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THE REINFORCEMENT EFFECTS OF  
CONTINGENT SELF-REWARD

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE  
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## ABSTRACT

The purpose of this study was to examine the reinforcing effects of contingent self-reward with college students on an intellectual, though boring task. Forty-five male and female college students were instructed to work on a pile of simple addition problems for as long as they wished. Subjects in the self-reward condition presented themselves with sections of a television film contingent upon a fixed-ratio schedule that they had selected from three alternatives. An experimenter-rewarded group, yoked to the self-reward subjects in terms of the schedule upon which they were reinforced, received the movie sections automatically. A control group received rest-periods instead of sections of the film.

The results supported the hypothesis that contingent self-reward can have reinforcing effects. The self-reward group completed significantly more problems than the control group; however, there were no significant differences in number of problems completed between the self-reward and the experimenter-rewarded groups. Two other measures, rate of performance and increase in rate of performance over time, reflected no significant reinforcement effects for the two rewarded groups over the control group. Individual differences in the rate of performance and the relative stability of these measures are believed to account for the lack of effects.

A model analyzing self-reinforcement into two separate behavioral sequences and a discussion of the applications and generalizability of the results were presented.

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## CHAPTER I

### Introduction

A frequently observed phenomenon is that humans can engage in long series of behaviors and in strenuous persistence tasks, seemingly without much or any reinforcement accruing from external sources. In an effort to explain these behaviors which seem to contradict the Law of Effect, concepts such as vicarious- and self-reinforcement have been invoked. It is the self-reinforcement process that is the concern of the present study.

The term "self-reinforcement" has been used unsystematically in the psychological literature, referring to qualitatively different mechanisms of behavioral strengthening. Two broad categories of meaning can be discerned: the self-reinforcement process in which no external administration of a reward occurs and that in which a person administers contingently to himself a reward upon having performed a target behavior.

Staats' writings reflect the first mentioned conceptualization: self-reinforcement occurs in those situations "where the stimuli produced by the activity itself are the reward that maintains the activity. When this state occurs, it is not necessary to provide external reward, at least to the same extent as it is when no

intrinsic (self) reinforcement is available (Staats, 1971a, p. 197)."

A few behavioral examples will clarify this position. Mowrer (1960) argues that the maintenance of frequent babbling in infants is the result of the fact that the parent's voice, which often accompanies feeding or meeting other basic needs of the infant, acquires through classical conditioning reinforcing capacity. When an infant babbles, it produces sounds similar to those of the parent's voice, and this self-emitted sound will be reinforced along a generalization gradient of similarity to the parent's voice. An infant may thus babble without any observable reinforcement, simply because the stimuli produced by the activity have acquired reinforcing value. Staats (1971a) describes the manner in which imitative responses might be maintained in an analagous fashion. An important person in the life of the child is frequently paired with reinforcement. Thus, through classical conditioning, not only the person himself, but also his behaviors may take on positive characteristics. The closer the behavior of the child matches that of the rewarding person, the more will that behavior be reinforced.

According to Staats (1971a) pleasure in learning for its own sake, need for achievement, standards and rivalry can be seen as part of the self-reward system formed through classical conditioning. Initially, overcoming obstacles,

performing long sequences of behavior, and boring repetitions of acts when practicing a skill are not rewarding in and of themselves. However, for a child who has frequently been praised for mastery of skills, the ability to acquire a skill will itself become rewarding. Similarly, when a child is only rewarded for a certain standard of achievement, the standard itself will acquire positively reinforcing characteristics. The closer an individual matches his internalized standards, the greater will be the resulting reinforcement. A person may thus be motivated to work until he has matched his standard.

The above description has shown how the construct of self-reinforcement has been invoked to explain the maintenance of certain behavioral events in which the lack of observable external reinforcement is so remarkable. As already mentioned, the term self-reinforcement has been used to describe and explain another sequence of behavior, distinct from the above, namely, the strengthening of behavior as a result of contingent self-reward. Self-reinforcement defined in this manner constitutes the focus of the present study.

Skinner (1953) is generally quoted as the originator of the idea that a person may be able to control himself by functioning as his own reinforcing agent, applying to his behavior a contingent reward. Not only does this conceptualization have far-reaching implications for the

clinical field, but it also provides a bridge between the humanist and the behaviorist. As our own contingency managers, we are invested with self-determining characteristics, but the self-determination process can be explained within a behavioristic framework.

The potential importance of self-verbalizations as a vehicle for an individual to provide his own reinforcement has been stressed by Staats (1971b). Words have been shown to be capable of eliciting emotional responses in humans as a result of higher order classical conditioning. Thus, the words "good," "well done," "that was a clever thing you did," all can be used as conditioned reinforcers to modify the behavior of another person. Staats suggests that in a similar fashion one may be able to strengthen or modify one's own behavior. For example, after performing a certain difficult piece of work, we may say to ourselves, "That was well done!" and in that manner strengthen such future behavior. Little research has yet been performed to assess the effectiveness of verbal self-reinforcement. It seems, however, that it may be very difficult to assess separately the verbalizations "that was well done," "very good," etc. from the feedback derived directly from the stimuli produced by the response. As suggested by Staats (1971a), an individual may carry within him an image of a standard of performance. Meeting the requirements of that standard may act as the reinforcer,

while the verbalization "good" may only be an additional event that has little reinforcement value of its own.

Cautela reports some success in the modification of certain neurotic behaviors by instructing the S to use rewarding (1970) or punishing (1967) images contingent upon imagining the target behavior. It is difficult to pinpoint the actual mechanism for such modifications. This "covert sensitization" and "covert reinforcement" are identical processes in terms of the sequencing of the images (first the target behavior is imagined, then its consequence) and yet, Cautela uses classical conditioning to explain covert desensitization and operant conditioning to explain covert reinforcement.

The self-administration of a material reward has been studied to some extent. At present there are two core groups of researchers in this area: Bandura and his associates, and the Marston and Kanfer group. Bandura (Bandura & Perloff, 1967) conceptualizes the self-reinforcement process as consisting of four components: (a) a self-prescribed standard of behavior that serves as a criterion for self-evaluation; (b) a social comparison process, consisting of a comparison of one's own performance to that of a reference group; (c) freely accessible reinforcers under the persons own control; (d) the person serving as his own reinforcing agent.

Research on self-reinforcement, defined as the

strengthening of a response by the self-administration of a reward, has focused on three issues: (a) the acquisition of the self-reinforcing response; (b) the variables affecting the self-reinforcement response; and (c) the motivating or reinforcing effects of self-reinforcement, i.e., the question of whether self-applied "reinforcers" really reinforce.

The following discussion will describe some of the more important studies in those areas. Since the present study is concerned with the reinforcing effects of contingent self-reward, major emphasis is given to investigations in that area.

#### The Acquisition of Self-Reinforcing Responses

Mahoney and Bandura (1972) demonstrated that pigeons can be taught to reward their own performance contingently. Contingent self-reward was maintained in two pigeons for over 800 test trials, even though they had free access to the food and were not punished for non-contingent self-reward during those trials. The training procedure consisted of the following method: the food hopper was faded in at earlier and earlier stages of the pecking responses until it was introduced before the pigeon began to peck; if the bird entered the food hopper before pecking, the hopper was immediately removed.

One pigeon was successfully trained to impose higher and higher criteria of performance for self-reward by

gradually increasing the work requirements up to a fixed-ratio schedule of nine. At this point the pigeon suddenly stopped rewarding himself contingently and began to feed freely without performing any more pecking responses. Mahoney and Bandura were able to re-establish contingent self-reward after extinction in all of their experimental pigeons. However, the resistance to rule violation was never again so strong as after the initial training.

Humans can acquire self-reinforcing behaviors through direct differential reinforcement as shown by the Kanfer and Marston (1963) study. The Ss in this investigation were presented with a subliminal discrimination task in which no stimulus was actually presented. During a training phase the positive self-reinforcement (SR) group was encouraged to say that their own responses were correct and to ask for reward-chips without hesitation. A negative SR group was discouraged from asking for chips by instructing them to feel very confident in being correct before asking for a chip. Furthermore, the E gladly gave chips to the Ss in the positive SR group, while he only grudgingly gave them to the negative SR group. At the end of training the SR positive group said they were correct and asked for chips on 58% of the trials, while the SR negative group demanded chips only on .2% of the trials. When, after training, the groups were tested for generalization on another task, it was found that the SR positive group

reinforced themselves with tokens significantly more frequently than the SR negative group.

Bandura and his associates have demonstrated in a number of studies that self-reinforcing behaviors can be acquired through observations of a model. Generally, the following basic method was used: in an initial phase children observe a model playing a bowling game and rewarding himself with either candy or tokens and praising himself upon achieving a certain standard or score on the game; in a second phase the Ss are asked to play the game themselves. The performance of the Ss is usually predetermined, a fact of which the Ss are ignorant. The dependent variable is generally the level of performance for which the Ss reward themselves.

It has been found that children adopt self-reinforcing responses that closely match those of the model to which they had been exposed (Bandura & Kupers, 1964). That is, when children observed a model rewarding himself for only high performances, they would adopt those standards for rewarding themselves when they were playing the game, while children exposed to a model rewarding himself for low-level performances, would also reward themselves for low performances. Children that were confronted with a situation in which the adult model imposed different standards of reinforcement on himself than those with which he rewarded them, rewarded

themselves for intermediate performances when they were asked to play the game (Mischel & Liebert, 1966).

A study by Bandura, Grusec and Menlove (1967) investigated the degree of nurturant relationship between the model and the S, the social reinforcement that the model received for high standards of reinforcement, and the presence or absence of a peer model who adopted a low standard for self-reward as opposed to the high standard of the adult model. It was found that rewarding the adult model for high standard setting, enhanced the adoption of high criteria for self-reinforcement. The additional presence of a peer model reinforcing himself for low performances and a high level of nurturance on part of the adult model lowered the adoption of the high criteria for self-reward by the observing Ss.

McMains and Liebert (1968) and Liebert and Allen (1967) found that verbalization of the rule for self-reinforcement increase the adoption of stringent self-reward standards and decreased violations of the rule.

#### Determinants of Self-Reinforcing Responses

Kanfer and Marston and their associates have studied a number of variables that are related to the frequency and accuracy of self-reinforcing responses. The basic design that they used to investigate various determinants is as follows: in an initial phase the Ss are presented with a discrimination task, usually consisting of about

10 sets of four syllables presented randomly. The Ss are required to select the correct syllables in each set. A light signals to the S that he has chosen correctly. Trials are continued until a specified criterion of correct responses has been achieved. In the second phase, one group, the self-reinforcement group (SR), is instructed to turn on the light themselves whenever they think they are correct. It is this turning on of the light by the S himself that constitutes the self-reinforcement response in these studies.<sup>1</sup> The accuracy of the responses is not previously rigged and thus can vary from one S to the next.

A study by Kanfer and Marston (1963) found that the more advanced the stage of learning, the more frequently and the more accurately Ss rewarded themselves. Lenient instructions for self-reinforcement produced more frequent, but also more incorrect self-reinforcement than more stringent instructions. When test stimuli were different from Phase 1 to Phase 2, the self-reinforcement occurred less frequently, but more inaccurately than when the test stimuli were the same in the two phases. However, similarity or difference in type of reinforcement did not affect the self-reinforcement pattern.

In an investigation varying task ambiguity and type of reinforcer, Marston (1964) found that on structured tasks, on which Ss could observe their learning as a function of practice, Ss reinforced themselves more during the later

stages of the learning task than did the group of Ss in the unstructured, ambiguous task, where learning was not observable. Different reinforcers (chips, light, or ratings of confidence in being correct) did not produce significant differences in the reinforcement patterns.

Several personality variables have been found to correlate with frequency and accuracy of self-reinforcement as measured by the Kanfer and Marston paradigm described earlier. Task-oriented Ss tend to reward themselves more frequently than interaction- or self-oriented Ss as measured on Bass' Inventory (1962) and task-oriented females more than task-oriented males (Marston, 1964). Frequency of self-applied punishment has been found to be related to characteristics measured on the Social Desirability (Crowne & Marlow, 1960), on Coppersmith's Self-Esteem Inventory (1959) and on Rotter's Internal and External Control scale (Rotter et al., 1966) and also to task orientation (Marston & Cohen, 1966).

Although patterns of self-reinforcement can be directly established through differential reinforcement and through modeling, and although their occurrence depends on a variety of situational factors described above, it has been shown that, once established, self-reinforcement patterns can be relatively stable over tasks (Kanfer, Duerfeldt, & Le Page, 1969) and that they can be transmitted through a series of models (Mischel & Liebert, 1966).

### The Motivating or Strengthening Effects of Self-Reinforcement

The above review demonstrates that self-reinforcement responses can be established through the usual learning principles involved in the learning of a behavior. But what function, what purpose do these self-rewarding, self-evaluative behaviors serve? Since these responses have been called self-reinforcement, it is implied that they reinforce the behavior upon which they are contingent.

Skinner (1953), when introducing the concept of self-administered reward, questioned whether self-reward could function to reinforce behavior in the same manner that consequences administered by another person have been found to do. In analyzing the self-reinforcement process, Skinner writes, "The place of operant reinforcement in self-control is not clear. . . . self-reinforcement presupposes that the individual has it in his power to obtain reinforcement, but does not do so until a particular response has been emitted (p. 237)." The ultimate question is whether positive self-reinforcement results in any strengthening of the behavior upon which it is contingent. Skinner presents the example of a man, denying himself social contact until he has finished a certain job. Would this man be more likely to perform such a similar behavior when he makes social contact contingent upon having performed the job? Skinner's answer is indefinite, "It would

not be surprising if he were not (p. 238)."

Sixteen years later, Bandura seems confident of the important role that self-reinforcement plays in behavioral control. Two quotations from Bandura's book Principles of Behavior Modification will exemplify this position: "Although the controlling power of externally occurring consequences cannot be minimized, self-reinforcement may frequently outweigh the influence of external outcomes in governing social behavior, particularly in the case of older children and adults. . . . People typically set themselves certain standards of behavior and self-administer rewarding or punishing consequences (p. 32)." "Response patterns may be effectively maintained by self-reinforcement operation under conditions of minimal external support. It is perhaps because of the stabilizing effects of self-reinforcement that persons do not ordinarily behave like weathervanes in the face of conflicting contingencies of reinforcement (p. 37)."

The discussion will now turn to the studies which supposedly have provided evidence for the conclusion that self-reward can reinforce behavior.

#### Laboratory Studies on the Reinforcing Effects of Contingent Self-Reward

Marston and Kanfer (1963), using a design similar to the one described earlier, investigated the effects of self-reward in extinction. During Phase I all Ss were

presented with the nonsense syllable discrimination task, the light acting as a reinforcer and indicating correct responding. In Phase II the Continued Acquisition (AC) group continued to receive the light for correct responding; the Self-Reinforcement (SR) group was instructed to take control of the reinforcement light and reward themselves by switching the light on whenever they thought that they were correct; a third group, the Extinction (EXT) group, no longer received the light without any clarifying statement or instructions. It was found that the AC group continued to learn, the SR group continued to perform at the same level of competence as at the end of Phase I, while the EXT group's performance decreased during Phase II. Evidence for the motivational capacity of self-reinforcement was believed to be found by the authors in the decline of correct responding in the EXT group as opposed to the SR group.

The SR and EXT groups, however, not only differed in terms of the presence or absence of the reinforcing light, but also in terms of instructional cues. The EXT group, after having received the light indicating a correct response, suddenly, in Phase II no longer received the light. One would expect these Ss to wonder what is wrong with their correct responses and to attempt to discover a new rule that will again turn on the light, in this manner extinguishing their old responses. The SR group, on the

other hand, are instructed to take over the control of the reinforcing light, indicating to them that they should continue responding as they had previously. Thus, it may well be that the difference in performance between the SR and the EXT groups during Phase II is the result of instructional differences rather than due to the presence or absence of the reinforcer.

Some evidence for this interpretation of the results can be found in a study by Marston (1964). Once more the learning task consisted of the usual discrimination task, the light being presented to different groups on different schedules. In Phase II three conditions existed: regular extinction, instructed extinction (Ss were instructed to continue to respond as they had during Phase I, but told that they would no longer receive the light), and a self-reinforcement group. No differences were found in the performances of the various groups. Although this study was not a direct replication of the Marston and Kanfer (1963) study, the results do make their conclusion from the earlier study somewhat weaker.

A further study by Kanfer and Duerfeldt (1967), also interpreted by the authors to have demonstrated reinforcing effects of self-reward, presented Ss with a geometric discrimination task. In Phase I all Ss, with the exception of the No-Reinforcement (No-R) group, received 60% non-contingent reinforcement, i.e., a light labelled correct

was made contingent upon a response 60% of the time, whether the response was correct or incorrect. During Phase II, the External-Reinforcement (ER) group continued to receive the light, the Self-Reinforcement (SR) group were given control of the light with instructions to switch it on whenever they thought that they were correct, while the Extinction (EXT) group no longer received the light. During Phase III the light was removed from all conditions. The results showed that the ER group's performance increased slightly from Phase I to Phase II and then decreased again slightly in Phase III. The SR group's performance continued to increase over the three phases. It was concluded that the use of self-reinforcement enhanced performance in extinction.

The study once again, however, has design problems that make the interpretation of the results questionable. The F test for Phase I and II showed no significant differences in performance for any of the four groups (the No-R group did not perform more poorly than the groups receiving reinforcement), making the reinforcing function of the light questionable. If the light had had any significant reinforcing effect, one would expect a difference between the No-R and the groups that were reinforced during Phase I. From a logical standpoint, one would actually predict the results of no-difference, since the supposed reinforcer, the light, was presented noncontingently upon the accuracy of the response.

A further factor confounding the results is the difference in amount of non-contingent reinforcement received by the ER and the SR groups during Phase II. In this phase the reinforcement procedure favored the SR group over the ER group. Specifically, the ER group continued to receive non-contingent reinforcement, i.e., the light would flash for incorrect responses occasionally. On the other hand, the SR group could turn on the light whenever they thought that they were correct. In this manner they did not receive as much erroneous feedback as the ER group. In fact they administered to themselves the light 7.5% more frequently contingent upon a correct response. It is interesting to note that in Phase III, the SR group performed 7% more accurate responses than the ER group. On the basis of the two criticisms described, it is concluded that this study by Kanfer and Duerfeldt does not provide evidence for self-reinforcement.

Montgomery and Parton (1970) instructed their self-reward Ss to pull a lever each time that they believed they had made a correct response, rather than switching on a light for self-reinforcement as in the Kanfer and Marston studies. A second self-reward group gave themselves pennies in addition to the lever press. The task consisted of pushing one of three buttons in response to the presentation of one of five colors. The Ss received no information about the correctness of their choice at any point in the

experiment. The implicit hypothesis was that the Ss would be more likely to press the same button to the same stimulus light on subsequent occasions, if he had rewarded himself on previous trials for that response.

The authors found an increase over blocks of trials in the proportion of matched responses (a matched response is one that is the same as the response on the last presentation of that particular light) that had been rewarded on the previous trial. The proportion of matched responses that had not been rewarded, however, decreased over trials. The difference between these two proportions was enhanced for the lever-plus-penny condition. The authors concluded that their results provided evidence for the reinforcing effects of self-reward.

Once again the study is open to criticism that precludes such a conclusion: (a) A control group that did not give themselves any reward--lever or penny--was not included. Thus, the increase in matched and previously self-rewarded responses and the decrease in matched, but previously unrewarded responses may simply be the result of the Ss becoming more consistent in their response tendencies over trials. The interpretation that the difference between the lever and the lever-plus-penny condition is due to differences in reward magnitude may also be questioned, since the Ss knew at the beginning of the experiment that they could not keep the pennies. (b) No learning

curve, showing the increase of matched responses and the decrease of unmatched responses over trials was presented. If self-reward had any reinforcing effects one would expect each color of light to elicit more and more frequently the same button-press over trials.

The authors did present the expected and observed proportions of matched responses that were rewarded on the immediately preceding trial. The difference between these proportions, though statistically significant, was actually minimal (.02). Furthermore, the observed proportion of matched rewarded responses was greater than the expected proportion only on Trial Blocks 1 and 4, but less than the expected on Trial Block 2. The difference between the observed and expected proportions, therefore, does not increase systematically over trials as one would predict in a regular learning situation.

Miller and Clark (1970) investigated the reinforcing effects of a conditioned self-reinforcer. Children were presented with a discrimination task. After a S had chosen an answer, the E would point to the correct answer. If the E's and the S's answers coincided, the S was instructed to say "PIB." During the conditioning phase, "PIB" was paired with candy for one group, for another it was paired with praise from the E, and for a third group it was paired with candy and praise. The capacity of "PIB" to act as a reinforcer was then tested on a second learning

task. Once more, after the S had responded, the E would point to the correct item. During this phase, half of the Ss (the self-reinforcement group or SR group) were asked to say "PIB" when their responses corresponded with E's response. The other group of Ss (the no-reinforcement group or No-R group) were told not to use "PIB" any longer, even if they were correct.

Only two comparisons were significantly different from each other on Task 2. The SR group that had "PIB" paired with candy and verbal praise on Task 1 learned significantly faster and made fewer errors on Task 2 than a group that had received no prior training at all on the first task. This SR group was also significantly better than the No-R group that also had candy and praise paired with "PIB" on Task 1, but had been asked to inhibit "PIB" on Task 2. The authors concluded, "The results indicated that a combination of primary and conditioned reinforcers was most effective in developing a verbal conditioned reinforcer, a new one which effectively functioned as a self-reinforcer (p. 5)."

However, not only was E the main source of reinforcement, but E was always present and giving feedback, even on Task 2. The Ss were, therefore, in no way free in their use of "PIB." As a matter of fact, they received very explicit instruction as to its use. Thus, one might question whether this experiment was investigating

self-reinforcement as we have defined it. Furthermore, the finding that the No-R group performed significantly poorer than the SR group on Task 2 may be due to the fact that the No-R group was forced to inhibit "PIB" on that task--"PIB" by that time presumably being a strong response for the No-R group who had been trained to use "PIB" in the first phrase.

Bandura and Perloff (1967) provide the most clear-cut evidence for the motivational powers of self-reward. Children were asked to perform a wheel-cranking response. A self-reinforcement group (SR) selected the number of cranks they wanted to do before rewarding themselves. Whenever they met the criterion, a chime rang and the Ss pressed a button for the delivery of a token. An external-reinforcement group (ER) was yoked to the SR group in terms of the standards of performance required for reinforcement which they received automatically. There were three control groups: a group that received tokens before performing the task, a group that set their own standards but received no tokens, and a group that neither set standards nor received tokens. All Ss were left unsupervised and were free to quit the experiment whenever they wanted. It was found that both the SR and the ER group performed significantly more cranks than any of the control groups.

#### Applied Studies on the Reinforcing Effects of Self-Reward

A study by Lovitt and Curtiss (1970) showed that for their single Ss, self-imposed contingencies were associated with an

increase in academic response rate in relation to teacher-imposed contingencies. However, since the teacher still administered the final reward and the child only determined for what he was to be rewarded, this study is not strictly a demonstration of self-reinforcement.

Johnson (1970) trained children to reward themselves with points contingent upon correct matching to sample responses. He found that a self-reward group performed significantly more correct responses than a non-rewarded group. The experiment, however, may be criticized on grounds that all self-reward Ss did not administer the actual rewards to themselves, but had to trade in their points at the end of the school day to obtain the rewards.

Glynn (1970) compared self-determined, chance-determined, and experimenter-determined token reinforcement with a no-token group on a history or geography learning task in ninth graders. All token-reinforcement was self-administered, i.e., even if the teacher determined the number of tokens for a child, the child took those tokens himself. However, exchange of tokens for the actual reinforcer seems to have occurred in the presence of the teacher. It was found that during the first implementation of the reinforcement system the self-determined and experimenter-determined contingency groups performed significantly better than the control groups. After the contingencies had been withdrawn and then introduced again (during a second experimental phase) the differences between

the groups, though still present, were no longer significant. The author was careful in their conclusions, leaving unanswered the question of whether the results would have been obtained had there been wider limits allowed on the contingency arrangements and on the tokens taken, and had there been no ultimate check by E on the amount of tokens taken.

"Overt" self-reinforcement was used in an applied study by Rehm and Marston (1969) to effect positive change in self-concept, associated reduction in anxiety, and increased approach to feared social situations--specifically, dating girls--in college males. Ss in the experimental group were instructed on hierarchy formation of the feared situations and encouraged to place themselves into more and more difficult social situations with girls. They were presented with a point system for performing various target behaviors and were instructed to reward themselves with self-approval and points. The therapist (E) went over the behavioral successes with the patient (S) on each session and gave verbal approval for points gained. Two control groups were included: a non-specific therapy and a no-therapy group.

The dependent measures consisted of (a) ratings performed by girls of the responses that the male Ss gave to taped social situations with girls; (b) verbal reports by Ss of their subjective discomfort in heterosexual situations; (c) number of dates reported; (d) changes on various paper and pencil tests. The results showed generally no impressive superiority for the self-reinforcement therapy group: the ratings of the SR

groups' social responses were generally not judged significantly better than that of the control Ss; however, self-report measures did show some improvement for the SR group in terms of decreased anxiety and increased number of dates.

The significance of this study is difficult to evaluate. Not only is the study not a true assessment of self-reinforcement, since E was always checking the points that Ss had given to themselves and made praise contingent upon an increase in points, but it also confounded a variety of potentially powerful therapeutic procedures, such as hierarchy formation of feared situations, attempting to cope with problem behavior in graded steps, specific behavioral instructions, and the therapist's approval contingent upon improvement in the target behaviors.

Homme's (1965) conception of increasing self-control by applying Premack's principle (Premack, 1959) to "coverants" or covert operants (thoughts) is relevant to the present definition of self-reinforcement. An example of this procedure is presented by Homme: a person who is trying to write a paper might say to himself, "As soon as I think about this paper I'll get myself some coffee." According to Homme, carrying out this sequence should increase the probability of thinking about the paper, as opposed to another sequence exemplified by the statement "as soon as I get myself a coffee, I shall think about my paper." Thus, Homme hypothesizes that by making an

extrinsic reinforcer contingent upon a covert response, the covert response will increase in strength.

Homme's procedure has been applied to a number of studies attempting to decrease smoking by increasing anti-smoking coverants and making a high probability behavior contingent upon them. The findings thus far are not very encouraging. Kreutzer (1968) found no difference between Homme's procedure and two placebo control groups. Tooley and Pratt's (1967) and Rutner's (1967) studies preclude conclusions on account of inadequate designs. Strand-Johnson (1968) found no difference between Mees' (1966) breathholding technique and Homme's procedure. Ss in both groups improved in comparison to a control group immediately after conclusion of treatment. However, there were no more differences between the treatment groups and the Control Ss after six months.

Watson and Tharp (1972) taught college students to construct a self-modification program using contingent self-reward. They found that desired behavior changes occurred as a result of their program. The book, however, is mainly an instructional book on how to set up such a self-modification program and does not present much data on the effectiveness of the technique. The data that are presented are based on self-reports given to a professor in fulfillment of a course requirement. The reliability of the data must, therefore, be questioned (Simkins, 1971). Furthermore, a

number of other variables were present that might also contribute to behavior change, such as taking baseline recordings of target behavior (Johnson & White, 1971; McFall, 1970), or making a written contract with oneself. With all the different events occurring in their self-modification program it is not possible to determine to what extent Watson's and Tharp's findings are directly the result of self-reinforcement. These authors explicitly acknowledge the contribution of all these other elements.

A number of clinical studies exist using self-punishment procedures upon non-desirable behavior. Self-applied shock was used by Bucher and Fabricatore (1970) to eliminate hallucinatory activity in a schizophrenic. The S was presented with a shock box and instructed to shock himself whenever he hallucinated. Reported hallucinations decreased rapidly, the S was released from hospital and within a week returned to the hospital reporting hallucinations once again.

Weingaertner (1969) investigated a similar self-shock procedure on hallucinations in a group of schizophrenic patients and compared with with a placebo control group that also carried boxes like the shock boxes of the treatment group, and with a no-treatment control group. No differences were found between the shock group and either of the two control groups in terms of overall change in behavior.

Boberg (1968) compared in stutterers the effects of

self-administered and experimenter-administered time-out from speaking contingent upon stuttering. Two out of three Ss showed less relapse into stuttering under self-applied time-out than under experimenter-applied time-out. Since there were so few Ss and a within-subject design was employed with inappropriate controls for order effects, the conclusions must remain tentative.

The above review of the three issues in self-reinforcement indicates that the act of contingent self-reward can be established by the usual methods used in establishing a motor response. However, the conclusion is drawn that the reinforcing function of these self-reward responses is only weakly supported by research. Either the studies have found no maintaining effects of self-reward, or the evidence is marred by design problems that do not warrant clear-cut conclusions. The study by Bandura and Perloff (1967) is the only laboratory study that provides clear support for the reinforcing effects.

Bass (1971) has also questioned the validity of the concept of self-reinforcement. His conclusion, however, is based on a different argument from that presented above. Bass considers the term self-reinforcement to be a redundant and unnecessary addition to operant theory and believes that self-reinforcement effects can be explained in terms of the demand characteristics of the experimental situation. He demonstrated that when the demand characteristics that

are usually present in self-reinforcement studies were changed, self-reward occurred non-contingently. Actually, what Bass showed is that if Ss are rewarded before achieving a pre-set goal, then in a later self-reward situation, they will also reward themselves non-contingently, i.e., previous instructions or treatments will affect the degree to which an individual will reward himself contingently. This finding, however, in no way reflects upon the validity of the self-reinforcement concept.

The present reviewer maintains that the concept of self-reinforcement is a viable one, but that the reinforcing effects still need to be demonstrated without the presence of confounding variables. The studies attempting to show the strengthening capacity of self-reward have generally been inadequate in design. A reason for the many design problems and inconclusive results of the studies described, may be found in the difficulty in conceptualizing the self-reinforcement process. In the following chapter a model is presented that may help to elucidate the situation.

## CHAPTER II

### A Model for the Analysis of the Self-Reinforcement Process

Skinner (1953) showed how certain self-control sequences could be conceived of as two separate behaviors:

(a) the response to be controlled and (b) the controlling response that affects the variables of which the controlled response is a function. For example, in a person who wants to decrease his food intake, eating would be the response to be controlled, while putting a time-lock on the refrigerator would function as the controlling response. Surprisingly, this conceptual scheme has not been adopted systematically in the self-control literature, although most of the current self-control techniques, such as covert sensitization and Homme's use of coverants, can be readily analyzed into those two response sequences (Speidel, 1971).

A similar analysis can clarify the issues involved in self-reinforcement. This process also may be conceptualized as consisting of two behavioral chains, each with their own maintaining reinforcers and their own discriminative stimuli. The response upon which a reward is made contingent is the to be controlled response, while the act of

contingent self-reward is the controlling response (see Figure 1). The hypothesis implicit in self-reinforcement is that the controlled response is reinforced by the controlling response which in turn is maintained by various external events. As shown above, the manner in which the controlling response can be acquired and maintained is through differential reinforcement or modeling (vicarious reinforcement). Its resistance to extinction depends upon the variables present during acquisition. Contingent self-reward is actually a response that is inhibited until the appropriate conditions, namely, the fulfillment of the requirements for obtaining the reward, are met. That is, the self-reward response can be conceived of as a compliance to rules or a resistance to temptation. It can, therefore, be established through punishment (Mahoney & Bandura, 1972; Aronfried, 1968a, 1968b). There is some evidence that greatest resistance to deviation occurs when mild punishment is paired with the statement of a rule (Cheyne & Walters, 1969; Cheyne, 1972). (See Cheyne & Walters, 1970, for a review of some of the dimensions relevant to punishment in a resistance to temptation paradigm.)

In the laboratory investigation of the self-reinforcing process, the situation is somewhat different from that described above. Figure 2 shows the potential stimuli that may have reinforcing or discriminative functions under laboratory circumstances. It is difficult if not impossible to rule out the stimuli that control the adherence to the

Figure 1

An Analysis of the Self-Reinforcement Process

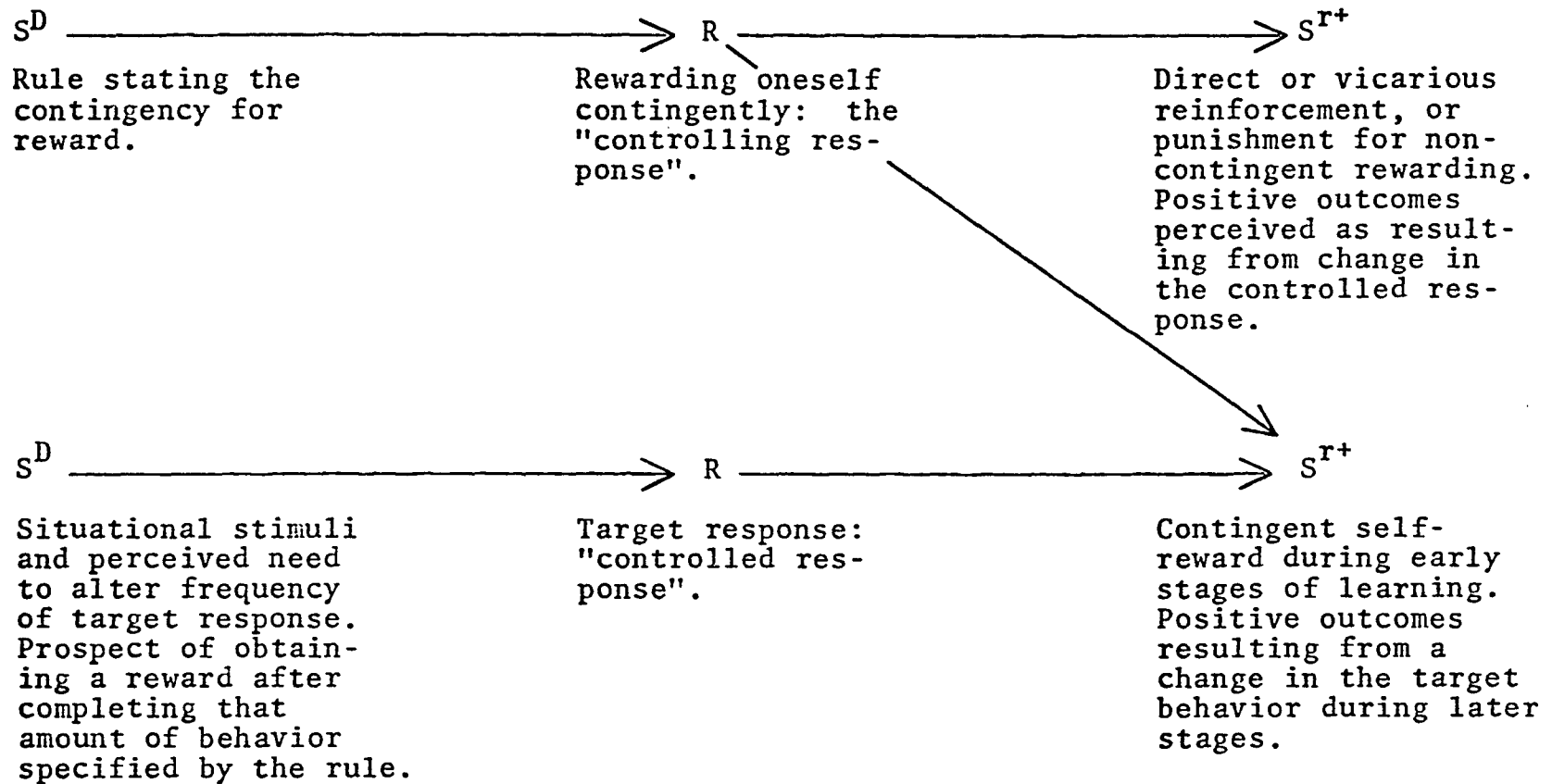
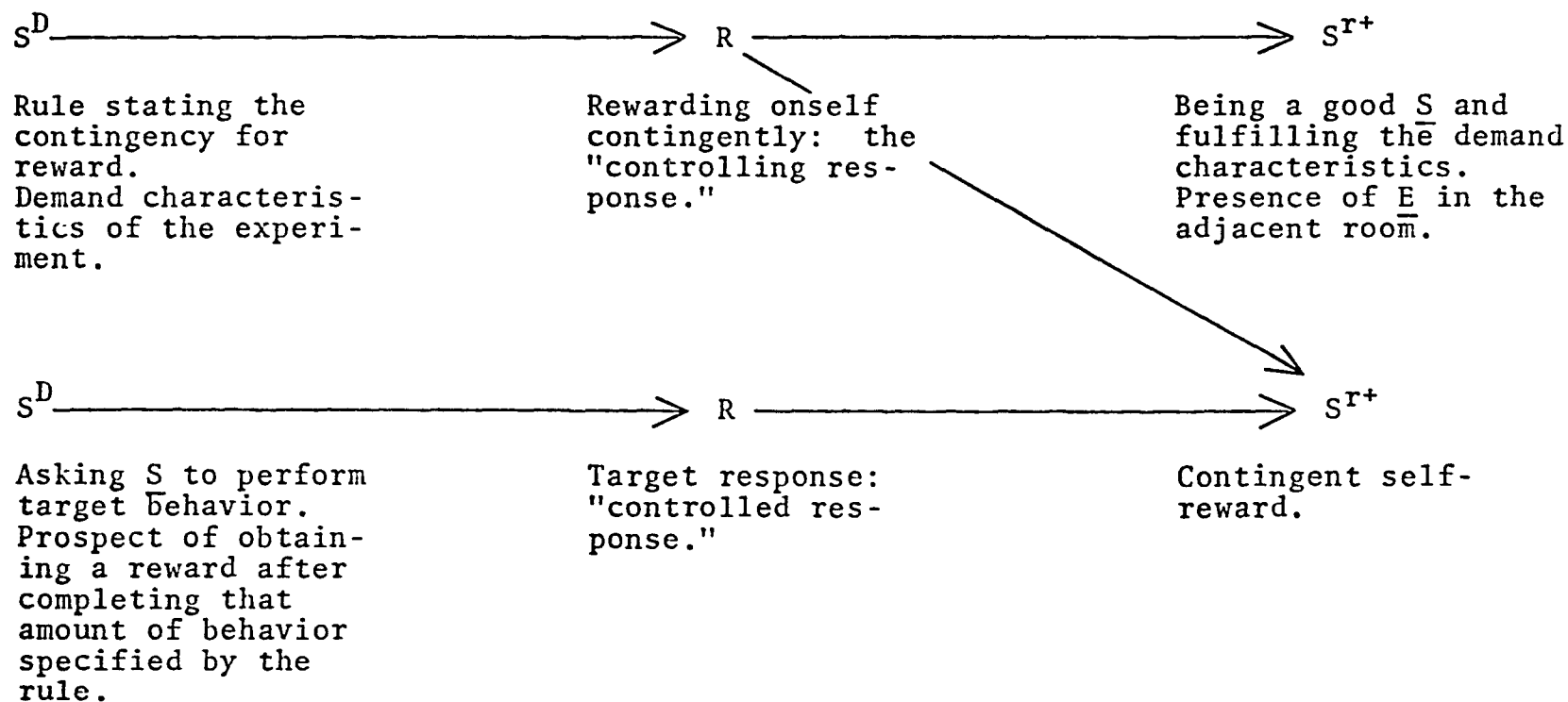


Figure 2

An Analysis of the Self-Reinforcement Process  
In a Laboratory Setting



rule of contingent self-reward, i.e., the controlling response; there are generally demand characteristics present in the laboratory for complying with the instructions given by the experimenter and it may be these demand stimuli that maintain the controlling--but not the controlled--response in such a situation.

The study by Bandura and Perloff (1967), described above, is an example of this difficulty of eliminating the demand characteristics. In this experiment a bell rang whenever the self-reward S had reached his self-selected criterion and it was this bell that signified to the children to take a token. Furthermore, the self-reward Ss had to give their accumulated tokens to an experimenter at the end of the experiment and received the reward only a few weeks later. Both of these features help to insure that the S does not "cheat" and take tokens before he has completed the demands of his rule.

The present study focused on the second behavioral sequence shown in Figures 1 and 2, and specifically on the question of whether the controlling response can serve to reinforce the controlled response. An attempt was made to eliminate the demand characteristics that maintain the controlling response. On account of the necessary control groups this was not achieved completely.

## CHAPTER III

### Methodology

The review of the literature showed that the reinforcing characteristics of contingent self-reward, defined as the strengthening of a behavior which is followed by a reward that the individual administers to himself, have not been well documented. Only one laboratory study (Bandura & Perloff, 1967) has shown clear-cut reinforcing effects. This was with children on a motor task. The present experiment was designed to test whether contingent self-reward can reinforce behavior as effectively as experimenter-controlled reward, and whether it can reinforce behavior significantly more than a non-reinforcement condition. It also tested whether self-reward is an effective reinforcer (a) with adults, (b) on an intellectual task.

Specifically, the questions posed were (a) whether sections of a movie presented by an individual to himself, contingent upon having completed a certain number of addition problems, will motivate the individual to complete as many problems, work as rapidly, and increase in rate of performance as much as an individual who receives the movie presentations contingently from the experimenter;

and (b) whether this self-administration of the reward will motivate an individual to complete more problems, work more rapidly, and increase in rate of performance more than a person who does not receive such a reward, but rest-periods instead.

### Subjects

The Ss were solicited from undergraduate psychology classes. The only information that the volunteers were given was that the experiment was open-ended in length, but that they should put aside two hours in case they wanted to stay that long, that the task they would be performing was a simple and overlearned one, that no shock, no physiological measures, and no memory or intelligence tests would be given.

Those Ss that had volunteered in the class solicitation were contacted by telephone for appointments. The final sample consisted of 21 male and 24 female students.

### Design

The present experiment had a self-reward (SR) group, an experimenter-rewarded (ER) group and a no-reward control group. The Ss in the SR group administered the reward to themselves contingent upon having completed a certain number of addition problems. They could choose on which of three suggested fixed-ratio (FR) schedules they wanted to work (100, 150, or 200).

In the ER group, the experimenter controlled the occurrence of the reward. These Ss were yoked to the SR Ss in terms of the schedule on which they received the reward. For example, an ER S yoked to an SR S, who had worked on a schedule of 150 problems and 7-1/2 minutes of movie time, was also given the movie for 7-1/2 minutes after every 150 problems he had completed.

The control group received instead of the reward a rest-period to control for the time that the ER and SR Ss were watching the movie. The control Ss were also yoked to the SR Ss in terms of the schedule on which they received the rest-period. However, rather than giving the period in a single unit for the completion of a schedule, it was given in two parts--one at some point in the middle of the set of problems, the other at the completion of the schedule. For example, an S yoked to an SR S working on an FR 150 might receive a three minute rest period after 55 problems and then a 4-1/2 minute break after another 95 problems. This splitting of the rest period was done because a pilot study suggested that breaks of too great duration were punishing to some of the Ss.

There were 15 Ss in each treatment group: seven males and eight females. The assignment of Ss within each sex-group proceeded as follows: Ss were randomly scheduled for participation; then, the first scheduled S of each sex was placed into the SR condition, the following two Ss of

the same sex were placed into the ER and Control groups at random; the fourth S was again assigned to the SR group and the fifth and sixth into the Control and ER groups, and so on until all Ss were placed.

### Apparatus and Materials

The Ss were tested individually in a room separate from that of E's room. They were seated on a swivel chair, in front of a work table. On the table was a pile of 70 pages of simple addition problems of approximately equal difficulty and following the same basic pattern of two rows of three numbers across as shown in the example 
$$\begin{array}{r} 347 \\ +284 \\ \hline \end{array}$$
. The problems were constructed with the help of six decks of cards, each containing the digits one through nine. (Zero was omitted since a problem containing a zero would automatically have been easier than one with no zero.) Each deck provided the digits for one of the six possible positions in the addition problems. The first digits appearing on the six decks constituted the first problem. Then the second digit that appeared on each of the decks was used for the next problem and so on until nine problems had been constructed and all the cards in each deck used up. The decks were then shuffled and the procedure was repeated.

The problems were typed with a primary typewriter onto regular, letter-sized paper. Twenty-five problems were placed into columns of five on each page. The page number

appeared on the top, right-hand corner (see Plate 1, Appendix A for a sample page). Beside the pile of addition problems was placed a gray panel with two buttons and a counter. These were connected to a relay system in E's room. A press of one of the buttons activated a cumulative recorder and either a count-down or a count-up counter in the experimental room. For the SR and the ER groups, the button also activated the counter on S's panel. The second button activated a buzzer in E's room who then turned on the video-tape recorder. (This button was only used by the SR Ss.)

A television set was placed in the corner of the room behind the S. The film that was played on the set was a video-tape recording of a television detective story. A loud-speaker was suspended above the table on which the Ss were working. The speaker was only used for the Control Ss.

A personality scale (Eysenck & Eysenck's, 1968, P.E.N. Inventory) which consists of Extraversion, Neuroticism, Psychoticism, and Lie scales was given to all Ss. Also employed was a questionnaire that asked Ss for ratings of the boringness of the task, the restfulness of the break (for Control Ss) and the enjoyment of the movie (for rewarded groups). (See Figures 4 and 5, Appendix B for the questionnaires.)

### Procedure

E was present in the subject-room while delivering the instructions to each S. The initial instructions for all Ss were as follows: "Here is a pile of addition problems on which I would like you to work. Each time that you have completed a problem press this button." (E then pointed to the left button on the response panel.) "Sometimes you may realize that you have forgotten to press the button, then you may press it twice on the next time. Now please add the problems on the first page to make sure that you know what to do and that you remember to press the button every time that you have completed a problem." E then waited standing diagonally behind the S until he had finished the first page. Whenever the S would forget to press the button, E would remind him to press the button each time he completed a problem.

After S had completed the first page, E said, "Very good! I want you to continue working like that. This was only a trial run." The rate with which Ss worked on the trial page, however, actually was used as a pre-treatment rate measure.

The SR and the ER Ss were then shown the counter on the response panel and given instructions on keeping track of the number of problems they had completed and how to reset the counter.

Instructions on the use of the television set proceeded as follows for the SR Ss: "Here is

another button." (E pointed to the button on the right side of the response panel.) "Whenever you press that button, the TV behind you is activated and a taped movie will come on." A brief description of the film was given and the Ss were asked whether they had seen that film already. (If Ss had seen the film, they would receive another film; however, the data obtained from these Ss were not included in the results, in order to keep the reward constant.) They were then shown how to tune the television monitor for brightness and loudness.

Instructions to the Ss continued: "Whenever you have finished a certain number of problems, treat yourself to some movie-time. Here is a table of alternative schedules on which you may work." They were shown a 3" x 6" card on which the following information had been written:

#### ALTERNATIVE WORK SCHEDULES

Number of problems completed	Amount of movie-time in minutes
100 -----	5 minutes
150 -----	7-1/2 minutes
200 -----	10 minutes

E then continued, "I want you to choose one of these schedules. For example if you choose to work on the 150 problems completed - 7-1/2 minute movie-time schedule, you

would do 150 problems, keeping track on your counter of how many problems you have done, then treat yourself to some movie-time by pressing the TV button. The TV will go off automatically. Then you would continue to work on the problems again, do another 150 problems and treat yourself to some more movie-time. Should you feel that the schedule is either too easy or too difficult you may change to another schedule, but please do not change more than once."

Instructions to the ER group continued, "Now if you swivel your chair around you will see a TV. The TV will come on automatically after every X number of problems you have completed for Y number of minutes (X and Y being stated for each individual according to the schedule on which the SR S to which he was yoked had worked), i.e., whenever you have finished X number of problems, the TV will come on for Y minutes." They were then informed as to the title, the nature of the film and the use of the tuning buttons of the monitor.

In place of the television instructions the Control group were given the following information: "Occasionally the loud speaker over your head will come on and announce 'break-time'. During break-time you are not to work on the problems. You may do anything else, except touch the equipment for the other experiments. After some time the loud speaker will come on again and announce that the break

is over. Then go back and work on some more problems until the next break is announced."

The final instructions were the same for all three groups. "The experiment is open-ended in length and you may leave the experiment whenever you wish. When you decide to leave, please come next door. I have some forms that I would like you to fill out. Do you have any questions?" Ss were then given an opportunity to ask questions and clear up confusions. Then E said, "You may begin to work now," and left the room.

If Ss did not signal that they wanted to leave after 900 problems, E stopped them by saying, "I think that's enough. You worked very hard." After completion of the problem solving part of the experiment, Ss were asked to fill out the P.E.N. Inventory and the appropriate questionnaire on the task, movie or break ratings. They were thanked for their participation and told that they would receive the results and conclusions of the experiment by mail when all the data had been collected and analyzed.

#### Dependent Variables

The three dependent variables upon which the reinforcement effects of contingent self-reward were to be assessed were: (a) number of problems completed, (b) the average time per problem, and (c) the decrease in time per problem from the first work-session to the last work-session. A cumulative record was used in order to have

a continuous recording of Ss' work behavior and to detect any patterns of behavior or scheduling effects. Additional variables were included for purposes of interpretation and clearer understanding of the results and to help account for some of the potential variability due to individual differences.

A description of the various measures and the manner in which they were obtained follows:

1. Number of problems completed. The number of problems that Ss completed before deciding to stop or before being stopped by E was obtained from the counter in E's room. This counter was activated by each press of the "problems completed" button. (The actual number of problems completed never deviated more than one-half percent from that obtained from the counter.)

2. The average number of seconds per problem. The average number of seconds to do a problem reflects the rate with which Ss worked during the whole experiment. This measure was obtained from the cumulative recorder in the following manner: the total distance, in centimeters, travelled by the cumulative recorder during all the work periods of an S was divided by the number of problems the S had completed. This ratio was then multiplied by 120 (since the speed of the drum was .5cm/60 seconds) to give an average number of seconds per problem. The procedure is expressed by the formula

$$\frac{\text{Sum of distances travelled by the drum during each work-session, in cm.}}{\text{Total number of problems completed}} \times 120 \text{ sec.}$$

3. Decrease in number of seconds per problem. The decrease in number of seconds to complete a problem reflects the degree to which Ss increased in rate from the beginning to the end of the experiment. Scores for the average number of seconds per problem were obtained for both the first and the last work-session from the cumulative record, in a manner similar to that described above, using the formula

$$\frac{\text{Distance travelled by the drum during the work-session, in cm.}}{\text{Number of problems completed in the work session}} \times 120 \text{ sec.}$$

The score obtained for the last work-session was then subtracted from that obtained for the first session, resulting in a decrease in seconds per problem score for each S.

4. Pre-treatment number of seconds per problem. This measure was obtained from the first 25 Trial problems that Ss were asked to complete before receiving the different treatment instructions on movie or rest-period. A score was calculated for each S by the formula

Distance travelled by the drum  
during the Trial session, in cm. X 120 sec.

25

The variable was included as a possible covariate in an analysis of covariance for variables 2 and 3 above, since it was predicted that the initial rate with which Ss came to the experiment would correlate highly with these other two rate variables, but that there would be large differences in rate of performance among Ss.

5. Error rate. An error rate score was obtained for each S by dividing the total number of errors by the number of problems completed. This measure was included as a check on the accuracy of the Ss and to see whether any of the experimental treatments or differences in personality traits would yield differences in error rates.

6. Extraversion. This measure reflects the degree of extraversion. A score was obtained for each S from the P.E.N. Inventory (Eysenck & Eysenck, 1968), where zero refers to extreme introversion and 20 is the highest extraversion score obtainable.

7. Neuroticism. This score reflects the emotional stability of the Ss as measured on the P.E.N. Inventory. A score of zero indicates complete emotional stability while 20 is the ceiling for the neuroticism score.

8. Task rating. The degree to which the Ss enjoyed or disliked the task was assessed through a bipolar rating

scale that ranged from -3 (extremely boring), through 0 (the neutral point), to +3 (extremely interesting). (See Figures 4 and 5, Appendix B.)

9. Movie rating. A rating of the attractiveness of the movie was obtained from each S who had received the movie on a bipolar scale ranging from -3 (extremely boring or distracting), through 0 (the neutral point), to +3 (extremely enjoyable). (See Figure 4, Appendix B.)

10. Rest-period. A rating of the restfulness of the break was obtained from the Ss in the Control group, who were asked to rate the break on a bipolar scale ranging from -3 (extremely punishing), through 0 (the neutral point), to +3 (extremely restful). (See Figure 5, Appendix B.)

## CHAPTER IV

### Results

#### Number of Problems Completed

The number of problems completed by each S is presented in Table 1. The mean number of problems completed by the Control, the SR, and the ER groups was 527.53, 723.33, and 826.67 respectively (see Table 1 and Figure 3). The differences among the means were statistically significant ( $F=7.23$ ,  $df=2/42$ ,  $p < .005$ ). A summary of the analysis of variance is given in Table 2. (The assumption of homogeneity of variance was tested using Hartley's  $F_{\max}$  Test. No significant departure from the assumption was found:  $F_{\max}=2.73$ , which falls short of the critical value at the .05 level.)

A comparison of the means by the Newman-Keuls method showed that the SR group as well as the ER group completed significantly more problems than the Control group: the difference between the ER and the Control group was significant at the .01 level; the difference between the SR and the Control group was significant at the .05 level. Although the ER group performed more problems than the SR group, this difference was not significant.

Figure 3

Mean Number of Problems Completed by the  
Control, SR and ER Conditions

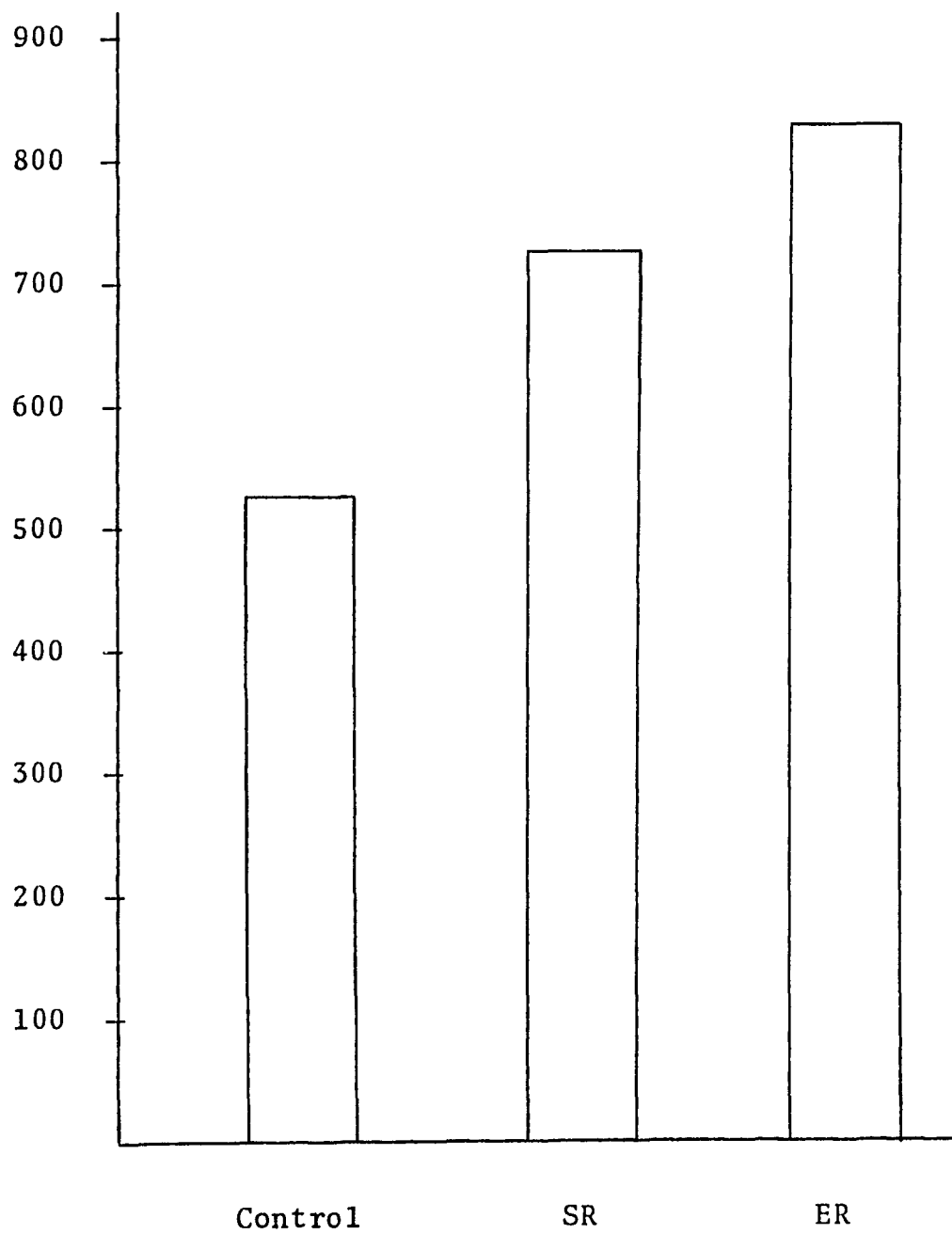


Table 1

The Number of Problems Completed by Each Subject,  
the Group Totals and the Group Means

				Condition		
		Control	SR	ER		
		716	400	900		
		150	900	900		
		365	600	600		
		225	600	900		
		600	900	900		
		275	900	900		
		475	400	900		
		900	900	900		
		600	900	900		
		600	900	900		
		450	450	600		
		200	300	900		
		600	900	400		
		860	900	900		
		900	900	900		
Total	7,916		10,850	12,400		
Mean	527.73		723.3	826.67		

Table 2

Analysis of Variance on  
the Number of Problems Complete

Source	df	MS	F
Between conditions	2	345,745.69	7.23*
Between subjects	42	47,821.10	

\*p < .005

### Average Number of Seconds per Problem

The average number of seconds per problem for the Control, the SR, and the ER groups is given in Table 3. An analysis of variance showed that there were no significant effects due to treatment differences (see Table 4).

The average number of seconds per problem was highly correlated with pre-treatment number of seconds per problem ( $r=.78$ ,  $df=43$ ,  $p < .001$ ), i.e., the greater the rate of Ss on the 25 initial trial problems, the greater was the rate with which they worked throughout the experiment. Therefore, an analysis of covariance was conducted in order to control statistically for individual differences. However, no significant treatment effects emerged (see Table 5).

Correlations between treatment conditions and number of seconds per problem, with pre-treatment number of seconds per problem partialled out, were in the expected direction and rank order: the ER condition was negatively related to number of seconds per problem ( $r=-.24$ ), the Control condition was positively related ( $r=.20$ ), and the SR condition took an intermediate position ( $r=.05$ ). That is, the ER group worked faster and the Control group worked slower than the SR group. However, the coefficients were not significantly different from each other.

### Decrease in Number of Seconds per Problem

The mean decrease in number of seconds per problem

Table 3

## Mean Performance Scores for All Conditions

Measure	Conditions		
	Control	SR	ER
Pre-treatment mean number of seconds per problem	4.80	4.18	4.70
Mean number of seconds per problem	5.30	4.54	4.67
Mean decrease in number of seconds per problem	.696	.624	.936
Mean error rate	.036	.033	.024

Table 4

Analysis of Variance on  
Average Number of Seconds Per Problem

Source	df	MS	F
Between conditions	2	2.463	1.30*
Between subjects	42	1.893	

\*n.s.

Table 5

Analysis of Covariance on  
Average Number of Seconds Per Problem

Source	df	MS	F
Between conditions (adjusted)	2	1.106	1.48*
Between subjects (adjusted)	41	.747	

\*n.s.

from the first to the last work-session for the Control, the SR, and the ER group is shown in Table 3. The differences between the means were not significant, indicating that there were no treatment effects (see Table 6 for summary of the analysis of variance).

Once again the pre-treatment number of seconds per problem correlated highly with this dependent variable ( $r=.61$ ,  $df=43$ ,  $p < .001$ ), i.e., the slower the Ss worked on the 25 initial trial problems, the more they increased in rate from the first work-session to the last. However, an analysis of covariance, with number of seconds per problem during the pre-treatment phase as the covariate, indicated no significant differences between the groups due to treatment (see Table 7 for the results of the analysis of covariance).

The correlation coefficients between treatment groups and the decrease in number of seconds per problem, with pre-treatment number of seconds per problem partialled out, were in the predicted direction and rank order: the ER group was related positively to the number of seconds per problem ( $r=.16$ ), the Control group was negatively related ( $r=-.19$ ), and the SR group took an intermediate position ( $r=.02$ ). In other words, the ER group increased more and the Control group increased less in rate of performance during the experiment than the SR group. However, once again, the coefficients were not significantly different

Table 6

Analysis of Variance on the Decrease in  
Number of Seconds Per Problem

Source	df	MS	F
Between conditions	2	.400	.79*
Between subjects	42	.504	

\*n.s.

Table 7

Analysis of Covariance on the Decrease in  
Number of Seconds Per Problem

Source	df	MS	F
Between conditions (adjusted)	2	.268	.694*
Between subjects (adjusted)	41	.386	

\*n.s.

from each other.

Since both number of seconds per problem and decrease in number of seconds per problem were highly correlated with pre-treatment number of seconds per problem, it seems that stable individual differences in performance rate, existing prior to the experiment, were the main determinants of the rate with which Ss worked during the experiment and the degree to which they increased in rate. The finding, therefore, that these two rate variables showed no significant treatment effects (although the partialled correlations were in the predicted directions) may be attributable to pre-experimental individual differences in ability to do addition problems, an ability that is unaffected by temporary treatment changes (see section on error rate for a further discussion).

#### Pre-Treatment Number of Seconds per Problem

The mean pre-treatment number of seconds per problem was 4.8, 4.18, and 4.7 seconds for the Control, the SR and the ER groups respectively, as shown in Table 3. The differences between the group means were not significant.

#### Error Rate

The mean error rate for the three groups was as follows: Control=.036, SR=.033, and ER=.024 (see Table 3). The differences between the means were not significant, i.e., no significant treatment effect occurred.

Aside from one S who made 12 errors per 100 problems, no S made more than 6.3 errors per 100 problems. This low error rate is surprising since the Ss were never told that accuracy was important and that their problems would be checked. (If an S inquired about accuracy, he was told to do the best he could.) The low number of errors indicated that Ss took the task seriously.

Error rate was positively related to number of seconds per problem during the pre-treatment phase ( $r=.32$ ,  $t=2.21$ ,  $p < .03$ ) and also to average number of seconds per problem during the experiment ( $r=.34$ ,  $t=2.37$ ,  $p < .04$ ). That is, Ss who worked faster made fewer mistakes. This finding seems astonishing at first. An explanation, however, may be found by invoking a factor of skill or ability in doing addition problems. Those Ss who are "good" at adding can work quicker and yet make few mistakes. This explanation is supported by the finding that increasing in rate during the experiment is positively related to number of errors made ( $r=.31$ ,  $t=2.14$ ,  $p < .04$ ), i.e., an S who comes into the experiment with a slow rate will tend to increase in rate during the experiment; however, this increase results in more errors made.

### Extraversion

The mean extraversion scores for the three groups were as follows: Control=12.2, SR=10.4, and ER=11.9 (see Table 8). The differences between the means were not significant.

The scores ranged from 2 to 19 indicating that there was no curtailment in the range. No significant correlations between extraversion and any of the task variables were found. Extraversion correlated .002 with the number of problems completed, -.04 with pre-treatment number of seconds per problem, .067 with average number of seconds per problem, -.04 with decrease in number of seconds per problem, and .107 with error rate.

However, one correlation was significant, that between extraversion and task rating ( $r=.29$ ,  $t=1.99$ ,  $p < .05$ ). The meaning of this relationship is ambiguous and no attempt at interpretation will be made since the opposite had been predicted. It was believed that the stimulus-hungry and change-seeking extravert would dislike the boring and monotonous task more than the introvert.

### Neuroticism

The mean neuroticism scores for the three groups were as follows: Control=9.1, SR=10.33, and ER=8.4 (see Table 8). The differences between the means were not significant. The range of scores was from 1 to 19 indicating no curtailment. No significant correlations between neuroticism and any of the performance variables were found. Neuroticism correlated -.22 with number of problems completed, .07 with pre-treatment number of seconds per problem, .004 with average number of seconds per problem, -.02 with decrease in number of seconds per problem, and -.02 with

Table 8

Mean Scores on the Neuroticism and the  
Extraversion Scales for All Conditions

Personality Measure	Condition		
	Control	SR	ER
Neuroticism	9.1	10.33	8.4
Extraversion	12.2	10.4	11.9

Table 9

Mean Rest-Period Rating of the Control Condition  
and Mean Movie Ratings of the  
SR and ER Conditions

Measure	Condition		
	Control	SR	ER
Break	.33	-	-
Movie	-	1.4	2.0

error rate.

### Movie and Rest-period Ratings

The mean movie and rest-period ratings are shown in Table 9. The mean rest-period rating given by the Control group was .33, while the mean movie ratings given by the SR and the ER groups were 1.4 and 2.0 respectively. The fact that the Control group's mean rating for the rest-period was so close to zero indicates that it did function as a neutral controlling event for the time that the ER and the SR groups were watching the movie.

The movie was rated significantly more positively than the rest-period ( $t=4.28$ ,  $df=44$ ,  $p < .001$ ). This perceived greater attractiveness of the movie supports the conclusion that the movie functioned as a reinforcer for the SR and the ER group to complete more problems than the Control group. Further evidence for the hypothesized causal relationship between the attractiveness of the movie and the number of problems completed comes from the positive correlation between them ( $r=.28$  which just misses significance at the .05 level). The ER group rated the movie as more positive and completed more problems than the SR group, though both comparisons were not significant. Similarly, males rated the movie significantly higher than females and completed more (but not significantly more) problems than the females.

## CHAPTER V

## Discussion

The purpose of the present study has been to find further support for the widely assumed, but sparsely demonstrated, principle that contingent self-reward functions as a reinforcer. The results of one of the three dependent variables confirmed the predictions and showed that self-reward can reinforce behavior. Specifically, the SR group, which administered the movie to themselves, completed significantly more addition problems than the non-rewarded Control group. Furthermore, the SR group did not complete significantly less problems than the ER group, which had shown strong reinforcing effects as opposed to the Control group.

Two further dependent variables were included, rate of performance (number of seconds per problem) and increase in rate of performance over work-sessions (decrease in number of seconds per problem), the hypothesis being that these two measures would also be sensitive to the effects of reinforcement. However, the results reflected no significant treatment effects, but only tendencies in the predicted direction for the three groups of Ss. Self-reinforcement effects can only be tested if the experimenter-controlled reward has demonstrable reinforcing effects. Since not even the ER group showed any significant reinforcing effects on these two rate measures, it is concluded that the

measures did not constitute an appropriate test for the effects of self-reward.

The high correlations between the two rate measures and pre-treatment rate of performance, suggest that the variation found in these two dependent variables was largely the result of individual differences in arithmetic skill and did not readily reflect the brief treatment differences of the present study. Additional support for the presence of such a stable skill came from the finding that the Ss who worked faster made fewer mistakes, but that increases in rate of performance during the experiment were associated with increases in number of errors.

The assessment of the personality factors of Extraversion and Neuroticism had been included in order to control and account for some of these individual differences in performance. There is, for instance, strong evidence that introverts perform better than extraverts on vigilance tasks (Bakan, Belton, & Toth, 1963; Claridge, 1960; Hogan, 1966), which may be considered similar to the present task of doing pages and pages of simple addition problems in a small, isolated experimental room. However, since the two personality measures did not correlate with any of the present performance measures, they could not shed any light on the findings.

The model presented earlier analyzed the self-reinforcement process into two behavioral sequences. As stated

above, the study has provided evidence in support of the second of the two sequences described, namely, the strengthening of the controlled response through the occurrence of the controlling response. It may, however, be argued that the present experimental situation did not represent a "real-life" or completely "free" self-reinforcement sequence. The controlling response, i.e., complying with the rules of contingent self-reward, may have been maintained in part by the demand characteristics of the setting (instruction to work on one of three alternative schedules and knowledge of E's presence in the adjacent room).

An attempt was made to reduce the demand characteristics as much as possible: (a) the SR Ss were given a choice of alternative work schedules; (b) they were given the choice to change the schedule on which they worked; (c) they monitored the number of problems they had completed on their own counter; (d) no signal occurred to indicate that they had reached their criterion for self-reward; and (e) they consumed the reward immediately and did not have to exchange tokens for the reward in the presence of an experimenter. (The last two features had been present in the Bandura & Perloff, 1967, study.)

It was unfortunate that the somewhat obtrusive monitoring system and the scheduling instructions could not be eliminated entirely. Elimination of these elements would have, for all practical purposes, made it impossible to

conduct and statistically assess the required control groups.

Despite these difficulties, it is permissible to conclude from the present study that, if one can insure compliance with the rule of contingent self-reward, i.e., if one can maintain the controlling response, the controlled or target response will be reinforced in a manner similar to when the reward is controlled by someone else. From the studies reviewed in the section on the acquisition of contingent self-reward and from the research on the resistance to temptation, we may assume that it is possible to teach individuals to comply with the rule of contingent self-reward without any external monitor being present. (It is imperative, nevertheless, that future research study a "real-life" self-reinforcement situation, a setting in which Ss have free access to the reward, choose their own rules and standards without the constraining presence of an experimenter, but at the same time permitting reliable observation of the behavior.)

A question does arise, though, concerning the exact equivalence in reinforcer effectiveness between self-reward and experimenter-controlled reward situations. Statistically there were no significant differences between the ER and the SR groups. Yet, a quantitative comparison on the number of problems completed showed that the ER group completed over 100 problems more on the average than the SR

group. Not only is this a lower, though statistically non-significant, output on part of the SR Ss, but this same pattern appears on the other two dependent measures, number of seconds per problem and decrease in number of seconds per problem during the experiment when initial differences in rate were partialled out. The results for the male children in the Bandura and Perloff study fell into the same pattern: the males in the ER group performed more cranking responses than those in the SR group.

An explanation for the somewhat lesser output on part of the SR group in the present study, may be found in the different movie ratings given by the SR and the ER Ss. The SR group rated the movie less rewarding than the ER group did, although again the difference misses significance. It is possible that the SR group did not like the movie as much as the ER group simply as the result of pre-experimental differences in taste. An equally viable alternative explanation may be that as a consequence of administering the movie to oneself, it lost some of its attractiveness and, therefore, did not strengthen the problem solving behavior as much.

#### Generalizability of the Results

The generalizability of the present finding that contingent self-reward can function as a reinforcer is tentative at this stage. As mentioned above, it is still undetermined

whether the reinforcing effects will occur in a "real-life, free" self-reinforcement situation in which there are no external monitoring agents present. Furthermore, the self-reinforcement phenomenon is a delicate one that requires special conditions for its demonstration. A discussion of some of the difficulties that were encountered in the present experiment will clarify this statement.

The sample of Ss, college students, already had well established self-control behaviors and were accustomed to working on scarce reinforcement schedules and to consider the completion and achievement of a task as reinforcers in their own right. Thus, it was necessary to give them a task that was boring and to which they could attribute little pride for accomplishment. The selection of the reward also required careful attention. College Ss have very individualized reward systems, and yet, the reward had to be one that would be generally motivating to the group. Even with the movie that was finally chosen for the experiment, sex differences contributed to different ratings of enjoyability, and the individual ratings ranged from -3 to +3. A contingent reward has to be sufficiently powerful to reveal reinforcing effects--a well-established finding. However, in a self-reward situation, the reward should not be too powerful lest rule violation or non-contingent rewarding occur. A potentially very strong

reinforcer--a sex movie--was not used, partly on account of the possibility that the movie might be so rewarding that the Ss would either not comply with the schedule that they had chosen, or that they would experience such contrast effects, that the task would seem much more aversive than it would have been under somewhat less attractive consequences.

A further limiting factor, when the dependent variable is amount of behavior produced in an open-ended experiment, is the extra-experimental concerns of the Ss. A pilot study for the present experiment was conducted just before final examinations and yielded no significant reinforcing effects on number of problems completed, not even for the ER group. The actual experiment was then conducted during an interim period and summer school, when students were less busy and distractable.

From the above discussion one may conclude that a demonstration of the self-reinforcement effect in a laboratory situation depends on rather special circumstances. Some of the factors to which special attention must be given are (a) the type of controlling behaviors an individual already has in his repertoire; (b) the appropriate level of aversiveness of the task; (c) the appropriate level of attractiveness of the reward, so as to ensure motivating effects, but not evoke rule violation; (d) the extra-experimental concerns of the Ss, especially if the

experiment is open-ended, and Ss are permitted to leave whenever they wish.

### Applications

The results of the present study, together with Bandura and Perloff's (1967) findings, provide an experimental data basis for the development of a potentially important self-control technique. The various studies described above in the section on the applied studies of self-reward all exemplify how contingent self-reward can be used in practice to effect and strengthen behavior change.

For instance, the studies by Lovitt and Curtiss (1970), Glynn (1970), and Johnson (1970) showed how self-administered reward might be used to increase attention and academic response rate. The advantage that a self-reward system would have in the classroom is that after the initial setting up of the program the teacher would have more time to concentrate on her other tasks. The students, on the other hand, would learn an important self-control technique that might maintain longer and longer sequences of studying without monitoring by the teacher.

Further examples of application are provided by a book by Watson and Tharp (1972) that presents behavioral guidelines for self-modification procedures in which self-reinforcement plays a central role. Watson and Tharp taught college students how to draw up self-modification

programs and how to use contingent self-reward to effect behavior change. Self-reported case histories showed that self-reinforcement helped to increase work efficiency and ease in social situations, and to reduce overeating, smoking and unwanted sexual behavior.

The act of contingent self-reward, however, was only a part of their self-modification procedure. The client is also asked to specify in objective terms the behavior to be changed, to make a baseline recording of the frequency of occurrence of the to be controlled response, its setting events and its usual consequences, and to make a specific written contract with oneself, stating the intervention plan. The relative contribution of all of these factors must still be assessed.

Bass (1971) has suggested that, since compliance with self-reward rules, i.e., the maintenance of the controlling response, depends on environmental factors, the therapist should exercise as much control as possible. This suggestion is a sound one; yet, it is probable that the compliance to the rules may be taught to the client by the therapist--in fact, it would seem to be an essential initial step in self-reinforcement program. The manner in which compliance with contingent self-reward may be brought about has already been discussed earlier, namely, through differential reinforcement, modeling and perhaps even punishment for rule violation. Watson and Tharp (1972) use a shaping process

to insure resistance to non-contingent self-reward. They argue that if a client finds himself "cheating," he is probably requiring too much of himself and must first set himself a lower goal. Then, through a process of shaping he may work himself up to more and more difficult behaviors.

Future research must assess the circumstances in which self-reinforcement would be the treatment of choice for clinical settings. A general evaluation of the comparative effectiveness of the self-reward technique and other presently available behavior therapy techniques, such as systematic desensitization, assertive training, modeling, and other self-control techniques, is essential.

## FOOTNOTES

<sup>1</sup>Bandura (1971) has questioned the appropriateness of equating a determination of being correct with self-reinforcement; correctness evaluations and self-recommendations are probably only partially correlated. For instance, a person may judge himself to be correct, but may consider the task so simple and trivial that he does not consider it worthy of self-reward; or he may realize that he is incorrect, but in an area of knowledge so far removed from his own field that he does not criticize himself.

APPENDIX A

Plate I

Sample Page of the Addition Problems

1.

651  
234

585  
187

347  
398

174  
621

213  
916

798  
845

439  
763

922  
452

866  
579

272  
975

589  
896

658  
541

495  
684

717  
322

364  
119

Figure 4

Post-Experimental Questionnaire for the  
Rewarded Subjects

1. Was the task interesting and enjoyable? Would you please rate how you felt about the task on a scale from -3 to +3, where -3 means very dull and boring, +3 means very interesting and enjoyable, and 0 means that the task was neutral, neither interesting, nor uninteresting. (Just give a number.)
  
2. How enjoyable did you find the movie? Rate your answer on a scale from -3 to +3, where -3 means that the movie was extremely boring or distracting, +3 means that you enjoyed the movie very much, and 0 means the movie was neither interesting nor distracting or boring.
  
3. Did you at any time feel like leaving the experiment? Rate your answer on a scale from 0 to 10, where 0 means not at all, 5 means frequently and 10 means constantly.

At what point did you feel most like leaving the experiment?

Why did you not leave earlier? (Feel frank in your answer.)

4. Describe briefly what you think the experiment was about, what hypothesis might it be testing?
  
5. Were you consciously using any particular strategy in making yourself continue to work?

Figure 5

Post-Experimental Questionnaire for the  
Control Subjects

1. Was the task interesting and enjoyable? Would you please rate how you felt about the task on a scale from -3 to +3, where -3 means very dull and boring, +3 means very interesting and enjoyable, and 0 means that the task was neutral, neither interesting, nor uninteresting. (Just give a number.)
  
2. How restful or punishing did you find the break? Rate your answer on a scale from -3 to +3 where -3 means very punishing and +3 means very relaxing, and 0 means the break was neutral, neither punishing nor relaxing.
  
3. Did you at any time feel like leaving the experiment? Rate your answer on a scale from 0 to 10, where 0 means not at all, 5 means frequently, and 10 means constantly.

At what point did you feel most like leaving the experiment?

Why did you not leave earlier? (Feel frank in your answer.)

4. Describe briefly what you think the experiment was about, what hypothesis might it be testing?
  
5. Were you consciously using any particular strategy in making yourself continue to work?

## REFERENCES

- Aronfried, J. Aversive control of socialization. Nebraska symposium on motivation, 1968, 271-320. (a)
- Aronfried, J. Conduct and conscience: The socialization of internalized control over behavior. New York: Academic Press, 1968. (b)
- Bakan, P., Belton, J. A., & Toth, J. C. Extraversion-introversion and decrement in an auditory vigilance task. In D. N. Buckner and J. J. McGrath (Eds.), Vigilance: A Symposium. New York: McGraw-Hill, 1963.
- Bandura, A. Principles of behavior modification. New York: Holt, Rinehart, & Winston, 1969.
- Bandura, A. Vicarious and self-reinforcement processes. In R. Glaser (Ed.), The nature of reinforcement. Columbus, Ohio: Merrill, 1971.
- Bandura, A., Grusec, J. E., & Menlove, F. L. Some social determinants of self-monitoring reinforcement systems. Journal of Personality and Social Psychology, 1967, 5, 449-455.
- Bandura, A., & Kupers, C. J. Transmission of patterns of self-reinforcement through modeling. Journal of Abnormal and Social Psychology, 1964, 69, 1-9.
- Bandura, A., & Perloff, G. Relative efficacy of self-monitored and externally imposed reinforcement systems. Journal of Personality and Social Psychology, 1967, 7, 111-116.
- Bandura, A., & Whalen, C. K. The influence of antecedent reinforcement and divergent modeling cues on patterns of self-reward. Journal of Personality and Social Psychology, 1966, 4, 373-382.
- Bass, B. A. Demand characteristics as a determinant of self-reinforcement. Unpublished doctoral dissertation. University of Tennessee, 1971.
- Bass, B. M. The Orientation Inventory. Palo Alto: Consulting Psychologists, 1962.

- Boberg, E. B. The effects of self-administered and experimenter-administered time-out on stuttering. Unpublished doctoral dissertation, University of Minnesota, 1968.
- Bucher, B., & Fabicatore, J. Use of patient-administered shock to suppress hallucinations. Behavior Therapy, 1970, 1, 382-385.
- Cautela, J. R. Treatment of compulsive behavior by covert sensitization. Psychological Record, 1966, 16, 33-41.
- Cautela, J. R. Covert sensitization. Psychological Record, 1967, 20, 459-468.
- Cautela, J. R. Covert reinforcement. Behavior Therapy, 1970, 1, 33-50.
- Cheyne, J. A. Some parameters of punishment affecting resistance to deviation and generalization of a prohibition. Child Development, 1972, 42, 1248-1261.
- Cheyne, J. A., & Walters, R. H. Timing of punishment and cognitive structure in resistance to deviation. Journal of Experimental Child Psychology, 1969, 8, 127-238.
- Cheyne, J. A., & Walters, R. H. Punishment and prohibitions: Some origins of self-control. New Directions in Psychology, 1970, 4, 281-366.
- Coppersmith, S. A. Method for determining types of self-esteem. Journal of Abnormal and Social Psychology, 1959, 59, 85-95.
- Crowne, D., & Marlowe, D. A new scale of social desirability independent of psychopathology. Journal of Consulting Psychology, 1960, 24, 349-354.
- Eysenck, S. B. G., & Eysenck, H. J. The measurement of psychoticism: A study of factor stability and reliability. British Journal of Social and Clinical Psychology, 1968, 7, 284-294.
- Glynn, E. L. Classroom applications of self-determined reinforcement. Journal of Applied Behavior Analysis, 1970, 3, 123-232.

- Hogan, M. J. Influence of motivation on reactive inhibition in extraversion-introversion. Perceptual Motor Skills, 1966, 22, 187-192.
- Homme, L. E. Perspectives in Psychology: XXIV. Control of coverants, the operants of the mind. Psychological Records, 1965, 15, 501-511.
- Johnson, S. M. Self-reinforcement vs. external reinforcement in behavior modification with children. Journal of Developmental Psychology, 1970, 3, 147-148.
- Johnson, S. M., & White, G. Self-observation as an agent of behavioral change. Behavior Therapy, 1971, 2, 488-497.
- Johnson, S. S. The effects of self control techniques upon differing types of smoking behavior. Unpublished dissertation, University of Colorado, 1968.
- Kanfer, F. H., & Duerfeldt, P. H. Motivational properties of self-reinforcement. Perceptual and Motor Skills, 1967, 25, 237-246.
- Kanfer, F. H., Duerfeldt, P. H., & LePage, A. L. Stability of patterns of self-reinforcement. Psychological Reports, 1969, 24, 663-670.
- Kanfer, F. H., & Marston, A. R. Conditioning of self-reinforcing responses: an analogue to self-confidence training. Psychological Reports, 1963, 13, 63-70.
- Kanfer, F. H., & Marston, A. R. Determinants of self-reinforcement in human learning. Journal of Experimental Psychology, 1963, 66, 245-254.
- Kreutzer, C. S. Behavior modification of smoking: the experimental investigation of diverse techniques. Behavior Research and Therapy, 1969, 6, 137-157.
- Liebert, R. M., & Allen, M. K. Effects of rule structure and reward magnitude on the acquisition and adoption of self-reward criteria. Psychological Reports, 1967, 21, 445-452.
- Lovitt, T. C., & Curtiss, K. A. Academic response rate as a function of teacher and self-imposed contingencies. Journal of Applied Behavior Analysis, 1969, 2, 49-53.

- Mahoney, M. J., & Bandura, A. Self-reinforcement in pigeons. Learning and Motivation (in press).
- Marston, A. R. Personality variables related to self-reinforcement. Journal of Psychology, 1964, 58, 169-175.
- Marston, A. R. Variables in extinction following acquisition with vicarious reinforcement. Journal of Experimental Psychology, 1964, 68, 312-315.
- Marston, A. R. Response strength and self-reinforcement. Journal of Experimental Psychology, 1964, 68, 537-540.
- Marston, A. R., & Cohen, N. J. The relationship of negative self-reinforcement to frustration and intropunitiveness. Journal of General Psychology, 1966, 74, 237-243.
- Marston, A. R., & Kanfer, F. H. Human reinforcement: experimenter and subject controlled. Journal of Experimental Psychology, 1963, 66, 91-94.
- McFall, R. M. Effects of self-monitoring on normal smoking behavior. Journal of Consulting and Clinical Psychology, 1970, 35, 135-142.
- McMains, M. J., & Liebert, R. M. Influence of discrepancies between successively modeled self-reward criteria on the adoption of a self-imposed standard. Journal of Personality and Social Psychology, 1968, 8, 166-
- Mees, H. L. Placebo effects in aversive control: A preliminary report. Paper presented at the joint meeting of the Oregon-Washington State Psychological Associations, Oceanic Shores, Wash., 1966.
- Miller, A. W., & Clark, N. Self-reinforcement established for a discrimination task. Journal of Genetic Psychology, 1970, 117, 1-6.
- Mischel, W., & Liebert, R. M. Effects of discrepancies between observed and imposed reward criteria on their acquisition and transmission. Journal of Personality and Social Psychology, 1966, 3, 45-53.
- Montgomery, G. F., & Parton, D. A. Reinforcing effect of self-reward. Journal of Experimental Psychology, 1970, 84, 2, 273-276.

- Mowrer, O. H. Learning theory and symbolic processes. New York: Wiley, 1960.
- Premack, D. Toward empirical behavior laws. I: positive reinforcement. Psychological Review, 1959, 66, 219-223.
- Rehm, P., & Marston, A. R. Reduction of social anxiety through modification of self-reinforcement: an investigation therapy technique. Journal of Consulting Psychology, 1968, 32, 565-574.
- Rotter, J. B., Seeman, M. R., & Liverant, S. Internal versus external control of reinforcement: A major variable in behavior theory. In N. F. Washburne (Ed.), Decisions, Values, and Groups (Vol. 2.). London: Pergamon, 1966.
- Simkins, L. The reliability of self-recorded behaviors. Behavior Therapy, 1971, 2, 83-87.
- Skinner, B. F. Science and human behavior. New York: MacMillan, 1953.
- Speidel, G. E. Unpublished Manuscript, University of Hawaii, 1971.
- Staats, A. W. Child learning, intelligence and personality. New York: Holt, Rinehart & Winston, 1971. (a)
- Staats, A. W. Learning and personality, and language (symbolic) behavior therapy. Technical Report No. 12 under Office of Naval Research Contract N00014-67 with the University of Hawaii, February, 1971. (b)
- Tooley, J. T., & Pratt, S. An experimental procedure for the extinction of smoking behavior. Psychological Record, 1967, 17, 209-218.
- Watson, D. L., & Tharp, R. G. Self-directed behavior: self-modification for personal adjustment. Monterey: Brooks/Cole, 1972.
- Weingaertner, A. H. The effects of self-shock procedure on hallucinatory activity in hospitalized schizophrenics. Unpublished Doctoral Dissertation, University of Southern California, 1969.