

THE EFFECTS OF SELF-MONITORED
FEEDBACK ON WEIGHT
LOSS IN FEMALE SUBJECTS

by

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Abstract

The intent of this study was to investigate the effects of self-monitored feedback alone as well as in conjunction with therapist and visual reinforcement on weight reduction in female subjects. Since the self-controlling techniques presuppose that each individual views her behaviour as contingent upon her "actions", it was further hypothesized that subjects classified as internal - those who consider that they exert control over things which affect them, would achieve different results than those subjects classified as external - those subjects who consider that they have little or no control over things which affect them. A sampling of forty-two subjects were randomly assigned to one of the following conditions: self-monitored feedback in conjunction with therapist and visual reinforcement, self-monitored feedback alone, control. The data obtained was the "weight in pounds" of each subject pre-treatment, the weight in pounds of each subject post-treatment, and the weight in pounds of each subject at a follow-up session four weeks later. The results of the analyses resulted in a variance ratio significant at the .01 level. The Duncan's Multiple Range Test analysis revealed that Group 3, the self-monitored feedback with therapist and visual reinforcement mean weight loss, and Group 2, the self-monitored feedback group mean weight loss were each significantly greater than the Control group mean weight loss. There was no

significant difference in weight loss between the two treatment groups. Further, t tests performed on each of the three groups to test the second hypothesis revealed virtually no differences between subjects classified internal and those classified external.

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CHAPTER I

INTRODUCTION

Obesity is one of North America's major health problems. It may affect as many as one-quarter of American adults, contributing to their poorer health and higher death rates. Both men and women live with perpetual worries about their weight. Dieting has become a national obsession, yet research shows that fewer than 10 percent of dieters successfully maintain their weight losses for as long as a year (Stunkard, 1982).

Obesity is a disorder of multiple and diverse origins - the reasons for getting fat or staying fat vary enormously. In our society being fat is viewed and experienced as much more than a physical condition. It is tinged with powerful sexual, psychological, and social meanings and myths.

The application of behavioural techniques in recent years has produced significant results in the treatment of this stubborn and often baffling condition. When compared with contemporary treatment alternatives, specific behavioural techniques seem to offer the most promising and lasting approach to weight control. Recent research attempts to isolate the most effective components of behavioural treatment programs in order to optimize their consistent application and maintenance (Millman, 1981).

Statement of the Problems and Hypotheses

Self-monitored feedback is a valuable and relevant com-
ponent of virtually all self-control programs. Is self-
monitored feedback alone sufficient to significantly modify
eating behaviours?

It is the purpose of this study to investigate the
effects of self-monitored feedback on weight reduction. Is
self-monitored feedback alone a powerful contributing variable
to the modification of eating behaviour, and is it sufficient
to produce and sustain weight loss in female subjects?

Since the self-controlling techniques presuppose that
the individual views her behaviour as contingent upon her
"actions", it is further hypothesized that the internally
controlled individual, one who considers herself exerting
control over things affecting her, would achieve different
results than the externally controlled individual, one who
considers herself exerting little control over things
affecting her.

Rationale for the Study

Rationale for the Problem and Hypotheses

As the following chapters will illustrate the results
of behaviour modification for obesity have been relatively
consistent and positive, leaving little doubt that obesity
can be profitably viewed as a modifiable aspect of human
behaviour (Stunkard, 1972).

Behaviourists assume that all socially relevant behaviours are learned and maintained through interaction between the individual and relevant persons and situations in her environment. According to Skinner (1957) the individual controls her own behaviour through the manipulation of behavioural or environmental variables.

Behaviour, because of the fact that it is ongoing, can best be analyzed if partitioned into segments that can then be examined without loss of the key elements of both the behaviour and the environmental conditions. Traditionally, the essential components for analysis of any behaviour have been defined as stimuli and responses. Expanding on these two basics, it is necessary to include three other important elements: the biological condition of the behaving organism, the consequence of the behaviour for the organism or its environment, the contingency relationship between the behaviour and its consequences (Kanfer, 1971).

For operant or voluntary behaviours, one set of operant conditions called antecedents precede the response. These increase the likelihood that certain classes of responses will occur. They do not guarantee a specific outcome. Consequent conditions are produced by operant responses and can accelerate the rate of a response, as is the case with positive and negative reinforcement. They might also decelerate the rate of a response as is the case with extinction and punishment. The positive or negative consequences of a behaviour manifest two responses: the controlling response

and the controlled response. The former, by the manipulation of variables, influences the probability of the latter's occurrence (Skinner, 1953). The occurrence of the controlling behaviour can be made more powerful by the arrangement of reinforcement contingencies. More important than the mere frequency of the reinforcer is the contingency of which the reinforcer is a part. The solution does not lie in the elimination of reinforcers but in the moderation of their effects.

Within a chain of behaviour, each response produces the stimulus for the next one (Skinner, 1938; Hull, 1952). At any point in the sequence a stimulus serves simultaneously as the reinforcing stimulus for the response that produced it, as well as the discriminative stimulus for the next response of the behaviour chain. Frequently many of the stimuli which are part of a behaviour chain are conditioned reinforcers. By studying the effects of experimental manipulations within one link of a chain upon the strength of the behaviour in other links of the sequence, more may be discovered about conditioned reinforcement.

The further a behaviour is removed from the primary reinforcement, the weaker its response strength. For example, a study using the urge to overeat as the target behaviour made it (the urge) more distant from the terminal behaviour (actually eating) by inserting an intervention behaviour such as writing and recording the amount of food and the caloric intake (Youdin, Hemmes, 1978).

Recording a predictable behaviour just before it occurs may be good strategy for weight reduction studies. Prebehaviour monitoring of a negative valenced excess may break the chain and facilitate the insertion of self-restraining responses (Paquin, 1980).

Specifically, the behavioural approach measures the form and rate of observable behaviour. The rate is defined as the frequency of response over time. The form is that occurrence observed in a specific time frame. Because behaviour, unlike thoughts and feelings, is observable, it is possible to measure it using an individual as a monitor. Azrin and Powell (1968) adopted the caveat of having other persons monitor (social monitoring) certain kinds of responses at certain times.

Having identified the starting form and rate of an observable target behaviour, the behaviourist then decides the form and rate at which he would like it to occur. Also to be determined are the conditions under which the response is expected to occur.

The learning theories formulated by Pavlov and Skinner form the basic framework for behavioural therapists, that framework being characterized by three features:

1. exact specification of the behaviour to be changed
2. exact specification of the procedure to be used in attempting the change
3. frequent monitoring of the behaviour to determine what effects the procedures have had.

Once a behaviour is learned it becomes part of an individual's behavioural repertoire. Assuming that the subject has the ability to make subtle discriminations, she, as well as the therapist, could continuously monitor her own behaviour, as well as receive feedback throughout therapy. The research indicates that feedback provided to a patient is a significant factor in the reported successes of the various behaviour therapy procedures (Leitenberg, Agras, Thompson, and Wright, 1968).

Generally, feedback has been defined as a stimulus which indicates a change in behaviour. However, it is important to note that when no change in behaviour occurs this also provides feedback. Kanfer (1966, 1971) found that an individual behaviour may be controlled when immediate behavioural feedback is available. Self-monitoring provides this immediate feedback by enabling the individual to identify the effect and consequences of her behaviour. Kanfer hypothesized that by focusing attention on the behaviour itself, feedback would be provided. This would allow the individual to specify some of the variables of which her behaviour is a function, thereby taking steps to control it.

Ayllon and Azrin (1968) showed that feedback may serve a discriminative function. Their subject was found to respond under the control of the feedback stimulus when response-produced feedback was followed by a reinforcer. When feedback was withheld and the responses were no longer followed by it, the subject switched to an operandum to which feedback was provided. This indicated the control exerted by feedback.

Several physiological studies (Brener, Klunman, and Gosling, 1969; Brener and Hathersall, 1967) have shown the role of feedback in controlling behaviour. The research indicates that the amount of heart rate control which can be exerted by the individual is a function of the amount of feedback monitored (Lang, Snaufe, and Hasings, 1967). Even an "involuntary behaviour" such as heart rate may be regulated by the use of feedback. This data suggests that when naturally occurring response feedback has proved insufficient for the development of control over behaviour, the feedback may be more effective by making it more observable.

Leitenberg, Agras, Thompson and Wright (1968) working with two anorexic patients combined self-monitoring treatment and positive reinforcement. The patients monitored the amounts of food consumed and graphed the results. Withdrawal of positive reinforcement had little effect on behaviour. This demonstrates that self-observed signs of progressive improvement, provided by the self-monitoring procedure, maintained the behaviour in the absence of other explicit reinforcers.

Significance of the Study

The technique of self-monitoring uses feedback to make the individual aware of her own behaviour. Each individual keeps a record of the frequency in which she engages in the to-be-controlled behaviour thereby providing feedback which enables the individual to control the behaviour. This

technique has been used in a variety of situations. For example, subjects exposed to self-monitored feedback were able to reduce smoking behaviour by a significant amount (Nolan, 1968; Tooley and Pratt, 1967). Harris (1969) and Stollack (1967) found self-monitored feedback an important variable in the modification of eating behaviour.

Numerous studies have been conducted comparing the use of self-monitoring techniques to other self-control strategies, to control groups, and to various specific treatments designed specifically for weight reduction. While earlier studies indicated that the use of feedback in self-monitoring was probably not sufficient on its own to significantly change eating behaviour, more recent studies have demonstrated just the reverse. At this time it is still unclear as to whether or not self-monitored feedback alone is sufficient to bring about a significant behavioural change.

The purpose of this study was to investigate the effects of self-monitored feedback on weight reduction, in an effort to establish that self-monitored feedback alone is a powerful contributing variable to the modification of eating behaviour, and is sufficient to produce and sustain weight loss in female subjects. This study deals with the concept of locus of control: whether or not internality or externality has any bearing on the subject's ability to identify variables that influence her weight and then to successfully implement corrective self-monitoring actions. It is the intent that this investigation of self-monitored feedback and weight

reduction, and the influence of locus of control on the implementation of corrective self-monitoring actions, will be of value to those individuals interested in controlling their own eating behaviour.

Limitations of the Study

There are four limitations of this study. The first limitation concerns measuring change. The most direct indicator of change is pounds lost. That measure has the disadvantage of not taking initial weight into consideration. For example, the greater the pre-treatment weight of a person, the more they have to lose. Secondly, weight change is a function of the relationship between energy intake and expenditure. A 200-lb. person following the same procedure as a 150-lb. person, and engaging in the same activity, will require more energy and lose more weight by virtue of her moving fifty extra pounds (Mayer, 1968). Thirdly, there may have been a Hawthorne Effect on subjects. The fact that they were part of a study might have affected their behaviour. It may have reinforced the idea of commitment to the program in some subjects, while others responded to the pressures that commitment can cause, and withdrew. Fourthly, although the therapist attempted to standardize all instructions, there may have been experimenter bias if she inadvertently differed her interactions with various subjects.

CHAPTER II

REVIEW OF THE LITERATURE

It is the purpose of this chapter to examine the literature dealing with the origins of obesity and the complex factors involved in regulating body weight. The following sections will focus primarily on the behavioural approach to intervention because the most recent research indicates that behavioural techniques, among them the use of self-monitored feedback, have produced positive results. If the feeding disturbance is regarded as the primary disorder with the weight picture representing only a secondary system, it would follow that the individual who is able to successfully modify her eating behaviour by learning to dispense reinforcers to herself could do so for as long as it was desirable.

The chapter discussion is organized under four headings: origins and reasons for obesity, behavioural treatment of obesity, complex self-control, self-control and overeating.

Origins and Reasons for Obesity

When considering the role of behaviour modification in the treatment of obesity it is important to discuss the origins of obesity. What causes obesity? In one sense the answer is a simple one: eating more calories than are expended as energy. If this is the case, then changing

inappropriate and maladaptive eating habits should make fat people slim. But why do people eat more calories than they can expend in the first place? Investigators no longer feel that the causes of obesity are as important as the many factors involved in regulating body weight. Nevertheless behaviour modification programs must be set up to operate within certain biological constraints.

Biology of Body Weight

An average non-obese man stores enough fat (15% of his body weight) to provide for all his caloric needs for about one month. Although this same man will consume almost one million calories a year, if he expends an equal number of calories, his body fat stores will remain unchanged. But, an error of no more than 10% in either intake or output would lead to a 30 pound change in body weight within the year. This would show that, in persons of normal weight, body weight is precisely controlled (Mayer, 1967).

The most detailed explanations of the effects of caloric restriction in man were the classic studies of Keys et al. (1950). They restricted 36 young male volunteers to low-calorie diets which produced a deficit of 1600 calories per day for a period of 6 months. Subjects lost 25% of their body weight while developing severe behavioural disorders subsumed under the designation "semi-starvation neurosis". When provided with free access to food all subjects promptly began to restore their lost body weight and within three months were maintaining it at prestarvation levels.

Numerous studies on experimental animals of normal weight amply confirm the remarkable stability of the regulation of body weight. Research also shows that with hereditary-obese hyperglycemic mice and hypothalamic obese rats, although body weight was double and even triple that of their non-obese littermates, their weight fluctuations were not greater than that of non-obese subjects. Therefore, it would seem as if the regulation of body weight of experimentally obese animals may be intact. The set point around which this regulation occurs undergoes alteration.

Genetics

A number of studies have confirmed that obesity runs in families. Mayer (1957) reported a background of obesity in approximately 80% of obese-obese matings, in 40% of obese-nonobese matings, and in more than 10% nonobese-nonobese matings. Unfortunately, researchers find it difficult to separate genetic and environmental influences. Studies done with twins and adopted children can only provide a rough estimate of the relative contribution of inheritance (Withers, 1964), because so many non-genetic factors can influence body weight.

With more emphasis being given the transmission of somatotypes (Seltzer and Mayer, 1964), research shows that obesity occurs with much greater frequency in some physical types than in others. For example, obese adolescent girls show extremely low ratings of ectomorphy designating the

slender physical type and characterized by performance of the structures developed from the ectodermal layer of the embryo, i.e., sense organs, nerves, etc. The presence of even a moderate degree of ectomorphy appears to offer protection against obesity. Withers (1964) has suggested that body types are inherited from father to daughter and from mother to son, but more research is needed on the relation between genetics and regulation of body weight.

Obesity in Childhood

Obesity that begins in childhood shows a very strong tendency to persist. A study by Abrahams, Collins and Nordsieck (1971), using a time interval of thirty-five years and fairly rigid criteria for obesity, found the difference in adult weight status continuing to grow: 63% of obese boys became obese men, as compared to only 10% of average weight boys.

Juvenile-onset obesity tends to be more severe, more resistant to treatment, and more likely to be associated with emotional disturbances than the condition of obesity in adults. Studies have revealed the remarkable degree to which obese children become obese adults (Abraham and Nordsieck, 1960).

Research using males showed 86% of a group of overweight boys became overweight men, as compared to only 42% of boys of average weight who became overweight adults. Results for females were 80% of overweight girls became overweight women, as compared to 18% of average weight girls. The odds against

an overweight child becoming a normal weight adult at age 12 were 4 to 1, and they rose to 28 to 1 for those who did not reduce during adolescence (Stunkard and Burt, 1967).

Many obese persons, especially those who suffer from juvenile-onset obesity, show a marked increase in total number of adipocytes in subcutaneous tissue and in other depots. An average non-obese person has $25-30 \times 10^9$ fat cells, an obese person up to five times this number (Hirsch and Knittle, 1971). Individual cells shrink greatly with weight reduction but the total fat cell number remains constant. According to a number of animal studies by Knittle and Hirsch (1968), initially adipose tissue grows by increasing all size and cell number. A change of feeding pattern during the first three weeks of life will produce change in cell number. When an adult animal is fed to obesity, it produces no new fat cells, but simply enlarges the old ones. This research demonstrates the influence that early feeding patterns have on the later development of obesity.

Also worth noting are possible differences in the actual fat cell structure (Bray, 1970). Research suggests that fat cell differences can predict later changes in body weight.

Metabolism

Metabolism is as individual as the subject itself. Metabolic research has shown that experimental subjects level off at 220 lbs. despite the continuing ingestion of 8,000 calories a day. This indicates that the usually accepted figure of

3,500 calories as the caloric equivalent of a pound of fat did not apply in these subjects when the weights became stable (Simms, 1968). Passmore et al. (1963) have provided further indications of the uncertain relationship between calories of food intake and gain and loss of body weight. Research showed that obese persons can gain weight on fewer calories. This does not mean that calories do not count but that other metabolic variables play an influential role as well. Different persons seem to use different numbers under different conditions.

Also of importance are the metabolic changes which result from overeating. People who overeat for longer than a few days not only gain weight, but also undergo hormonal and metabolic change. Also associated with overeating and obesity are, among other factors, decreased glucose tolerance, and elevated triglyceride, blood cholesterol, and insulin levels (Bortz, 1969; Forsham, 1974; Rabinowitz, 1970). The increase in levels of insulin is important because it triggers the experience of hunger which usually leads to more eating. The higher the basal levels of insulin, the more insulin is released at the sight, thought, and smell of highly appealing food (Rodin, 1978). Therefore, overeating results in some obese people becoming more physically primed to be tempted by tasty foods, and consuming more and more food. It would be important for these people to realize that physiological changes have occurred to which the overeating can be attributed, rather than assigning their behaviour as a result of depression or gluttony.

Physical Activity

The only variable on the energy expenditure side of the caloric ledger that both fluctuates and is under voluntary control is physical activity. It is a vital factor in the regulation of body weight. Until recently it was believed that physical inactivity directly caused obesity by the restriction of energy expenditure. Now research shows that inactivity may contribute to an increased food intake as well. Although food intake increases with increasing energy expenditure over a wide range of energy demands, intake does not decrease proportionately when physical activity falls below a certain minimum level (Mayer and Thomas, 1967). Restricting physical activity may actually increase food intake.

The brief view of causes of obesity stated above should convey some idea of the complexity of factors involved in regulating body weight. They indicate why a behaviour modification program which is successful in reducing body weight and body fat may not simply be a matter of unlearning maladaptive eating habits and then learning more appropriate ones. Aside from the aforementioned causes, there is still the pertinent question of individual variability. Most investigations of behavioural weight control strategies have been characterized by marked individual variability in degree of weight loss (Penick and others 1971). Some variables have been shown to have strong correlations. These include mood disturbance (Hall, Bass and Monroe 1978), family involvement (Mahoney and Mahoney 1976; Brownell and

others 1977), age of onset (Stunkard and Rush 1974), and self-reported alteration of eating habits (Mahoney 1974).

Behavioural Treatment of Obesity

The behavioural approach to intervention as indicated by the research shows that individuals can learn and maintain new behaviours if they make a commitment to take responsibility for changing their behaviour. In order to alter behaviour, the reward value of an old response system is reduced, and a new behaviour with a high reward value is established. This can be done through selective reinforcement and modeling (Bandura, 1969, 1976; Bandura and Walters, 1963).

Behavioural research suggests that obesity is due to the learning of faulty eating patterns (Ferster, Nurnberger, and Levitt, 1962; Stuart, 1967), and that overeating (and under exercising) can be directly influenced to produce a change in body weight. The literature currently relies to a lesser degree on accurate knowledge about nutrition and energy consumption and focuses mainly on the individual acquiring new skills with which to manipulate his own environment.

Research concerning the behavioural treatment of obesity indicates that four areas of study dominate the literature. These are covert sensitization, covert conditioning, aversive stimulation, and self-monitoring techniques; all of which fall under the general heading of complex self-control. The use of therapist reinforcement techniques will be examined

briefly, because to date the literature seems to emphasize the disadvantages rather than the advantages of this system. The greatest amount of time will be devoted to those self-management techniques utilizing self-monitored feedback, as recent studies have shown that significant behavioural change is possible.

Covert Sensitization

Through the use of covert behavioural variables, this technique pairs a highly aversive event (nausea) with a stimulus which formerly elicited approach responses (food). If successful, the stimulus assumes the properties which cause discomfort to the individual. According to Cautela (1976), when this occurs, the individual seeks "escape" from the stimulus, thereby learning to avoid it. The procedure is termed "covert" because neither the conditioned (undesirable) stimulus nor the unconditioned stimulus is actually presented. Because the goal is to build up avoidance responses to the undesirable stimulus, the term "sensitization" is used (Cautela, 1976).

To date research using this method alone in the treatment of obesity is inconclusive. Murray and Harrington (1972) conducted studies using covert sensitization in conjunction with an aversive physical stimulus to promote weight loss. Weight loss occurred as long as subjects remained in treatment, but no lasting effects were reported.

Janda and Rimm (1972) reported successful weight loss for one covert sensitization group as compared to an attention-control group and control group. Due to the specific nature of this technique, that is, if one food is treated there will be little generalization to other foods (Cautela, 1967), subjects perceived their treatment positively and were found to be highly motivated.

Manno and Marston (1972) evaluated positive covert reinforcement and negative (covert sensitization) in group therapy. Their results showed a greater weight loss for these two groups (although no difference between them) as compared to the minimal treatment control group.

Recently DeBerry (1981), on considering the "recalcitrant nature of obesity" designed a study which relied on a framework for mapping the most effective intervention strategy. Following the approach of Lazarus (1973), DeBerry's program utilizes a multimodal treatment approach, while making the assumption that the more areas of one's personality dealt with, the more effective therapy will be. He designed the Basic ID (Behaviour, Affect, Sensation, Imagery, Cognition, Interpersonal Relations, Drugs) and employed different techniques in each area.

After an initial two week baseline over which time the subject compiled food data logs, it was decided which factors were contributing to this particular weight problem. Covert sensitization was used in relation to specific food substances such as junk food and excessive beer drinking. The results

showed it to be powerful and characteristically specific in its effect. One conclusion might be that the technique of covert sensitization has proven useful in treating eating responses of a highly specific nature.

Coverant Conditioning

In 1965, Homme introduced the term "coverant", a contraction of covert operant to refer to mental events such as thinking, imagining, or reflecting. His argument states that these unobservable, private events obey the same laws as non private events. Coverants, like operants, can be manipulated by environmental cues and consequences. According to Homme, the problem of trying to measure mental events has been exaggerated by researchers reluctant to deal with covert behaviour. He suggested that the presence or absence of coverants can be easily detected by the subjects in whom they occur.

The work of Premack (1965) lent support to Homme's coverant conditioning theory. "For any pair of responses the more probable one will reinforce the less probable one" (Premack Principle). He maintained that a reinforcer was always available and that reinforcement contingencies are the same, regardless of the topography of a response. Any coverant can be strengthened by the individual demanding that it occur immediately prior to highly probably behaviour.

Consider the following example regarding one overweight female subject. She must first make a list of several aversive thoughts connected with her obese condition. Secondly,

the subject must make a list of pleasant thoughts associated with being slender. Then the subject must identify a reinforcing event, e.g., a high probability behaviour such as answering the phone. In order to implement this technique, whenever the telephone rings the subject must think the aversive thoughts, and then the pleasant ones. After making these two coverants the subject indulges in the high probability behaviour and answers the phone.

Assuming that the subject is able to conjure up both anti-obesity and pro-slender thoughts at sufficient strength and appropriate times, this self-control technique should reduce overeating and result in weight loss.

Researchers Tyler and Straughan (1970) used this technique in a comparative study which used "breath holding" and "relaxation" measures. Results showed that, although each group experienced minor weight reduction, the differences between groups were insignificant.

Horan and Johnson (1971) assigned 96 female subjects to four groups, the first three being controls for the fourth, the coverant conditioning treatment group. Results showed that Treatment 4 produced greater weight loss than Treatments 1, 2, and 3. More importantly, this study presented individual data on all subjects, clearly indicating the striking differences between subjects and the affect this has on final results.

Another study (Horan, et al. 1975) using overweight female subjects suggested that the use of positive coverants produced significantly more weight loss than did negative coverants.

To date the use of coverant conditioning as a powerful behavioural technique in the treatment of obesity has not been confirmed. The few studies which have been conducted seem to indicate positive short term effects only. However, the possibility still remains that coverant conditioning might be a useful tool in combination with other methods.

Aversive Stimulation

The use of aversive stimulation can achieve self control. Aversion therapy refers to a wide variety of techniques in which a noxious, aversive, unconditioned stimulus (U.S.) is repeatedly paired with a conditioned stimulus (C.S.), or with the stimulus components of the behaviour to be eliminated in order to reduce the attractiveness of the conditioned stimulus. Electric shock, foul odors, chemical nauseants, and imagery of unpleasant scenes typically serve as the unconditioned stimulus. The conditioned stimulus is usually in the form of food, or the problematic behaviour either imagined or previously photographed (Rachman and Teasdale, 1969).

Behaviourists rationalize that the learned avoidance of particular foods will result in reduction of calorie intake, and hence in weight loss. Aversive conditioning of actual eating behaviour (Meyer and Crisp, 1964), food obsessionality (Thorpe, et al., 1964), (Wolpe, 1958), of merely thinking about problematic foods (Tyler and Straughan, 1970), are three techniques believed to be potentially useful in lessening the appeal of eating. Overall, though, the results do not appear

to be too promising. It has been suggested (Foreyt and Kennedy, 1971) that aversion therapy might be useful as an adjunct to a comprehensive weight reduction program. There is, however, no long term follow up data to substantially support this statement.

Therapist Reinforcement Techniques

Although therapist reinforcement techniques have resulted in rapid and sometimes dramatic weight losses (Bernard, 1968), the disadvantages of using these techniques outway the moderate successes. Research questions the extent of control a therapist can realistically achieve as well as questioning the techniques themselves. Generally, the emphasis is on reinforcing weight loss (and for punishment for weight gain) but fails to teach subjects how to most effectively achieve that loss.

The treatment process is severely lacking in any follow-up data because of the therapist's inability to influence subjects once they have left the institution or treatment center. The research results indicate the inefficiency of therapist reinforcement techniques and then question the effectiveness of any program in which the subject does not reinforce himself for correct responses.

Based on the assumptions that the number of individuals seeking dietary programs exceeds the available time of health professionals, individuals would be unwilling to commit themselves to time consuming clinical contact schedules, and

face-to-face counseling may be a needless exercise for those capable of significant self-direction, Jeffrey and Gerber (1982) designed a low cost correspondence program. This program examined the attractiveness of correspondence and intensive group approaches, the efficacy of the two programs among men actively participating in them, and the relationship of weight history to both program interest and efficacy. Subjects were asked to choose between group weight reduction and 'correspondence weight reduction'. There was no "no interest" option offered.

Results showed that recent weight gain might make people more interested in professional assistance, and that responding to correspondence is easier than making a totally negative response. Because non-participation is a problem for many clinical programs (Stunkard, McLaven, Hume, 1959), it is helpful to have subjects leave a deposit to be refunded by the therapist upon completion of treatment.

Complex Self-Control

Generally speaking, self-control techniques have gained public acceptance because of Western society's belief in the individual. These techniques require the individual's active and voluntary participation in her own treatment, usually without the presence of a therapist. Another advantage is the degree of efficiency that treatment conducted solely by one individual makes possible.

Self-control can be viewed as a process by which an individual sets up conditions in her environment to bring about specific behaviours in herself (Goldiamond, 1966). However, large segments of human behaviour are not under control of external stimuli. This being the case, self-control can be thought of as the ability of the individual to reinforce herself when it is appropriate to her own behaviour. In reinforcing herself, the individual is discriminating the correct response to be reinforced. Kanfer, Bradley, and Marston (1962) investigated the effect of learning on the correctness of self-reinforcement and found the accuracy of self-reinforcement was a function of learning.

"Internal self-generated stimuli" can control behaviour in the same way as "external stimuli" (Bijou and Baer, 1967). In the case of an individual where "internal" and "external" stimuli seek to control behaviour, the consequences of one might influence the consequences of the other.

Referring to what he calls loci of reinforcement, Rotter (1954, 1966) maintains that some individuals are internally directed and perceive that an event is contingent upon their own behaviour or their own relatively permanent characteristics. Those who are externally controlled perceive a reinforcement as following some action, but not being entirely contingent upon it. In our culture, it is generally perceived as luck, chance, or fate.

Since self-controlling techniques presuppose that the individual views her behaviour as contingent upon her actions, the hypothesis might follow that the internally controlled

individual, one who considers herself exerting control over things affecting her, would achieve different results from the externally controlled person, one who considers herself having little control over things affecting her.

Rotter and Mulry (1965) tested the hypothesis that "internals" and "externals" differ in the value placed on the same reward depending upon whether it was perceived as contingent upon chance or skill. They measured decision time in a matching test involving various angles, described to half the subjects as skill, and to half as chance determined. Results showed "internals" take longer to decide in a matching test when the task is defined as skill controlled than when it is said to be chance controlled. "Externals" take longer to decide when the task is defined as chance rather than skill controlled. The greatest difference was observed in the time taken by "internals" to decide under skill conditions.

Kincey (1979) designed a weight loss program to examine the effects of varying the short term 'target' expectations of weight loss. Results indicated that greater weight loss occurred under "unrealistic" high target levels. Internally controlled individuals did significantly better under the "High" than the "Low" expectations. Kincey predicts that Externals might achieve better results through the use of "Immediate" self-reinforcement rather than delaying gratification, and consequently would benefit by receiving "Low" realistic targets in order to lose weight.

Ninety-six psychiatric inpatients with a history of problematic pacing were given the Rotter I-E and assigned to four categories: self-monitoring, external monitoring, social demand, and no treatment. Internals reduced pacing and increased general adjustment scores in the self-monitoring condition. Externals reduced pacing and showed improved general adjustment in the external-monitoring condition (Rostow, 1980).

Internals and externals have been shown to respond differentially in a great many situations (Joe, 1971). In group therapy, internals achieve greater results with a non-directive approach, while externals improve under more directive techniques (Abramowitz et al., 1974). In summary, it would appear as though internals show greater reactivity when they self-monitor, while externals benefit more from being externally monitored.

In recent years, evidence indicates that an 'external' orientation serves a defensive function by allowing the external subject to project blame for personal incompetence on to fate rather than taking responsibility for failure (Hochreich, 1975). This being the case, an overweight person could always have a ready-made excuse for his inability to lose weight. According to Phares (1973) internal subjects take a more active and copying stance towards life. They are not necessarily overcome by failure or negative feedback because of enduring confidence in their own capabilities and self-worth. Since they feel that most situations can be

rectified, internals are protected from overreacting to negative evaluations in specific situations. External subjects, having less confidence in their ability to manipulate the environment, may be more affected by others' opinions, since they do not believe they can change (Molinari and Khanna, 1980).

As recent studies show, external subjects are more variable in their self-descriptive behaviour than are internal subjects (Hersch and Scheibe, 1967; Rotter, 1966), use blame to explain failures (Phares, Wilson, and Klyver, 1971), and choose external options on Rotter's locus of control scale for divergent reasons (Hamsher, Geller, and Rotter, 1968). Based on these findings it seems probable that an 'external' in a weight loss situation would conceivably have an unclear picture of how she would like to look and feel, and could become defensive and unmotivated if weight loss did not proceed as expected.

People in American culture have developed generalized expectancies in learning situations regarding whether or not reinforcement, reward, or success in these situations is dependent on their own behaviour or is controlled by external forces, particularly luck, chance, or experimental control (Rotter, 1966). It is of interest to observe the progress of subjects designated 'internal' and those designated 'external' in the present weight reduction study.

Self-Control and Overeating

Behavioural self-control techniques compliment humanistic concerns because they help the individual to master her environment and to change herself if she so desires. Earlier research in behavioural self-control has assumed that the individual is a passive recipient of environmental forces. As Bandura (1969) has suggested, the relationship between the individual and her environment is a continuous reciprocal influence process - another way of saying that people affect their environment and in turn are affected by it. This interdependence is continuous and needs to be taken into account in behavioural applications.

In 1962, the first study presenting a model of self-control of overeating was completed (Ferester, Nurnberger, and Levitt). They wrote: "Self-control is a very complex repertoire of performance which cannot be developed all at once" (p.87). Their method paired ultimate aversive consequences (U.A.C.) with eating through the use of a sophisticated vocabulary. Each subject was encouraged to become familiar with extensive amounts of verbal behaviour dealing with the consequences of eating. After establishing a strong repertoire of accurate facts about nutrition, the continued intensive pairing of facts about the U.A.C. with different kinds of eating performance would turn the performances into conditioned aversive stimuli.

A major principle of self-control is to pace the rate of the subject's weight loss so that the effect of the weight

loss on the disposition to eat would be less than the given stage of development of self-control. For example, there is some level of food deprivation that will cause the subject to eat in spite of learned self-control skills.

This research stressed gradual weight loss and pointed out that the effect of rapid weight loss is a large increase in the disposition to eat which can overcome the subject's temporary motive. Also, food intake that is unbalanced, i.e. protein diet, generates an enormous disposition for carbohydrates, sugars, etc. Again, this results in undue pressure on the subject's self-control.

The central issue, as indicated by this classic study, is the development of self-control in eating which would endure and become an available part of the individual's future repertoire.

Another noteworthy study was conducted by Stuart (1967), in which three initial procedures for dealing with the problem of overeating were outlined. The first stage involved an analysis of the response to be controlled, its antecedent and consequent conditions. The second step was to identify the behaviour which facilitated eating a proper amount of food. The third step identified positive or negative reinforcers which would control these behaviour patterns.

Stuart gave his subjects Food Data sheets because he felt time was an important determinant of the pattern of between-meal eating. Stuart's emphasis was aimed at building the skill of the patient in being his own contingency manager.

Changing his emphasis in 1971, Stuart's second study stressed environmental management because the cues for over-eating are environmental rather than inter-personal. He also believed the balance between the consumption of energy as food and the expenditure of energy through exercise must also be taken into account. Although the term used to designate this treatment was "situational control", it does require the subject to initiate behaviour which will change his environment and modify his eating.

These three initial studies were of special importance because they viewed the problem of weight reduction as a behavioural disorder which could be modified through the use of the various techniques we now call self-control or self-management. Since this time, research has demonstrated that certain behavioural techniques have a greater success rate than do others. The following studies clearly indicate that self-monitored feedback has proved to be a powerful variable in the modification of eating behaviour.

A study comparing behaviour techniques divided 32 subjects into two behaviour modification groups and a psychotherapy group. Subjects in the behavioural program were instructed to describe the behaviour to be controlled, and keep daily records of the amounts, time, and circumstances of eating behaviour. They were to confine their eating to one spot, set the table, and have no distractions (T.V.). They were encouraged to eat more slowly and count each mouthful if necessary. Each subject earned points which could be

converted to money upon completion of treatment. The results show greater weight loss for the behaviour modification groups. Two interesting aspects of this study were the less frequent weighings and the separate reinforcement schedules used for exercise of self-control and for weight loss (Penick, Filion, Fox, and Stunkard, 1971).

A treatment using direct manipulation of eating habits (Rodriguez, Sandler, 1981) investigated the effects of three different conditions in adult obese subjects: monitoring-contract (return of valuables as reinforcement), monitoring, and attention - placebo. The monitoring-contract group lost significantly more absolute weight and a significantly greater percentage of weight at the end of treatment. Programs involving self-monitoring and the use of feedback seem to enjoy a high success rate in comparison with other behavioural techniques.

The following section of this paper will present research in which self-monitoring techniques are compared to control groups and the various results documented. One such study (Harris, 1969) reported that subjects achieved a stable loss in weight greater than the controls, and reported, as well, a decreased temptation to overeat. All participants in Harris' study monitored their own eating behaviour.

Romanczyk, Tracey, Wilson, Thorpe, (1973) conducted a study comparing self-monitoring, self-control procedures, monetary rewards, aversive imagery, and relaxation training. All of the self-management procedures resulted in greater

weight reduction than the no-treatment group. The indication here is that self-monitoring of daily caloric intake was as effective as the other methods, both singly and combined, over a four week period. In a second study they compared the long term effects of self-monitoring alone against all the behavioural techniques used in the first study. The self-monitoring group produced substantial weight loss among its subjects, as did those groups utilizing several behavioural techniques.

Another comparative study randomly assigned 49 subjects to one of the four treatment groups: self-reward for weight loss, self-reward for habit improvement, self-monitoring, and delayed treatment control.

All three treatment groups lost weight with self-reward conditions for habit improvement (rather than weight loss) producing the greatest results in terms of weight reduction. The control group lost an insignificant amount of weight (Mahoney, 1974). An important aspect of this study is the significant relationship found between successful weight reduction and the degree of eating habit improvement.

Jeffrey (1974A) compared an external control group which awarded responsibility for weight loss to the therapist, and a self-control group whose members were responsible for their own weight management. The results showed equal success for both groups, but self-control interventions were more effective in promoting maintenance of weight loss. Jeffrey maintains that behavioural therapy research on obesity has reached a level where it is no longer necessary to compare

the behavioural group to a control group but instead to another treatment method. The following section presents research on the use of drugs, self-help groups, monetary contingencies, and booster sessions. The results indicate that behavioural techniques, among them the use of self-monitoring, have given researchers continued, positive feedback.

The drug Fenfluramine which lacks stimulants was tested against behavioural methods because it was believed to be an effective weight reducing agent. Initially, weight reduction was significant although most of it was regained after treatment. Behavioural methods were more effective than the pharmacological treatment in reducing the subjects' weight (Ost and Gotestam, 1980).

Other comparative studies found behavioural treatments more effective than group therapy (Hermatz and Lapuc, 1968), more effective than non-specific group therapy (Wollersheim, 1970), and more effective than nutrition training aimed at a self-help group (Levitz and Stunkard, 1974).

A recent evaluation of self-help treatment programs for weight loss (Meyers, et al., 1980) randomly assigned subjects to five groups, each with a different program. The groups were instructed to meet for eight weeks. In agreement with Brownell, Heckerman, and Westlake's findings (1978), the results indicate that self-help treatment programs for weight loss are not useful strategies. They found little or no weight loss among subjects and subject motivation seemed to

decrease. Rosen (1978) contends that non data based reviews of self-help programs can be deceptive, posing yet another problem concerning this method.

The research presented thus far focuses attention on the feeding disturbance as the primary disorder with the weight picture representing only a secondary symptom. If the individual learns to dispense reinforcers to herself - reinforcers which in turn control her behaviour - she also learns that she is the controller of her behaviour, and perhaps is more likely to maintain her behaviour in the absence of external rewards. This being the case it seems reasonable to assume that long term effects might be enhanced by continuing to focus on minimal systematic changes in actual eating habits at regular intervals long after the initial treatment has been completed.

Brightwell and Sloan (1977) have argued, "To be clinically useful, a treatment should demonstrate sustained weight loss with a meaningful decrease in obesity and a low premature termination rate" (p.898).

Stunkard and Penick (1979) supports a "long term treatment program because obese patients fail to maintain adequate levels of weight control after formal treatment has been terminated" (p.71).

Wing and Epstein (1981) explored the use of strong monetary contingencies for weight loss during treatment and maintenance. Working with two groups they returned the subjects' deposits in Group 1 for weight loss during treatment and

attendance during maintenance. Group 2 received their deposits in the reversed order - for attendance during treatment and weight loss during maintenance. The results showed no difference in weight loss between groups, but differences were apparent between the treatment and follow-up periods within the experimental design. In an experiment of this kind other variables must be taken into account: reduced therapist contact, rate of weight loss decreased during the latter phase of weight loss (Bray, 1969), negative feedback from physical factors (tight clothes) associated with initial desire, and reduction of positive reinforcement from friends. It is possible that each of the above contributed to a change in reinforcement contingencies for weight controlling behaviour. The result may be a decrease in the performance of these behaviours.

Booster sessions which have been used in several studies to provide continued reinforcement for behaviour change have produced equivocal results. Some research has indicated that booster sessions facilitated the maintenance of weight loss, while other studies found no difference between groups treated with or without booster sessions (Hall, Hall, Borden, Hanson, 1974).

One of the main strategies focused on by Ashby and Wilson (1975) for facilitating maintenance of weight loss was the use of post-treatment booster sessions. Following a typical behavioural treatment program, Hall et al. (1975) assigned subjects to one of three maintenance groups: a

booster condition wherein subjects met every two weeks with a therapist, self-monitoring condition in which subjects mailed pertinent data to the therapist every fortnight, and a control condition. A three month follow-up showed the self-monitoring group superior to the control group, while the booster session group did not differ from either of the two groups. This data does not seem to support the view that booster sessions facilitate maintenance. To date, studies dealing with long term maintenance pertaining to weight control are inconclusive.

In combination with other behavioural treatment variables, self-monitored feedback has seemed to be an important influence on weight loss. This study will attempt to demonstrate that self-monitored feedback alone is sufficient to significantly modify eating behaviour and maintain behavioural change.

Stunkard and Mahoney (1976) have concluded that behavioural techniques have proven superior to all other treatment modalities for managing mild to moderate obesity. The development of self-regulatory functions which enable individuals to identify variables that influence their weight, and to implement corrective self-monitoring actions when necessary is essential to the long term maintenance of weight reduction.

Most of the research on complex self-control has yielded positive outcomes. It is noteworthy that one condition of the frequently employed technique seems a critical

factor to a variety of situations. Self-monitored feedback has proved a valuable and relevant component of virtually all self-control programs, many entirely unrelated to studies concerning obesity.

Given that the literature has demonstrated that self-monitored feedback is an important contributing variable to behavioural treatments - what is the extent of its influence? Is self-monitored feedback alone sufficient to significantly modify eating behaviour?

If self-monitored feedback alone can modify eating behaviour, it would follow that daily food intake would be greater prior to exposure to this technique than would food intake after exposure. Reduction in food intake would in turn result in a reduction of weight, to be sustained over an indefinite period of time.

CHAPTER III

METHODOLOGY

Statement of Hypotheses

It is hypothesized that there will be a significant difference between pre and post experimental food intake resulting in weight reduction for female subjects utilizing three methods of self-monitored feedback alone:

1. listing foods before eating
2. recording and totalling daily caloric intake
3. charting daily progress

In an effort to establish that self-monitored feedback alone is a powerful, contributing variable to the modification of eating behaviour and is sufficient to produce and sustain weight loss in female subjects, another group using self-monitored feedback as part of a larger behavioural treatment in conjunction with therapist and visual reinforcement will be used. The research indicates that the group using only self-monitored feedback methods can produce a significant change in eating behaviour; specifically a difference between pre and post treatment food intake and consequent weight loss among its female subjects.

Since the self-controlling techniques presuppose that the individual views her behaviour as contingent upon her "actions" it is further hypothesized that the internally

controlled individual, one who considers herself exerting control over things affecting her, would achieve different results than the externally controlled individual, one who considers herself exerting little control over things affecting her.

Sample of Subjects

Forty-two female subjects, not participating in other weight loss efforts and having no relevant health problems, were recruited through a newspaper announcement (See Appendix 1). At the initial meeting each subject was weighed and given the Rotter I-E Scale to complete (See Appendix 2). Rotter's I-E Scale is an objective index designed to measure the extent to which a person believes that she is in control of those things affecting her. It was chosen because it is the most widely used and researched measure of the construct locus of control for which reliability and validity have been well established.

A general explanation as to procedure over the next thirteen weeks was given at this meeting. All subjects completed an initial form (name, address, present weight, desired weight, etc.) and were given the Canada Food Guide in order to become aware of what foods constitute proper nutritional intake. They were informed that a follow-up weigh-in would occur four weeks after the treatment program was officially completed.

The procedure was explained as follows: Group 2 and Group 3 would be weighted weekly at the same time, on the same scale. Each group received instructions specific to their group only and were expected to follow these instructions. If a problem arose, or the subject felt unable to complete the program, she was encouraged to contact the therapist at once in order to discuss her reasons for withdrawing from the program.

Procedure

Forty-two subjects were randomly distributed to one of three conditions. The conditions were: Group 1 - control; Group 2 - subjects who record food and calories before eating, chart their progress with a graph, and weigh in on a weekly basis; and Group 3 - subjects who record food and calories before eating and chart their progress with a graph. The subjects of Group 3 also weighed in weekly, viewed themselves each week in a mirror, and were subject to therapist reinforcement at this time. In this way each individual received weekly feedback from the scale, the mirror, and the therapist instead of depending entirely on self-monitored feedback.

As well, the females were identified as those who achieved high scores and those who achieved low scores on the I-E Scale. Those who scored above the median were classified external (those who consider themselves exerting



little control over things affecting them) and those below the mean were classified internal (those who consider themselves able to control things which affect them).

Due to attrition, eleven subjects did not complete treatment. Group 1 lost five subjects, none of whom had experienced weight loss before leaving the program. Group 2 lost four subjects during treatment, all of whom were experiencing weight loss, but chose to withdraw in any case. Group 3 lost two subjects both of whom were experiencing weight loss at the time. Thirty-one females completed the nine week treatment period and the four week follow-up.

GROUP 1

The instructions to subjects in the control condition were: "We are conducting an experiment on modifying eating behaviour through the use of self-monitored feedback. At the moment all the groups are full. Please weigh yourselves weekly for the next nine weeks until further arrangements can be made".

GROUP 2

The instructions to subjects in the second group were: "We are conducting an experiment on modifying eating behaviour through the use of self-monitored feedback. A calendar booklet, a calorie book and a graph are being provided for you. Please list in your calendar book all the foods and amounts you intend to consume, as well as the corresponding amount of calories per food item. Do this before you eat

each time. Total the number of calories at the end of each day. Note whether total consumption is up or down. Chart your daily caloric intake on the graph given to you. Post this graph on your refrigerator. Bring your calendar booklet to your weigh-in session next week."

GROUP 3

The instructions to subjects in the third group were: "We are conducting an experiment on modifying eating behaviour through the use of self-monitored feedback. A calendar booklet, a calorie book and a graph are being provided for you. Please list in your calendar booklet all the foods and amounts you intend to consume, as well as the corresponding amount of calories per food item. Do this before you eat each time. Total the number of calories at the end of each day. Note whether total consumption is up or down. Chart your daily caloric intake on the graph given to you. Post this graph on your refrigerator. Each week you will be weighed by the therapist and given the chance to see yourself in a full length mirror. It is not necessary for you to weigh yourself at home. Bring your calendar booklet in to the therapist when you weigh in, in order that she might discuss your individual progress with you and answer any questions."

Techniques Used in Data Analysis

To test hypothesis one an analysis of variance was

performed to determine whether there was a significant difference between the mean scores of each group. If a significant variance ratio resulted from the analysis of variance, then the Duncan Multiple Range Test was applied to determine which means were significant. All levels of significance were tested at the .01 level.

Hypothesis two was tested by computing t tests on the weight loss or gain score post-treatment, and at Follow-up, for internal subjects compared to external subjects within each group. A visual examination of the difference in means was performed in addition to the statistical analysis.

CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to investigate the effects of self-monitored feedback alone, as well as in conjunction with therapist and visual reinforcement, on weight reduction in female subjects.

The data obtained were the "weight in pounds" of each individual pre-treatment, the weight in pounds of each individual post-treatment, and the weight in pounds of each individual at a follow-up session four weeks later. During a nine week treatment period each subject was weighed once a week at approximately the same time on the same day. At the completion of treatment, each subject functioned without an organized weigh-in for a four week follow-up period. At the end of four weeks all subjects reported a final time to the therapist for a follow-up weigh in. Weight differences - loss or gain in pounds - were noted each week. The Rotter I-E Scale was used at the initial meeting to determine internality - those subjects who consider that they exert control over things which affect them, and externality - those subjects who consider that they have little or no control over things which affect them. A total sample of forty-two female subjects were assigned at random to one of the following treatment groups: self-monitored feedback in conjunction

with therapist as well as visual reinforcement, self-monitored feedback alone, and a control group.

The results and discussion chapter is divided into four sections. Firstly, the results section explains the analysis of variance for repeated measures and its outcome to test the first hypothesis; that there is no difference between the effects of self-monitored feedback alone and self-monitored feedback in conjunction with therapist and visual reinforcement and a control group on weight loss in female subjects. Secondly, an explanation pertaining to whether, as stated in hypothesis two, internality or externality has any bearing on the subject's weight loss is given. Thirdly, analyses of the within group effect for the control group and each treatment group over the pre, post, and follow-up weights is discussed. In the fourth section, the results of all analyses will be discussed.

Results

Hypothesis One

In the present study, forty-two female subjects (31 active, 11 drop-outs) participated in a weight reduction program under one of the following conditions: self-monitored feedback in conjunction with therapist as well as visual reinforcement, hereafter referred to as Group 3, self-monitored feedback alone, hereafter referred to as Group 2, and the Control Group, hereafter referred to as Group 1.

The results of the analyses for the post weight changes from the pre weight for the Control Group 1, Group 2 and Group 3 are reported in Table 1. The analysis resulted in a variance ratio significant at the .01 level. The Duncan's Multiple Range Test analysis revealed that Group 3, self-monitored feedback with therapist and visual reinforcement mean weight loss, and Group 2, the self-monitored feedback group mean weight loss were each significantly greater than the Control group mean weight loss. There was no significant difference in weight loss between the two treatment groups although the self-monitored feedback with therapist and visual reinforcement group mean weight loss was greater by 2.2 pounds.

The hypothesis that there is no difference between the effects of self-monitored feedback and self-monitored feedback in conjunction with a therapist plus visual reinforcement and a control group was rejected.

The follow-up weight changes from the post-weights for the Control group, the self-monitored feedback alone group and the self-monitored feedback in conjunction with therapist and visual reinforcement group are reported in Table 2. The analysis resulted in a variance ratio not significant at the .01 level. There was no significant difference between either of the two treatment groups and the control means. It should be noted that the Control group mean increased from the post test as did the self-monitored feedback with therapist and visual reinforcement group mean. However, the self-monitored

Table 1

Summaries of the Analysis
of the Post-Weight Change
From Pre-Weight for the
Control and Two Treatment Groups

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F*
Treatments	2	1050.743	525.372	22.801
Within	28	645.151	23.041	
Total	30	1695.894		

*F required at the .01 level equals 5.45

Duncan's Test on Post-Weight Changes
from the Pre-Weight for the Control
and Two Treatment Groups

Means	Treatment 2 Self-Monitored Therapist and Visual	Treatment 1 Self-Monitored	Control	Shortest Significant Ranges*
	19.400	21.650	32.545	
Treatment 2		2.250	13.145	$R_2=5.913$
Treatment 1			11.895	$R_3=6.171$

*Ranges at the .01 level

Table 2

Summaries of the Analysis
of the Follow-up Weight Change from
the Post Weight for the Control Group
and Two Treatment Groups

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F*
Treatments	2	16.215	8.107	1.252
Within	28	181.334	6.476	
Total	30	197.549	6.584	

*F required at the .01 level equals 5.45

feedback group mean weight decreased slightly as compared to the post test mean.

An analysis of variance for repeated measures was used to analyze the changes of within group mean weight for each of the two treatment groups (Group 2 and Group 3) and the Control group from the pre to the post to the follow-up weights. The analyses for the Control group are found in Table 3. The analysis of variance resulted in a variance ratio significant at the .01 level. Duncan's Multiple Range Test revealed that the follow-up weight mean and the post weight mean were significantly greater than the pre weight mean. The follow-up mean was not significantly greater than the post weight mean. The results show that the Control group mean weight increased at each of the post weight and follow-up periods.

The analyses of Group 2, self-monitored feedback alone, are found in Table 4. The analysis of variance resulted in a variance ratio significant at the .01 level. Duncan's Multiple Range Test revealed that the follow-up weight mean and the post weight mean were significantly less than the pre weight mean. There was no significant difference between the post weight and follow-up weight mean, although the follow-up weight mean was less than the post weight. This indicates a continued weight loss during the four week period following the conclusion of the program.

The analyses of Group 3, self-monitored feedback with therapist and visual reinforcement are found in Table 5.

Table 3

Summaries of the Analysis
of the Control Group Weights for the
Pre-Post and Follow-up Weights

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F*
Treatments	2	119.316	59.658	20.001
Subjects	10	6753.125	675.312	
Residual (Error)	20	68.184	3.409	
Total	32	6940.625		

*F required at the .01 level equals 5.85

Duncan's Test on Pre-Post
and Follow-up Weights

Means	Weight 1 Pre-Weight 136.636	Weight 2 Post-Weight 140.136	Weight 3 Follow-up Weight 141.045	Shortest Significant Ranges
Weight 1		3.500	4.409	$R_2=2.14$
Weight 2			.909	$R_3=2.23$

*Ranges at the .01 level

Table 4

Summaries of the Analysis
of Group 2 Weights for the Pre-Post
and Follow-up Weights

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F*
Treatment	2	406.684	203.342	47.755
Subjects	9	9659.469	1073.27	
Residual (Error)	18	76.652	4.258	
Total	29	10142.805		

*F required at the .01 level equals 6.01

Duncan's Test on Pre-Post
and Follow-up Weights

Means	Weight 1 Follow-up Weight 129.500	Weight 2 Post- Weight 130.350	Weight 3 Pre- Weight 137.700	Shortest Significant Ranges
Weight 1		.85	8.200	$R_2=2.528$
Weight 2			7.350	$R_3=2.839$

*Ranges at the .01 level

The analysis of variance resulted in a variance ratio significant at the .01 level. Duncan's Multiple Range Test revealed that the follow-up weight mean and the post weight mean were significantly less than the pre weight mean. There was no significant difference between the post weight and follow-up weight mean, although the post weight mean for Group 3 was less than the follow-up weight. This indicates a slight weight gain during the four week period following the conclusion of the program.

Hypothesis Two

The hypothesis that the internally controlled individual, one who considers herself exerting control over things affecting her, would achieve different results than the externally controlled individual, one who considers herself exerting little control over things affecting her was tested statistically. A t test was performed on each of the two treatment groups as well as a visual examination, both of which revealed virtually no significant differences (See Tables 6 and 7). A t test was not done on the Control group because there was only one subject who was internal and no test could be run.

Table 5

Summaries of the Analysis
of Group 3 Weights for the Pre-Post
and Follow-up Weights

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	F*
Treatments	2	608.102	304.051	13.091
Subjects	19	20465.199	1077.116	
Residual (Error)	18	418.066	23.226	
Total	29	21591.367		

*F required at the .01 level equals 5.85

Duncan's Test on Pre-Post
and Follow-up Weights

	Weight 1 Post- Weight	Weight 2 Follow-up Weight	Weight 3 Pre- Weight	Shortest Significant Ranges*
Means	165.150	165.250	124.750	
Weight 1		.100	9.600	$R_2=5.592$
Weight 2			9.500	$R_3=6.212$

*Ranges at the .01 level

Table 6

t Analysis of Mean Difference
for Group 2 and Group 3 Internality
and Externality Post Weight

Group	Mean	Difference Between Means	t
Group 2 Internals	7.30	1.00	.060
Group 2 Externals	7.40		
Group 3 Internals	6.50	5.167	1.067
Group 3 Externals	11.667		
For 8 degrees of freedom t for <u>P</u> of .01=2.896			

Table 7

t Analysis of Mean Differences
for Group 2 and Group 3 Internality
and Externality Follow-up

Group	Mean	Difference Between Means	t
Group 2 Internals	.200	1.300	.910
Group 2 Externals	1.500		
Group 3 Internals	1.250	1.917	.855
Group 3 Externals	.667		
For 8 degrees of freedom t for <u>P</u> of .01=2.896			

Discussion

Hypothesis One

The null hypothesis is there is no difference between the effects of self-monitored feedback alone, and self-monitored feedback in conjunction with therapist and visual reinforcement and a control group on weight loss in female subjects.

As discussed in the review of the literature, Bellack et al. (1974) compared various forms of self-monitoring using three groups of subjects. His results indicate that the two groups which monitored food consumption attained more significant results than a third group which did not monitor food consumption at all. Also noteworthy was the fact that of the two groups which monitored food intake, those that provided themselves with feedback prior to food consumption achieved better results than those who did not.

In this study, mean pre-treatment weight of the Control Group was 136.636 pounds. Mean pre-treatment weight of Group 2 was 137.700 pounds, demonstrating that Groups 1 and 2 were comparable in terms of overall pounds at the beginning of treatment. Mean pre-treatment weight of Group 3 was 174.750 pounds, indicating a slightly heavier group overall.

After nine weeks of treatment, Group 1 showed a mean weight of 140.136 pounds, indicating weight gain among the control subjects. Mean post-treatment weight of Group 2

was 130.350 pounds indicating a reduction in weight among the subjects using self-monitored feedback alone. Mean post-treatment weight of Group 3, the heavier group, was 165.150 pounds, which also indicated a reduction in weight, this time among the subjects using self-monitored feedback as well as therapist and visual reinforcement.

At post-treatment (nine weeks), the mean weight loss for Group 2 was 7.347 pounds and for Group 3 it was 9.60 pounds. The mean weight gain for Group 1 was 3.55 pounds, indicating that those subjects who engaged in self-monitored feedback alone as well as self-monitored feedback plus therapist and visual reinforcement lost significantly more weight than those subjects who were not part of any program. Romanczyk's (1974) earlier findings were similar. He contrasted weight loss of a no treatment control group with four other groups: daily self-monitored feedback of weight, daily self-monitored feedback of weight and calorie intake, behaviour management instructions without self-monitored feedback, and behaviour management instructions with self-monitored feedback pertaining to weight and calorie consumption. This study demonstrated that the groups using self-monitored feedback for weight and calorie consumption, without the influence of a therapist, proved as effective in promoting changes in eating behaviour, as did the behaviour management groups which did have therapist reinforcement.

At the Follow-up weigh-in, Group 1 showed a mean score of 141.045 pounds, again indicating further weight gain as a

group over the final four week period. During this time the subjects did not report weekly to be weighed by the therapist. The mean total for Group 1 was 139.273 pounds, greater than the pre-treatment mean score of 136.636 pounds indicating weight gain. At the follow-up weigh-in, Group 2 showed a mean score of 129.500 pounds, indicating further loss as a group. During the final four week period, the subjects of Group 2 did not report weekly to be weighed by the therapist. The mean total for Group 2 was 132.517 pounds, less than the pre-treatment mean score of 137.700 pounds, indicating weight loss during and after treatment. At the Follow-up weigh-in, Group 3 showed a mean score of 165.250 pounds, indicating a slight gain, as a group, during the final four week period in which the subjects of Group 3 did not report weekly to be weighed by the therapist. The mean total for Group 3 was 168.383 pounds, less than the pretreatment mean score of 174.750 pounds, indicating weight loss during treatment. However, the weight gain during Follow-up might indicate that Group 3 had come to rely on therapist and visual reinforcement, thereby showing a tendency to gain weight without these variables present. It is believed by this investigator that Group 2, those subjects who relied on self-monitored feedback alone to modify eating behaviour, were able to continue to lose weight during Follow-up because they did not feel the loss of therapist and visual reinforcement having never experienced it as part of their program. The review of the literature is supportive

of this belief as in the case of Jeffrey (1974A) with Mahoney, whose study compared an external control group which awarded responsibility for weight loss to the therapist, and a self-control group whose members were responsible for their own weight management. The results showed equal success for both groups, but self-control interventions were more effective in promoting maintenance of weight loss.

Hypothesis Two

Hypothesis two, that the internally controlled individual, one who considers herself exerting control over things affecting her, would achieve different results than the externally controlled individual, one who considers herself exerting little control over things affecting her, could not be supported by the results of this study.

Although internals and externals have been shown to respond differentially in a great many situations (Joe, 1971) and the research shows that internals show greater reactivity when they self-monitor, while externals benefit more from being externally monitored, this study did not demonstrate significant results. Due to the small sample size, and the fact that the number of internal subjects differed in each group, a visual investigation of difference in means was first conducted. The visual investigation was supported by performing a t test on the two treatment groups, which also revealed virtually no differences.

In Group 1, the Control Group, of the eleven female subjects who participated, only one subject was classified internal. This individual gained 10 pounds during the nine week treatment period, as compared to a mean weight gain of 2.9 pounds for the ten external subjects of the group over the same period of time. During the four week Follow-up period this subject was able to maintain her weight and gain 0 pounds, as compared to a 1.00 pound mean weight gain for the ten external subjects of the group.

In Group 2, self-monitored feedback alone, of the ten female subjects who participated, five individuals, (half the group) were classified internal. These subjects recorded a mean weight loss of 7.30 pounds during the nine weeks of treatment as compared to the five external subjects mean loss of 7.40 pounds. The mean weight loss for the subjects classified as internal was only .10 pounds less than the mean weight loss for the external subjects of Group 2, suggesting the validity of the second hypothesis for this group. During the four week Follow-up period, the mean weight loss for Group 2's external subjects was 1.50 pounds. The mean weight loss for those subjects classified as internal was .200 pounds. The results seemed to indicate that locus of control is insignificant as a predictor of weight gain or loss in females.

In Group 3, self-monitored feedback in conjunction with therapist and visual reinforcement, of the ten female subjects who participated, four individuals were classified

internal. These subjects recorded a mean weight loss of 6.50 pounds during the nine weeks of treatment as compared to the Group's external subjects' mean of 11.667 pounds. During the four week Follow-up period the mean weight loss for the external subjects of Group 3 was .667 pounds. The mean weight gain for those subjects classified as internal was 1.25 pounds.

Although the evidence in some previous studies suggests that internals are more likely to take preventive measures that promote physical well-being and compliance with therapeutic modalities following diagnosis of disease (Strickland, 1973, 1978; Walston and Walston, 1978), the confounding results of this study did not support Hypothesis Two as stated.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Obesity has long been recognized as a serious health problem by those devoted to studying its effects. Particularly problematic is the apparent resistance of this condition to effective and long lasting treatment. Most of the research concerning complex self-control programs and their effectiveness in dealing with the problem of obesity have yielded positive outcomes. Self-monitored feedback has proved a valuable component of virtually all self-control programs.

The purpose of this study was to investigate the effects of self-monitored feedback in an effort to establish that self-monitored feedback alone is a powerful contributing variable to the modification of eating behaviour, and can, by itself produce significant change among the female subjects involved. In addition to a visual investigation a statistical analysis using a t test, was conducted in order to assess whether or not internality or externality has any bearing on weight loss in female subjects.

The subjects for this study consisted of forty-two female subjects assigned randomly to one of three treatment groups: Group 3, self-monitored feedback in conjunction

with therapist and visual reinforcement, Group 2, self-monitored feedback alone, and Group 1, Control. Due to attrition thirty-one subjects actively participated for the nine-week treatment period and four-week follow-up.

An analysis of variance for repeated measures was performed to test the first hypothesis, namely that there is no difference between the effects of self-monitored feedback alone and self-monitored feedback in conjunction with therapist and visual reinforcement and a control group on weight loss in female subjects.

By way of statistical analysis a t test was performed on each group to test the second hypothesis that the internally controlled individual, one who considers herself exerting control over things affecting her, would achieve different results than the externally controlled individual, one who considers herself exerting little control over things affecting her.

Results

The following results were obtained from the analysis of the data:

1. Group 2, self-monitored feedback alone, and Group 3 self-monitored feedback in conjunction with therapist and visual reinforcement, both produced post-treatment mean scores lower than their pre-treatment scores indicating weight loss as a group.
2. Although the Control Group had a greater post-treatment

- mean score indicating weight gain; it was not a significant gain at Follow-up.
3. Group 2 continued to lose weight during the four week Follow-up period, demonstrating that self-monitored feedback alone can produce and sustain weight loss in female subjects.
 4. Group 3 experienced a slight weight gain during the four week Follow-up period, suggesting that these subjects may have come to rely on therapist and visual reinforcement, and gained weight without these variables present.
 5. The Control Group continued to gain weight during Follow-up.
 6. It could not be established with any degree of significance that Group 2, self-monitored feedback alone, achieved greater success than Group 3, self-monitored feedback with therapist and visual reinforcement. Both treatment groups achieved significantly greater results than Group 1, Control. Both treatment groups achieved significant weight loss within their respective groups.
 7. In total, eleven subjects dropped out before completing the first nine weeks of treatment. The Control Group lost five subjects, none of whom had experienced weight loss during this time. Group 2, self-monitored feedback alone had four drop-outs, during the first nine weeks, all of whom had experienced weight loss before deciding not to continue for personal reasons

feedback alone continued to lose weight during the four week Follow-up throughout which they did not attend a weekly weigh-in session with the therapist present.

This investigation concludes that these subjects continued to implement corrective self-monitoring actions essential to long term maintenance of weight reduction.

4. Subjects who employed the technique of self-monitored feedback in conjunction with therapist and visual reinforcement experienced a slight gain in weight during the four week Follow-up period throughout which they did not attend a weekly weigh-in session with the therapist present. This investigation concludes that these subjects might have come to rely on therapist and visual reinforcement, thereby showing a tendency to gain weight when these variables were no longer present.
5. It is noteworthy that Weight Watchers and other organized weight loss groups choose not to publish a 98% failure rate for members who successfully lose weight while attending weekly sessions with a therapist present, and then consequently regain all their weight and more when they stop attending weekly sessions (Stunkard, 1982). This figure and the results of this investigation would suggest that for the long term maintenance of weight reduction it is essential that corrective self-monitoring actions be implemented.
6. Self-monitored feedback alone is sufficient to significantly modify eating behaviour. The validity of this

technique was demonstrated during the Follow-up period. The subjects of Group 2 had learned long term corrective self-monitoring behaviours and did not run the risk of creating therapist dependencies which might undermine the individual's ability to control their own behavioural patterns.

7. Subjects found to have an internal locus of control did not lose significantly more weight than those with an external locus of control.

Recommendations

The following recommendations are made based on the findings derived from this study:

1. The most direct indicator of change is pounds lost. Although this measure has the disadvantage of not taking initial weight into consideration, it is still a valid measure to subjects involved in weight reduction studies.
2. It is possible for an individual to modify existing behavioural patterns through the use of self-monitored feedback alone.
3. Self-monitored feedback is an essential and valuable component of most self-control programs. As this study demonstrates, it is a powerful and relevant behavioural tool in its own right.

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Appendix 1

Newspaper Announcement

The Winnipeg Sun
September 21 and 22, 1982

Attention Ladies

Female subjects needed to participate
as volunteers in a weight loss program
being conducted by a student of the
University of Manitoba, Faculty of
Education.

Initial meeting: Churchill High School
510 Hay Street
September 23, 1982
Room 23 at 7:00 p.m.

Absolutely free

Appendix 2

THE I-E SCALE

1. a. Children get into trouble because their parents punish them too much.
b. The trouble with most children nowadays is that their parents are too easy with them.
2. a. Many of the unhappy things in people's lives are partly due to bad luck.
b. People's misfortunes result from the mistakes they make
3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
b. There will always be wars, no matter how hard people try to prevent them.
4. a. In the long run people get the respect they deserve in this world.
b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
5. a. The idea that teachers are unfair to students is nonsense.
b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
6. a. Without the right breaks one cannot be an effective leader.
b. Capable people who fail to become leaders have not taken advantage of their opportunities.
7. a. No matter how hard you try some people just don't like you.
b. People who can't get others to like them don't understand how to get along with others.

8.
 - a. Heredity plays the major role in determining one's personality.
 - b. It is one's experiences in life which determine what they're like.

9.
 - a. I have often found that what is going to happen will happen.
 - b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10.
 - a. In the case of the well prepared student there is rarely if ever such a thing as an unfair test.
 - b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11.
 - a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
 - b. Getting a good job depends mainly on being in the right place at the right time.

12.
 - a. The average citizen can have an influence in government decisions.
 - b. This world is run by the few people in power, and there is not much the little guy can do about it.

13.
 - a. When I make plans, I am almost certain that I can make them work.
 - b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14.
 - a. There are certain people who are just no good.
 - b. There is good in everybody.

15.
 - a. In my case getting what I want has little or nothing to do with luck.
 - b. Many times we might just as well decide what to do by flipping a coin.

16.
 - a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
 - b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.
17.
 - a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.
 - b. By taking an active part in political and social affairs the people can control world events.
18.
 - a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
 - b. There really is no such thing as "luck."
19.
 - a. One should always be willing to admit mistakes.
 - b. It is usually best to cover up one's mistakes.
20.
 - a. It is hard to know whether or not a person really likes you.
 - b. How many friends you have depends upon how nice a person you are.
21.
 - a. In the long run the bad things that happen to us are balanced by the good ones.
 - b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
22.
 - a. With enough effort we can wipe out political corruption.
 - b. It is difficult for people to have much control over the things politicians do in office.
23.
 - a. Sometimes I can't understand how teachers arrive at the grades they give.
 - b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.
- b. A good leader makes it clear to everybody what their jobs are.
25. a. Many times I feel that I have little influence over the things that happen to me.
- b. It is impossible for me to believe that chance or luck plays an important role in my life.
26. a. People are lonely because they don't try to be friendly.
- b. There's not much use in trying too hard to please people, if they like you, they like you.
27. a. There is too much emphasis on athletics in high school.
- b. Team sports are an excellent way to build character.
28. a. What happens to me is my own doing.
- b. Sometimes I feel that I don't have enough control over the direction my life is taking.
29. a. Most of the time I can't understand why politicians behave the way they do.
- b. In the long run the people are responsible for bad government on a national as well as a local level.

Appendix 3

Pre, Post, and Follow-up
Weight in Pounds for
Female Subjects

Group 1 - Control

	Pre-Treatment	Post-Treatment	Follow-up
1.	121.0	128.0	130.0
2.	135.0	138.0	138.0
3.	177.0	180.0	180.0
4.	123.0	125.0	130.0
5.	143.0	145.0	145.0
6.	133.5	135.0	135.0
7.	142.0	146.5	146.5
8.	125.0	135.0	135.0
9.	126.0	129.0	128.0
10.	135.0	135.0	136.0
11.	142.5	145.0	148.0

Group 2 - Self-Monitored Feedback

1.	130.5	127.0	127.0
2.	153.0	146.0	147.5
3.	183.0	173.5	171.5
4.	139.5	128.0	128.0
5.	140.5	132.0	128.0
6.	133.5	126.0	122.0
7.	141.5	133.0	130.0
8.	117.5	111.0	113.0
9.	126.5	119.0	120.0
10.	111.5	108.0	108.0

Group 3 - Self-Monitored Feedback with
Therapist and Visual Reinforcement

1.	163.0	149.0	150.0
2.	170.5	164.0	165.0
3.	226.0	198.0	190.0
4.	150.0	145.0	149.0
5.	192.0	184.0	187.5
6.	155.0	148.5	147.0
7.	119.0	113.0	115.0
8.	192.0	178.0	178.0
9.	176.0	169.0	170.0
10.	204.0	203.0	201.0