

Choice and Commitment in College Students:
Attempting a Realistic Analogue of
Bachlin's Model of Self-Control

An Honors Thesis (ID 499)

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Abstract

The present study attempted to replicate, in a real-life analogue, the findings of Rachlin and Green (1972) regarding the reversal of preference for a small, immediate reward or a large, delayed reward in time, as well as the utility of prior commitment as a means of self-control. One hundred three college students were presented with a two-link chain of events. In the initial link, subjects could either commit themselves to a large, delayed reward or proceed to a terminal link, T days later, in which they could choose between the large, delayed reward or a small, immediate reward. According to Rachlin and Green, self-control is evidenced by both a reversal in preference from small to large reward in time and an increase in commitment to the large reward as T increases. In the present study, a definite and consistent preference was found for the large, delayed reward across all values of T . These results replicated neither Rachlin and Green (1972) nor Burns and Powers (1975) in their attempt to replicate Rachlin and Green's results. In post hoc analyses of the data, a methodological problem was discovered which altered the procedure used in this study from that used by Rachlin and Green. Upon correction of delay values, tentative support was found for Rachlin and Green's matching equation for finding the value ratio for two alternative choices differing in amount and delay of reinforcement.

CHOICE AND COMMITMENT IN COLLEGE STUDENTS:
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Choices are an inevitable part of every person's life. People are constantly making choices, and it is a well-known (or at least well-assumed) fact of life that we do not always make the wisest or most beneficial choice. This seems often to be the case when the choice involves the delay of one of the consequences. For example, we may go ahead and spend money on an evening out now instead of saving it for a vacation trip later, only to regret it when the time for vacation rolls around. Or, we may settle for an inferior product that is available now, rather than wait for a superior one to arrive on special order later.

Both of these examples involve what has been called delay of reward or delay of gratification. It has been the goal of a good many research studies to explain the various conditions and variables that determine whether one will opt for a delayed, large reward or accept a small, immediate, or less delayed, one. Among the factors found to influence preference for delay are age, intelligence, socioeconomic status, length of delay, attention and other cognitive mechanisms, presence or absence of the reward during the delay, and even the presence or absence of the father in the home. (Mischel, 1958; Mischel & Metzner, 1962; Mischel & Ebbeson, 1970; Mischel, Ebbeson, & Zeiss, 1972). Interestingly, it has been demonstrated

that magnitude or value of the reward influences preference for delay (Crooks, 1977), and, conversely, that delay influences the subjective value of reward (Mischel, Grusec, & Masters, 1969).

Mahoney(1972) has defined self-control as any response made by an organism which modifies the probability of another response. This easily relates to the study of preferences for delayed reward. Given a situation in which there is a choice between a small, immediate reward and a large, delayed reward, there exists a tendency to choose the small, immediate reward. By reason of Mahoney's definition of self-control, there must be some response available that would alter the probability of making this choice. This response exists in the form of prior commitment to the larger, delayed reward. Study of the use of commitment as a means of self-control in such preference situations has been conducted, most notably, by Rachlin and Green (1972).

Rachlin and Green initially found that when given a choice of a 2-second exposure to grain immediately or a 4-second exposure after a delay of 4 seconds, pigeons reliably chose the smaller, immediate reward. In studying the reversibility of this preference, Rachlin and Green first exposed the pigeons to a choice between two keys lit with white light. This was termed the initial link. By pecking either key, the pigeon proceeded to a terminal link. If the pigeon pecked the right key in the initial link, the terminal link presented a choice of a red or a green key. A choice of red produced the

immediate 2-second exposure to grain while a choice of green produced the 4-second exposure to grain delayed by 4-seconds. Choosing the left key in the initial link produced a no-choice situation in which only the green key was lit in the terminal link. This represented a commitment to the large, delayed reward. A diagram of Rachlin and Green's paradigm is provided in Figure 1.

Insert Fig. 1 about here

T represents the time between the initial link and the terminal link, and served as the independent variable.

Rachlin and Green's model is based on a version of the matching law in which "the ratio of the values of two reward alternatives differing in delay and amount is the product of the ratio of amounts and the inverse ratio of delays" (Rachlin and Green, 1972). Expressed mathematically, this would be:

$$\frac{V_1}{V_2} = \frac{A_1}{A_2} \cdot \frac{D_2}{D_1}$$

In testing this model, Rachlin and Green studied self-management behavior in pigeons.

If the reversal of preference exists, then at small values of T, the small, immediate reward will be preferred, or have a higher V value, than the large, delayed reward. At larger values of T, the reverse will be true. Using Rachlin's values for amounts and delays of reinforcements, with a T value of 1 second, the equation becomes:

$$\frac{V_1}{V_2} = \frac{2}{4} \cdot \frac{(4+1)}{(0+1)} = \frac{10}{4}$$

Since the final ratio is greater than 1, the value of the first alternative is greater. Hence, the small, immediate reward is the preferred one. If, on the other hand, $T = 10$, with all other variables constant, the equation becomes:

$$\frac{V_1}{V_2} = \frac{2}{4} \cdot \frac{(4+10)}{(0+10)} = \frac{28}{40}$$

In this instance, the ratio is less than 1 and it is the second alternative that is more highly valued. The large, delayed reward is preferred at $T = 10$ seconds. In addition, Rachlin predicted that at larger values of T the pigeons would tend to commit themselves in the initial link and lock themselves into a no-choice situation in the terminal link. In other words, they would exhibit self-control. In fact, this is exactly what Rachlin and Green found. As T increased, so did commitment responding, which, in turn, provided strong evidence for the reversal of preferences in time.

A replication of Rachlin and Green's findings was attempted with human subjects. Burns and Powers (1975) used two children (ages 9 and 10) in an experimental situation very similar to the one used by Rachlin and Green for pigeons. These investigators found that there was a reversal in preference; however, it was the small, immediate reward that increased in preference and not the large, delayed one as Rachlin had predicted. Although replication was not achieved, the preference reversal that was found was useful in "suggesting the model's utility in the investigation of self-control with humans" (Burns and Powers, 1975)

The purpose of the present experiment was to replicate Rachlin and Green's finding in a real-life analogue to their paradigm using human subjects.

Method

Subjects

The subjects were 103 male and female college students who were enrolled in an introductory psychology course. Participation was voluntary and in exchange for extra-credit in the course. Since the class met in both a large group situation and in small discussion groups, assignment to experimental conditions was made on the basis of membership in one of six discussion groups. That is, the members of each discussion served as subjects in a different experimental condition.

Design

In order to simulate a real-life situation and still maintain an acceptable level of control, deception of subjects was necessary. However, the deceptive aspects were kept to a minimum. What follows is the "contrived" situation with which subjects were confronted.

Subjects were presented with a choice between two experiments (EXP 1 and EXP 2) in which they could participate for extra-credit in their psychology course. The experiments differed in both amount and delay of reinforcement. EXP 1 offered the opportunity to earn up to 5 points of credit, with the amount of credit earned being disclosed the day following the experiment. EXP 2, on the other hand, offered up to 10 points of credit, but notification of points earned would not

be possible for two weeks following the experiment.

The choice was presented in a two-link chain. In the initial link, which was presented at the same time for all groups during a large class meeting, subjects either committed themselves to EXP 2 or opted to choose between EXP 1 and EXP 2 later, in the terminal link. It should be noted that, for all subjects, both experiments were to be conducted on the same given date, 29 days after presentation of the initial link. The terminal link took place within small discussion groups and occurred on different days for each group. Thus, systematic variation of T (the time between initial and terminal links) was achieved. The six intervals of T used were: 1 day, 2 days, 9 days, 10 days, 23 days, and 24 days. Based on Rachlin's matching equation, two hypotheses were formed: 1) as T increased preference should shift from EXP 1 to EXP 2, and 2) this shift would be evidenced in an increasing amount of commitment in the initial link as T increased.

Procedure

On the first day of the study, the experimenter entered the large class situation, presumably, to recruit subjects for two experiments to be conducted at a later date. After explaining the experiments and the extra-credit "package" of each, the experimenter distributed schedules indicating when choices could also be made in the different discussion groups. The subjects were also informed that if anyone wished to sign up for EXP 2 at that time it was possible to do so. A more detailed copy of the instructions given at this period is supplied in

Appendix 1.

After the various time intervals (1 day, 2 days, 9 days, 10 days, etc.) the experimenter visited the discussion groups where he reviewed the experiments and extra-credit options for the subjects and accepted sign-ups for either experiment. The instructions used at this time are supplied in Appendix 2.

After visiting all discussion groups, the experimenter returned to the large group on the day the experiments were to be conducted. At this time, subjects were debriefed regarding the deception, the true nature of the study, the necessity of the deception, etc. Subjects were encouraged to ask any questions regarding the experiment that they may have had. Also, all subjects were informed that everyone would be awarded a full 10-point credit for participating.

Results

Table 1 presents the frequency and percentage of total subjects opting for each alternative for each T value.

Insert Table 1 about here

This data is depicted graphically for each T value in Figure 2.

Insert Fig. 2 about here

As can be seen, preference for the larger, delayed reward (both in the form of commitment in the initial link and in the form of choosing EXP 2 in the terminal link) steadily increased with increases in T . Preference for the small, immediate reward (EXP 1) is almost negligible, never exceeding 8% (with the exception of $T = 2$ days, where preference for EXP 1 jumped to 37.5%. This will be discussed later).

Discussion

Clearly, the results of the present study fail to replicate either Rachlin and Green's results or those found by Burns and Powers. No complete reversal of preference was found. Quite the contrary, preference for the large, delayed reward remained rather constant and substantial, accounting for over 90% of all responses across all values of \underline{T} , with the exception of $\underline{T} = 2$ days, where preference for EXP 1 jumped to account for 37.5% of the responses. However, this rather dramatic increase in preference for EXP 1 is likely to be attributable to a difference in information for the group at $\underline{T} = 2$ days. This group was the only group of subjects in which the question was raised as to the certainty of points earned in EXP 2 and the possibility of not earning, in EXP 2, the five (5) points possible in EXP 1. The experimenter had been forced to affirm the existence of such a possibility since the phrases "up to 5" and "up to 10" meant any point values from 0 to 5 and 0 to 10, respectively. The experimenter could not, however, propose any probability for such an occurrence. Nevertheless, such an increase in uncertainty regarding the rewards of EXP 2 could very easily account for such a shift in preference to EXP 1.

This particular experimental group notwithstanding, preference for EXP 2 established itself and was maintained for all values of \underline{T} . However, these results cannot be interpreted as discounting or disproving Rachlin's model.

In post hoc analyses of the data it was discovered that the present study contained an additional time element which

was not considered in the original predictions. Since all subjects in the present study came from the same introductory psychology class, it was convenient to present all subjects with the initial link at the same time in a large class situation and present the terminal link at varying time intervals (\underline{T}) within the discussion groups. It was also convenient (for debriefing purposes, realism, etc.) to present the "experiments" for which the subjects signed up as taking place on the same specific date. It was from this specific date that the fixed delays of reward were calculated. What was overlooked was the fact that by varying the times at which subjects were exposed to the terminal link, a varying amount of time was passing between the terminal link and the "experiment" date from which the delays were calculated. That is, in actuality, not only were \underline{T} values varied, but also the delays of rewards themselves were varying! For example, at $T = 1$ day, the delay of reward for EXP 1 at the terminal link includes not only the 1 day delay between participation in the "experiment" and notification of reward, but also the 28 days elapsing between the terminal link and the day of the "experiment". Thus, the delay for EXP 1 at $\underline{T} = 1$ day was actually 29 days. Following the same procedure, the delay for EXP 2 becomes, not 14 days, but 42 days. At this point Rachlin's matching equation becomes:

$$\frac{V_1}{V_2} = \frac{5}{10} \cdot \frac{42}{29} = .724$$

Since the ratio is less than 1, it would be predicted that

EXP 2 would be the preferred alternative. Since the discussion groups were visited at different times, this time interval between terminal link and "experiment" was varied unintentionally.

When all actual delays were re-calculated and these values inserted into the equation suggested by Rachlin and Green, it was found that, indeed, preference for the large, delayed reward was predicted for 4 out of the 6 experimental groups. These value ratios and actual delays are presented in Table 2.

Insert Table 2 about here

The last two groups ($\underline{T} = 23, 24$) are the two where a reversal would be predicted. By reviewing Table 1 and Figure 2, it can be seen that from $\underline{T} = 23$ to $\underline{T} = 24$, both preferences of large, delayed reward drop slightly, while preference for EXP 1 increases slightly. However, with no greater \underline{T} values tested, it is impossible to determine if these differences actually represent the start of a reversal.

Brief questionnaires were distributed to subjects at the time of debriefing concerning the reasoning and logic behind the choices made. It is interesting to note that responses indicating impulsivity as a factor in the decision were more common for subjects who had committed themselves to EXP 2 in the initial link. Of those subjects that opted for a choice at the initial link, a great many indicated they were waiting for more information regarding the two experiments. In this light, it would seem possible that those subjects not choosing commitment at the initial link were exhibiting more

self-control than those who did commit themselves.

In summary, while an additional time factor and a consequent difference in paradigm prevented replication of the findings of Rachlin and Green, some tentative support was found for the utility of Rachlin and Green's value ratio for two reward alternatives in predicting preference for delayed rewards.

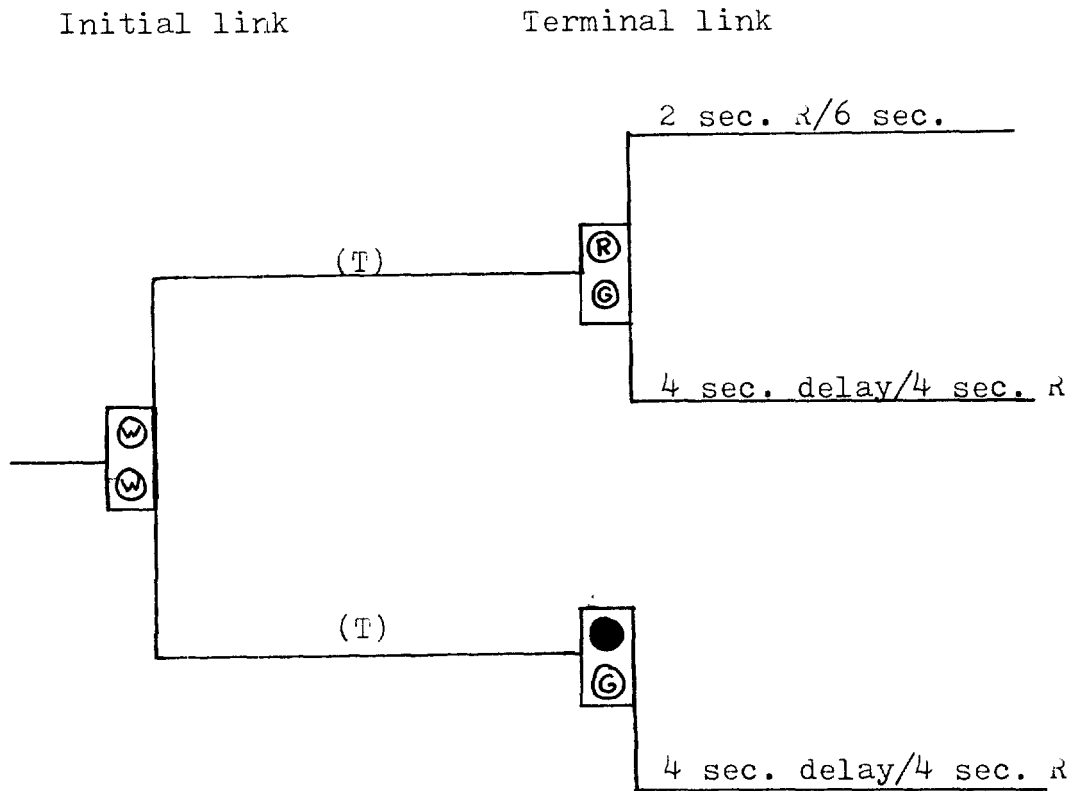


Fig. 1. Diagram of the paradigm used by Wachlin in his study of self-management in pigeons.

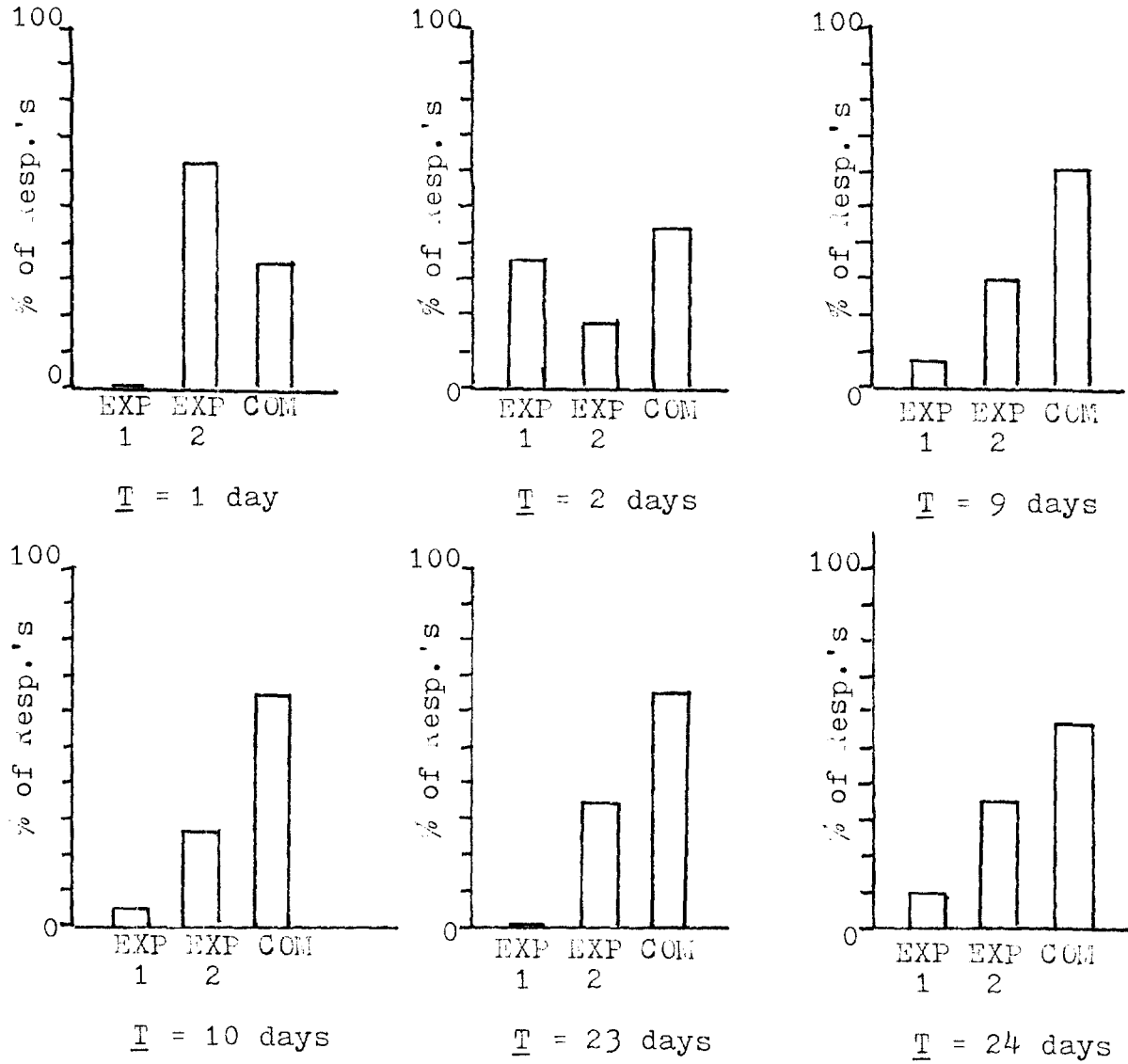


Fig. 2. Percentage of subjects choosing each of three possible alternatives plotted for each value of \underline{T} .

<u>T</u> =	#Ss	EXP 1		EXP 2		COMMITMENT	
		(terminal link)		(terminal link)		(initial link)	
		f	%	f	%	f	%
1	19	0	0	12	63.2	7	36.8
2	16	6	37.5	3	18.75	7	43.75
9	13	1	7.7	4	30.8	8	61.5
10	18	1	5.5	5	27.8	12	66.6
23	23	0	0	8	34.8	15	65.2
24	14	1	7.1	5	35.7	8	57.1

Table 1. Number of subjects, frequency, and percentage of subjects choosing each possible alternative for each value of T.

Actual delays			
$\underline{T} =$	EXP 1	EXP 2	$\frac{V_1}{V_2} =$
1	29	42	.724
2	28	41	.732
9	21	34	.809
10	20	33	.825
23	7	20	1.428
24	6	19	1.583

Table 2. Actual delays for each "experiment" and value ratios plotted for each value of \underline{T} .

Appendix 1

On (specific date given), there will be two research experiments conducted by members of the psychology department. Your instructor has agreed to offer extra-credit in this course for participation in these experiments. However, since they are being conducted on the same day you will only be able to participate in one. In both cases, awarding of credit will be dependent on your performance in the required tasks of each experiment.

By participating in the first experiment, you will have the opportunity to earn up to 5 points of extra-credit. You will be notified of credit earned the following day (specific date given).

By participating in the second experiment you may earn up to 10 points of credit. However, it will not be possible to notify you of credit earned until two weeks later, (specific date given). Are there any questions?

I will be around to your discussion groups in the next few weeks to give you the opportunity to sign up for whichever experiment you choose. I am handing out a schedule of dates and times that I will be coming to each discussion group. The date that I meet with your discussion group will be the only time you may sign up. If anyone would like to sign up for the second of the two experiments now, I will be available after class for you to do so. Are there any questions at this point?

Appendix 2

As you will recall, I visited your large class a few days/weeks ago. At that time I described two experiments to you, one of which you can sign up to participate in for extra-credit. At that time, if you wanted, you were allowed to sign up for one of the experiments. Today, you may sign up for either experiment you wish. To review, in EXF 1, you may earn up to 5 points of credit and will be notified how many points were earned on the following day. In EXF 2, you may earn up to 10 points of extra-credit, however it will not be possible to notify you of credit earned until two weeks later. Are there any questions?

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