

TREATING OVERWEIGHT CHILDREN THROUGH PARENTAL TRAINING AND CONTINGENCY CONTRACTING¹

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Fifteen overweight girls aged 5 to 11 yr were randomly assigned to one of two weight-reduction treatments: response-cost plus reinforcement, response-cost only, or a no-treatment control group. In the response-cost plus reinforcement group, parents contracted to facilitate their child's weight loss by carrying out reinforcement and stimulus control techniques, completing weekly charts and graphs, and encouraging their child to exercise. The response-cost only group parents did not contract to reinforce their child's performance. The response-cost program applied to both experimental groups was conducted in weekly meetings in which parents lost previously deposited sums of money. Twenty-five per cent was deducted for missing the weekly meeting, 25% for failing to fill out charts and graphs, and 50% if their child failed to meet her specified weekly weight-loss goal. At the end of the 12-week treatment period, both experimental groups had lost significantly more weight than the control group. After an eight-week, no-contact follow-up, some of the lost weight was regained. The response-cost plus reinforcement group was still significantly below the controls. The response-cost group just missed significance. A 31-week, no-contact follow-up failed to show a treatment effect, but did show a trend towards slower weight gain by the response-cost plus reinforcement group.

DESCRIPTORS: weight control, children, contingency contracting, fines, home-based reinforcement, obesity, parents as therapists, parental training, response cost

Because overweight children tend to become overweight adults (Abraham, Sand, and Nord-sieck, 1960; Crisp, Douglas, Ross, and Stone-hills, 1970; Mullins, 1958; U.S. Public Health Service, 1966), there have been attempts stemming from various theoretical viewpoints to curb the problem of childhood obesity. However, psychodynamically oriented counselling, drug treatment with amphetamines, and thera-

peutic fasting, have been either ineffective (Stuart and Davis, 1972), problematic because of side effects (U.S. Public Health Service, 1966) or tolerance (Collipp, 1972), or in the latter case considered inadvisable (American Academy of Pediatrics: Committee on Nutrition, 1967).

Recently, behavioral technology has been applied to the problems of overweight adults. Using aversion therapy, Kennedy and Foreyt (1968, 1971) and Meyer and Crisp (1964) reported favorable results; Manno and Martson (1972) found that both positive covert reinforcement and negative covert sensitization produced weight loss. Bernard (1968) and Upper and Newton (1971) employed token economies on hospitalized obese schizophrenics to obtain weight losses. Further, contingency contracting and response-cost procedures have also been used successfully in treating obesity and maintaining normal, stable eating habits among adults (Harris and Bruner, 1971; Jeffrey and

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Christensen, *unpublished*; Mann, 1972). Finally, following the conclusions of Bullen, Reed, and Mayer (1964), Huenemann, Hampton, Shapiro, and Behnke (1966), and Stefanik, Heald, and Mayer (1959) that the obese tend to exercise less than their normal peers, Penick, Ross, Fox, and Stunkard (1971) and Stuart (1971) incorporated exercise programs in addition to stimulus control techniques in their weight-reduction treatments.

Unfortunately, few studies have involved overweight children. Dinoff, Rickard, and Colwick (1972) successfully employed gradually increasing weight-loss contracts with a 10-yr-old "emotionally disturbed" boy, while Foxx (1972) used social reinforcement to effect weight loss in a 14-yr-old, slightly retarded, overweight girl. There have been no studies in which parents have been trained to initiate and maintain weight-loss programs for their children.

Since behavioral techniques have been demonstrated to be effective in treating overweight adults, and because of the paucity of studies dealing with children, the present study treated with behavioral techniques overweight children 5 to 10 yr of age. Parents were taught behavior-modification techniques to alter their children's eating and exercise habits in order to effect a weight loss. Additionally, via contingency contracting (response cost) with the experimenters, parents were penalized when their children failed to meet weight-loss criteria.

METHOD

Subjects

Fifteen female subjects, 5- to 10-yr old, were obtained from pediatric referrals and newspaper advertisements. Children were considered overweight if both their physician and parents recommended that they participate in the weight-loss program. Any subject undergoing psychotherapy, drug therapy, or who was involved in a weight-reduction program was excluded. All families in the study owned bath-

room scales. Subjects were randomly assigned to one of three groups as follows: Group 1—response-cost plus reinforcement; Group 2—response-cost only; Group 3—controls.

Apparatus

Apparatus consisted of:

1. Physician permission form (adopted from Jeffrey, Christensen, and Pappas, *unpublished*) for both experimental groups. This indicated that it was medically safe for the subject to lose a specified amount of weight over a 12-week period.

2. Daily weight and calorie graphs, calorie counter guide (*Food and Your Weight*, U.S. D.A. Bulletin No. 74, 1967), and eating diary (adopted from Jeffrey *et al.*, *unpublished*) for parents of subjects in both experimental groups.

3. Weight reduction program behavioral contract for parents of subjects in both experimental groups (adopted from Jeffrey *et al.*, *unpublished*).

4. Daily exercise instructions and program for parents of subjects in both experimental groups.

5. Nutritional information (*Nutrition*, U.S. D.A., 1971) for parents of subjects in both experimental groups.

6. Instructions in stimulus control techniques for parents of subjects in both experimental groups (adopted from Jeffrey *et al.*, *unpublished*).

7. A copy of *Living with Children* (Patterson and Gullion, 1971) and information in reinforcement techniques for parents of subjects in the response-cost plus reinforcement group.

8. Reinforcement diary for parents of subjects in the response-cost plus reinforcement group.

9. Sears spring bathroom scale guaranteed to be within plus or minus one-pound accuracy for 5 yr (used for the weight checks).

Procedure

Three baseline measurements were obtained over a two-week period for both experimental

groups. At the first baseline meeting, measurements of height were also taken. Control subjects were measured on the same day as the experimental groups at home. After measurement, the control subjects were informed that the program was closed at the present time but that they would be able to participate at a later date. At the second baseline meeting, both experimental group parents were given similar response-cost contracts and told to bring back money for deposit by the following week. They were also told to decide on a weight-loss goal of between one and two pounds per week for their child. The amount of money deposited was based on a sliding scale of income *versus* number of dependents. For example, a family with four dependents and a \$9000 annual net income would deposit \$36 for the 12-week treatment period; a family with six dependents and a \$7000 annual income would deposit \$12. The range of deposits was \$12 to \$30. Parents were also told that if they dropped out of the program without first consulting the experimenters, their deposits would not be refunded.

At the third baseline meeting, the following was accomplished:

1. Parents, according to group, were given an overview, explanation, and rationale.
2. Materials were handed out and parents were told to read them and prepare to discuss their content.
3. Physicians' permission forms were collected.
4. Parents received final specific instructions (*i.e.*, filling out their child's charts and exercise procedures).
5. Response-cost contracts were completed, signed, and money was collected. All monies were deposited in a special checking account.
6. Children were weighed. At this and all subsequent sessions, children were sent to a playroom after weighing while the experimenters discussed the program with and trained their parents.

The two experimental groups underwent a 12-week treatment procedure that consisted of the following:

Response-cost plus reinforcement group. This group received the exercise program, nutritional information, and stimulus control information. The exercise program consisted of a daily series of calisthenics that increased in difficulty over a three-week period. At this time, it levelled off so that the child did about 30 min of exercises per day. Each day that the child completed her prescribed exercises, she was given a check mark on the exercise chart by her mother. Nutritional information consisted of discussions of the content of *Food and Your Weight* (U.S. D.A. Bulletin No. 74, 1967) and *Nutrition* (U.S.D.A., 1971). Stimulus control information consisted of implementing such techniques as training to eat more slowly, delaying gratification, eating in one designated area, eating low-calorie snacks, leaving food on the plate, and making nonfattening foods look more palatable.

Parents in the response-cost plus reinforcement group also kept a daily food diary and graphed daily caloric intake and weight of their children. These parents were given a response-cost contract that required them to deposit a specified amount of money with the experimenters. Since treatment consisted of a 12-week period, these parents were required to deposit a sum equal to 12 times the amount of the weekly level set by the sliding-income scale. They could redeem the money in 12 weekly installments as follows: 25% weekly for attendance, 25% weekly for bringing completed graphs and charts to the meeting, and 50% weekly for their child losing the predetermined amount of weight as set by the contract. Finally, parents in this group received instructions on reinforcement and changing their child's behavior. First, they received a copy of *Living with Children* (Patterson and Gullion, 1971); contents were continuously discussed at subsequent meetings. Second, each week a reinforcer for losing weight was negotiated between parent, child, and experimenters. Other reinforcing events such as

praise, tokens, and money were discussed and negotiated for daily caloric reduction, following stimulus control techniques, and doing the exercises. To enable the experimenters to monitor the reinforcing events, parents in this group kept a daily reinforcement diary in which they recorded specific reinforcers, the behavior being reinforced (*i.e.*, following stimulus control techniques and exercises), and when the reinforcer was dispensed.

Response-cost only group. Parents of these subjects received the same treatment as parents in the former group, except that they were not given reinforcement information nor did their contract stipulate that their children were to receive reinforcement for desired eating behaviors and weight loss; *i.e.*, they did not receive *Living with Children* (Patterson and Gullion, 1971) or the reinforcement diary. Moreover, reinforcement procedures and weekly reinforcement contracts were not discussed.

Both groups. The contract stipulated that both groups chart daily caloric intake and weight, and implement the exercise program for their children. In addition, these parents were given an eating diary in which they indicated by meal the antecedent events, kinds and amounts of food ingested, their caloric values, and finally events subsequent to eating. It was also recommended that they decrease their children's daily caloric intake in accordance with what their physician had suggested on the physician's permission form. Every six weeks the unearned, surplus money was divided among successful parents, who received bonus money, the amount being determined by how often during the preceding six weeks their child had met weight-loss criterion. Subjects' and parents' successful progress in implementing the treatments according to group was discussed and verbally reinforced by the experimenters. Unsuccessful progress was ignored.

Control group. Pre- and postweights and heights were measured but no contact was made with the control group during treatment. After treatment, there was an eight-week, no-

contract follow-up for all three groups. Finally, there was a postfollow-up check 31 weeks later. After treatment, parents in the experimental groups had been asked to continue the procedures they had learned.

Reliability. To ensure reliability, the experimenters independently read all height and weight measurements in the presence of the parents. If there were any inter-rater discrepancies on weight, the child was weighed again. Weights were recorded when there was inter-rater agreement on two consecutive measurements.

RESULTS

Results were analyzed using 12 subjects. In the response-cost plus reinforcement group, one subject dropped out after the second treatment week. In the response-cost only group, two subjects failed to arrive at the first baseline meeting; a phone call indicated that they had decided not to participate. The control group remained intact. Table 1 illustrates individual subjects' pre, post, follow-up, and postfollow-up age, height, weight, and net weight gain or loss.

The mean initial baseline weight (in pounds) for each group was: response-cost plus reinforcement group, 105.5; response-cost only group, 105.3; control group, 99.3. An analysis of variance on the pretreatment means showed no differences between groups ($F = 0.093$, $df = 2/9$, $p < 0.05$). At the end of treatment, an analysis of variance was performed on the mean difference measures in terms of net weight gain or loss for each group. The children in the response-cost plus reinforcement group lost an average of 11.3 pounds. Children in the response-cost only group averaged a weight loss of 9.5 pounds; children in the control group gained 0.9 pounds. This analysis showed a significant effect for treatment ($F = 12.42$, $df = 2/9$, $p < 0.01$). Figure 1 illustrates the cumulative mean weight loss or gain for each group. The computed omega square equalled 0.65, and indicates a strong statistical association between

Table 1
 Individual's age, height, and weight gain or loss. Group 1 indicates response-cost plus reinforcement; Group 2, the response-cost only group; Group 3, the control group. Prewrite is the mean baseline weight, except for controls who received only one premeasure on weight.

Group	Sub- ject	Age	Height			Weight			Net Change Treatment	Net Change Follow- up	Net Change Post Follow- up		
			Pre	Post	Follow- up	Pre	Post	Follow- up					
1	1	10-1	60.00	60.50	61.00	62.62	107.33	94.00	100.50	113.50	-13.33	-6.83	+6.17
	2	9-6	61.00	61.00	61.00	61.75	112.66	101.00	105.00	111.00	-11.66	-7.66	-1.66
	3	10-11	58.75	58.75	59.00	60.00	121.00	112.00	116.00	120.50	-9.00	-5.00	-.50
	4	7-3	53.50	53.50	53.75	54.25	81.33	70.00	69.00	74.50	-11.33	-12.33	-6.83
2	5	10-6	58.75	59.00	59.50	59.75	114.16	100.50	102.50	116.00	-13.66	-11.66	+1.84
	6	9-6	56.50	56.50	57.00	61.00	109.16	96.50	100.00	115.00	-12.66	-9.16	+5.84
	7	9-11	55.00	55.50	55.50	56.75	90.33	88.00	96.00	104.50	-2.33	+5.67	+14.17
3	8	5-10	50.50	50.50	50.50	—	77.00	79.50	82.00	—	+2.50	+5.00	—
	9	6-4	48.50	49.75	50.00	50.50	69.50	74.00	74.00	85.00	+4.50	+4.50	+15.50
	10	10-11	65.00	65.25	65.25	68.00	143.00	142.00	144.50	148.00	-1.00	+1.50	+5.00
	11	9-3	55.50	56.00	—	57.75	123.00	118.50	—	119.00	-4.50	—	-4.00
	12	9-4	52.50	53.25	53.50	—	84.00	87.00	87.50	—	+3.00	+3.50	—

the experimental treatment (Groups 1 and 2) and the dependent measure weight loss.

A Newman-Keuls test for unequal *n*'s (Winer, 1971) was performed between all pairs of mean net gains or losses. This test indicated that the response-cost plus reinforcement, and response-cost only groups, lost significantly more weight than the control group ($p < 0.01$ and $p < 0.05$ respectively), but were not significantly different from one another. Figures 2 and 3 show the cumulative weight loss or gain for individual children in the response-cost plus reinforcement and response-cost only groups respectively. Figure 4 shows the individual net loss or gain for the control group.

Eight-week follow-up results were analyzed using 11 subjects, as one of the controls had entered another treatment program. An analysis of variance was again performed on the mean difference measures in terms of net gain or loss for each group. At this time, the chil-

dren in the response-cost plus reinforcement group maintained an average weight loss of 7.9 pounds. Children in the response-cost only group maintained an average weight loss of 5.0 pounds, and children in the control group showed a net gain of 3.6 pounds. This analysis showed an effect for treatment at follow-up ($F = 5.41$, $df = 2/8$, $p < 0.05$). The Newman-Keuls test for unequal *n*'s (Winer, 1971) indicated that the response-cost plus reinforcement group had gained back significantly less weight than the controls ($p < 0.05$). But the response-cost only group just missed significance ($p < 0.06$).

Thirty-one weeks after treatment ended, post-follow-up measures were taken. At this time, children in the response-cost plus reinforcement group maintained an average weight loss of 0.7 pounds; children in the response-cost only group showed an average net gain of 7.3 pounds. Two subjects in the control group (8

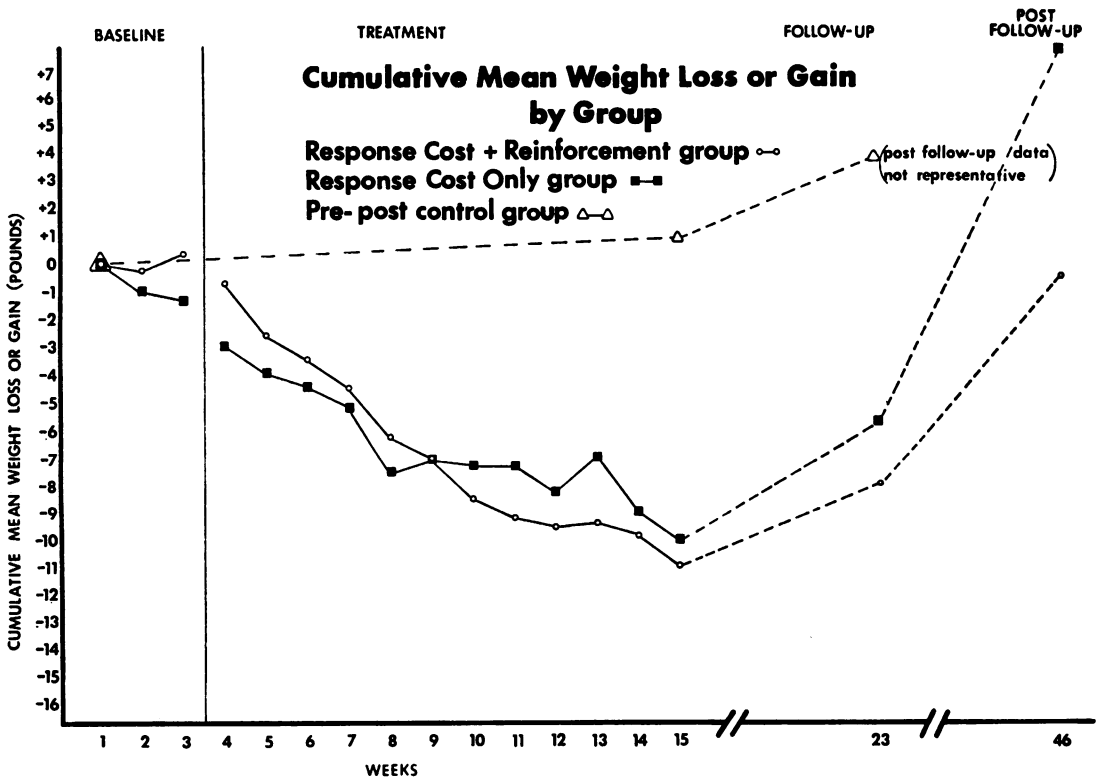


Fig. 1. Mean weight loss or gain in pounds as a function of weeks of treatment for the three groups.

and 12) were not available and Subject 11 could not be used because of participation in another treatment program. Therefore, a *t* test (Hays, 1963) was performed on the two experimental groups. These results showed that the groups were not significantly different at post-follow-up ($t = -1.99, df = 5, p > 0.05$). However, the individual and mean data in Figures 1 to 4 suggest a trend for the response-cost plus reinforcement group to have regained less weight than those in either of the other groups.

Table 2 shows group assignment as a function of source of referral. As can be seen, the remaining three subjects in Group 2 came from newspaper referrals. Unfortunately, the two that dropped out of the program in this group were physician referrals. Both left for medical reasons (a serious illness in one family and a subject's broken leg in the other). Considering the explanations given, there does not seem to

be any reason to attribute a systematic drop-out rate for physician referrals. Nor does there seem to be any systematic differential performance by physician or newspaper referrals in the individual data for Groups 1 and 3.

DISCUSSION

The present study demonstrated that behavior-modification techniques can be successfully used to enable parents to help their children lose weight.

Table 2

Subjects as to source of referral: N = newspaper, P = physician.

Group	I				II			III				
Subject	1	2	3	4	5	6	7	8	9	10	11	12
Source of Referral	N	P	N	P	N	N	N	P	P	N	P	N

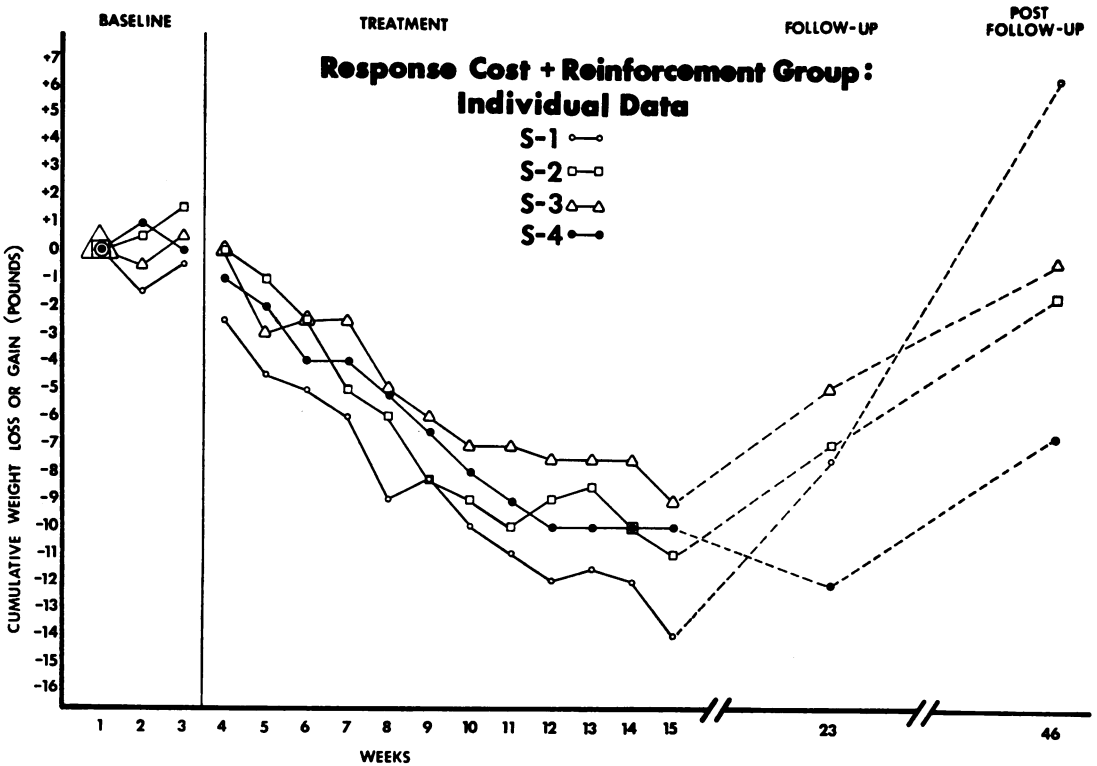


Fig. 2. Weight loss or gain in pounds as a function of weeks of treatment for the response-cost plus reinforcement group (individual data).

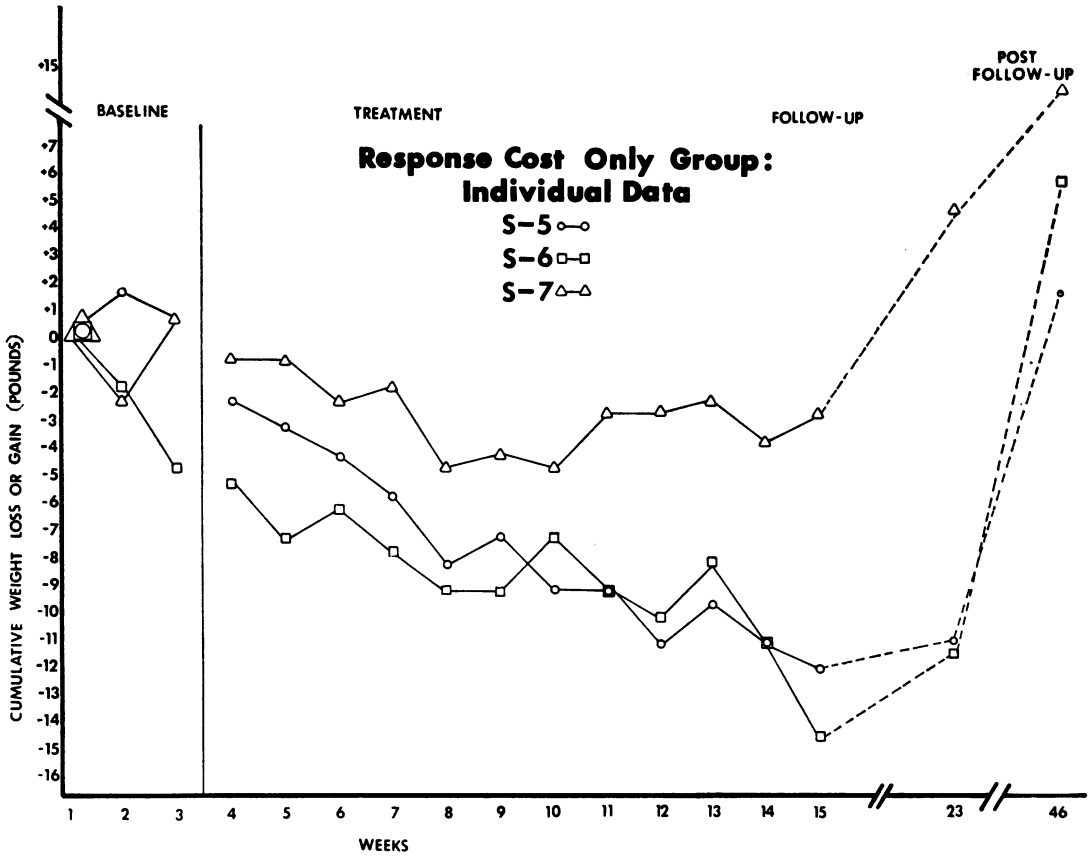


Fig. 3. Weight loss or gain in pounds as a function of weeks of treatment for the response-cost only group (individual data).

At the end of treatment, there was no significant difference between the two experimental groups, probably because parents in the response-cost only group reinforced their children's weight loss. Thus, Subject 5, who lost 13.6 pounds, was given part of her mother's response-cost money for weekly weight loss. Subject 6, who lost 12.6 pounds, was offered clothes. Subject 7, who lost only 2.3 pounds, was never observed to be under any contingency. Thus, it seems that the controlled behavior-modification instructions and weekly negotiated reinforcers were initially no more effective than the uncontrolled reinforcement procedures introduced by parents of subjects in the response-cost only group. However, this does not suggest that reinforcement techniques are not valuable in a children's weight-loss program.

During the first and second follow-up, both treatment groups regained some of the weight lost during treatment. It would be expected that these subjects would gain weight as a result of maturational development, including growth in height. However, the response-cost plus reinforcement group regained weight more slowly than the response-cost only group. This may indicate that parents in the response-cost plus reinforcement group were more likely to continue their effective use of reinforcement procedures than were parents in the response-cost only group. Perhaps the addition of a post-treatment contingency contract to ensure the long-range maintenance of weight loss attained during treatment would have been a valuable addition to the procedure.

In general, it would seem that a program using these techniques would be a community

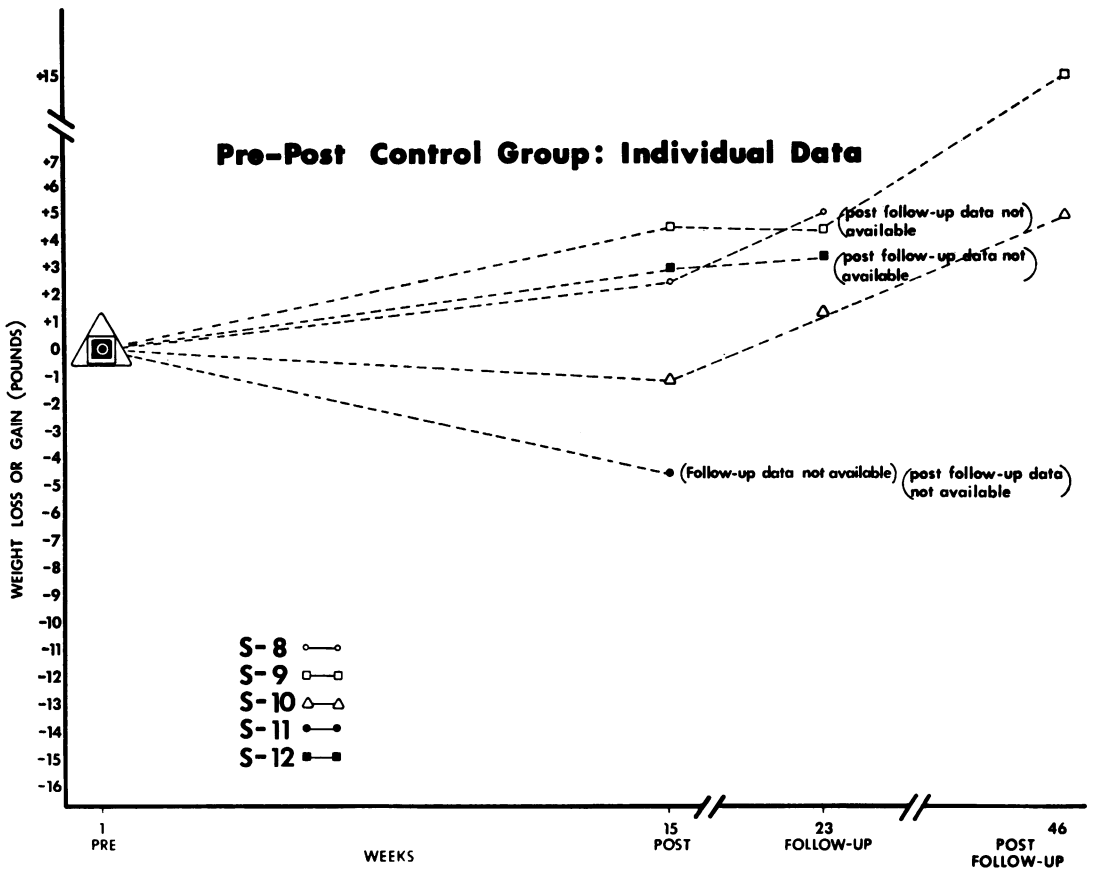


Fig. 4. Weight loss or gain in pounds as function of weeks of treatment for the control group (individual data).

asset in helping overweight children. Given the evidence that childhood weight problems persist into adulthood and lead to many medical problems, development of an effective preventative program is desirable.

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