Self-Reward, Self-Monitoring, and Self-Punishment as Feedback in Weight Control

LEONIDAS CASTRO

HOWARD RACHLIN

State University of New York at Stony Brook

A group of subjects who "punished" themselves for losing weight by paying money proportional to weight loss and a group who paid money irrespective of weight loss lost as much weight as a group who "rewarded" themselves for losing weight by taking money proportional to weight loss. The result calls into question the distinction between self-reward, self-punishment, and self-monitoring. The three procedures were equally effective as response feedback. Their differing incentive valences did not result in behavioral differences.

One current theory of self-reward in behavior therapy (Bandura, 1976) asserts that self-reward may act on a response in the same way that external reward does. That is, a self-imposed feedback stimulus of positive affect is assumed to increase the strength of the response it follows because of its positive affect. To test this theory, it is necessary to compare self-imposed feedback of various affective valences—of positive affect and of neutral or negative affect. In other words, self-reward must be compared with self-monitoring and self-punishment. In making this comparison, the salience of the various feedback stimuli must be balanced in the three procedures so that affect alone operates. If there is any validity of self-reward as a mechanism for behavioral control distinct from self-imposed feedback, it would have to be shown that, with equal salience of feedback, self-reward was more effective than self-monitoring and still

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1 In this sense, the concept "self-reward" is like the concept "superstition" (Skinner, 1948). It supposes that temporal contiguity between response and reward is sufficient to strengthen the response regardless of the environmental dependency of reward on response. Staddon and Simmelhag (1971) have demonstrated with pigeons that reinforcement does not work this way.
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more effective than self-punishment which, because of negative valence, might be expected to retard acquisition of the target response.

Several studies have compared self-reward with self-monitoring (summarized in Jones, Nelson & Kazdin, 1977), but none has attempted to balance salience of feedback. This may be due partly to a failure to consider that feedback alone can enhance responding and partly to the difficulty of measuring and balancing salience of positive, negative, and neutral stimuli.

The present study of weight loss attempted to make the required comparison with salience (approximately) balanced. We compared three groups: self-reward, self-monitoring, and self-punishment (against a no-treatment control). For the self-reward group we duplicated as best we could the self-reward group of a study (by Mahoney, 1974) frequently cited (e.g., Bandura, 1976; Jones et al., 1977; Thoresen & Mahoney, 1974) as evidence for the efficacy of self-reward. The reward involved the subjects' taking money. For the self-monitoring group we strictly enforced self-monitoring and in addition asked for fixed payments not contingent on weight loss. For the self-punishment group we tried to make the punishment exactly opposite to the reward. The stimulus conditions for self-punishment and self-reward were the same, but wherever the self-reward group took money the self-punishment group gave money. In this way we tried to balance salience of the feedback.

Our purpose was essentially negative. It is impossible to show definitively that self-reward can never have an effect greater than an equally salient feedback stimulus. We can only show that there is reason to question the significance of the studies that now purport to show such an effect.

METHOD

Subjects

All subjects, recruited through local newspaper advertisements, were at least 18 years of age and 15% or more overweight by international standards. On the basis of their self-reported height and weight, the initial percentage of overweight was computed for each applicant by dividing current number of pounds overweight by ideal weight (Feinstein, 1959).

Two sets of subjects were involved separated by a two-week interval during the summer of 1977. The eligible respondents, numbering 48 and 50 in each set were ranked according to percentage overweight, and from stratified blocks were randomly assigned to one of four conditions: (1) self-reward for weight loss, (2) self-monitoring; (3) self-punishment, and (4) delayed-treatment control. Subjects assigned to the first three groups were given appointments for an initial treatment session, held separately for each group in the two treatment sets. Subjects assigned to the delayed-treatment condition were told that they would receive treatment eight weeks later and were given individual appointments for baseline weigh-in and assessment.
Of the total number initially assigned to experimental conditions, 46 (3 males, 43 females) actually started treatment for both recruitment series combined: Group 1 (self-reward), N = 13; Group 2 (self-monitoring), N = 10; Group 3 (self-punishment), N = 13; Group 4 (delayed treatment control), N = 10. Of the 46 subjects initiating treatment, 9 dropped out before the end of the study, 2 from the self-monitoring group, 3 from the self-reinforcement group, and 4 from the self-punishment group. Data from these subjects were excluded from analysis.

Experimenters

Three undergraduate research assistants, two males and one female, with no previous experience in research with human subjects and restricted knowledge about the nature of the experimental hypothesis, were the experimenters. Their contact with subjects involved providing and gathering information in the initial telephone contact, scheduling appointments for the treatment meeting, assisting in the treatment meeting, taking baseline weight and height, and conducting individual weigh-ins during the experimental period. Each experimenter had contact with subjects in all three treatment groups.

The six treatment sessions (three groups in two series) were led as follows: four Stony Brook graduate students in clinical psychology each led one treatment session; a Ph.D. clinical psychologist led two sessions. Treatment leaders were randomly assigned to conditions. Maintenance meetings at the end of treatment and the treatment meeting for the delayed-treatment condition were led by a graduate student.

Procedure

Each subject attended one 2-hour meeting, eight individual weekly weigh-ins, one group maintenance meeting at the end of the 8-week treatment, and one individual follow-up 2 months later.

Treatment session. Upon arrival, each subject was asked to fill out a questionnaire adapted from the Weight Reduction Clinic Questionnaire (Roswell, note 2) which asked for demographic information, chronicity, family history, addictive behaviors, previous attempts to lose weight, activity level, eating habits, attribution, expectation of success in treatment, motivation, commitment, and expected environmental support. Subjects were given a therapy manual consisting of rules for modifying eating habits (Ferster, Nurnberger, & Levitt, 1962; Stuart & Davis, 1972) and heard a lecture on its use. All subjects were asked for a $25.00 deposit and instructed that failure to attend a weigh-in would result in a $5.00 fine, deducted from the deposit. The self-reward group was asked for a $16.00 fee in addition to the deposit.

Subjects then read instructions which, for the self-reward group, included the following passage:

you will be getting your fee back as you lose weight. You are free to decide on the amount of money you deserve for each pound lost, although the total
amount with which you reward yourself over the 8-week period cannot be more than $16.00. Therefore, we suggest that you award yourself $1.00 for each pound lost since the previous weigh-in. If you lose the 16 pounds that we recommend by the end of the treatment, you will have gotten back your fee... You will find a change machine near the scale from which you may take, privately, the amount of money you decide to award yourself.

The self-monitoring group was instructed, "Each week at the weigh-in, you will pay a fee of $2.00, for an eight week total of $16.00 for the program."

The self-punishment group read:

- you will be paying your $16.00 fee, only as the treatment is being effective. You are free to decide on the amount of money you will pay for each pound lost, although the total amount you will have paid us over the 8-week period does not have to be more than $16.00. Therefore, we suggest that you pay $1.00 for each pound lost since the previous weigh-in. If you lose the 16 pounds that we recommend by the end of the treatment, you would have paid the $16.00 fee... You will find a change machine near the scale where you can deposit, privately, the amount of money you decide to pay us.

Each subject was given seven daily self-report cards, stamped and preaddressed. These were 8 × 5 in. cards with space at the top to record date, weigh-in time, weight, and subject's code. The card had seven rows to record (a) time at which eating began, (b) amount of food consumed, (c) description of food, (d) calories, (e) place, (f) emotional state, and (g) time eating ended. A new supply of seven cards was provided at each of the subsequent weekly weigh-ins. At the end of the session baseline height and weight measures were taken, subjects paid deposits, signed informed consent forms, and made appointments for the following weigh-in.²

Weekly weigh-ins. These constituted the experimental manipulation of the present study. They were held individually for each subject at the Psychological Center at Stony Brook. One research assistant met and escorted the subject to the scale, recorded the weight, and informed the subject of gain or loss since the previous weigh-in. The experimenter avoided making any additional comments. From this point on the procedure was different for each group.

Group 1, self-reward. After the difference in weight was told to the subject, the experimenter left the room and waited outside while the subject rewarded him/herself privately. A three-barrel commercial money changer filled with $16.00 in quarters was installed next to the scale at all weigh-ins. After the subject had the opportunity to use the machine, he or she met the experimenter outside and received a new set of self-report cards and stamps for the following week, and a new appointment was set.

Group 2, self-monitoring. After the experimenter informed the subject

² A more detailed description of these materials, including the complete instructions to subjects, is given in Castro (Note 1)
of the difference in weight, the subject paid a fixed weekly $2.00 fee directly to the experimenter. No money changer was available in this condition. Otherwise, the treatment was the same as for Group 1.

Group 3, self-punishment. After the experimenter informed the subject of the difference in weight, he or she left and waited outside while the subject put money in the machine privately. The money changer was initially empty in this condition. Otherwise, the treatment was the same as for Group 1.

**Maintenance meeting and assessment.** At the end of the eight week treatment period, one-hour maintenance meetings were held separately for each of the three experimental conditions. Subjects filled out a *maintenance questionnaire* which included a series of 70 rating scales on consistency in following each of the treatment rules, effectiveness of each rule in changing eating habits, and degree of difficulty in following and implementing each rule. Questions from the baseline questionnaire on eating habits, expectations of change, and motivation were also included to assess differences from baseline. Finally, questions about use of methods other than those recommended by the treatment during the previous eight weeks were also included. After the questionnaire was filled in, the meeting started with an open discussion about the effects of the program on each participant. The leader had participants identify areas of difficulty and suggested ways to deal with them. Basic components of treatment were briefly reviewed.

Subjects were instructed to continue at home using the same experimental procedures as before. The self-reward group was told to continue to take money for weight-loss from a supply kept in a jar or held by a family member. The self-monitoring group was given no specific suggestions about money. The self-punishment group was told to deposit money in a jar or give money to a family member depending on weight lost.

During the maintenance period each waiting-list control subject was given one of the experimental treatments (half, self-reward and half, self-punishment). However, the experimenters were different and the self-monitoring procedure was not strictly enforced.

**Follow-up.** Eight weeks after the maintenance meeting, individual follow-ups were held, at which weight was taken and the $25.00 deposit returned.

**RESULTS**

The reduction quotient, i.e., number of pounds lost since baseline over percentage of overweight at baseline, was used as the main measure of change. This index introduced by Feinstein (1959) and used in later studies on the effects of self-reinforcement in maintenance of weight loss (Mahoney, Moura, & Wade, 1973; Mahoney, 1974) controls for variations in height, weight, and percentage of overweight. Comparisons among groups at baseline did not reveal any significant differences in reduction quotient. Two additional measures were calculated: percentage of over-
weight (current weight minus ideal weight over ideal weight) and percentage of body weight lost since baseline. (Results for these measures were generally the same as for reduction quotient and will therefore not be discussed further.)

Treatment effects

Figure 1 shows mean reduction quotient as a function of weeks of treatment for each group. All three experimental groups consistently lost weight throughout the experimental phase. Subjects in the self-punishment group lost weight at a higher rate than subjects in the other two experimental groups, while those in the no-treatment control group actually gained weight.

Even though apparent differences among groups in percentage of overweight at baseline were not statistically significant, $F(3, 31) = .126, p > .25$, as a conservative precaution this measure was used as covariate in the analyses of covariance performed subsequently to assess the significance of differences. Analyses of covariance with repeated measures across the eight weigh-ins were performed for the three experimental groups. Differences in reduction quotient from baseline to the end of treatment were significant, $F(7, 161) = 16.68, p < .0001$. That is, weight loss was statistically significant for all three experimental groups. However, the three groups were not statistically different from each other ($p < .61$).
Body-weight changes at the end of the treatment were evaluated by one-way analyses of covariance performed for the four groups. A significant effect of treatment was found, $F(3, 30) = 3.87$, $p < .019$. A Duncan's multiple range test for $p < .05$ showed that only the no-treatment group differed from each of the other groups at that level of significance.

The waiting-list control group lost weight when it was finally exposed to treatment (during the maintenance period of the other groups). The weight loss of this group on average was less than that of the other three (perhaps because of the less effective self-monitoring procedure). However, there were no significant differences between any of the groups by the follow-up session.

**Maintenance**

Figure 1 shows that subjects in the three experimental conditions successfully kept their weight low over the 2-month maintenance period. Subjects in the self-monitoring and self-punishment conditions continued to lose weight; those in the self-punishment group lost a greater amount of weight at follow-up than any other of the groups.

Analyses of covariance with repeated measures carried out through the maintenance period for the three experimental conditions again revealed a significant weight reduction from baseline to follow-up, $F(8, 184) = 9.55$, $p < .0001$. One-way analyses of covariance of weight reduction at follow-up did not yield any significant difference among the four groups possibly because the waiting-list control group had by then received treatment.

The conclusions of the statistical analysis of weight change through the end of treatment can thus be extended through follow-up: the experimental procedure was effective in maintaining weight loss after the end of treatment, although the experimental treatments did not differ significantly among each other in maintaining weight loss.

**Questionnaire Measures**

The experimental treatment did not produce any appreciable changes in self-reported eating habits, motivation, commitment to treatment, expectations of success, target weight, or expected environmental support.

Product-moment correlation coefficients were computed between scores on each of the items of pre- and posttreatment questionnaires and each of the four dependent measures at baseline, end of treatment, and follow-up. None of the answers to items of the baseline questionnaire correlated significantly with changes in weight either at the end of treatment or at follow-up. However, ratings of overall consistency in following the experimental treatment, perceived effectiveness and difficulty of the overall treatment, and observed weight change showed a significant positive relationship with weight change at the end of treatment. Ratings of consistency and perceived effectiveness of each of the individual components of the treatment, i.e., each of the 19 rules, self-monitoring, daily weight, and weekly weigh-ins all showed significant positive relationship
with reduction quotient at the end of treatment, while some of the ratings on perceived difficulty of individual components showed the same trend. These results seem to indicate that self-rated consistency in the application of the experimental procedure was associated with improvement at the end of treatment.

Consistency of "Self-Reward" and Response Cost

Table 1 shows the average amount of money paid or received by the three experimental groups and the average number of pounds lost or gained since the previous weigh-in. The average amount of money paid by subjects in the self-punishment condition was higher than the amount of money obtained by subjects in the self-reward group on six of the eight weigh-ins. Product-moment correlation coefficients between weight change since previous weigh-in and amount of money paid or obtained at weigh-ins were computed for each subject of groups 1 and 3 (for group 2 the correlation was zero by definition). Significant correlations were shown by 70% of subjects in the self-reinforcement condition and 50% of subjects in the self-punishment condition.
DISCUSSION

Because of the purpose of this study and the findings of no difference among experimental groups, the conclusions we can draw are strictly limited. The "no differences" can be compared with the significant differences that we did find, and our procedures can be compared with the procedures of other experiments that did find significant differences among experimental groups. Doing only this, however, is enough to call seriously into question the belief that self-reward is a more effective procedure in behavior therapy than self-monitoring or self-punishment.

First, it is clear that the subjects in the three experimental groups lost significant amounts of weight as compared with subjects in the no-treatment control. We can look to the study by Mahoney (1974), the design of which we imitated, for a standard by which to compare the weight loss of our subjects. Subjects in our self-reward group lost on the average about the same amount of weight as subjects in the most effective of Mahoney’s conditions (also self-reward); subjects in our self-punishment group lost more. Furthermore, unlike Mahoney’s subjects, who gained weight during the maintenance period, the self-punishment group continued to lose weight during the maintenance period.

If self-monitoring was no less effective than self-reward in our experiment why was it less effective than self-reward in other experiments? As indicated above, our self-reward group lost as much weight as that of Mahoney (which is some evidence that we succeeded in imitating the self-reward conditions of Mahoney’s experiment). It is unlikely that the difference in results was due to the differences in the self-reward groups of the two experiments. The difference in results is more likely to be due to differences in the self-monitoring groups. Our self-monitoring group, unlike that in Mahoney’s (1974) experiment, paid us money at each weigh-in. The exchange of money at the weigh-ins common in all groups in the present experiment might have been salient enough to have strengthened the dieting of all subjects.

One of us has argued (Rachlin, 1974) that it is inappropriate to mix cognitive and behavioral explanations of a phenomenon, and we shall not do so here. It may be appropriate, however, to discuss some psychological phenomena from a purely cognitive point of view. But self-reward is not one of these phenomena; it does not necessarily lend itself to discussion in cognitive terms. A fundamental axiom in cognitive psychology is the assertion that reinforcement does not work unless the subject believes

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1 One difference, however, was that Mahoney took 2 weeks of baseline data before instituting the self-reward procedure, whereas our experiment contained no baseline period. There was some loss of weight by subjects in Mahoney’s experiment during baseline, which could have reduced the apparent effectiveness of the self-reward procedure in Mahoney’s (1974) experiment.
that the reinforcer is contingent on the response. Mere contiguity between reinforcer and response is insufficient (Estes, 1964; Levine, 1971; Wallach & Henle, 1942). For self-reinforcement to work cognitively, the subject must not believe that the reinforcer is not contingent on the response so as to institute self-reinforcement and then believe that the reinforcer is contingent on the response so that the self-reinforcement will work. This seems far-fetched.

Another interpretation of our results, which may be fairly termed a "psychodynamic" approach, holds that subjects feel guilty about getting something for nothing and thus are "rewarded" when asked to pay for losing weight. Our self-monitoring and self-punishment groups might really have been reward groups in disguise. But what, then, of our self-reward group which received money for losing weight? The "psychodynamic" approach must hold that they should feel more guilty and thus be punished. If it is rewarding to pay for something, as our self-punishing subjects did, it must then be punishing to get money for that same thing, as our self-rewarding subjects did, and one must then still face the fact that there was no significant difference between our self-reward and self-punishment groups.

One could suppose that entirely different mechanisms mediated behavior of the various groups of subjects who behaved similarly. It behooves proponents of those mechanisms to say what they are and to show how postulation of their existence is useful.

In this experiment self-reward was effective only insofar as it aided self-monitoring. The positive affect engendered by the so-called self-rewarding stimulus added nothing significant to dieting. Whether money was received or paid made no significant difference. Whether the amount received or paid was self- or experimenter-determined made no significant difference. Subjects still lost weight. And if these factors (the so-called self-rewards and self-punishments) were insignificant in our experiment, there is every reason to believe that they were insignificant in other experiments in which they were used. Our results suggest that their apparent significance in other experiments may have been due to other factors (enforcement of self-monitoring or salience of feedback stimuli).

There were effective rewards in these experiments (ours, and others on weight control). These were the rewards offered by society and human physiology, actually contingent on losing weight. Evidently, such rewards and the stimulus relationships that may have brought the subjects' behavior into sharper focus were the significant factors. The spurious contingency between a response and a self-reward did not seem to matter.

REFERENCE NOTES

REFERENCES


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