Self-Control in Children: The Impact of Reinforced Commitment

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SELF-CONTROL IN CHILDREN: THE IMPACT OF REINFORCED COMMITMENT

by

Michael G. Winter

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Michael G. Winter
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Self-control in children: The impact of reinforced commitment

Winter, Michael Gustav, M.A.
Western Michigan University, 1990

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INTRODUCTION

Background

Self-control is an important and pervasive aspect of everyday life. Self-control allows people to achieve larger goals by learning to work over extended periods of time. For example, when we enroll in college, we "delay the gratification" of immediately obtaining employment and earning money in hopes of obtaining a better job making more money at a later date (usually after about four years of extended effort).

The development of self-control is relevant to effective functioning in a wide array of daily activities. For example, the importance of self-control to health issues has been noted by people such as Mahoney and Arnkoff (1979) who state, "there is a strong and growing conviction in the health professions that the management and prevention of medical disorders are largely under the control of the individual" (p. 75). For example, people can exhibit self-control by learning to forego many fatty, high cholesterol foods in hopes of reducing their risk of heart disease and arteriosclerosis.

In addition, children commonly display behavior many adults would classify as "impulsive," thus, indicating a
need to learn to "delay gratification." O'Leary and Dubey (1979) point out several reasons why it is important for children to develop "self-control." First, they state, acting independently is valued and typically expected by our culture. Second, the child's teacher and/or parent may not always be capable of successfully implementing external controls. Third, when a child controls his/her own behavior well, adults can spend more time teaching the child other important skills. Fourth, the self-controlling child is able to learn and behave effectively when adult supervision is not available. Fifth and finally, teaching children to control their own behavior may lead to more durable behavioral changes than relying solely on external means of influence. (p. 449)

Self-Control

Behavioral psychologists have defined self-control broadly by stating, that, when one manipulates any variable in one's environment in order to exert control over one's future behavior, and that manipulation has some effect on that future behavior, then one has exhibited self-control (Goldiamond, 1965; Skinner, 1953). Although several models of self-control exist in the literature, Rachlin's (1976) model is one of the more widely accepted models.

In this model, a typical self-control paradigm involves the mutually exclusive choice between a task that results in a small, but immediate, reward and a task that produces a larger, but delayed reward. Selecting the large, delayed reward is said to show self-control whereas
selecting the small, immediate reward shows a lack of self-control, or impulsiveness (Rachlin, 1976). Further, one may also exhibit self-control when choosing a lesser, more immediate pain over a delayed, greater pain. A primary benefit of this model is it can serve as a means of assessing, or measuring, an individual's degree of self-control.

Also, this model suggests two variables that can help quantify self-control, namely, the relative delay of reinforcement and the relative magnitude of reinforcement. In general, Rachlin claims that if the magnitude of reinforcement is equal for two tasks, people will choose the more immediate one; also, if the delay of reinforcement for two tasks is held constant, then people will choose the task with the higher magnitude of reinforcement.

Consider two tasks: Task A requires 5 minutes of effort and Task B requires 30 minutes of effort. It should be noted that "effort" in the present study consists of two variables: The delay between choosing a task and beginning to complete that task and the period of time it then takes to actually complete the task. Completing either Task A or Task B obtains a small reward such as 1 M&M, thus, the relative magnitude of reinforcement is equal. Likely, most people would choose the shorter Task A because the reward
is the same as the larger Task B, but the latency to the reward is shorter.

Further, suppose we offer a person the same choice between Tasks A and B, but this time, whereas completing Task A still obtains 1 M&M, completing Task B will now obtain 2 M&M’s. Might the person change his decision and switch to choosing Task B? Perhaps not, for 30 minutes is still a lot longer than 5 minutes even when the reward ratio is 2 M&M’s to 1 M&M. So, the question remains, how many M&M’s (i.e., how much reinforcement) will it take in order to get the person to “switch over” from choosing to complete Task A (a small, immediate-reward task) to choosing to complete Task B (a large, delayed-reward task)? Will 3 M&M’s be sufficient? Will 5 M&M’s? Will 10? This particular variable, the “switch point,” is central to the present study as it can be used to quantify self-control. This can be thought of in the following way: when a person "switches" from one task to another, that person is either showing self-control or impulsiveness. Thus, in this study, when a person "switches" from a small, immediate-reward task to a large, delayed-reward task, that person is displaying self-control. Conversely, when a person "switches" from a large, delayed-reward task to a small, immediate-reward task, one is displaying "impulsiveness." Therefore, by measuring the point at which one "switches"
from one task to another, a person's self-control choice can be assessed in terms of this switch point.

A number of strategies and procedures have proven successful in teaching children self-control; indeed, a wide variety of techniques have been tested in an effort to increase "self-control." In a review of applications of self-control procedures by children, O'Leary and Dubey (1979) noted five main strategies. The first strategy, self-instruction, involves verbal statements to oneself to affect one's behavior (Hartig & Kanfer, 1973; Meichenbaum & Goodman, 1969; Mischel & Patterson, 1976; Monahan & O'Leary, 1971; Palkes, Stewart, & Freedman, 1972). The second strategy, self-determined criteria, involves setting one's own standards for performance prior to engaging in a specified behavior (Brownell, Coletti, Ersner-Hershfield, Hershfield, & Wilson, 1977; Masters, Furman, & Barden, 1977). The third strategy, self-assessment (self-monitoring, self-recording, self-evaluation), involves the assessment of the quantity or quality of one's own behavior (Broden, Hall, & Mitts, 1971; Lovitt, 1973; McKenzie & Rushall, 1974). The fourth strategy, self-reinforcement, involves the self-administration of contingent rewards (Kanfer, Karoly, & Newman, 1975; Masters & Santrock, 1976). The fifth and final strategy, self-punishment, involves the self-administration of aversive stimuli (Humphrey,
A limitation of the above studies of self-control is their focus on the management of on-going behavior lacking mutually exclusive response options. For example, a child may use self-instructions as an aid in completing a sequence of math operations required in a long division problem. While many self-control problems are of this nature, some involve discrete choices between only two or more response options, much like Rachlin's model of self-control. For example, a child may use self-reinforcement when deciding to complete a spelling assignment over a math assignment.

Thus, much research has focused on those factors that influence a person's choice between available response options in Rachlin's model of self-control as those choices relate to the relative delays to reinforcement and relative magnitudes of reinforcement. In addition, further research on this model has focused on those responses a person can emit to control his own behavior at a later point in time. This area of self-control is known as commitment model research.

Commitment model paradigms require one to "promise" to select one of two response options, namely, either a small reward or a large reward, both of which are dependent
on some specified response, but the large reward is delayed (Ainsle, 1975).

Correspondence training is a recently developed research area in applied behavior analysis that has many similarities to the commitment model in which a subject "promises" or "commits" to one of two or more alternatives. In general, correspondence exists when what one says one will do matches what one actually does; i.e., a correspondence between verbal and nonverbal behavior. In addition, the importance and effectiveness of correspondence training in controlling delayed behaviors has been investigated frequently (Baer, Osnes, & Stokes, 1983; Baer, Williams, Osnes, & Stokes, 1984; Deacon & Konarski, 1987; Israel, 1978; Israel & Brown, 1977; Karoly & Dirks, 1977; Osnes, Guevremont, & Stokes, 1986; Paniagua & Baer, 1982; Risley & Hart, 1968; Rogers-Warren & Baer, 1976).

Although developing from different research areas, both the commitment paradigms and the correspondence paradigms involve some sort of verbal commitment by a person to behave in a certain way in the future. The commitment model involves a choice between two rewards and the correspondence model involves a statement, or commitment, as to how one will act in the future where response options are less clearly defined.
Given the social importance of "self-control," the identification of strategies to develop self-control has substantial applied and theoretical importance. Still, it is unclear whether children can develop "self-control" via the emission of a commitment response prior to the opportunity to choose between a small, immediate-reward task and a large, delayed-reward task. If children could develop self-control in such a manner, then this commitment strategy would be valuable, for it would provide an efficient and durable method of allowing children to change their own behavior, leaving parents and teachers more time to teach them other important skills.

The Present Study

The present study attempts to examine if making a verbal commitment to a large, delayed-reward task will affect the point at which subjects choose a task with a large, delayed reward (thus displaying self-control), versus a task with a small, immediate reward when the relative magnitude of the rewards is experimentally manipulated.

The commitment aspect of this study will require a subject to "commit" to choosing one of two alternatives (a small, immediate reward or a large, delayed reward) at a choice point in the future. The correspondence aspect will
require a subject to then complete, at that future choice point, the previously chosen alternative in order to obtain reinforcement.

More specifically, the present study attempts to determine whether offering a reward to subjects for "committing" to a large, delayed-reward task will affect their self-control (i.e., later choosing the large, delayed-reward task over the small, immediate-reward task) as assessed by the switch point—the switch point being the relative ratio of reinforcement present when a subject consistently chooses the large, delayed-reward task over the small, immediate-reward task. Thus, two phases will be present: one phase will entail a rewarded commitment choice; the other phase will not have a rewarded commitment choice and the subject will be free to choose either alternative. Greater self-control would be exemplified by requiring a smaller ratio of delayed reinforcement to immediate reinforcement in order to effect a switch in preference from one task to another, or from the small task to the large task.
METHOD

Subjects

Four children were selected from a local daycare center based on the age of the child (three to five years old), the number of days a child would attend each week (five days per week was the priority and four days per week was the minimum), and the presence of verbal skills. Subjects ages were 5 (S1), 3 (S2), 4 (S3), and 5 (S4). S1 and S3 were female; S2 and S4 were male. Informed consent was obtained from all children's guardians.

Apparatus and Materials

The study was conducted at the daycare center each morning from approximately 8:00 a.m. to 10:00 a.m. in a room (32 ft. by 18 ft.) separate from day care center activities. Sessions were conducted at a table (5 ft. by 3 ft.) with one chair on each side. A smaller, separate table with a smaller chair was used by subjects to color during delay periods. Two cereal-size bowls were used to dispense reinforcers which varied across children (S1—M&M's, S2—M&M's, S3—Skittles, S4—grapes); reinforcers were selected based on guardians' recommendations when asked what treats their children might really enjoy and
also what foods their children should not consume. The two "choice" boxes (8 in. by 4 in.) were made from manilla folders and contained the unsorted squares. The four "sorting" boxes (6 in. by 6 in.) were made from colored tagboard (red, yellow, blue, and green) and served as receptacles for subjects to sort squares. The squares (1 in. by 1 in.) were made from the same colored tagboard as the sorting boxes.

During the fixed-time two-minute delay, subjects were allowed to sit at the coloring table and color with blank paper and crayons or to play with toys in the experimental room.

Experimental Design

An ABAB experimental design was used in which condition A was a non-rewarded commitment choice and condition B was a rewarded commitment choice. S1 and S2 followed a BABA sequence and S3 and S4 followed a ABAB sequence (intended to account for potential phase sequencing effects).

Subjects were presented with a choice between a small, immediate-reward task and a large, delayed-reward task. Selecting the small, immediate-reward task required sorting 12 colored squares and selecting the large, delayed-reward task required sorting 80 colored squares.
Initially, the large, delayed-reward task consisted of 160 squares. After several sessions subjects were consistently choosing the small, immediate-reward task despite relatively high magnitudes of reinforcement for the large, delayed-reward task in comparison to the small, immediate-reward task (up to 22 to 1). Rather than further increasing the magnitude of reinforcement for choosing and completing the large, delayed-reward task, (which might have resulted in considerable time to consume the large number of reinforcers and potential satiation), the number of squares in the large, delayed-reward task was cut in half to 80 squares before any phase changes were implemented.

Reinforcer Magnitude Ratios

Initially, the reward ratio between the large, delayed-reward task and the small, immediate-reward task started at 2:1 (e.g., 2 M&M's to 1 M&M). While the reward for the small, immediate-reward task always remained at 1 (e.g., 1 M&M), the reward for the large, delayed-reward task gradually increased until a subject "switched over" from choosing the small, immediate-reward task to choosing the large, delayed-reward task. Thus, each subject would begin with a 2:1 ratio of reinforcement, then a 3:1 ratio, then 4:1, then 5:1, etc.
All subjects began at single increment increases in ratios of reinforcement; i.e., 2:1, 3:1, 4:1, etc. It became clear that altering ratios of reinforcement in increments of one would take excessive amounts of time, so, when each subject reached the point where squares in the large, delayed-reward task were cut from 160 to 80, the ratios of reinforcement were increased to increments of two; i.e., 2:1, 4:1, 6:1, etc. S1 and S2, who followed a BABA sequence, remained at increments of two throughout the remainder of the study. S3 and S4, who followed an ABAB sequence, showed quite high ratios of reinforcement at their "switch points" during Phase B. Because it took excessive periods of time to reach these switch points, S3 and S4 increased to increments of three half-way through the second phase change and to increments of four at the start of the last phase change.

The point at which the subjects chose the large, delayed-reward task was called the "switch point," and a titration procedure (see Fuqua, Heckler, Brett, & Saunders, 1977; Lockhart, 1979) was used to determine the stability of this "switch point." Therefore, the ratio of reinforcement for the large, delayed-reward task to the small, immediate-reward task was run back down and up two or three times to see if the subjects' "switch points" would remain relatively stable at a given ratio of reinforcement.
For example, a subject may choose the small, immediate-reward task at a 12:1 ratio of reinforcement (12 M&M's for the large, delayed-reward task; 1 M&M for the small, immediate-reward task), and then "switch" to choosing the large, delayed-reward task at a 14:1 ratio of reinforcement. If so, the titration procedure would involve changing the ratio of reinforcement back down to 12:1, then back up to 14:1, then back down to 12:1 to see if the subject would consistently choose the small, immediate-reward task at a 12:1 ratio and the large, delayed-reward task at a 14:1 ratio, thus, showing a stable "switch point." Once stability was reached, a phase change was commenced.

Pre-training

Each subject underwent one day of sorting/correspondence training to ensure they knew how to sort the squares and to allow for an adaptation period to the experimental situation. One trial consisted of one commitment choice, one two-minute delay, one sorting choice, one actual sorting, and receiving any rewards. Each subject participated in two trials per day. Subjects' first and second daily trials were never consecutive; i.e., they never started their second trial just after completing their first trial.
Aside from Subject 2, all subjects showed consistent correspondence between their commitment choices and their sorting choices after the initial training. Subject 2 was provided two sessions of additional instructions to correct this situation.

Experimental Sessions Procedures

In both Phases A and B, subjects were brought to the experimental room and were seated across from the experimenter at a table. Colored squares were previously placed in the appropriate boxes; the small, immediate-reward task box contained 12 colored squares and the large, delayed-reward task box contained 80 squares. Next to each box, in view of subjects, was a bowl with the appropriate number of rewards in it (e.g., M&M's).

Phase A

In this phase, subjects were asked the following for the commitment choice:

"Johnny, would you like to sort these squares in a couple of minutes and get this M&M" (experimenter points to 12-square box and bowl containing one M&M) "or would you like to sort these squares in a couple of minutes and get these M&M's" (experimenter points to 80-square box and bowl containing two or more M&M's)?
Whichever sorting option a subject chose, the experimenter told that subject he could color or play with toys for a couple of minutes as noted below.

**Phase B**

In this phase, subjects were given the same sorting options, but, during the commitment choice in this phase, the experimenter held up one of the available rewards (e.g., one M&M) and told subjects they could have the one reward right now if they promised to sort the large, delayed-reward task. Thus, in Phase B, the experimenter asked the following for the commitment choice:

"Johnny, would you like to sort these squares in a couple of minutes and receive this M&M" (experimenter points to 12-square box and bowl containing one M&M) "or would you like to sort these squares in a couple of minutes and receive these M&M's" (experimenter points to 80-square box and bowl containing two or more M&M's)? "Listen, if you promise to sort these squares in a couple of minutes and receive these M&M's" (experimenter again points to 80-square box and bowl containing two or more M&M's), "then you can have this M&M right now. So, which box would you like to sort in a couple of minutes?"
If subjects committed to sorting the large, delayed-reward task, the experimenter gave them the reward; if not, they were told they could color or play for a couple of minutes as noted below. Subjects were still allowed to commit to and sort either option but the same criteria applied as described below. Next, the following general procedures were common to both phases once a subject made a commitment choice in one of the above phases.

General Procedures

As detailed above, subjects were presented the choice options in Phase A and Phase B and asked to make a commitment choice. Once a subject committed to sorting one of the boxes, the experimenter said, "Okay, Johnny, you can go play for a couple of minutes," and subjects would go to either the coloring table and color or to the shelves to play with some toys. After a stopwatch "beeped" signalling the end of the two-minute delay, the experimenter said, "Okay, Johnny, you can come back now." Next, the subject was presented with the choice option again (the sorting choice) and the experimenter said:

"Johnny, would you like to sort these squares and get this M&M" (experimenter points to 12-square box and bowl with one M&M), "or would you like to sort these squares and
get these M&M's" (experimenter points to 80-square box and bowl containing two or more M&M's)?

Once subjects selected one of the boxes to sort, the experimenter started the stop watch and began to tally incorrectly sorted squares.

If subjects displayed correspondence between their commitment choice and their sorting choice and they sorted at, or above, a 90% criterion of accuracy, then the reward was presented. In this case, the experimenter said, "Johnny, you may have your reward now."

If subjects did not display correspondence and/or did not sort at, or above, the 90% criterion of accuracy, then the reward was not presented. When subjects showed correspondence but did not sort above the 90% criterion of accuracy, the experimenter said:

"Johnny, you sorted well but you didn't put all the right colors in the right place so there's no reward this time. I hope you'll do better next time so you can get the reward, okay."

When subjects sorted accurately but did not display correspondence between their commitment choice and their sorting choice, the experimenter placed his hands over the reward bowls and said:
"Johnny, you sorted well but you didn't sort the way you promised you would sort so there's no reward this time. I hope you'll do better next time so you can get the reward, okay."

It should be noted that the number of rewards present in each bowl for each option was always right next to the appropriate box of colored squares in full view of subjects. Also, no subjects ever failed to sort below the 90% criterion of accuracy and failed to show correspondence between their commitment choice and their sorting choice.

Subjects were required to eat all of their rewards before leaving the experimental room and, when they were finished, the experimenter said, "Johnny, we can go back now," and the experimenter walked the subject back to the classroom and got the next subject.
RESULTS

Sorting Errors

Subjects sorted over 2000 squares each during the course of the study. S1 and S4 made only 1 error each, S2 made 5 errors, and S3 made 10 errors.

Sorting Times

Each time a subject sorted either box of squares, the period of time that subject took to sort those squares was timed with a stopwatch. Average sorting times for the long, delayed-reward task were similar across subjects ranging from 4:11 to 4:57. Average sorting times for the short, immediate-reward task varied relatively more with a range from :29 to 1:25. Thus, there was a different amount of effort (sorting time plus delay) involved in sorting the two boxes of squares.

Switch Points

Figure 1 shows that S1 displayed consistent "switch points" during the following phases: B=2, A=10, B=2, and A=10. S1 alternated between the large, delayed-reward task and the small, immediate-reward task at a 2:1 ratio of reinforcement during the rewarded-commitment condition.
Figure 1. Number of Reinforcers for Large, Delayed-Reward Task and Short, Immediate-Reward Task Across Experimental Conditions for S1 and S2.
(Phase B). This appears to indicate that S1 had "no preference" in this condition. S1 did show a consistent "switch point" in the non-rewarded-commitment condition (Phase A) by shifting preference at a 10:1 ratio of reinforcement.

S2 displayed the most inconsistent responding. Also shown in Figure 1, S2's "switch points" were: B=11, A=2, B=2, A=6, B=2, and A=8. It appears the reduction from 160 squares to 80 squares for the large, delayed-reward task had an initial effect on S2, but, in subsequent returns to the rewarded-commitment condition (Phase B), S2 displayed a consistent "switch point" at a 2:1 ratio of reinforcement. Similar to S1, S2 alternated responding between the two tasks in the rewarded-commitment condition. This seems to indicate that S2 also had "no preference" in this condition. Further, under the non-rewarded-commitment condition (Phase A), the reduction from 160 to 80 squares for the large, delayed-reward task appears to have again had an initial effect, but S2 showed a fairly consistent "switch point" at a 6-8:1 ratio of reinforcement.

Figure 2 shows that S3 displayed consistent "switch points" during the following phases: A=6, B=24, A=6/8, and B=22. S2 alternated responding during the non-rewarded-commitment condition (Phase A) at a 6:1 ratio of reinforcement and at a 22-24:1 ratio of reinforcement under the rewarded-commitment condition (Phase B).
Figure 2. Number of Reinforcers for Large, Delayed-Reward Task and Short, Immediate-Reward Task Across Experimental Conditions for S3 and S4.
Also shown in Figure 2, S4 displayed the following "switch points:" A=11, B=28, A=17, and B=26. S4 displayed a fairly consistent "switch point" under the non-rewarded-commitment condition (Phase A) at a 11-17:1 ratio of reinforcement and, under the rewarded-commitment condition (Phase B), S4 consistently "switched" to the large, delayed reward task at a 26-28:1 ratio of reinforcement.
DISCUSSION

Generally, the present study has shown that using a rewarded commitment affects a child's degree of self-control as assessed by the "switch point." Although all subjects displayed differential responding under the two separate conditions, it remains unclear why one-half of the subjects displayed greater self-control under the rewarded-commitment condition and the other half of the subjects displayed greater self-control under the non-rewarded-commitment condition. It seems most reasonable that these results are due to a phase ordering effect. In spite of this result, this study has still provided a useful model for assessing a child's degree of self-control, the "switch point," and has examined one important variable for affecting a child's degree of self-control, namely, a rewarded commitment. Some implications for applied and clinical work can be drawn. For example, using the switch point to assess the degree of self-control, clinicians may use a rewarded commitment to increase on-task behavior of attention deficit and hyperactive children. Applied studies may compare its effectiveness against and with various medication regimes. Teachers may use it to increase homework completion. Parents may try to increase rule compliance.
Now, a more specific discussion of the results might be useful.

Regarding subjects' sorting accuracy, the error rates were so low that interobserver agreement was deemed unnecessary. All subjects sorted over 2000 squares each during the course of the study and no subject incorrectly sorted more than ten squares (two subjects sorted only one square incorrectly). It seems reasonable, then, to rule out incorrect sorting of squares as a variable affecting the data.

Although sorting times varied somewhat for the short, immediate-reward task (12-square box), the sorting times for the large, delayed-reward task (80-square box) were quite consistent among subjects. The large, delayed-reward task of sorting 80 squares required more effort, as defined by the average time required to sort the squares plus the delay to sorting the squares, than the small, immediate-reward task of sorting 12 squares. Thus, it can be concluded that, indeed, there was a difference in the amount of effort (sorting time plus delay) required for the two tasks and the large, delayed-reward task was more work than the small, immediate-reward task.

As noted previously, this study has shown that providing a reward for making a commitment to some future behavior has an effect on a child's degree of self-control. The
"switch point" has been used to assess each child's degree of self-control. As the "switch point" refers to the point at which a subject switches responding between a small, immediate-reward task and large, delayed-reward task, it can be said that switching from the smaller task to the larger task constitutes "self-control." Conversely, switching from the large task to the small task would constitute "impulsiveness." Thus, the lower the switch point, the greater the degree of self-control and, the higher the switch point, the lower the degree of self-control.

In regards to this study, S1 and S2 showed higher degrees of self-control when a reward was provided for making a commitment than when no reward was provided for making a commitment; i.e., their "switch points" were lower in the rewarded-commitment condition (Phase B) than in the non-rewarded-commitment condition (Phase A). In contrast, S3 and S4 showed lower degrees of self-control when a reward was provided for making the same commitment and, thus, they exhibited higher degrees of self-control when no reward was provided for making a commitment; i.e., their "switch points" were higher in the rewarded-commitment condition (Phase B) than in the non-rewarded-commitment condition (Phase A).
Each subject displayed quite consistent switch points within each phase. S1's switch points in Phase B were 2 and 2; in Phase A they were 10 and 10. S2's switch points in Phase B were 2, 6, and 8; in Phase A they were 11, 2, and 2. S3's switch points in Phase A were 6 and 6 or 8; in Phase B they were 24 and 22. S4's switch points in Phase A were 11 and 17; in Phase B they were 28 and 26. The consistency of these switch points suggests that choice behavior was reliably controlled by alterations in the relative magnitude of reinforcement coupled with a commitment. In addition, the differences in the switch points under the rewarded-commitment condition (Phase B) versus the non-rewarded-commitment condition (Phase A) are noteworthy. The relative difference in S1's switch points were 2:1 (Phase B) and 10:1 (Phase A); S2's were 6 or 8:1 (Phase B) and 2:1 (Phase A). The relative difference in S3's switch points were 6:1 (Phase A) and 22 or 24:1 (Phase B); S4's were 11 or 17:1 (Phase A) and 28 or 26:1 (Phase B).

Although the switch points were consistent within subjects and within phase sequences, the switch points did differ in relation to the overall ordering of phases. Recall that S1 and S2 followed a BABA phase sequence and S3 and S4 followed a ABAB phase sequence. Thus, as indicated by the lower ratio of reinforcement between the large, delayed-reward task and the small, immediate-reward task,
S1 and S2 showed higher degrees of self-control under the rewarded-commitment condition (Phase B). Conversely, S3 and S4 showed higher degrees of self-control under the non-rewarded-commitment condition (Phase A). Considering that each subject exhibited consistent and stable responding within one's own experimental conditions, it seems most likely that the difference in S1 and S2's results and S3 and S4's results is best accounted for by the order in which subjects experienced the rewarded-commitment and non-rewarded-commitment conditions (Phase B and Phase A).

It is necessary to point out some limitations of the present study. First, with only four subjects (two following each phase ordering), the generality of the results may be limited. Second, the task used (sorting colored squares), may not exemplify common self-control problems. Third, the artificiality of the experimental situation may also limit the generality of the results. Future research in this area may attempt to control for these and other factors by using more subjects, targeting more common self-control tasks in more natural environments such as in-seat behavior in a classroom, and by using other varieties of reinforcers such as verbal praise.

Finally, although the results are somewhat inconsistent, it can be concluded that providing a reward for making a commitment to a future behavior involving a large,
delayed-reward task does have an effect on a child's degree of self-control as measured by a "switch point." In addition, the "switch point" has been shown to be a useful tool for assessing a child's degree of self-control.
Appendix A

Human Subjects Institutional Review Board
Research Protocol Clearance
Date: August 30, 1989
To: Michael Winter
From: Mary Anne Bunda, Chair

This letter will serve as confirmation that your research protocol, "Correspondence Training with Rule Statements in a Self-Control Paradigm", has been approved by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval guidelines.

Please note that the Consent Form accurately represents what you are doing in your research; however, the HSIRB still believes that the language is convoluted.

The Board wishes you success in the pursuit of your research goals.

cc: R. W. Fuqua, Psychology Department
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