THE EFFECTS OF ENVIRONMENTAL CONSEQUENCES AND DATA COLLECTION IN THE BEHAVIOR-CONTRACTING TREATMENT OF OBESITY

THESIS

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By

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This study investigated the effects of environmental consequences and data collection in a behavior contracting procedure for obesity. Also, a validity study examined the GSR as a subject-independent-monitoring technique.

Sixteen subjects matched on sex and percent overweight were assigned to one of three contract conditions or to a no-treatment condition. The Data Only Contract Group received consequences for data collection. The With Consequences Contract Group received consequences for data collection and behaviors relevant to weight loss. The Without Consequences Contract Group received no consequences for data collection or behaviors relevant to weight loss. The With Consequences Contract Group lost significantly more weight ($p \leq .05$) than the No Treatment Group. Specific effects were not determined.

The results of the validity study suggest that the GSR may not be a valid instrument as a subject-independent-monitoring technique. Factors affecting the galvanic skin response's effectiveness were discussed.
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INTRODUCTION

Obesity has become one of the most prevalent health problems in the United States (Stuart, 1972). Traditional methods of treatment have been largely unsuccessful (Stunkard and McClaren-Hume, 1959). Stunkard (1958) reported that "... most obese persons will not stay in treatment for obesity. Of those who do stay in treatment, most will not lose weight and of those who do lose weight, most will regain it" (p. 79). An exception to this dismal picture presented by Stunkard is the successful outcomes of various behavioral treatments.

Investigators have attempted to relate a number of factors with obesity and overeating. Kaplan and Kaplan (1957) presented the hypothesis that overeating was a learned coping response which reduces anxiety. Abramson and Wunderlich (1972) supported Kaplan and Kaplan's (1957) belief that obese individuals are anxiety rudder. However, their findings cast doubt upon the hypothesis that eating represents a method of coping with anxiety. Schachter et al. (1968) found that obese people's eating behavior showed little relationship with the internal physiological state. Evidence also suggested that the eating behavior of obese people was affected by external stimuli such as time.
of day, taste, sight, etc., whereas the eating behavior of normal people was not similarly affected (Schachter, 1968). McKenna (1972) found that obese people eat more under high anxiety, whereas normal people eat less, adding some support to Schachter’s findings as well as those of Kaplan and Kaplan (1957). Wooley’s (1969, 1972) findings that cognitive factors play a more important part in regulation of caloric intake than physiological factors, also lend support to Schachter’s report.

However, findings by Palmer (1973) cast some doubt on Schachter's contention that obese people are stimulus bound. Also, the findings of Meynen (1970) cast some doubt on Schachter's hypothesis that the obese overeat only in response to external cues. Raymond (1972) concluded that Schachter may have overgeneralized from the data. He reported that obese subjects did not differ from normal subjects on a task of external orientation, but obese and normal females differed significantly from males. Gold (1971) also suggested that Schachter’s contention that obese subjects are stimulus bound may not extend through the whole range of external cues.

Most cases of obesity are never directly caused by abnormal metabolism but are always due to food habits not adjusted to the metabolic requirement—either the ingestion of more food than is normally needed or the failure to reduce the intake in response to a lower requirement (Newburgh and Johnston, 1930, p. 212).
Mayer (1968) suggested that occasionally cases of obesity may be accounted for by an injury to the hypothalamus, hormonal imbalance, or other metabolic imbalances. Therefore, most cases can be treated by changing the eating behavior of the individual.

Harris (1969) suggested that the primary difficulty encountered in the treatment of obesity hinges on the properties of addictive behaviors.

Addictive behaviors such as overeating provide immediate positive reinforcement for the individual, while the reinforcement for refraining from eating is usually extremely delayed. Moreover, the aversive consequences of overeating are typically delayed for weeks or even years (p. 264).

Ferester et al. (1962) and Goldiamond (1965) have pointed out that eating behavior occurs in a very wide range of situations and is under the control of many stimuli other than physiological ones. This was another factor which made overeating a very difficult behavior to alter.

"The final goal of all learning theory approaches to weight reduction is the attainment of control on the part of the subject so that his eating behavior can be self-monitored and ultimately self-controlled" (Moore and Crum, 1969, p. 131). Skinner (1953) pointed out that the behavioral processes involved in a person's control of himself are the same as those one would use in controlling the behavior of others. Therefore, all behavioral treatments have concentrated on developing control of eating behavior in the individual through manipulations of the client's environment.
Harmatz and Lapuc (1968) compared a behavior modification treatment in which the subjects lost money if they did not lose weight by a weekly weigh-in with traditional group therapy. Results showed that both the behavior modification group and the group therapy group lost weight, but only the behavior modification group continued to lose weight on a four-week follow-up.

Social reinforcement has also been used by investigators to achieve weight reduction. Moore and Crum (1969) used social reinforcement to effect a weight loss with a schizophrenic. Foxx (1972) used social reinforcement to effect a weight loss in a mental retardate.

Token economy approaches have also been reported as producing significant weight reductions. Barnard (1968) obtained an eighty-nine pound weight loss in a schizophrenic woman. He reported that the patient continued to lose weight during a six-weeks extinction period. Klein et al. (1972) also reported successful weight reduction using a token economy with schizophrenic patients.

Several investigators have used avoidance or aversive conditioning to achieve weight loss. Kennedy and Foreyt (1968) reported a moderate weight loss by pairing noxious gas with the smell of desirable foods. Foreyt and Kennedy (1971) also paired a noxious odor with favorite foods to achieve moderate weight losses. Petty (1972) paired slides of fattening foods
with shock and slides of non-fattening food with shock avoidance. However, no significant results were reported. Kennedy and Foreyt (1968) reported that reliance of the subject's verbal report concerning the aversiveness of the conditioned stimulus as a major drawback of this approach. Another drawback of Kennedy and Foreyt's approach was that conditioning was specific to certain foods without the subject actually learning to eat properly. Kennedy and Foreyt (1968) reported a tendency for increased eating of foods not conditioned to the aversive stimulus.

Wollersheim (1970) reported success with a group therapy approach based on learning principles. Group therapy proved to be superior to nonspecific psychotherapy and social pressure treatment in effecting weight reduction. Hagen (1974) found that programmed bibliotherapy was not significantly different from the group therapy of Wollersheim in its effectiveness to produce weight reductions. However, neither group obtained a significant weight reduction.

Cautela (1966) reported success using a behavior therapy approach which paired the eating response of a particular food with a coverant (nausea). Janda and Rimm (1972) also reported success using the covert sensitization procedure. Mann and Marstom (1972) reported success using both positive and negative reinforcement in a covert sensitization procedure. Furthermore, clients who used either of the methods
maintained weight loss on a three-month follow-up study. A study by Murray et al. (1972) reported modest support for covert aversive sensitization although it was plagued with numerous methodological problems. In a study comparing covert sensitization, modified systematic desensitization and relaxation therapy, Meyhen (1970) found that all groups differed significantly from controls. Tyler and Straughan (1970) reported that the coverant method of Homme's (1966) as well as a method utilizing breath holding were ineffective in producing weight loss. Covert sensitization suffers from some of the same difficulties as avoidance and aversive therapies—namely, the subject's honesty, the strength of conditioning, and not learning proper eating behavior.

Another approach, induced anxiety (Sipprelle, 1967), taught subjects not to avoid anxiety cues but to use them as a means for relaxation. This counterconditioning process was reported by Bornstein and Sipprelle (1973) as being successful in achieving weight loss in a group procedure and in conjunction with verbal shaping and reinforcement.

Euler (1970) has indicated that self-monitoring itself may produce effects under certain circumstances. Results of a study by Rabin (1972) provided some evidence that data collection can lead to weight reduction. Rabin also found evidence to support the hypothesis that the greater the amount of informational feedback the greater the obtained weight loss.
Bellack et al. (1973) reported success with a self-monitoring procedure in which subjects recorded eating data prior to actual consumption. Mahony (1974) used a combined procedure of self-monitoring and self-reinforcement. Mahony reported a small initial weight loss due to self-monitoring alone. However, after eight weeks of continuous self-monitoring, subjects failed to lose weight. Subjects who administered self-rewards along with self-monitoring were able to obtain substantial weight losses. Mahony found that those who self-reinforced changes in "eating habits" lost more weight than those who self-reinforced weight loss. As well, those who self-reinforced changes in "eating habits" maintained their losses better than those subjects who self-reinforced weight loss. A group who self-reinforced multiple goals of changes in "eating habits" and weight loss did not do as well as those who self-reinforced only changes in "eating habits" and better than those who self-reinforced only weight loss. It seemed that problems were encountered when the individual met multiple goals to achieve reinforcement, and it appeared that reinforcing changes in "eating habits" was superior to reinforcing weight loss.

Other self-monitoring and self-direction programs have reported successful results in achieving weight reduction. Harris (1969) found that subjects in a self-direction procedure lost significantly more weight than a no treatment
control group. Several methodological aspects of this study were relevant to the present study. Subjects were weighed twice weekly in group meetings. Subjects were given calorie charts and asked to keep a record of their normal eating habits for one week and a record of their daily food intake including time and place for several months. The development of permanent adaptive eating habits was stressed. Emphasis was placed on awareness of what one was eating, caloric content, food value, reasons for eating, and the situation in which eating occurred. The experimenter stressed a gradual change which the subjects were more likely to maintain.

Stuart (1967) demonstrated that a graduated behavioral curriculum which governed the frequency, rate, and amount of food ingested was successful in producing weight loss. Stuart listed four preliminary steps in establishing self-control: (1) precise analysis of the eating response with its antecedent and consequent conditions, (2) identification of behaviors which facilitate proper eating or which interfere with improper eating, (3) identification of positive and negative reinforcers which will control these behavior patterns, and (4) application of consequences to alter the probability of the preselected response.

In the initial interview Stuart taught his clients how to take data on the time, nature, quantity, and circumstances of all food and drink intake. Stuart believed that the knowledge of the circumstances under which eating occurred provided
clues to the ways in which eating can be controlled through identification of the current controlling conditions. Also, during the initial interview Stuart gathered data on high rate activities which may have served as reinforcers. He instructed his clients to weigh four times daily on the premise that the client is more likely to be reminded of the program along with providing direct feedback on caloric intake. Each interview following the first had the same format. Food and weight data were discussed, and the client was reinforced for progress with praise. Throughout a series of twelve interviews, Stuart taught the use of various self-control procedures to control the eating response. Some of these were removing food from all places but the kitchen; making eating a pure act by instructing the client not to take part in other activities, such as watching television or reading while eating; and urging the client to engage in high rate reinforcing activities at those times in which between-meal eating is likely to occur. Two main features of Stuart's program stood out: treatment was specifically for overeating, and the format was based upon verbal behavioral assignments to be followed by the client. In addition to these assignments, the client received didactic discussion and training in the analysis of his own behavior. The results of Stuart's program indicated weight losses ranging from sixteen to forty-one pounds during a twelve-month treatment period with additional weight losses or maintenance on
follow-up. Stuart did not, however, include a control group or treatment reversal condition for purposes of comparison.

Stuart (1971) after reviewing the literature concluded that the evidence suggested that "... the first of two requirements for the treatment of overeating must stress environmental management rather than self-control, because the cues of overeating are environmental rather than intrapersonal" (p. 180). Stuart's second requirement stressed manipulation of the energy balance—the balance between the consumption of energy-producing food and the expenditure of energy through exercise. Stuart listed three ways in which weight may be lost: "... (1) an increase in the amount of exercise, holding food intake constant, (2) a decrease in the amount of food intake, holding exercise constant, or (3) both an increase in exercise and a decrease in food intake" (p. 180). Stuart stressed eating relatively larger amounts of protein and relatively smaller amounts of carbohydrates due to the latter's caloric content being more available to adiposity. Stuart recommended progressive changes in the energy balance.

The exact determination of these levels must be empirically determined for each patient, beginning with tables of recommended dietary allowance, adjusting these for the amount of exercise; carefully monitoring weight and mood changes as time on the program progresses, and being careful to make certain that the degree of weight loss provides sufficient motivation for the patient to continue using the program (p. 181).

Stuart (1971) compared a self-control procedure with a group using instruction concerning the management of food in
the environment. This involved the elimination or suppression of cues associated with problematic eating while strengthening the cues associated with desirable eating patterns. Results showed that the group using contingency management steadily lost weight over a fifteen-week period while the self-control group gained weight over the same period. After the fifteen-week period the self-control group was placed on the contingency management program. Both groups continued to lose weight over another twenty-week period. A twelve-week follow-up revealed that both groups had maintained weight losses. Another finding of Stuart's study was that merely the collection of baseline self-monitoring data resulted in a mild weight loss. Penick (1971) also reported success in the treatment of obesity using techniques similar to those used by Stuart (1967, 1971).

Stuart and Davis (1972) published a programmed self-control weight-control program encompassing many of Stuart's (1967, 1971) previous techniques. Abrahams and Allen (1974) examined the utility of the Stuart and Davis (1972) program in conjunction with social pressure and monetary "pay offs" for weight loss. The combined behavioral programming and financial remuneration group and the behavioral programming group were significantly more effective than the social pressure group and the no-treatment control group. However, there was not a significant difference between behavioral programming plus financial remuneration and only behavioral programming.
Hall (1972) raises a basic question as to whether control in weight-reduction therapy should lie primarily with the experimenter or with the client himself. In a comparison between methods of behavioral control in which the locus of control resided either in the self or in the experimenter, Hall found both methods able to effect weight loss, but self-control techniques did not generate enough losses to be of practical use. On the other hand, the experimenter-control technique appears to be successful enough to be of clinical use. Hall and Hall (1974) in a review of the weight-reduction-treatment literature pointed out that experimenter-managed procedures have produced relatively rapid weight loss when they have been successful. Self-management studies have tended to produce slow weight losses. Assessment at follow-up has indicated treatment with combinations of self-management techniques results in either a stabilization in weight (Wollersheim, 1970; Hager, 1974) or continuing losses (Stuart, 1967, 1971). Harris and Bruner (1971) and Hall (1972) found that experimenter-controlled contracting procedures were more effective than self-control procedures. Hall and Hall (1974) suggested that some combination of experimenter-control and self-control procedures would produce the best results.

"Recent studies have shown that the more potent the influence of the natural environment throughout the treatment, the greater the likelihood that behavioral changes will be
maintained following treatment" (Stuart, 1971b, p. 1). Contingency contracting is a recently developed procedure through which control over natural environmental contingencies has been gained. "A behavioral contract is a means of scheduling the exchange of positive reinforcements between two or more persons" (Stuart, 1971b, p. 2).

Contracts structure reciprocal exchanges by specifying: who is to do what, for whom, under what circumstances. They therefore make explicit the expectations of every party to an interaction and permit each to determine the relative benefits and costs to him of remaining within that relationship (Stuart, 1971b, p. 3).

Reciprocity is the norm which underlies behavioral contracting. Reciprocity implies that each party has rights and duties and further that items of value in an interchange must be exchanged on an equity basis (Stuart, 1971b, p. 3).

Dinoff (1966) listed several criteria which he believed must exist in a successful contract. (1) The contract must actively involve both parties. (2) Contracts should be written in a clear distinct fashion. (3) The terms of the contract should be clearly stated and well understood by all participants. (4) The contract should be viewed as being fair by both parties. Dinoff suggested that the contract should be re-assessed from time to time to making sure each party still perceives the contract as being fair. (5) The contract must be reasonable and within the capabilities of all parties involved.

Behavior contracts have been successfully used on smoking behavior (Winett, 1973 and Tolley and Pratt, 1967). Homme
et al. (1970) and Cantrell et al. (1969) described the use of contingency contracting with children in the classroom and children with school problems, respectively. Boudin (1972) used a contract with twenty-four hour availability on a crisis intervention basis to decrease the use of amphetamines with a drug abuser. Miller (1972) used behavioral contracting to decrease the rate of alcohol consumption in an excessive drinker.

Tobias (1973) found contingency contracting as effective as Hagen's bibliotherapy and better than a self-determination group in effecting weight loss. Harris and Bruner (1972) found contracting procedures superior to self-control and control groups although weight reduction was not maintained in either group. Dinoff (1972) used a series of successive contracts in which an adolescent received positive reinforcement for the performance of a specified weight loss. Dinoff noted that the client needed to reduce food intake, reduce the caloric content of the food, and increase physical exercise to accomplish the weight losses. Korman (1973) compared an experimental group using diet, exercise, and social skills training implemented through contractual management with a control group using all the above but without a contract. The results indicated significant results for both the experimental group and the control group. However, only the experimental group maintained weight loss on an eight-week follow-up.
A study by Mann (1972) using behavior contracting to obtain significant weight losses had particular relevance to the present study. Mann commented that there are few therapeutic techniques displaying generality in natural settings dealing with the problems of normal adults. He cited two possible reasons:

(1) It is difficult for a therapist to discover and/or gain systematic control over relevant consequences of an adult's behavior in its natural setting. (2) Even if a therapist had such control it would be difficult to obtain reliable measurement of the behavior, without reliable measurement, it would be difficult to deliver relevant consequences at appropriate times" (p. 99).

Mann used the behavior contract as a means of controlling a client's behavior and used weight loss as a reliable measure on which reinforcement would be contingent. His clients forfeited valuables if a specified number of pounds had not been lost by the end of a two-week period. Valuables were also forfeited for immediate weight gains. Valuables were deposited and returned when the client reached a predetermined weight. When the goal weight was reached, all valuables were returned. This procedure helped insure that the client would not drop out of the study. Mann used a contract which was a legal document that incorporated the procedures of the weight-control program as separate clauses. He reported that only one subject lost weight as a result of taking baseline data. He also found evidence suggesting that the permanent loss of the subject's valuables was a necessary component of the treatment.
Mann reported

... some subjects indicated that they used extreme measures at various time to lose weight rapidly and temporarily in order to avoid aversive consequences. These measures reportedly included taking diuretics, and doing vigorous exercise just before being weighed (p. 108).

Mann attributed these extreme behaviors to the fact that consequences were delivered contingent on weight loss rather than a specific behavior curriculum. Penick et al. (1971) also pointed to the difficulties associated with attaching contingencies to weight loss. In summary, Mann's procedure had five main features. First, the client surrendered valuables to be used as consequences for appropriate behavior. Second, Mann used a legal contract signed in front of witnesses and the experimenter. Third, the contract specified that the client be available for monitoring. Fourth, the contract stipulated that the experimenter might manipulate relevant treatment variables. Finally, Mann's contract was a behavioral trap in which the client agreed to a set of contingencies to which he committed valuables before actually experiencing the contingencies.

It appears that the most desirable behavior contract treatment program would include most of the following features: (1) a signed legal contract specifying each behavior to be performed by the client and therapist; (2) the client's deposit of valuables which are forfeited for each violation of the contract; (3) contingencies that are in effect for those behaviors which lead to weight reduction rather than
weight loss itself, including the direct manipulation of calorie and carbohydrate intake as well as possible situational variables or specifications of the client's verbal behavior; (4) requirements that the client take appropriate data on his eating behavior and daily weight so that direct feedback is obtained from following the specifications of the contract and to promote the client's awareness of his eating behavior; (5) empirical frequent determination of the caloric and carbohydrate intake necessary to effect reasonable weight losses; (6) frequent monitoring sessions at which the client's weight, data, and progress are checked along with social reinforcement for appropriate behavior; and (7) a method to monitor the client's behavior objectively without relying on the client's honesty or self-report.

The behavior contract used in the present study lists the specifications of a weight-control program which if followed will result in a weight reduction by the subject. In return for the services of monitoring and providing an effective weight-control program, the subject agrees to perform the specifications of the weight-control program or forfeit certain items of value to the experimenter. In this way when the subject performs the specifications of the contract, he is negatively reinforced by not having to forfeit valuable items and positively reinforced by any resulting weight reduction.

This study is concerned with some of the more salient features found in the contracting procedure of a weight-reduction
program. Specifically, it examines the effects of data collection and consequences within the contracting procedure. The hypotheses are: (1) a behavior contract with consequences is more effective in producing weight loss than a contract without consequences; (2) a contract with consequences is more effective in producing weight loss than merely taking data on the same behaviors; (3) a contract without consequences is more effective in producing weight loss than merely taking data on the same behaviors; (4) taking data is more effective in producing weight loss than no treatment; (5) a contract with consequences in more effective in producing weight loss than no treatment; (6) a contract without consequences in more effective in producing weight loss than no treatment; and (7) a contract with consequences will result in fewer violations than a contract without consequences.
EXPERIMENT 1

Method

Subjects

Subjects were four male and twelve female participants eighteen to thirty-five years of age who responded to notices about the study placed in campus dormitories, the local and campus newspapers, and various buildings on campus as well as individuals referred to the experimenter by acquaintances. Only those subjects whom the experimenter was able to obtain adequate responses on a galvanic skin response (GSR) test were accepted into the study. A precise description of the initial GSR test is found in the Procedure. All subjects were at least twenty percent over their desirable weight as determined by a height and weight table (Metropolitan Life, 1960). Four subjects were assigned to each of four groups for purposes of matching. The variables utilized for matching were sex and the percent over desirable weight. Group One (G1) consisted of females who ranged from 21 to 25 percent above their desirable weights. Group Two (G2) consisted of females who ranged from 30 to 37 percent above their desirable weights. Group Three (G3) consisted of females who ranged from 49 to 60 percent of their desirable weights. Group Four (G4) consisted of males who ranged from 29 to 36 percent above their desirable
weights. Subjects within each group were then randomly assigned to one of the four treatment groups.

Two subjects who were assigned to treatment groups dropped out before completing the study. One subject complained of stomach cramps and obtained a note from his physician to be released from treatment. The second subject had missed a number of meetings and had accumulated many violations of his contract. He stated that he did not want to pay for these violations and that it would be less expensive to drop out and forfeit all monetary deposits. Two new subjects were selected who matched those who withdrew in sex and percent over desirable weight.

Upon completion of the study, it was learned that the No Treatment Control Group subject assigned from G4 had undergone other professional treatment with a local physician. Because of this the data from G4 was not used for comparison or testing hypotheses one through six. However, hypothesis seven involved only the With Consequences Contract Group and the Without Consequences Contract Group. The data of the subjects assigned from G4 was used for this comparison.

Apparatus

One Lafeyette model 58018 GSR unit was used to monitor the subjects' behavior. A Detecto doctor's scale capable of measuring to the nearest one-fourth pound was used to weigh subjects. Each subject used a calorie and carbohydrate counter (Kraus, 1973).
**Procedure**

Nine subjects who responded to the advertisement met for one nightly meeting discussing generally what the study was about and the responsibilities that were expected of them. Subjects were told: that this was a program investigating the effectiveness of various treatments; that an initial deposit of thirty dollars would be required from each individual taking part which would be returned at the end of the study if the individual remained in the study for the entire eight weeks; about basic information concerning positive and negative reinforcement and the effect of consequences on behavior; that the only way to lose weight was to reduce caloric and carbohydrate intake or to increase physical exercise; about the fundamental concepts of behavior contracting; and that they might be required to sign a contract for which they would put up a cash deposit and from which money would be deducted for noncompliance of the contract specifications.

Nine subjects who did not attend the nightly meeting were seen privately and given the same information provided to those who met in the group meeting.

Only those subjects who agreed to deposit a thirty-dollar check were accepted into the study. Those subjects who agreed to put up a thirty-dollar deposit were then weighed and measured by the experimenter. All subjects who were not at least 20 percent over their desirable weight were excluded from the study. Desirable weights were determined by using
the Metropolitan Life (1960) table of desirable weights for various heights and body frames. Weighing was done on a doctor's scale to the nearest one-fourth pound. A ten-pound weight was placed on the scale, and the scale was adjusted until it was in balance.

Before subjects were accepted into one of the treatment groups, the subjects were administered an initial GSR test. Each subject was asked to choose a number from one to ten and to write it on a sheet of paper without showing the experimenter. After instructing the subject to answer each question with a "No" response, the experimenter asked numbers above the number ten until the subject no longer showed a response on the GSR indicator. Then the experimenter asked the subject in sequence, "Is the number one? Is the number two?" et cetera until the entire sequence was completed. The experimenter then continued to ask the subject which number was written on the piece of paper until the experimenter was ready to choose. If the experimenter correctly identified the number, the subject was accepted into the study. If the experimenter did not correctly identify the number, he repeated the procedure. Failure of the experimenter on the second trial resulted in the exclusion of the subject from the study, otherwise, the subject was accepted. The experimenter correctly identified all subjects' selected number of the first or second trial. Subjects were then matched on percent over desirable weight and sex. Each group of four subjects was
randomly assigned to treatment groups. The subjects assigned to the No Treatment Control Group were told that there were no monitors available at that time and that they would be contacted when monitors became available. The subjects assigned to each treatment group met twice weekly throughout the study. The subjects in each of the three treatment groups met with one of the three monitors at a mutually agreed upon time.

Two of the monitors in this study had had at least six months experience using the GSR with various behavior contracts. One of the monitors had no previous experience in behavior contracting. This monitor was given instruction by the experimenter in the application and interpretation of GSR questions and procedure.

The first three monitoring sessions were spent teaching the subjects the importance of data collection, how it should be taken, and what data to collect. Each subject learned to keep calorie data, carbohydrate data, and stimulus condition data including time, place, and nature of activity in which eating occurred. A small notebook was utilized for this purpose. Subjects also learned to plot calorie, carbohydrate, and home weighing data on a separate graph. All subjects were told that they should limit caloric content to 1100 calories and carbohydrates to 100 grams. Each subject purchased or placed a deposit with the experimenter for a calorie and carbohydrate counter. Each subject signed a contract at the
end of the third monitoring session and made the required monetary deposits.

**Data Only Contract Group.** Four subjects signed a contract with the following specifications: the client agrees to take accurate daily data on calorie intake, carbohydrate intake, stimulus conditions under which eating occurred, and weekly weight which is to be recorded in a notebook for this purpose; the client agrees to keep graphs of daily calorie intake, daily carbohydrate intake, and weekly weight; the client agrees to have his graphs up-to-date for each monitoring session; the client agrees to accurately measure all food with a scale, measuring cup or other measuring utensil when food is prepared at home or in one's own dormitory room; the client agrees to accurately estimate the measurement of all food in cases when food is not prepared at home or in one's own dormitory room; the client agrees to attend all monitoring sessions unless physically ill or absent from the city in which case either twenty-four hours prior notice or a doctor's note will be submitted; and the client agrees to bring in by the next succeeding monitoring session cash for any money lost through violation of the contract or an additional five dollars will be deducted from the client's deposit for each succeeding monitoring session that all money lost has not been returned. [See Appendix IV for examples of each of the three contracts used in this study.]
The subject's behavior was monitored in three ways: the subject's data was checked to see if it had been correctly taken and was up-to-date; the subject was weighed; and questions concerning the specifications of the contract were asked using the GSR as a means of identifying truthful and nontruthful answers. Each subject was required to attend monitoring sessions twice weekly. The GSR questions were administered only once a week. The monitor checked the subject's data and graphs and recorded any violations detected at each meeting.

The GSR question session was conducted in the following fashion. A pair of metal plates, attached to the GSR unit by wires, were placed on the second and fourth fingers of the subject's right hand by the monitor. The subject was asked to relax and to breathe normally. When the GSR needle had reached a resting point, the monitor asked the subject several neutral questions, those for which the subject could not be consequted, until the subject registered a stable response or one which was very small. The monitor proceeded to ask a standardized list of questions in a sequential fashion. The monitor asked all questions at least twice. If the monitor had any doubts about a particular response, he repeated the sequence of questions until he was satisfied as to the verity of the response. If the monitor discovered a violation, he informed the subject that he had violated the contract and
specified where the violation had occurred. If the subject insisted that he had not violated the contract, the monitor gave him the experimenter's phone number which the subject had the option of calling. The subject had a twenty-four hour option to call the experimenter who would then readminister the GSR questions to the subject if desired. The decision of the experimenter was final. If the subject did not call within the twenty-four hour period, he lost his option and was consequated as specified in the contract. (See Appendix V for examples of the GSR questions for each contract group.) For the first three violations of the contract five dollars was deducted from a fifty-dollar check deposited with the monitor when the contract was signed. For each violation after the first three, ten dollars was deducted from the subject's deposit.

With Consequences Contract Group. Four subjects signed a contract with the following specifications: the client agrees to all specifications listed in the Data Only Contract Group; the client agrees to limit calorie consumption to 1100 calories per day; and the client agrees to limit carbohydrate consumption to 100 grams per day. Monitoring was identical to the Data Only Contract Group with the exception of the additional GSR monitoring questions concerning the two additional specifications. Consequences were the same as those used in the Data Only Contract Group.
Without Consequences Contract Group. This group was identical to the With Consequences Contract Group except that the subject was consequated only for not attending monitoring sessions. GSR question sessions were conducted in the same manner.

Results and Discussion

The treatment subjects were measured from two time periods. Time Period One \((T_1)\) was the eight-week period from the first initial contact with each subject until the end date of the subject's contract. This included the sessions in which the subject was taught how to record data. Time Period Two \((T_2)\) included only the six-weeks time period from the beginning date of the subject's contract until the ending date of the subject's contract. The No Treatment Control Group subjects were measured only from \(T_1\) although this data is used for \(T_2\) comparisons as well.

In Table I it can be seen that the With Consequences Contract Group lost a total of 50.75 pounds with an average loss of 16.92 pounds per subject as measured from \(T_1\) and 40.50 total pounds with an average loss of 13.50 pounds per subject measured from \(T_2\). The Without Consequences Contract Group lost a total of 23.00 pounds with an average loss of 7.67 pounds per subject as measured from \(T_1\) and 10.25 total pounds with an average loss of 3.42 pounds per subject measured from \(T_2\). The Data Only Contract Group lost a total
of 38.00 pounds with an average loss of 12.67 pounds per subject as measured from $T_1$ and 22.50 total pounds with an average loss of 7.50 pounds per subject measured from $T_2$. The No Treatment Control Group gained a total of 9.00 pounds with an average gain of 3.00 pounds per subject.

TABLE I

TOTAL AND AVERAGE WEIGHT LOSS OR GAIN

<table>
<thead>
<tr>
<th>With Consequences</th>
<th>Without Consequences</th>
<th>Data Only</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_1$</td>
<td>$T_2$</td>
<td>$T_1$</td>
<td>$T_2$</td>
</tr>
<tr>
<td>Total</td>
<td>-50.75</td>
<td>-40.50</td>
<td>-23.00</td>
</tr>
<tr>
<td>Average</td>
<td>-16.92</td>
<td>-13.50</td>
<td>-7.67</td>
</tr>
</tbody>
</table>

A Wilcoxon matched-pairs signed-ranks test (Hollander and Wolfe, 1973, and Siegel, 1956) was used to determine whether the treatment group lost a significant amount of weight when all treatment groups were collapsed to form one group. The results using each subject as his own match were significant measured from $T_1$ and $T_2$. From $T_1$, $T(8) = 0$, $p \leq .002$. From $T_2$, $T(8) = 3.00$, $p \leq .01$. See Appendix VI for raw sign rank data.

A one-sided Friedman two-way analysis of variance was used to determine if there were overall differences among
groups. The results are not significant from \( T_1 \),
\[ \chi^2_{(11)} = p \leq .07. \] The results from \( T_2 \) are significant,
\[ \chi^2_{(11)} = p \leq .05. \] [See Appendix I and II for raw weight
and rank data.]

A distribution-free multiple comparison test based on
the Friedman rank sums (Hollander and Wolfe, 1973) was used
to determine where the overall differences lie from \( T_2 \). A
one-sided all treatments comparisons test would have been
appropriate to test hypotheses (1), (2), (4), (5), and (6).
However, the experimenter was unable to find a table using
an alpha level of .05 for a one-sided test. Due to this fact
a one-sided treatment versus control comparison test was
used to test hypotheses (1), (2), and (3). The one-sided
treatment versus control comparison yielded the following
results: hypothesis (4), \( \chi(7) = 4.50, p \leq .24 \); hypothesis (5),
\( \chi(7) = 7.50, p \leq .03 \); hypothesis (6), \( \chi(7) = 3.00, p \leq .43 \).
The two-sided all treatments comparison on hypotheses (1),
(2), and (3) yielded the following results: hypothesis (1),
\( \chi(7) = 4.50, p > .05 \); hypothesis (2), \( \chi(7) = 2.00, p > .05 \);
hypothesis (3), \( \chi(7) = 2.50, p > .05 \).

A one-sided \( t \) test for two-matched groups (McGuigan, 1968)
was used to test hypothesis (7). The results supported the

\[ ^7 \] Probability figures were given only for critical alpha
level values on the two-sided all treatments comparison test.
hypothesis that the With Consequences Contract Group would violate the contract less frequently than the Without Consequences Contract Group: \( t(3) = -2.38, p \leq .05 \). Table II gives both groups' total and mean number of violations of the contract. The With Consequences Contract Group had a total of seven violations and a mean of 1.75 violations of the contract. The Without Consequences Contract Group had a total of 249 violations and a mean of 62.25 violations of the contract during the six-weeks contract period.

TABLE II

<table>
<thead>
<tr>
<th></th>
<th>With Consequences</th>
<th>Without Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>7.00</td>
<td>249.00</td>
</tr>
<tr>
<td>Mean</td>
<td>1.75</td>
<td>62.25</td>
</tr>
</tbody>
</table>

The results indicate that a highly significant amount of weight was lost when all treatments are collapsed and treated as one. This is true when the two-weeks data instruction time period included \( T_1 \) or excluded \( T_2 \). This supports previous research that a behavior contracting procedure is an effective means of achieving weight reduction. Overall differences were obtained only when the initial two-weeks data instruction period was excluded. The hypothesis that
the With Consequences Contract Group would lose significantly more weight than the No Treatment Control Group was supported. Significant differences were not obtained between the With Consequences Contract Group and either the Data Only Contract Group or the Without Consequences Contract Group. Nor were significant differences obtained between the Without Consequences Contract Group and the Data Only Contract Group or with either of these groups and the No Treatment Control Group.

It appears that a contract containing specification of behaviors leading to weight loss (i.e. calorie and carbohydrate intake), data collection, and environmental consequences is an effective procedure for obtaining significant weight reductions. Neither a contract containing only specification of behavior leading to weight loss and data collection or contracts containing only environmental consequences and data collection on relevant behaviors were effective in producing significant weight losses. It appears that all three elements in combination were necessary variables to achieve significant weight reductions in the present study. The exact nature of the interaction of these variables can not be determined from the present study. There was not a significant difference between a contract containing all three variables and those containing only specification of behavior leading to weight loss and data collection on relevant behavior or those containing only data collection on relevant behavior and environmental consequences.
EXPERIMENT 2

Because of the rather central importance of a subject-independent-monitoring technique in Experiment 1, a validity study of the galvanic skin response (GSR) test as used in Experiment 1 was undertaken. In addition, a subject-independent-monitoring technique has important implications for behavior contracting in areas other than weight control. Therefore, a study of the GSR as a monitoring technique in behavior contracting will provide a basis to assess the usefulness of this particular technique.

Method

Subjects

A subject not previously known by the experimenter or to the monitors was obtained from a pool of subjects consisting of undergraduate psychology students provided by the Psychology Department of North Texas State University. The subject was screened using the same baseline procedure used with potential treatment subjects of Experiment 1. The subject was asked to choose a number from one to ten, and the experimenter attempted to determine which number the subject had chosen using the GSR. If the experimenter had not determined which number the subject had selected after two attempts, the subject would have been dismissed. Another subject would
have then been selected, and the procedure repeated. The experimenter was successful in identifying the number selected by the first subject, and he was accepted into the study.

Apparatus

One Lafeyette model 58018 GSR unit was used.

Procedure

The purpose of the study was explained to the subject, stressing the importance of honesty. The subject was taught how to take data on calorie intake, carbohydrate intake, and the stimulus conditions under which the food was eaten. The subject was then instructed to take precise data on all food items eaten, the amount of each item consumed, the caloric content of each item, the carbohydrate content of each item, and the stimulus conditions under which each item was consumed including time, place, and concurrent activities for a two-day time period.

After collecting two days of data, the subject reported to the experimenter. The experimenter questioned the subject about the authenticity of the data collected. It was stressed that it made no difference whether the data was accurate or not, but it was absolutely necessary that the experimenter know whether the data was accurate or not accurate. The experimenter asked specific questions about all the data to make certain the subject had no doubts concerning the authenticity of the data.
**Condition 1.** On the basis of the data reported by the subject a list was made consisting of ten questions similar to those used in Experiment 1. A key was made so that the subject gave a false answer on five questions and a true answer on five questions. The questions on which the subject lied were chosen by the experimenter. Monitors in the experiment were the same monitors used in Experiment 1. Each monitor asked the ten questions to the subject and independently decided whether each answer was truthful or not truthful.

**Condition 2.** The same subject was submitted to the same procedures used in Condition 1 with two exceptions. First, the subject was given six dollars. It was explained to him that the money was his to keep with one reservation. Each time a monitor correctly identified a lie response to a question, he would have to return forty cents of the money to the experimenter. Second, the subject had complained about some difficulty in remembering those questions to which he was to lie. The subject was instructed to lie on any five questions but to remain consistent during a particular monitoring session and across monitors once he had chosen to lie on a particular question.

**Results and Discussion**

A phi coefficient (Edwards, 1974) was used to determine the degree of relationship between the monitors' determination of trueness or falseness and whether the item was actually
true or false. Condition 1 yielded the following results:
\[ r = 0, \chi^2(1) = 0, p \geq .99. \] An examination of each individual
monitor yielded the following. Monitor 1 (M_1): \[ r = 0, \]
\[ \chi^2(1) = 0, p \geq .99. \] Monitor 2 (M_2): \[ r = 0, \chi^2(1) = 0, \]
\[ p \geq .99. \] Monitor 3 (M_3): \[ r = 0, \chi^2(1) = 0, p \geq .99. \]

Condition 2 yielded the following results: \[ r = .20, \]
\[ \chi^2(1) = 1.21, p \leq .26. \] An examination of each individual
monitor yielded the following. \[ M_1: r = .65, \chi^2(1) = 4.29, \]
\[ p \leq .05. \] \[ M_2: r = .41, \chi^2(1) = 1.67, p \leq .20. \] \[ M_3: r = .41, \]
\[ \chi^2(1) = 1.67, p \leq .20. \]

Neither correlation for Condition 1 or Condition 2 yielded significant results. However, one of the correlations of the individual monitors (M_1) in Condition 2 did reach the level of statistical significance. This suggests the possibility of individual differences in ability to detect true or false statements operating in the present study. Therefore, another experiment was designed to see whether two more experienced monitors would obtain similar results.
EXPERIMENT 3

Method

Subjects
A new subject not previously known to the experimenter or to the monitors was obtained from a pool of subjects consisting of undergraduate students provided by the Psychology Department of North Texas State University. The subject was administered the same screening procedure used in Experiment 2. The experimenter was able to correctly identify the number selected by the subject on the first trial.

Procedure
The same procedure was used as in Experiment 2 with two exceptions. First, the subject was allowed to select any five of the ten questions on which to lie as long as she remained consistent during a particular monitoring session and across monitors. Second, two new monitors replaced the three used in the previous studies. One of the two new monitors (M_5) had three years of prior experience using the GSR in a contracting procedure; the other monitor (M_4) had one year experience using the GSR in a contracting procedure.
Results and Discussion

The correlation between the monitors' decision of trueness or falseness and whether an item was actually true or false yielded the following phi correlation coefficients. Condition 1: \( r = .31, \chi^2(1) = 1.98, p \leq .17 \). Condition 2: \( r = .31, \chi^2(1) = 1.98, p \leq .17 \). An examination of each of the individual monitors yielded the following results.

Condition 1: \( M_4: r = .20, \chi^2(1) = .40, p \leq .57 \); \( M_5: r = .50, \chi^2(1) = 2.5, p \leq .12 \). Condition 2: \( M_4: r = .47, \chi^2(1) = 2.21, p \leq .15 \); \( M_5: r = .20, \chi^2(1) = .40, p \leq .57 \). The results of the present experiment indicate that although the overall correlations in both conditions were higher in this experiment than in Experiment 2, neither was significant. Furthermore, neither of the individual correlations of either monitor in either condition was significant. On the whole these results support the conclusions of Experiment 2.
DISCRIMINATIVE EFFICIENCY OF THE GALVANIC SKIN RESPONSE

If the data obtained from Condition 2 of Experiment 2 are combined with the data in Condition 2 of Experiment 3, an analysis of the various hitrates yields useful information concerning the discriminative efficiency of the GSR in determining trueness or falseness of answers within the contracting procedure for weight reduction. Conditions 2 as opposed to Conditions 1 are used for this analysis for two reasons. First, because of the monetary consequences of false answers, Conditions 2 are more similar to the actual contingencies encountered in the contracting situation. Second, Conditions 2 provide an overall higher correlation between the monitor's prediction and reality thereby providing a more optimal picture of the procedure.

Valid Positives (VP) indicate those instances in which the monitor decides an answer is true, and the answer is actually true. False Positives (FP) indicate those instances in which the monitor decides an answer is true, but the answer is actually false. Valid Negatives (VN) indicate those instances in which a monitor decides an answer is false, and the answer is actually false. False Negatives (FN) indicate those instances in which a monitor decides an answer is false, but the answer is actually true. Using the phi coefficient, hitrates for each possible outcome are calculated (Wiggins,
3973, p. 245). The combined groups yield a $r = .25$, $\chi^2(1) = 3.12$, $p \leq .08$. The obtained hitrates shown in Table III indicate: $VP = 72$ percent, $FP = 48$ percent, $FN = 28$ percent, and $VN = 52$ percent with a Baserate ($BR$) of .50 and a Selection Ratio ($SR$) of .60.

### TABLE III

<table>
<thead>
<tr>
<th></th>
<th>FN(7)</th>
<th>VP(18)</th>
<th>BR = .50</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>28%</td>
<td>72%</td>
<td></td>
</tr>
<tr>
<td>VN(13)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>52%</td>
<td>48%</td>
<td>1-BR = .50</td>
</tr>
</tbody>
</table>

SR-1 = .40

In order to interpret usefully the obtained hitrates, we must first examine the value of each outcome. Probably the most important outcome is the $FN$ rate. From a purely rapport standpoint the therapist can not afford to consequate a client unjustly. A client is unjustly consequated when the client tells the truth, but it is interpreted by the therapist as a lie. With a $FN$ rate of 28 percent the dropout rate would be severe. However, the procedure of readministering the GSR test if the client questions the monitor's determination...
acts as a sieve by selecting some answers as false on the first test and again selecting from these potentially false items a subset which is false on both administrations. The retest procedure should greatly reduce this percentage of False Negatives to 8 percent (28% x 28%). Even at this rate it is possible that an appreciable number of dropouts would occur, and ill will and mistrust could be generated in those who remain in treatment.

At first look, a VN rate of only 52 percent appears to be totally unacceptable. This rate is only a little above that expected by chance. At second glance, however, it may be that being consequated half of the time is enough to control the behavior of the client so that he makes the proper avoidance response and performs the specified behaviors. This is an empirical question which only additional research can answer. Suffice it to say that it is possible that being consequated half of the time would be effective in controlling the client's behavior.

In summary, everything equal, the value of the GSR as a monitoring device is limited by two factors. First, the FP rate is most likely too high to be useful unless additional procedures or factors alter this rate in some fashion. Second, the VN rate adds little predictive efficiency to chance although it is not clear how critical this effect would be in controlling the client's behavior.
DISCUSSION

It appears that behavior contracting at least in some form is an effective means of achieving weight reduction. Of the seven hypotheses tested, two were supported. First, a behavior contract which included specification of relevant behaviors leading to weight loss, the collection of data on these relevant behaviors, and specific environmental consequences was more effective in achieving weight reductions than a no-treatment group as measured from the beginning to the end of the contract. This contracting procedure is the only procedure tested which produced significant weight reductions. Second, a contract containing specific environmental consequences resulted in significantly fewer violations than a group which did not include specific environmental consequences.

Of more importance to the present study is the relative importance of the three main ingredients found in behavior contracting, specifically, the collection of data, the use of environmental consequences, and the specification of relevant factors leading to weight loss. Although the With Consequences Contract Group is significantly different from the No Treatment Control Group, it is not significantly different from either the Data Only Contract Group or the Without Consequences Contract Group. The separate effects of the individual elements can not, therefore, be inferred from the data.
The findings that the With Consequences Contract Group violated the contract less frequently than the Without Consequences Contract Group bear some light on the effect of consequences in a contracting procedure. To the extent that the relevant behaviors are isolated and specified in the contract, the more likely it is that a client will obtain a successful outcome. If this is true, the contract which meets with the compliance more frequently is much more likely to be successful. In this regard, the effect of the consequences in this study suggest, everything equal, that the inclusion of consequences will result in compliance of the contract more frequently than if they are not included. The fact that the Data Only Contract Group who also had specific environmental consequences contingent on contractual compliance had a low mean number of violations (2.33) lends additional support to this conclusion although a direct comparison can not be made due to methodological considerations. [See Appendix III for violation data.] It appears that unless specific circumstances indicate the contrary, specific environmental consequences should be used to insure adequate compliance of the contractual specifications.

One interesting facet of the study is the probable causative factors surrounding the two subjects who dropped out of the study. The subject who complained of "stomach cramps" and obtained a note from his physician to be released from treatment believed he was having a "psychosomatic reaction"
to the reduced intake of calories and carbohydrates. However, after the subject had talked with the experimenter, it was decided that the subject would stay on contract but with unlimited calorie and carbohydrate limits. After one week the subject still reported "stomach cramps" and did not believe that the cramps had lessened during this period. It appears that some other factor accounted for the "stomach cramps" other than a decreased intake of calories and carbohydrates. It is quite possible that this was merely an avoidance response to treatment. The other subject who dropped out did so because of excessive violations of his contract resulting in larger sums of money than he presently had on deposit with the experimenter. This subject had successfully avoided the monitoring session by calling the monitor and giving various reasons for his nonattendance. The experimenter and the monitor did not catch the emerging pattern of absences and their significance until it was too late. By not attending the monitoring sessions and thereby missing the GSR test, the subject successfully avoided the consequences resulting from violations of the contract, at least in the short run. It is very important that the contract contain strict attendance specifications and that the subject is not allowed to miss more than one monitoring session without an immediate makeup session. Had the subject been immediately consequated, it is less likely that future violations would have occurred. The experimenter talked
with the subject when he dropped out of the study. The subject reported that he had not attended monitoring sessions primarily because of his violations. He stated that he followed the contract specifications up until this point and began to comply less and less with the contract specifications as the time since his last monitoring session increased.

A few methodological and design questions of Experiment 1 should be considered. First, hypotheses (1)–(6) were tested based on measurement from two time periods. One time period included eight weeks beginning with the initial contact with the subject and lasted until the end of the contract. The other measurement period lasted from the beginning date of the contract until the ending date of the contract. All groups were measured from the former period, but the No Treatment Control Group was not measured from the latter period. However, comparisons were made between the treatment groups and the control group for both time periods. The main effect would be that the treatment groups had six weeks to lose weight, and the no-treatment group had eight weeks to lose weight. Even though an apparent advantage was given to the subjects in the no-treatment group, it would have been advisable to measure all groups from equal-interval time periods.

The \( T_1 \) measurement period included a two-week instruction period in which the subject was taught how to collect, record, and plot data. During this period there were no specific
identifiable variables being manipulated. All but one of the treatment subjects lost weight during this two-week period. It is possible that certain placebo effects were operating. The one subject who did not lose weight gained seven pounds during this period. At the conclusion of the study this subject stated that she overate intentionally in anticipation of the beginning of the contract and its restriction of food intake. It is interesting that this subject was in the With Consequences Contract Group, the only group which had limited food intake and environmental consequences for exceeding those limits. Due to the potential variable results produced by these nonidentified and nonspecific factors, it would appear advisable not to include data during this time period in assessing the effectiveness of each of the treatments in future studies. Also, it would seem advisable to include a placebo condition to independently assess any possible effects if a group design is employed.

The results of Experiment 2 investigating the validity of the galvanic skin response as a means of detecting true and false statements indicate that the GSR may not be a valid instrument for this use. This appears to be true whether environmental consequences are contingent upon telling lies or whether there are no explicit environmental consequences. The validity coefficients are not significant in either condition. The results of Experiment 2 are replicated in Experiment 3 and provide additional support for this conclusion.
Other general and methodological factors must be considered before any final determination of the usefulness of the GSR can be made. First, the base rate of lies used in Experiment 2 and 3 is .50. The base rate of lies is in all likelihood much less in an actual contracting situation. The initial screening procedure acts as an effective means of establishing the credibility of the GSR as a monitoring technique for the subject. The belief that the GSR is actually a "lie detector" unquestionably lowers the base rate of lies in the actual contracting situation. Indeed, the belief in the effectiveness of the monitoring technique is most likely responsible for much of the compliance of the contract's specifications by the subject.

A methodological difference found in both experiments but not found in the actual contracting situation may have made the experiment a more difficult situation for prediction. In the experimental situation the subject was able to lie and in fact did lie about not performing one of the expected behaviors when in fact the behavior had been performed. As a practical matter this would never occur in an actual contracting situation. In addition, it is possible that lying in this direction could produce a different effect on the GSR than a lie in which the subject had actually not performed the expected behavior.

There is also some empirical evidence in Experiment 1 which suggests that the base rate of lies is much lower than .50 or that the Selection Ratio is much lower is Experiment 1.
than in Experiment 2 and 3. The number of violations reported by the monitors in the two treatments employing consequences is low. Also, only two subjects who were consequated on the first GSR test asked for a makeup. These instances comprised four violations, two by each subject. On retest three of these violations were determined to be unjust, and the subject was therefore not consequated. The remaining violation was upheld by the makeup test and eventually admitted by the subject. Based on this information the rate of False Negatives would appear to be very low in Experiment 1.

One factor affecting the discriminative efficiency of the GSR is the Selection Ratio. The Selection Ratio was independent and variable between monitors. It is possible that some Selection Ratios may be more optimal than others. For instance, it is possible that if the Selection Ratio for trues is high, and therefore low for lies, the rate of False Negatives would be greatly reduced possibly without severely decreasing the number of Valid Negatives. This procedure would have the additional effect of increasing both the Valid Positives and False Positives. It must be remembered that a high FN rate is the severest problem encountered in the contracting procedure. While it is uncertain what effect a high FP rate and a lower VN rate would have, these rates are not nearly as critical as that of the FN rate. As long as the VN rate is sufficient to control the client's behavior in making the desired avoidance response, a lowered hitrate is not critical.
Another means by which the discriminative efficiency of the GSR may be improved is by reducing the Baserate of lies by directly reinforcing the behavior of telling the truth. This may be done by providing a specification of the contract which reduces the amount of money lost by the client by 50 percent of the contracted amount if the client informs the monitor of any violations before administration of the GSR test. This should have the effect of increasing the rate of telling the monitor of any violations of the contract. This will, of course, happen only if the client believes in the ability of the GSR to detect lies.

The validity study of the GSR has several methodological problems which should be considered. Any further attempts to validate the GSR as a monitoring instrument should include a larger number of observations which could detect small or moderate correlations. Although consequences were provided in the experimental condition, it is possible that certain qualitative differences may have changed the experimental situation to a significant degree from that actually encountered in the contracting situation. Finally, in the present study an additional variable was manipulated other than the one originally intended. Namely, the questions in Condition 1 of Experiment 2 were selected by the experimenter and not the subject before the GSR test, whereas, in Condition 2 of Experiment 2 as well as both Conditions in Experiment 3 the subject chose those questions on which he lied during the
administration of the GSR test. The comparability between conditions is, therefore, somewhat confounded.

The nature of the present study indicates several inherent problems. Although considerable effort was made to insure the accuracy of the self-report of each of the subjects in the validity study, it is impossible to know to what extent the subject's report was inaccurate. The experimenter must assume that the subject's report is accurate. To assess the degree to which a subject has made a true or false statement one must first know the truth. Even when behavior is directly observed, the reliability of observers does not usually reach unity. Because of this dependence on the subject's verbal report, it is a necessity that the situation in which investigation is conducted be somewhat artificial. This is particularly true if consequences are used in the manner of Experiment 1. The effect of the consequence as well as the effect produced by admitting that one has lied, can not be entirely eliminated in an actual contracting situation.

Finally, attention should be directed to the question of physiological determination of the compliance of a contract's specifications. It seems that a subject-independent physiological method of monitoring is a necessity if the contracting procedure is to relinquish the consequation of outcome measures such as weight loss. The acceptance of verbal report appears to be totally unacceptable in light of the notorious inconsistency of verbal report and the potential effect on self-report when consequation is made on this basis.
Although the use of the GSR as an effective monitoring device must be questioned based on the results of this study, the use of the GSR as one of several physiological measures must be considered. The use of other physiological measures in combination with the GSR may substantially increase its validity. In fact, the use of a device such as the electro-polygraph should improve substantially the performance of the GSR in the contracting situation. These alternatives should be seriously investigated in an effort to find a valid and reliable subject-independent-monitoring technique.
**APPENDIX I**

WEIGHT LOSS/GAIN DATA ON ALL GROUPS AND ALL TREATMENT GROUPS

<table>
<thead>
<tr>
<th>Groups</th>
<th>With Consequences Contract Group</th>
<th>Without Consequences Contract Group</th>
<th>Data Only Contract Group</th>
<th>No Treatment Control Group</th>
</tr>
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<tr>
<td></td>
<td>$T_1$</td>
<td>$T_2$</td>
<td>$T_1$</td>
<td>$T_2$</td>
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<tr>
<td>G1</td>
<td>-3.00</td>
<td>-10.00</td>
<td>-5.50</td>
<td>-2.50</td>
</tr>
<tr>
<td>G2</td>
<td>-19.50</td>
<td>-15.00</td>
<td>-5.00</td>
<td>+2.00</td>
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<td>G3</td>
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<td>-16.76</td>
<td>-10.50</td>
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<td>-15.50</td>
<td>-11.00</td>
<td>-9.75</td>
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## APPENDIX II

**RANK DATA USED IN DETERMINATION OF THE FRIEDMAN RANK SUMS**

<table>
<thead>
<tr>
<th>Groups</th>
<th>With Consequences Contract Group</th>
<th>Without Consequences Contract Group</th>
<th>Data Only Contract Group</th>
<th>No Treatment Control Group</th>
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<tbody>
<tr>
<td></td>
<td>$T_1$</td>
<td>$T_2$</td>
<td>$T_1$</td>
<td>$T_2$</td>
</tr>
<tr>
<td>G1</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>2.0</td>
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<tr>
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<td>2</td>
<td>1.5</td>
</tr>
<tr>
<td>G3</td>
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<td>4</td>
<td>3</td>
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<td>Total</td>
<td>9</td>
<td>11</td>
<td>8</td>
<td>6.5</td>
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*The No Treatment Control Group was measured only from $T_1$, but this data was used to obtain comparable ranks at $T_2$ as well.*
APPENDIX III

THE NUMBER OF CONTRACT VIOLATIONS FOR EACH TREATMENT GROUP

<table>
<thead>
<tr>
<th>Groups</th>
<th>With Consequences Contract Group</th>
<th>Without Consequences Contract Group</th>
<th>Data Only Contract Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
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<td>0</td>
</tr>
<tr>
<td>G2</td>
<td>5</td>
<td>101</td>
<td>0</td>
</tr>
<tr>
<td>G3</td>
<td>0</td>
<td>29</td>
<td>10</td>
</tr>
<tr>
<td>G4</td>
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<td>113</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>249</td>
<td>10</td>
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APPENDIX IV

CONTRACTS FOR EACH TREATMENT GROUP

With Consequences Contract Group

Beginning date: Phone:
Ending date: Address:
Name:

1. The overall behavior to be performed is specifically defined as limiting calorie intake to 1100 calories and 100 grams carbohydrates, and taking the required data on calorie intake and carbohydrate intake.

2. The behavior is to be partitioned in terms of units so that each violation is defined as each day the client exceeds 1100 calories, each day the client exceeds 100 gm. carbohydrates, each day the client does not accurately count calories, and each day the client does not accurately count carbohydrates.

3. Each unit will be consequated such that the first, second, and third violations result in a $5 deduction from the client's deposit. Each violation thereafter will result in a $10 deduction from the client's deposit.

4. The client agrees to attend two monitoring sessions weekly and agrees to take one weekly galvanic skin response test over the specifications of the contract.

5. The client agrees to be monitored at the following times:


   Time: ___ ___ ___ ___ ___ ___ ___

6. The client agrees to accurately count calories and carbohydrates.

7. The client agrees to bring a notebook which includes up-to-date data on the type of food eaten, amount of food eaten, amount of carbohydrates eaten, amount of calories eaten, and the conditions in which the food was eaten including time, place, and concurrent activities as well as graphs of calorie, carbohydrate, and weight data.
8. The client agrees to forfeit $5 from the client's deposit for failure to bring up-to-date data and meeting the specifications of paragraph seven.

9. The client agrees to attend each monitoring session within 15 minutes of the appointed time or forfeit $5 from a deposit specifically for this purpose.

10. If the client gives at least twenty-four hours notice that he will be unable to attend monitoring due to being out of town, the client will not forfeit $5 from his deposit.

11. If the client is absent due to illness, the client agrees to bring a note from a physician or forfeit $5 from the client's deposit.

12. The client agrees to accurately measure all food that is prepared at the client's home or the client's dormitory room with a scale, measuring cup, or other measuring utensil.

13. The client agrees to forfeit $5 from the client's deposit for each day the client fails to accurately measure food at the client's home or the client's dormitory room with a scale, measuring cup, or other measuring utensil.

14. The client agrees to give the best estimate possible for all food which is not prepared at the client's home or the client's dormitory room.

15. The client agrees to replace any money lost for violations of the contract by the next succeeding monitoring session. Failure to replace any money lost through violation of the contract will result in an additional $5 deduction from the client's deposit for each succeeding monitoring session in which all money lost has not been replaced.

16. The monitor agrees to provide a service designed to help the client lose weight and gain control over the client's eating behavior.

17. The monitor agrees to check the client's data and weigh the client at each monitoring session in which the client is present.
APPENDIX IV--CONTINUED

18. The monitor agrees to administer the galvanic skin response test over the contract specifications.

19. The monitor agrees to be present no later than 15 minutes after the appointed monitoring session time.

20. The monitor agrees to forfeit $5 to the client for failure to attend monitoring sessions no later than 15 minutes after the appointed monitoring session time.

21. The experimenter holds the following deposits of the client:
   1. a thirty-dollar deposit to be returned to the client on the client's satisfactory completion of the study,
   2. a forty-dollar deposit to be used as consequences for the contract specifications,
   3. a twenty-dollar deposit to be used as consequences for attending monitoring sessions.

22. All money not lost for violations of the contract will be returned to the client at the ending date of the contract.

Client ____________________________
Monitor ____________________________
Experimenter _________________________

Without Consequences Contract Group

Beginning Date: ____________________
Ending Date: _______________________
Name: _____________________________
Phone: _____________________________
Address: ___________________________

1. The overall behavior to be performed is specifically defined as limiting calorie intake to 1100 calories and 100 grams carbohydrates and taking the required data on calorie intake and carbohydrate intake.

2. The behavior is to be partitioned in terms of units so that each violation is defined as each day the client exceeds 1100 calories, each day the client exceeds 100 grams carbohydrates, each day the client does not accurately count calories, and each day the client does not accurately count carbohydrates.
3. The client agrees to attend two monitoring sessions weekly and agrees to take one weekly galvanic skin response test over the specifications of the contract.

4. The client agrees to be monitored at the following times:


Time: ____________________

5. The client agrees to accurately count calories and carbohydrates.

6. The client agrees to bring a notebook which includes up-to-date data on the type of food eaten, amount of food eaten, amount of carbohydrates eaten, amount of calories eaten, and the conditions in which the food was eaten including time, place, concurrent activities as well as graphs of calorie, carbohydrate, and weight data.

7. The client agrees to attend each monitoring session within 15 minutes of the appointed time or forfeit $5 from a deposit specifically for this purpose.

8. If the client gives at least twenty-four hours notice that he will be unable to attend monitoring due to being out of town, the client will not forfeit $5 from his deposit.

9. If the client is absent due to illness, the client agrees to bring a note from a physician or forfeit $5 from the client's deposit.

10. The client agrees to accurately measure all food that is prepared at the client's home or the client's dormitory room with a scale, measuring cup, or other measuring utensil.

11. The client agrees to give the best estimate possible for all the food which is not prepared at the client's home or the client's dormitory room.

12. The client agrees to replace any money lost for violation of the contract by the next monitoring session. Failure to replace any money lost through violation of the contract will result in an additional $5 deduction from the client's deposit for each succeeding monitoring session in which all money lost has not been replaced.
13. The monitor agrees to provide a service designed to help the client lose weight and gain control over the client's eating behavior.

14. The monitor agrees to check the client's data and weigh the client at each monitoring session in which the client is present.

15. The monitor agrees to administer the galvanic skin response test over the contract specifications.

16. The monitor agrees to be present no later than 15 minutes after the appointed monitoring session time.

17. The monitor agrees to forfeit $5 to the client for failure to attend monitoring sessions no later than 15 minutes after the appointed monitoring session time.

18. The experimenter holds the following deposits of the client:
   1. a thirty-dollar deposit to be returned to the client on the client's satisfactory completion of the study,
   2. a twenty-dollar deposit to be used as consequences for attending monitoring sessions.

19. All money not lost for violations of the contract will be returned to the client at the ending date of the contract.

Client

Monitor

Experimenter

Data Only Contract Group

Beginning date: 
Ending date: 
Name:

Phone:
Address:

1. The overall behavior to be performed is specifically defined as taking the required data on calorie intake and carbohydrate intake.
2. The behavior is to be partitioned in terms of units so that each violation is defined as each day the client does not accurately count calories and each day the client does not accurately count carbohydrates.

3. Each unit will be consequated such that the first, second, and third violations result in a $5 deduction from the client's deposit. Each violation thereafter will result in a $10 deduction from the client's deposit.

4. The client agrees to attend two monitoring sessions weekly and agrees to take one weekly galvanic skin response test over the specifications of the contract.

5. The client agrees to be monitored at the following times:


   Time:

6. The client agrees to accurately count calories and carbohydrates.

7. The client agrees to bring a notebook which includes up-to-date data on the type of food eaten, amount of food eaten, amount of carbohydrates eaten, amount of calories eaten including time, place, and concurrent activities, as well as graphs of calorie, carbohydrate, and weight data.

8. The client agrees to forfeit $5 from the client's deposit for failure to bring up-to-date data and meeting the specifications of paragraph seven.

9. The client agrees to attend each monitoring session within 15 minutes of the appointed time or forfeit $5 from a deposit specifically for this purpose.

10. If the client gives at least twenty-four hours notice that he will be unable to attend monitoring due to being out of town, the client will not forfeit $5 from his deposit.

11. If the client is absent due to illness, the client agrees to bring a note from a physician or forfeit $5 from the client's deposit.
12. The client agrees to accurately measure all food that is prepared at the client's home or the client's dormitory room with a scale, measuring cup, or other measuring utensil.

13. The client agrees to forfeit $5 from the client's deposit for each day the client fails to accurately measure food at the client's home or the client's dormitory room with a scale, measuring cup, or other measuring utensil.

14. The client agrees to give the best estimate possible for all food which is not prepared at the client's home or the client's dormitory room.

15. The client agrees to replace any money lost for violations of the contract by the next succeeding monitoring session. Failure to replace any money lost through violation of the contract will result in an additional $5 deduction from the client's deposit for each succeeding monitoring session in which all money lost has not been replaced.

16. The monitor agrees to provide a service designed to help the client lose weight and gain control over the client's eating behavior.

17. The monitor agrees to check the client's data and weigh the client at each monitoring session in which the client is present.

18. The monitor agrees to administer the galvanic skin response test over the contract specifications.

19. The monitor agrees to be present no later than 15 minutes after the appointed monitoring session time.

20. The monitor agrees to forfeit $5 to the client for failure to attend monitoring sessions no later than 15 minutes after the appointed monitoring session time.

21. The experimenter holds the following deposits of the client:
   1. a thirty-dollar deposit to be returned to the client on the client's satisfactory completion of the study,
2. a forty-dollar deposit to be used as consequences for the contract specifications,
3. a twenty-dollar deposit to be used as consequences for attending monitoring sessions.

22. All money not lost for violations of the contract will be returned to the client at the ending date of the contract.

Client________________________
Monitor_____________________
Experimenter__________________
APPENDIX V

GSR QUESTIONS

GSR Questions for the With Consequences Contract Group and the Without Consequences Contract Group

Since our last GSR meeting:

1. Have you seen any food?
2. Have you seen other people eating food?
3. Have you eaten any food?
4. Have you measured your food?
5. Have you measured your food each day?
6. Have you measured your food accurately each day?
7. Have you accurately measured your food each day with a scale or measuring utensil?
8. Has there been at least one day on which you have not accurately measured your food with a scale or measuring utensil?
9. Two days?
10. Three days?
11. Have you counted calories?
12. Have you counted calories each day?
13. Have you accurately counted calories each day?
14. Has there been at least one day on which you have not accurately counted calories?
15. Two days?
16. Three days?
APPENDIX V--CONTINUED

17. Has there been at least one day on which you have gone over 1100 calories?
18. Two days?
19. Three days?
20. Have you counted carbohydrates?
21. Have you counted carbohydrates each day?
22. Have you accurately counted carbohydrates each day?
23. Has there been at least one day on which you have not accurately counted carbohydrates?
24. Two days?
25. Three days?
26. Has there been at least one day on which you have exceeded 100 carbohydrates?
27. Two days?
28. Three days?
29. Does your data match what actually happened?
30. Has there been at least one violation of your contract?
31. Two violations?
32. Three violations?

GSR Questions for the Data Only Contract Group

Since our last GSR meeting:

1. Have you seen any food?
2. Have you seen other people eating food?
3. Have you eaten any food?
4. Have you measured your food?

5. Have you measured your food each day?

6. Have you accurately measured your food each day with a scale or measuring utensil?

7. Has there been at least one day on which you have not accurately measured your food with a scale or measuring utensil?

8. Two days?

9. Three days?

10. Have you counted calories?

11. Have you counted calories each day?

12. Have you accurately counted calories each day?

13. Has there been at least one day on which you have not accurately counted calories?

14. Two days?

15. Three days?

16. Have you counted carbohydrates?

17. Have you counted carbohydrates each day?

18. Have you accurately counted carbohydrates each day?

19. Two days?

20. Three days?

21. Does your data match what actually happened?

22. Has there been at least one violation of your contract?

23. Two violations?

24. Three violations?
APPENDIX VI

WEIGHT LOSS/GAIN DATA FOR WILCOXIN MATCHED PAIRS, SIGNED RANKS TEST

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Total Sign Rank Value: 0, 3
APPENDIX VII

GSR QUESTIONS FOR EXPERIMENTS 2 AND 3

1. Has there been at least one day on which you have not accurately measured the food you have eaten with a scale or measuring utensil?

2. Have there been at least two days on which you have not accurately measured the food you have eaten with a scale or measuring utensil?

3. Has there been at least one day on which you have not accurately counted calories?

4. Have there been at least two days on which you have not accurately counted calories?

5. Has there been at least one day on which you have exceeded ________ calories?

6. Have there been at least two days on which you have exceeded ________ calories?

7. Has there been at least one day on which you have not accurately counted carbohydrates?

8. Have there been at least two days on which you have not accurately counted carbohydrates?

9. Has there been at least one day on which you have exceeded ________ carbohydrates?

10. Have there been at least two days on which you have exceeded ________ carbohydrates?
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