*COMPARISON OF ESTABLISHED AND INNOVATIVE
WEIGHT-REDUCTION TREATMENT PROCEDURES¹*

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A central component of a commonly used weight-loss procedure developed by Stuart (1967), which emphasizes situational engineering (SE), was compared to eating behavior control (EBC), a treatment employing reinforcement of changes in eating habits. A third treatment encouraged development of individuals' own applications of a model of self-control and attempted to provide effective feedback regarding progress toward weight-loss goals. This self-initiated treatment (SI) was designed to be less directive than many behavioral treatment packages and to be more realistic about the expectations of subjects and the actual eating habits of overweight and normalweight people. Following baseline, treatment lasted six weeks and followup lasted 16 weeks. While all treatments produced weight losses, EBC surpassed SE during treatment. SI losses during treatment did not differ from SE or EBC, but SI was the only group that lost weight throughout followup, indicating the possible utility of more subtle, less directive interventions than those that have often been associated with behavioral approaches. The results of SE question the applicability to clinical procedures of the external cue hypersensitivity theory of obesity (Schachter and Rodin, 1974), to which SE is closely related.

DESCRIPTORS: obesity, treatment, eating behavior, self-management, weight reduction, self-recording, stimulus control, humans

Three behavioral weight-reduction treatment procedures were compared: situational engineering, which emphasized the situational and stimulus control of external cues for eating; eating behavior control which emphasized directly modifying eating habits and reinforcing eating behavior change; and a behavioral control procedure, composed of innovative, previously unevaluated treatment techniques. Several

trends in recent thinking concerning behavior therapy and specific programs for weight reduction were considered in designing the study: (1) criticisms of the theory that obese and overweight people are hypersensitive to external eating cues; (2) questions about whether eating habits of the obese are markedly different from those of normals; (3) suggestions that overly directive behavioral treatments may provoke client resistance and undermine long-term adoption of behavior therapy goals; and (4) results from operant analyses of "self-control" behavior. Each of these trends is reviewed and the general purposes and procedures of this study are described.

Situational Engineering

A major, but not exclusive, component of Stuart's (1967) highly respected weight-loss program emphasizes the control of external cues for eating. This "situational engineering" component (SE) is parallel to the external cue hypersensitivity hypothesis of Schachter

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(Schachter and Rodin, 1974), even though Stuart's report of his treatment program preceded the publication of Schachter's research. Parallel to the view that external cues occasion excessive or inappropriate eating in the obese, SE procedures emphasize control of external cues. In SE, eating is made a "pure activity", as clients are directed to eat alone and not to engage in other activities (*e.g.*, reading, conversation) while eating. Additionally, SE entails preplanning meals, buying foods that require preparation, and storing such food out of sight so that visual cues that might prompt eating are removed from the world of the dieter. Because of the wide acceptance of Schachter's work, SE procedures have been routinely included in a number of reported treatments for overweight individuals (*e.g.*, Bellack, 1976; Bellack, Rozensky, and Schwartz, 1974; Hall, Hall, Hanson, and Borden, 1974; Harris and Hallbauer, 1973; Mahoney, 1974; Mahoney, Moura, and Wade, 1973; Romanczyk, Tracey, Wilson, and Thorpe, 1973; Rozensky and Bellack, 1976; Wollersheim, 1970).

In spite of the popularity of the external cue hypersensitivity hypothesis, the extent to which normal- and overweight individuals are differentially affected by external cues has been questioned in several recent studies (Leon, Roth, and Hewitt, 1977; Mahoney, 1974; Milich, 1975; Milich, Anderson, and Mills, 1976; Milich and Fisher, *in press*). Particularly, the generalizability of the hypothesis to nonlaboratory situations and to populations outside the college-student group may be limited. These doubts about the generalizability of Schachter's notions give rise to careful evaluation of the evidence supporting the SE portions of Stuart's procedures. Since Stuart and others have used SE procedures in combination with other techniques in such ways that their own efficacy cannot be established, *there are no data that clearly show that SE procedures constitute a sufficient weight-loss technique or make a significant contribution to the efficacy of procedures with which they have been combined.* In spite of this lack of

supporting evidence, they have been judged to occupy "a secure place within comprehensive programs" (Bootzin, 1975, p. 22) and to be "a very powerful component in the successful regulation of obesity" (Stunkard and Mahoney, 1976, p. 59). For these reasons, the present study was designed to test the efficacy of the SE portion of Stuart's treatment package when employed independent of other behavioral techniques, although in combination with brief nutritional counselling and weekly weigh-ins.

Overweight Eating Habits

The impressive results of Mahoney's (1974; Mahoney, Moura, and Wade, 1973) attempt to change eating habits directly by reinforcement of eating appropriate amounts of proper foods tend to be understood through the assumption that chronic, faulty eating habits are the appropriate targets in attempts to produce weight reduction and maintain weight loss. In fact, Mahoney (1975a, 1975b, 1976) and others (Hill and McCutcheon, 1975; Milich *et al.*, 1976; Wooley and Wooley, 1975), have published several articles severely questioning this assumption. Based primarily on observational data in natural environments, these studies suggest that the overweight may not generally eat more or faster than normalweight individuals. Although the null hypothesis is hard to prove, the studies suggest that differences between normalweight and overweight individuals may be far more subtle than we have tended to assume. While food intake restriction is generally necessary for weight loss, nutritional and eating habit purity in overweight clients may be a naive treatment goal if it is not more common among normalweight individuals than among the overweight. This prompted reconsideration in the present study of treatments that focus of food-intake habits.

Because of the reasons for questioning SE and EBC just outlined, the present study compared these two procedures. A speculative behavioral treatment composed of several techniques was used as a control. One of these, a

self-monitoring procedure had appeared to be a useful approach to weight reduction in a series of clinical case studies (Fisher, Green, Levenkron, Porter, and Friedling, 1976). Other aspects of the control procedures focused on the general notions of self-initiated self-control and problem solving. This control treatment, called self-initiated treatment (SI), was developed from two lines of thinking: first, that highly directive procedures may promote client resistance or reactance more than behavior maintenance (Davison, 1973); and second, that operant analyses of "self-control" may provide a useful perspective on initiating and promoting behavior change (Rachlin, 1974; Rachlin and Green, 1972).

Resistance and Behavior Therapy

In recent years, behaviorists have suggested that highly intrusive procedures (*e.g.*, Davison, 1973) or the use of unnecessary reinforcers or inducements for target behaviors (*e.g.*, Deci, 1971; 1972; Levine and Fasnacht, 1974) may *discourage* the maintenance of target behaviors. Such a viewpoint suggests that subtle change procedures may lead to greater maintenance and generalization than highly structured, directive, and demanding procedures.

In this context, consider the individual, genuinely desirous of losing weight, who is asked to comply with directions to make eating a "pure activity" (*i.e.*, by not combining it with other activities such as conversation, reading, watching TV, *etc.*); to buy only foods that require preparation; not buy or consume "junk" foods (such as potato chips, cookies, *etc.*); to eat slowly by putting utensils down on the table after each mouthful; to have no second helpings; not to snack while socializing, watching television, or engaging in other activities; and to eat meals that meet nutritionists' standards for a well-balanced diet. Consider also that this individual observes that friends of normal weight seem to do all the things that he/she is asked not to do. Further, consider that the individual probably begins the weight-

loss program highly motivated to lose weight and reacts with puzzlement or disappointment when he/she is told that the focus should not be on weight loss, but on changing his/her eating habits or the cues that occasion eating. Finally, consider that family members are likely to find behavioral prescriptions incompatible with traditional household routines of cooking and eating. Such factors may aid our understanding of the anecdotally common occurrence of individuals enduring their "diets" with eager anticipation of indulging in still-preferred foods that have been proscribed. As an alternative, one might look for ways to encourage subtle and idiosyncratic adjustments in eating habits that will both fit into an individual's life-style (so as to encourage maintenance) and yield appreciable weight losses so as to reinforce participation.

Self-initiated Treatment

Following the above ideas regarding client resistance, the control treatment, SI, was designed to address the idiosyncratic eating problems of the individual, to not overburden the individual with rules that are either irrelevant to the problem or unrealistic relative to the eating habits of normal individuals, and to provide meaningful reinforcement for continued weight-loss efforts.

An operant model of self-control described by Rachlin and Green (1972; *cf.* Ainslie, 1974; Rachlin, 1974) was employed through this treatment. According to this model, "self-control" occurs in situations in which a choice exists between an immediate temptation and a delayed, long-range goal. The more delayed the long-range goal relative to the immediate temptation, the more likely the choice will be for the temptation. However, when the temptation is not immediately available, and the *relative* delay of the long-range goal is reduced, the individual may engage in "self-control" by acting to constrict future alternatives. This model leads readily to many self-control techniques (Rachlin, 1974; Skinner, 1953, pp. 227-241)

and was used to write a manual that describes self-control as a skill involving anticipation and cleverness, so that immediate temptations do not interfere with progress toward delayed goals (Fisher and Friedling, Note 1). The manual did not prescribe any self-control strategies but was designed to illustrate a wide range of self-control activities and to give individuals a general understanding from which they could develop their own techniques.

The second component of the SI was a weight graphing technique based on the assumption that measures that increase the salience of the long-term goals of weight loss and increase the salience of progress toward that goal will support continued preferences for it (Fisher *et al.*, 1976). This technique was designed, then, to make effective, rather than to replace, the naturally occurring positive consequences of changes in behavior. It was also included because of other reports of impressive weight-loss results with simple self-monitoring of daily weight and calorie intake (Romanczyk, 1974).

Plan of Present Study

As indicated above, the major purpose was to compare two popular weight-loss procedures, SE and EBC. A number of studies had compared packages of such procedures to attention-placebo or waiting list control groups and had generally shown significant advantages of the experimental procedures. More valuable than repeating such a demonstration seemed the testing of the SI procedure. At the same time, this speculative, unproven package was originally designed as a control for the comparisons of SE and EBC and was so treated in the statistical analyses. Experimental hypotheses were that both SE and EBC would surpass SI and that EBC would surpass SE.

METHOD

Subjects

Subjects were recruited through newspaper stories, notices, and advertisements. Approxi-

mately 200 respondents were scheduled for one of several 1.5-hr screening and introductory meetings, which included an overview of the program and information on all restrictions and requirements.

Each subject had to be at least 18 yr old, desirous of losing at least 10 lb, not under medical care for any problem that might contraindicate weight loss, not participating in or planning to participate in any other weight-loss program, and not pregnant.

Subjects were systematically assigned to one of the three treatments, so that the groups were matched in terms of pretreatment baseline levels of both bodyweight and per cent overweight. When necessary, personal schedules were also considered in making assignments to groups.

Following the introductory meeting, 135 of the 200 who had attended indicated their desire to join the program. Twenty-five of these failed to meet pretreatment criteria, *e.g.*, did not obtain medical clearance, leaving 110 who actually began the program.

Measures

Skinfold caliper measures. Standardized Harpenden skinfold calipers, John Bull type (manufactured by British Indicators, Ltd., St. Albans, Hertfordshire, England) were used to measure the thickness of a full fold of skin and subcutaneous tissue on the back of the triceps. Measurements were taken on the client's non-dominant arm, while the arm was relaxed and hanging limp. This site is reported by several researchers to be the easiest to measure, as well as the most representative of total body fat (Seltzer and Mayer, 1965, 1967). Obtained readings express thickness to the nearest 0.2 mm. Caliper application was made twice by the same experimenter on the same client for relatively stable caliper readings. The results of these two readings were then averaged to provide a single measurement. In reliability checks made on caliper readings at pretreatment and midtreatment, the same subject was measured twice by two different experimenters. The

resulting percentages of agreement (# of agreements / # of agreements plus # of disagreements $\times 100\%$) were 94% ($n = 33$, pre-treatment) and 90% ($n = 30$, midtreatment). A discrepancy of ± 2 mm was used as the agreement criterion.

Baseline records. During the pre- and post-treatment baselines, all clients were required to weigh themselves daily. They also recorded their daily food intake, including approximate amounts and calorie values. Subjects used calorie books with which they were familiar to determine calorie values.

Weekly weigh-ins. At each meeting, all clients were weighed privately by the experimenter, without shoes, in indoor clothing, on a physician's balance beam scale (Continental Health-O-Meter, #400 CEG). Weights were recorded to the nearest half pound.

Followup questionnaire. At the followup meeting, eight weeks after the final treatment session, all subjects were asked to fill out a questionnaire that surveyed their reactions to the program. One item on the form was a general client rating of change on a seven-point scale (1: "have changed markedly for the worse" . . . 7: "improved markedly"). Four items asked clients to indicate on seven-point scales how "enjoyable", "interesting", and "meaningful and involving" they found the treatment to be and how much they felt treated either as an "object to be controlled" or a "human being to be respected".

Attribution of changes to either oneself or aspects of the program was assessed through an adaptation of a series of questions developed for the same purpose in a study of attributional effects in systematic desensitization (Maiuro and Fisher, Note 2). Five pairs of items tested various dimensions of attribution, the importance of the leader *versus* the importance of oneself, techniques *versus* one's own effort, whether the program involved actively applying procedures or merely following directions, whether eating behavior was changed or whether the participant "gained control over

my eating behavior", and, similarly, whether weight was reduced or "I was able to reduce my weight." Subjects indicated the extent of their disagreement or agreement with each item on seven-point scales. Summing across the five self- and five external-attribution items, subscores for each type of orientation were obtained.

General Treatment Procedures

Treatment contracts and deposits. In order to prompt serious participation, all subjects were required to sign a formally worded, witnessed treatment contract before the program began. This contract detailed the terms of participation and included assurances that subjects would cooperate with routine program requirements. In addition to the treatment contract, subjects signed an informed consent document in accord with university policies regarding use of human subjects.

All clients were required to make a refundable deposit ranging from \$12.00 (for an individual with a monthly income of less than \$300) to \$144.00 (for an individual with no dependents and a monthly income in excess of \$2,800.00). Clients were returned their deposits piecemeal as rewards for completion of various data gathering procedures, attendance at meetings, and, as explained later, for attaining several performance criteria in the SE and EBC conditions. Clients in the SI treatment were only rewarded for attending meetings. This procedure of using a small portion of the refundable deposit as an attendance reward and adherence incentive worked successfully. The average rate of attendance for all treatment sessions was greater than 90% (*i.e.*, 92%, 92%, and 93%, for SE, EBC, and SI respectively).

All subjects were returned any balance of their deposit at the time of the first followup meeting, regardless of whether they had previously dropped out of treatment. If a subject incurred an injury or illness that necessitated

withdrawal from the program, he/she immediately received the balance of his/her deposit.

Therapists

Three psychology graduate students directed the treatment groups with the aid of an undergraduate assistant. Two of the three were males and doctoral candidates in clinical psychology; the third, a female, was a doctoral candidate in educational psychology. All three had some training and experience directing groups, and the female and one male had extensive training in this area. To ensure consistent and proper administration of treatments, therapists working from detailed treatment outlines were trained before the start of the treatment program, were monitored while administering the group sessions, and were provided with feedback about their performance.

To control for therapist expectancy effects, therapists were not informed of the hypotheses of the investigation until its conclusion. Also, to control for any therapist effects within a specific treatment, each therapist's treatment schedule was balanced to ensure equal amounts of contact with each treatment group as the three therapists rotated among the different treatments.

Schedule of Meetings

During the baseline periods, subjects were instructed to eat normally to allow accurate assessment of their typical eating habits. The program staff emphasized accurate and conscientious recording and supported this emphasis by making final acceptance into the program contingent on complete baseline records.

After beginning the baseline recording, all clients met twice, at one-week intervals, before being assigned to treatments. At the first of these meetings, initial baseline data were collected and recording procedures were reviewed. At the second, the second week's data were collected and subjects were assigned to treatment groups. During these meetings, a

thorough review of sound nutrition was conducted and clients were vigorously encouraged to follow these principles and select nutritional foods from the five important food groups. Fasting and other radical, short-term approaches to caloric restriction were discouraged and a comprehensive change in life-style was advocated as the basic orientation of the program. Clients were encouraged to ask their personal physicians for a suitable diet. Generally, females were encouraged to consume at least 1100 to 1200 calories per day and males were encouraged to consume at least 1500 calories per day.

Following the two weeks of baseline, subjects met in treatment groups for each of the next six weekly meetings. The first 30 min of each meeting were devoted to private weigh-ins, record examinations, record keeping, and brief individual consultations. Following these preliminaries, 30 min were devoted to introducing SE, EBC, or SI principles and techniques and applications of these techniques. The final 30 min of each meeting were used to answer questions and discuss treatment applications or problems.

After the last treatment sessions, clients were again asked to monitor daily weight and food and calorie intake for two weeks as they had during the pretreatment baseline. They were instructed to eat as naturally as possible and use whatever treatment techniques they had learned. All treatment procedures specific to particular treatments were suspended. Clients were again encouraged to eat nutritionally balanced meals. During this two-week, post-treatment baseline, only one meeting was scheduled to collect posttreatment data.

Five weeks after the end of the posttreatment baseline, seven weeks after the last treatment session, subjects returned for a followup session (FU1). At this meeting, they completed followup questionnaires and were weighed, measured with calipers, and given the remainders of their deposits. Those subjects (10) not able to attend the scheduled FU1 were weighed

and measured individually within three days of the followup date of their group.

A second followup session (FU2) was held nine weeks after FU1, 16 weeks after the last treatment session. At FU2, subjects were merely weighed, before receiving a mini-treatment of the procedures found most effective in the main part of the program. Those subjects not able to attend the scheduled FU2 were weighed within three days of the date of FU2. Two of the 51 subjects did not participate in FU2, one from SE and SI. Both of these subjects had changed their residences and phones, leaving no forwarding address.

Treatment-procedures common to situational engineering and eating behavior control: rewards for self-reported use of behavioral principles. Clients in the SE and EBC treatment groups completed weekly detailed behavioral checklists. These checklists noted the frequency of applying either SE or EBC principles. Clients in these treatments received a small portion of their refundable deposit for reporting the application of behavioral principles. The criteria for obtaining this reward was gradually increased during treatment so that each week, SE and EBC clients would need to use more behavioral principles. SI clients did not complete weekly behavioral checklists and received rewards for attending treatment meetings.

Treatments

Eating behavior control. EBC clients learned to apply quality and quantity control principles to their eating behaviors, such as eating dietetic foods and eating slowly. Specifically, they concentrated on eating low-calorie, nutritional foods, lengthening the time of their meals to 25 or 30 min, chewing their food thoroughly, putting their utensils down between bites, and decreasing their portion sizes. EBC clients also graphed their daily weight and total caloric intake. Their weight-loss graph, however, did not contain a goal-line to make progress toward their goal more salient as employed in SI (See SI treatment). Finally, clients learned to evalu-

ate and record their daily eating habits on an eating-habit checklist.

An important part of the EBC was the reinforcement of changes in eating habits. Clients who had accomplished a predetermined change in eating habits during the week leading up to a meeting were returned a portion of their refundable deposit. The self-reported eating-habit checklist was used to determine if a client had demonstrated sufficient eating-habit change, measured by a ratio of sound to poor eating habits. Sound eating habits involved eating slowly or consuming high quality/small quantity foods (e.g., a small piece of lean, broiled meat), while poor eating habits consisted of eating quickly or consuming low quality/large quantity foods (e.g., three scoops of chocolate ice cream). The ratio of sound to poor eating habits used as the reinforcement criterion was increased throughout treatment, from relatively easy to relatively difficult levels. For the first week of treatment, the criterion ratio of sound-to-poor eating habits was 1:2. It was advanced from 1:1, 3:2, 2:1, 3:1, and 4:1 for the second through sixth weeks.

Situational engineering. SE sessions included a didactic presentation of proper ways to apply SE principles to control eating influences. These principles emphasized teaching subjects to: (1) eliminate eating cues (e.g., removing ready-to-eat foods from home, eating in one relatively secluded, distraction-free place); (2) suppress eating cues (e.g., making portions of food appear larger, minimizing contact with fattening foods); and (3) strengthen the antecedents of appropriate eating behavior (e.g., providing self with variable arrays of nonfattening foods, saving foods from allowable meals for snacks). These procedures were derived from Chapter 3, "The situational management of overeating", in the professional edition of Stuart and Davis' *Slim Chance in a Fat World* (1972, pp. 75-89). Clients were encouraged to control situations and food influences before eating, and several detailed, concrete examples of SE applications were presented during each session.

SE clients who self-reported a predetermined ratio of applications of SE principles to possible opportunities for application were returned a portion of their refundable deposit. The ratio of SE applications to possible SE applications was increased throughout treatment, from relatively low to relatively high levels. The reinforcement criterion ratio was exactly similar to that of EBC clients, *i.e.*, 1:2, 1:1, 3:2, 2:1, 3:1, 4:1 for the first through sixth weeks.

Self-initiated. SI focused on the use of a special weight-loss graph and the development of individualized self-control strategies. During the first treatment session, clients were instructed in how to complete the weight-loss graph, which provided feedback and made progress salient. Clients were encouraged to keep their weight at or below the diagonal goal line.

Self-control strategies were presented in a written manual (Fisher and Friedling, Note 2). General strategies and ways to apply them to daily life were the topics of group meetings in Weeks 3, 4, 5, and 6. The first two SI treatment sessions were devoted to training clients in use of the SI weight-loss graph.

Subject Attrition

One hundred and ten clients were formally admitted to the program, *i.e.*, they obtained a doctor's consent to participate, made a refundable deposit, and signed a treatment contract. Of these 110 clients, 28 dropped out sometime during the 15-week program, leaving a total of 82 clients completing the entire program. Reasons for dropping out included personal and family health problems (9), scheduling conflicts (10), transportation problems (2), and dissatisfaction with treatment (7). Those clients who expressed dissatisfaction with treatment were equally distributed throughout the three treatments, *i.e.*, two in situational engineering, three in eating behavior control, and two in self-initiated treatment. A breakdown of the 28 dropouts indicated there were seven dropouts from situational engineering, 11 from eating

behavior control, and 10 from self-initiated treatment. To test for differential dropout rates across treatment groups, a chi square analysis was computed on the number of dropouts per group. This analysis failed to demonstrate that any of the three treatment groups had an unusual probability of producing treatment dropouts ($\chi^2 = 0.37$, $p < 0.50$).

Before statistical analyses, six sessions were designated as "critical". These were the first of the two pretreatment baseline meetings (B), the initial, middle, and the final treatment meetings (T1, T4, and T7), the posttreatment baseline meeting (PB) and FU1. Eight of the 82 clients completing treatment were excluded from analyses because they failed to attend one or more of these six, critical sessions. Three subjects were not included in analyses because they experienced medical problems during the program, which were unrelated to the treatments but which, nevertheless, required their taking medications that affect weight loss and behavior (*e.g.*, amphetamines and cortisone). The 11 males who completed treatment were not sufficiently numerous to allow statistical analyses of sex effects. At the same time, it was judged unwise to include them in analyses of results with females because previous research (Harris, 1969; Stuart and Davis, 1972) has shown that males may respond differently to weight-loss treatment than women. Thus, the males were excluded from analyses. Finally, nine clients were excluded from analyses in order to achieve homogeneity of variance and equality of means among groups with regard to pretreatment weight and percentage overweight. This left a total of 51 adult females comprising the refined sample, 17 from each treatment group. The mean ages of the three groups were 41.8 yr, (SD = 13.0), 44.5 yr, (SD = 10.6), and 37.2 yr (SD = 11.4) and their mean pounds overweight were 33.5 (SD = 20.3), 33.8 (SD = 25.5), and 33.1 (SD = 23.3) for SE, EBC, and SI, respectively.

Using norms developed by Seltzer and Mayer (1965), each subject was categorized as either

Table 1

Mean total bodyweight, per cent overweight, and skinfold thickness measures for each group at each critical session.

<i>Measure</i>	<i>Group</i>	<i>B</i>	<i>T1</i>	<i>T4</i>	<i>T7</i>	<i>PB</i>	<i>FU1</i>	<i>FU2^a</i>
Total bodyweight (lbs)	SE	174.1 (19.0) ^b	170.6 (19.4)	170.1 (18.6)	167.9 (19.1)	167.5 (19.1)	167.4 (20.4)	168.0 (21.8)
	EBC	171.4 (23.4)	169.9 (23.3)	165.3 (24.1)	163.0 (24.4)	161.0 (24.2)	161.9 (26.0)	161.7 (25.9)
	SI	166.9 (22.9)	163.5 (21.4)	159.7 (20.7)	157.5 (20.0)	156.5 (19.7)	154.8 (20.4)	153.4 (22.2)
	SE	21.1 (15.5)	18.8 (15.7)	18.4 (15.5)	16.9 (16.0)	16.5 (15.9)	16.6 (16.9)	17.5 (17.7)
Per cent Overweight	EBC	21.7 (19.9)	20.7 (19.8)	17.4 (20.5)	15.8 (20.6)	14.7 (20.5)	15.1 (22.0)	15.0 (22.5)
	SI	22.2 (17.3)	19.7 (16.4)	17.0 (16.1)	15.4 (15.8)	14.8 (15.9)	13.5 (16.4)	11.7 (17.9)
	SE	238.6 (11.7)		230.8 ^c (13.8)		231.8 (13.7)	228.6 (15.6)	
	EBC	241.5 (7.6)		237.2 (7.8)		236.5 (10.4)	234.8 (9.1)	
Normalized Skinfold Thickness	SI	230.2 (14.8)		228.5 (14.3)		226.3 (14.5)	224.9 (15.0)	

^aEntries for SE and SI at FU2 are based on 16 subjects per group. All others based on 17 subjects per group.

^bStandard deviations in parentheses.

^cSecond skinfold thickness measures were actually taken at either T3 or T4.

Table 2

Analyses of variance and planned comparisons for total bodyweight and per cent overweight.

<i>Source</i>	<i>Bodyweight</i>			<i>Per cent Overweight</i>	
	<i>df</i>	<i>MS</i>	<i>F</i>	<i>MS</i>	<i>F</i>
Treatments	2	2442.64	0.89	22.6	0.01
Subjects in Treatments	48	2730.10		1859.2	
Sessions	5	721.73	66.46****	359.4	68.33****
Treatment-by-Session Interaction	10	26.24	2.42***	14.64	2.78***
Subjects by Sessions within Treatments	240	10.86		5.26	

F^a VALUES for PLANNED COMPARISONS

<i>Source</i>	<i>Bodyweight</i>		<i>Per cent Overweight</i>	
	<i>T1-T7</i>	<i>T7-FU1</i>	<i>T1-T7</i>	<i>T7-FU1</i>
SE	5.87**	0.15	6.14**	0.13
EBC	36.66****	0.98	37.86****	0.86
SI	27.56****	5.99**	29.73****	6.21**
SI < (SE, EBC)	0.68	2.06*	1.64	2.24*
EBC > SE	6.60**	0.18	6.73**	0.16

^a1240 degrees of freedom for all comparisons

* $p < 0.20$

** $p < 0.025$

*** $p < 0.01$

**** $p < 0.001$

obese or overweight according to pretreatment skin-fold measurements. This resulted in the refined sample of each treatment group consisting of four obese and 13 overweight women. This rough balancing should have avoided confounding of treatment effects with obesity. More desirable would have been analyzing obesity/overweight as a separate variable. Unfortunately, the limited number of obese women in the final sample (four per group) did not permit such analysis.

Treatment Effects

Bodyweight. The total bodyweight data for each group at each critical session are presented in Table 1 and Figure 1. These data were analyzed through a mixed model, repeated measures analysis of variance with three levels of the treatment factor and six levels of the repeated sessions factor. This analysis, presented in Table 2, yielded significant sessions and treatment-by-sessions effects, indicating that all groups lost weight and that there were significant differences among the groups in the amount of weight lost. This interaction was examined by testing separately for each group the significance of losses during treatment, T1 to T7, and during the first part of the followup, T7 to FU1. These analyses indicated significant losses for each group between T1 and T7; however, only SI led to significant losses between T7 and FU1.

The experimental hypotheses were that both SE and EBC would exceed the effects of SI and that EBC would do better than SE. The first was tested by planned comparisons between SI means and pooled means for SE and EBC. The second hypothesis was tested by planned comparisons between the EBC and SE means. For losses during treatment, T1 to T7, the SI mean and pooled EBC and SE means did not differ, while EBC losses during T1 to T7 significantly exceeded those of SE. Similar comparisons for losses during followup, T7 to FU1, indicated a tendency for greater losses for SI than for EBC and SE, but no difference be-

tween EBC and SE. *Post hoc* comparisons between SI and SE and between SI and EBC showed no significant differences for either T1-T7 or T7-FU1.

Percentage overweight. For each subject's weight at each of the six critical sessions, the corresponding percentage overweight was calculated. From a standard table (Basic Health Publications, 1974), the "average weight" of women of each subject's height and age was obtained. For each subject, then, percentage overweight was calculated by dividing by average weight the difference between actual weight and average weight. The resulting data for each group are presented Table 1 and in Figure 1. Analyzed in the same manner as the total bodyweight data (Table 2), these data showed significant sessions and treatment-by-sessions effects, indicating that all groups decreased percentage overweight and that there were significant differences among the groups. As with the bodyweight results, comparisons for each treatment between T1 and T7 indicated that all three groups led to significant losses during treatment, while comparisons between T7 and FU1 means indicated that only subjects in SI continued to lose significant amounts after treatment ended.

Analyses of the major experimental hypotheses were carried out through the same planned comparisons as used in the analysis of total bodyweight data. For T1 to T7, the SI mean did not differ from the EBC and SE means. The hypothesis that EBC would lead to greater losses than SE was supported, however, by the comparison of EBC and SE losses during T1 to T7. For the T7 to FU1 differences, the same comparisons indicated a trend for greater losses with SI than with SE and EBC, but no difference between EBC and SE. As with total pounds, *post hoc* comparisons were not significant for differences between SI and either EBC or SE during T1 to T7 or T7 to FU1.

The results of the analyses of changes in bodyweight and changes in per cent overweight support several conclusions. All groups had

Fig. 1. Mean total bodyweight, per cent overweight, and skinfold thickness for each group at each critical session.

significant losses during treatment. SI equalled the statistically pooled effects of EBC and SE, while the effects of EBC surpassed those of SE during treatment. SI was the only treatment associated with continued losses between T7 and FU1.

Skinfold thickness. As described in the Method section, subcutaneous skinfold thickness measurements were made four times during the weight-reduction program at B, T3 or T4, PB, and FU1, at intervals of 5, 5, and 6 weeks, respectively. These data are presented in Figure 1. Groups were not equated on this measure at pretreatment, resulting in a significant F max test for homogeneity of variance on the pretreatment baseline measures ($F = 3.826$, $p < 0.05$), although a one-way analysis of differences among pretreatment means was not significant. To reduce the effect of the heterogeneity of variance, analyses of skinfold thickness measures were based on scores normalized according to Edwards (1955). These data are presented in Table 1.

A repeated measures analysis of variance of the normalized skinfold scores indicated a significant main effect of sessions, $F(3,144) = 24.42$, $p < 0.001$, a borderline difference among the treatment groups across sessions, $F(2,48) = 2.94$, $p < 0.10$, and only a trend for a treatment-by-sessions interaction, $F(6,144) = 1.52$, $p < 0.20$. While these results indicate that the treatments were generally effective, it appears either that the skinfold thickness measure is too insensitive or that differences between treatments were too slight to be reflected in this analysis. The borderline effect for treatments, across trials, indicates that future studies should probably balance groups at pretreatment for skinfold thickness.

Second Followup

Before a mini-treatment presentation of the best treatment combination from the program, subjects were seen at FU2, 16 weeks after T7, and nine weeks after FU1. Because of non-attendance, both SE and SI had one subject

fewer at FU2 than at previous meetings, preventing the FU2 data from being incorporated into earlier analyses. Consequently, one-way analyses of variance for change scores between T1 and FU2 and between T7 and FU2 were completed and followed by planned comparisons parallel to those used in earlier analyses, testing differences between SI means and pooled means of EBC and SE and differences between EBC and SE means. The analyses of the followup period, T7 to FU2, supported the effects manifest in previous analyses of T7-FU1 differences. For both percentage overweight and total bodyweight, the main effects were not significant, $F_s(2,46) = 1.49$ for both measures, but the planned comparisons with pooled means of EBC and SE indicated that SI was the only group to lose weight during followup, $F_s(1,46) = 2.74$, 2.78 , $p < 0.20$, 0.20 for total pounds and per cent data, respectively. For neither pounds nor percentage data did planned comparisons indicate a difference between EBC and SE, $F_s(1,46) = 0.36$, 0.22 , respectively.

Analyses of the total treatment effect from T1 to FU2 mirrored previous analyses. For pounds overweight, the main effect of treatments was of borderline significance $F(2,46) = 2.59$, $p < 0.10$, and planned comparisons indicated a trend toward an advantage of SI over the pooled effects of SE and EBC, $F(1,46) = 2.87$, $p < 0.10$, and a trend for EBC to exceed SE, $F(1,46) = 2.39$, $p < 0.20$. The same analyses of the percentage overweight data yielded highly similar effects for the main effect of treatments, $F(2,46) = 2.79$, $p < 0.10$, for the planned comparison of SI with both SE and EBC, $F(1,46) = 3.23$, $p < 0.10$, and for the comparison of EBC with SE, $F(1,46) = 2.44$, $p < 0.20$. For changes from T1 to FU2 in both bodyweight and percentage overweight, *post hoc* analyses indicated a trend for superiority of SI over SE, $p < 0.20$ for both measures.

Satisfaction and attributions. The means of the followup questionnaire's items regarding subjects' rating of change, satisfaction with the program, and attributions of change either to

themselves or to external factors are presented in Table 3. All of these measures were assessed with analyses of variance and planned comparisons of the pooled mean of SE and EBC with the means of SI and of SE with EBC.

On the client rating of change, SI was rated higher than EBC or SE, ($F_{1,38} = 6.71$ $p < 0.025$), the latter two not differing from each other. There was no significant difference among the groups on the sum of the three items assessing the extent to which the program was "enjoyable", "interesting", and "meaningful and involving". There was a borderline difference indicating that SE was rated as more interesting than EBC, $F_{(1,39)} = 3.69$, $p < 0.10$.

The measures of subjects' attributions were analyzed by summing across the five self-attribution items and five external-attribution items, deriving for each subject a general measure of endorsement of self- and external-attribution views of the treatment. There were no significant differences among the groups on the external measure; however, on the self-attribution measure, the SI mean was significantly greater than the pooled SE and EBC means, $F_{(1,40)} = 25.40$, $p < 0.001$, the latter two not differing from each other.

DISCUSSION

Several conclusions seem warranted from these results. SE alone, appears to be a *relatively* ineffective weight-loss procedure. It is important to understand that this study tested only SE, not the total treatment package of Stuart (1967; Stuart and Davis, 1972). Whether or not SE is effective when used with the rest of Stuart's treatment package or with other procedures is not ascertainable from the present study. Second, although more effective than SE, EBC is no more effective than SI in producing initial weight losses, and along with SE appears to be less effective than SI with regard to maintaining or increasing losses following treatment. Finally, the simple, easily

Table 3

Means for each group for measures of satisfaction and attributions.

Measure	Group		
	SE	EBC	SI
Client Rating of Change	5.4 (1.1) ^a	4.9 (1.4)	6.2 (0.6)
Sum: "Enjoyable", "Interesting", "Meaningful and Involving"	18.5 (3.0)	16.4 (3.2)	17.9 (2.8)
External Attributions Score	25.2 (4.4)	26.0 (3.9)	25.0 (3.9)
Self Attribution Score	22.7 (5.0)	23.5 (3.8)	30.3 (2.7)

^astandard deviations in parentheses

implemented set of procedures that made up SI, seems to constitute a promising weight-loss treatment.

As indicated in the introduction to this paper, these results should be seen in the context of recent evidence concerning the generality of the findings of Schachter and his colleagues (Schachter and Rodin, 1974) regarding the supposed hypersensitivity to external cues of the obese. The finding that SE procedures, designed to control and eliminate external eating cues, may be less effective than other, less restrictive procedures should lead one to question the practical importance of the hypersensitivity to external cues literature.

In a parallel manner, the success of SI supports current questioning of assumptions that the overweight eat in a manner grossly different from the eating habits of normalweight individuals. While EBC was designed to focus specifically and exhaustively on what and how individuals eat, SI included a general strategy for self-control, leaving subjects free to do what seemed best for them encouraged by the feedback obtained through goal-oriented weight graphing. It may be that the eating habits encouraged by EBC are unrealistic relative to those of normalweight individuals. The more moderate demands of SI may be more compatible with the eating rituals of contemporary

American culture. This may make changes in behavior, encouraged by SI, more likely to be maintained and may account for the followup results obtained in the present study.

It is important to note, however, the limitations of the present study. That is, it leaves entirely unassessed the nutritional effects of any treatment. It may be that SI encourages maintained weight losses through poor nutrition. Nutrition is increasingly appreciated as an important concern in weight-loss procedures (McReynolds, Lutz, Paulsen, and Kohrs, 1976), suggesting the importance of future research on the nutritional effects of SI or on combinations of extensive nutritional counselling with SI procedures.

Perhaps the most striking implication in the SI results is the possibility that well-reasoned procedures may be effective without being overly elaborate or burdensome for either clients or therapist. As discussed in the introduction, concern has been expressed about the intrusiveness of behavioral approaches. SI subjects rated treatment gains as greater than those in SE or EBC, indicated greater attribution of treatment effects to themselves, and were the only ones to continue to lose during followup. These results suggest that attention should be paid to subjects' reactions to the demands made of them by treatment.

A major limitation of the present findings needs to be pointed out. The present sample was predominantly middle-class and overweight (as opposed to obese). Whether these findings will generalize to other populations is an important question. Indeed, a recent study carried out with subjects who averaged 39% overweight (McReynolds et al., 1976), furnished evidence that a program with heavy emphasis on stimulus control strategies (situational engineering) may be more effective than a combined treatment (Wollersheim, 1970) when judged at six-month followup. Also, the weight losses reported herein are not substantial enough to be clinically significant. For this reason, these techniques need to be evaluated with clients of

clinical concern in an extended treatment program.

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