aversion Therapy approach because the subject learns no new skills that enhance his abilities to affect the environment.

The Self-Modification approach has another advantage over the Aversion Therapy approach in that the subject trained in self-modification techniques may use them to affect behavioral changes in areas other than eating behaviors. The Aversion Therapy approach seems to provide for less ability to generalize.

The Self-Modification approach provides a wider range of techniques dealing with both the external and internal dimensions of stimuli. This added variety may enhance adaptability and utility of the approach in that the subject may choose from any of eight techniques and therefore

has more flexibility in adapting a technique that is most effective to a specific situation. This flexibility is not available in the Aversion Therapy approach.

The Aversion Therapy approach relies on the availability of a machine to provide electrostimulation. This means that the approach is, at best, an expensive one for the person who wants to lose weight. He must either obtain his own machine or have someone provide that service for him. Since no machine is utilized in the Self-Modification technique, the subject may work on his target behavior at home in lieu of a laboratory or an office.

Another advantage of the Self-Modification approach is that it is adaptable to group training sessions. This experimenter is presently utilizing the group approach with the subjects in the Control group that are interested in acquiring the self-modification techniques. The group approach seems to enhance the self-modification techniques in that the subjects may provide refinements of techniques to fellow subjects during the group meeting. They also work together to solve particular problem techniques that are common to the group. This provides not only a broader problem-solving base but also immediate peer group reinforcement for the subjects' utilizing the techniques.

An interesting side effect is that the Self-Modification approach elicited weight losses with much less variability than the Aversion Therapy approach. Weight changes in the Aversion Therapy group ranged from a loss of 16.0 pounds to a 4.0 pound weight gain! The standard deviation of this group was 6.09 pounds. The Self-Modification group ranged in weight loss from 6.0 to 12.0 pounds with a standard deviation of only 2.38 pounds. This decreased variability indicates a higher

predictive validity of weight loss within the Self-Modification paradigm.

The study was designed to assess the effectiveness of the two treatment groups when compared with each other and with a Control group approach. The relative effectiveness of external/internal stimulus dimensions was not differentiated in the two treatment groups. There may well be other moderating variables within the two treatment procedures that are significantly related to their comparative effectiveness. Since the study was not designed to factor out the external/internal differences, these differences and the other moderating variables are confounded in this study. Future researchers may be interested in developing a research design that would clearly demonstrate the effectiveness of the two treatment procedures based on their effectiveness in dealing with the internal/external dimensions as well as enumerating and identifying other moderating variables.

This researcher hypothesizes that the Self-Modification approach will have significantly better long-term effects than the Aversion Therapy approach because the subjects in the Self-Modification group can continue to utilize the techniques long after the formal program ends. The Lafayette machine is not available to the Aversion Therapy subjects after the program ends so this approach provides no long-term behavioral techniques. At present, a six-month follow-up study is planned to attempt to verify this hypothesis. The follow-up will concentrate on determining if:

- 1) The Self-Modification subjects continued to lose weight. 2) The Self-Modification subjects' weight losses exceeded those of the Aversion Therapy group. 3) The subjects in the Self-Modification group were able to utilize the techniques to affect other behavioral changes.

APPENDIX A

PERSONAL INFORMATION SHEET

1. NAME _____
 ADDRESS: _____ PHONE # _____
 HEIGHT _____ WEIGHT _____ BUILD: Small Med Heavy
 (FRAME) Circle One

2. How do you define obese? _____

3. What are your particular "problem" areas (e.g. specific types of foods, snacking, eating too much, etc.)? _____

4. List 30 words that you associate with overweight FOR YOU IN PARTICULAR (e.g. "heavy", "overfull", "stuffed", "sweets", etc.)
 1 _____ 2 _____ 3 _____
 4 _____ 5 _____ 6 _____
 7 _____ 8 _____ 9 _____
 10 _____ 11 _____ 12 _____
 13 _____ 14 _____ 15 _____
 16 _____ 17 _____ 18 _____
 19 _____ 20 _____ 21 _____
 22 _____ 23 _____ 24 _____
 25 _____ 26 _____ 27 _____
 28 _____ 29 _____ 30 _____

5. List 5 words you associate with being "thin" or "normal".
 1 _____ 2 _____ 3 _____
 4 _____ 5 _____

6. List some of your favorite activities (preferably things you like to DO ACTIVELY). _____

7. What are your weight loss goals? Long Term _____ Weekly _____
8. List 3 problems with being overweight. 1 _____
_____ 2 _____
_____ 3 _____
9. List 3 pluses in NOT being overweight. 1 _____
_____ 2 _____
_____ 3 _____

WEIGHT DATA SHEETS

Weigh yourself every two days. Weigh yourself at the same time every weigh-in and record immediately. This will give you some information as to how you are progressing.

DATE WEIGHTDATE WEIGHTDATE WEIGHT

FOOD INTAKE SHEET

What eaten	How much	When (Day, Date & Time)	Circumstances (Where were you, alone? how did you feel, etc.)
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SESSION I

1. MANIPULATION OF EMOTIONAL RESPONSES

Refer to page two of your questionnaire. Note that on page two you listed three problems with being overweight. Note that you also listed three pluses in NOT being overweight. You were to think of three positive and three negative things that were very meaningful to you. They were to be as emotionally loaded and immediate as possible. You are to concentrate on these two classes of emotional reasons connected with being overweight at least three times a day. Do this every day. Also it is recommended that you do this whenever you feel the urge to eat! Begin trying this technique today and we will discuss it at our next meeting.

2. MANIPULATION OF DISCRIMINATIVE STIMULI

There are many cues that trigger eating responses in us. These cues or discriminative stimuli come from our pairing eating behaviors with other activities. For example, many of us eat in front of our television sets. We do this so often that we begin to equate eating behavior and the television at a level just below consciousness. It is no wonder that we often "get the urge" to eat when we watch television. We will be working to change those habits from now on. From now on you will not engage in any other activities while you are eating. This means that you are to eat either in the kitchen or dining room only. No more eating in front of the TV. While you are eating, do nothing else. No reading, listening to music, etc. This may be difficult at first but it is worth sticking to it. This will make the eating behaviors very distinct and separate from other behaviors as well as decrease the enjoyment associated with eating.

SESSION 2

3. CHAINING

- a) Shop on a daily basis if possible. DON'T shop while hungry. Take a list with you and stick to it! Try to take just enough money to cover the items on the list.
- b) Buy only the types of foods that need preparation. NO CONVENIENCE FOODS!!
- c) Make food less available. Especially problem foods. Put them high on shelves, etc.
- d) Try to use smaller plates and utensils. Portions look larger on smaller plates. This does have a significant psychological effect!
- e) During your meals do the following:
 - 1) Take smaller bites.
 - 2) Chew your food slowly.
 - 3) Put your fork down between each bite and rest.
- f) Prepare one portion of food at a time.
- g) Stop half-way between each meal and "take a break". Start with a 30 second pause and slowly work up to a 2-3 minute pause.

SESSION 3

4. ACTIVITY SUBSTITUTION

- a) Use activities that are incompatible with eating; use these especially during danger periods.
- b) Schedule activities whose interruption will bother you!!
- c) If emotions lead to eating behavior, remove yourself from the presence of food.

5. SNAP

Place a wide rubberband around your wrist. Whenever you get the urge to snack or do some other unacceptable eating behavior, snap yourself on the wrist. You do not need to do this very hard but you must be consistent to make it effective.

SESSION 4

6. RELAXATION

Relaxation that is learned as a skill is incompatible with eating behavior. It is also incompatible with the often aversive emotional states which often lead people to eat when they are not hungry (e.g. eat because of boredom, etc.). When practicing relaxation, be tuned to three cues. Verbal Cue--As you exhale, think the words "calm & controlled" to yourself. Physical Cue--Take notice of your inhalation and exhalations (be sure they are slow and steady). Sensory Cues--Picture a scene that is relaxing to you and try to imagine as many cues associated with that scene as possible (picture sights, smells, sounds, etc.). The more cues the better.

You can use relaxation instead of a snack during study breaks or as a good "pick-me-up" when down. Try it, you'll like it.

7. SELF REWARDS

Reward yourself when you don't give in to your old bad eating habits. Try doing some of your favorite activities you listed on your questionnaire. Make your rewards immediate and contingent upon performing the new behaviors.

Sometimes it is impossible to give yourself a good reward at the time when you performed the new desired behavior. If so, try using tokens so you can add them up and "spend" them for your rewards at a later date. You may also set aside a special fund for getting something you want. Make a contract with yourself to use only that fund to buy it. You can put money into the fund for weight losses or for performing the new and desired behaviors.

SESSION 5

8. COVERT SENSITIZATION

You should be fairly adept at getting yourself into a relaxed state by now. Now you can try using covert sensitization. After you get into the relaxed state, picture a problem eating behavior you have. Picture this instead of your "relaxation scene". Picture the problem behavior leading to an extremely aversive consequence. For example, picture your snacking behavior leading to you vomiting. Then go back to the relaxation state. Picture the scene again only this time picture that when you begin to feel nauseated, stop the behavior. This will lead to the nausea going away. Then go back to the relaxation state. Alternate the above procedure three times about three times a day. You can also do this during peak "danger periods".

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