

THE RELATIVE EFFECTS OF SELECTED COGNITIVE,
PERSONALITY, AND INCENTIVE VARIABLES
ON SELF-CONTROL

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THE RELATIVE EFFECTS OF SELECTED COGNITIVE,
PERSONALITY, AND INCENTIVE VARIABLES
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BY

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the University of Manitoba in partial fulfillment of the requirements
of the degree of

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TABLE OF CONTENTS

	Page
ABSTRACT	<i>i</i>
ACKNOWLEDGEMENTS	<i>iv</i>
LIST OF TABLES	<i>v</i>
LIST OF FIGURES	<i>vi</i>
CHAPTER	
I. Introduction	1
Models of Self-Control	12
The Behavioral Models of Self-Control	12
Behavioral Self-Control Research Based on the Externally-Imposed Delay Paradigm	13
Behavioral Self-Control Research Based on the Self-Imposed Delay Paradigm	18
Conclusions	23
Personality Models of Self-Control	24
Personality Research using the Externally- Imposed Delay Paradigm	29
Personality Research using the Self-Imposed Delay Paradigm	32
Conclusions	35
Cognitive Models of Self-Control	36
Cognitive Research using the Self-Imposed Delay Paradigm	38
Cognitive Research using the Externally- Imposed Delay Paradigm	42
Conclusions	44

CHAPTER	Page
Summary and Statement of Hypotheses	44
Behavioral Hypotheses	46
Personality Hypotheses	47
Cognitive Hypotheses	48
A Brief Summary of the Experimental Hypotheses	49
II. METHOD	
Subjects	51
Design	51
Dependent Measures	53
Covariate Measures	53
Procedure	54
Data Analysis	58
III. RESULTS	
Incentive Variables	60
Effects of Relative Reward Value	60
Effects of Reward Size	63
Effects of Delay	65
Combined Effects of Reward Size and Delay	67
Effects of Cognitive Instructions	67
Concurrent and Construct Validity of Reid and Ware's Scale	70
Are Choices Consistent with Subjective Reports of Relative Reward Value?	73
Effects of Age, Sex, and Money	73

CHAPTER	Page
IV. DISCUSSION	
Effects of Incentive Variables	75
Effects of Cognitive Instructions	77
Effects of Personality Variables	79
Effects of Age, Sex, and Amount of Personal Income	80
When is Choice Behavior Self-controlled? Implications for Future Research	81
REFERENCE NOTES	85
REFERENCES	86
APPENDICES	100
1. Matching Law Mathematics	100
2. Values Questionnaire for Rewards \$10 and \$5	101
3. Values Questionnaire for Rewards \$10 and \$1	122
4. Personal Inventory	143
5. Instructions Questionnaire	149

ABSTRACT

Based on previous literature, self-control is defined as the ability to forego a more immediate, smaller reward in favour of a more delayed, larger reward. Unlike most prior research, the present study focussed on the relative effects of selected incentive, cognitive and personality variables on self-control behavior of male and female high school students (N = 200), using an externally-imposed delay of reward paradigm.

First, the effects on self-control behavior of incentive variables reward magnitude and delay were tested by constructing a set of reward alternatives in a systematic way using Rachlin's (1970) matching law. This provided a test of the ability of the matching law to predict subjects' choices. In addition, the combination of rewards and delays was designed to test its assumptions that subjects' choices would be affected by the ratios of the delays and rewards and not by their absolute sizes. Finally, delays of 2 to 50 weeks, and magnitudes of \$1 to \$10 were chosen as more substantial and realistic than those used in the past to test predictions of the matching law.

From a personality perspective a number of approaches to predicting self-control behavior have been tried. In the present study it was assumed that the more internal a subject's locus of control and the more they were disposed to self-control, the more likely they would be to delay gratification. In the present study responses on Reid and Ware's (1974) combined self-control-IE scale were correlated with subjects' choices in the externally-imposed delay of reward paradigm. In addition, Reid and Ware's (1974) claim that

feelings of control over the external environment were distinct from feelings of control over personal desires was tested by factor analysing subjects' responses to the combined scale.

Finally, a large number of cognitive strategies have been used in the study of self-control behavior. For the self-imposed delay of reward paradigm, it has been found that such instructions decrease a subject's ability to wait for the delayed reward. For the externally-imposed delay of reward paradigm evidence from the work of Miller and Karniol (1976a, b) indicates that the reverse effect occurs. The present study compared the effects of consummatory instructions similar to Mischel and Baker's (1975) with a control group on subjects' choices between sets of delayed and immediate rewards.

Hypotheses were tested using a MANOVA, and ANOVAs corrected for circularity violations, Scheffe's comparison tests designed specifically to correct for the effects of circularity and multiple regression analyses. The analyses indicated that relative reward value as predicted by the matching law was significantly and systematically related to both subjects' choices, and ratings of the relative reward value of the choices. However, both assumptions of the matching law were violated under certain instances of delay and reward magnitude. While it was found that beliefs about their control over reinforcements was distinct from subjects' beliefs about their ability to control their own impulses, no significant correlations were found between these beliefs and reward choices.

With respect to cognitive instructions, it was found that particular consummatory instructions had very specific effects depending on the particular reward magnitude pair, relative reward values and delays which were involved, with subjects becoming more impulsive when reward magnitudes were \$10 and \$5 and less impulsive when reward magnitudes were \$10 and \$1 compared to the control group. Finally, it was clear from the analysis that the effects of incentive variables far outweighed those of either the personality or cognitive variables.

The results were discussed in terms of when we can call choice self-controlled or impulsive and the necessity of systematically including incentive variables in future studies.

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LIST OF TABLES

Table	Page
1. Multivariate Analysis of Variance	61
2. Varimax Rotated Factor Loadings on Scale Items for the Present Study and Reid and Ware's	71
3. Correlations between Choice and Self-reported value and Subjects' Scores on the Three Factors of Reid and Ware's (1974) Personality Inventory	71

LIST OF FIGURES

Figures		Page
1.	Hypothetical Incentive Curves that Ainslie Maintains Represent the Self-imposed Delay Paradigm of Self-control	18
2.	Hypothetical Incentive Curves that do not Represent Self-control Situations	19
3.	Means for each Dependent Measure are Plotted Against the Relative Reward Value of the Two Alternatives	62
4.	Means for the Dependent Measure Choice are Plotted Against the Relative Reward Value of the Larger Reward to the Smaller for Reward Sizes \$10-\$1 and \$10-\$5	64
5.	Means for the Dependent Measure Choice are Plotted Against Relative Reward Value for each of the Four Levels of Delay to the Larger, Later Reward	66
6.	Means for the Dependent Measure Choice are Plotted Against Relative Reward Value of the Larger, Later Reward for the Reward Size Level \$10 and \$1 for 2 Week Delays to the Larger Reward and for the Reward Size Level \$10 and \$5 for 50 Week Delays to the Larger Reward	68

CHAPTER I

Introduction

Self-control research has received increased attention in the recent clinical and experimental literature. Five books (Goldfried & Merbaum, 1973; Mahoney & Thoresen, 1974; Stuart, 1977; Thoresen & Mahoney, 1974; Watson & Tharp, 1972) as well as a number of reviews (Cautela, 1969; Kanfer, 1970; Kanfer & Karoly, 1972) have focussed on the area in a variety of ways. Taking a social-learning point of view, researchers such as Bandura (1976), Kanfer (1970), and Mischel (1974) have been investigating the effects of variables such as attention, modeling, and self-reinforcement on self-control. Meichenbaum (1977) has emphasized a cognitive-behavioral approach using verbal, self-instructional techniques. From a personality perspective, Shybut (1968), Getswinger (1977), and Miller (1978) have studied various psychodynamic variables associated with impulsiveness; Kagan, Rosman, Albert and Phillips (1964) and Riddle and Roberts (1977) have focussed on the cognitive styles associated with impulsive thinking; and a number of researchers (Bailer, 1961; Mischel, Zeiss & Zeiss, 1974; Walls & Smith, 1970) have spotlighted the role of Rotter's (1954) locus of control construct in self-control. Finally, there has been some interest by operant researchers such as Rachlin and Green (1972) and Ainslie (1975) in this area.

There is no consensus of opinion about the meaning of the word self-control. Some use it to refer to a particular kind of behavioral

situation (Ainslie, 1975; Rachlin & Green, 1972). Others seem to view it as any process where treatment is self-administered (Mikulas, 1976). Still others take the attitude that self-control occurs when there is a relative absence of control from the external environment (Bandura, 1976; Mahoney & Thoresen, 1974) due either to freedom to some degree from the deterministic forces of nature, or because more response alternatives are available (Bandura, 1977a).

Before examining the research in more detail, a clear and mutual understanding of the meaning of the word self-control is needed. The colloquial meaning of the word usually suggests restraint in the face of temptation. New Webster's Collegiate Dictionary (1975) defines it as well organized and planned activity that has some delayed benefit. Emotionally, being self-controlled suggests behavior that is cold and distant. As used in psychology, the word self-control often appears synonymous with words like self-regulation, self-management, self-direction, and self-reinforcement. Its opposites include concepts such as impulsiveness, lack of ego-strength, an impulsive cognitive style, and an external locus of control. These concepts give some flavor of the word's meaning, but they are too vague.

In a very general sense, the word self-control has been applied to therapies in which the client to a large degree is made responsible for his own treatment. Thus, when Mahoney and Thoresen (1974) talk about teaching self-control, they mean the therapist will be training the client in the basics of behavioral analysis and treatment with his goal

being to make the client not only responsible for his own personal change but also to provide him with the necessary information and training to carry out this task. The problem with using the phrase "self-control training" to describe procedures of this kind is that almost all therapeutic activity could be labelled self-control training. For example, within the behavioral framework alone, self-control problems have been treated by a wide variety of procedures, such as: systematic desensitization (Kahn & Baker, 1968), thought stopping (Cautela, 1969), stress inoculation (Meichenbaum, 1977), biofeedback (Schwartz & Shapiro, 1967), contingency management (Thoresen & Mahoney, 1974) verbal self-instructions (Camp, Blom, Herbert & Von Doorwick, 1977), and self-reinforcement (Bandura, 1977a). Thoresen and Mahoney (1974) give a more extensive list of the various strategies used to promote self-control. Many of these strategies are applicable to a wide variety of problems other than those normally considered problems of self-control. Obviously, trying to define self-control by the therapeutic strategies used to promote it, would lead to a definition that is far too general.

Another approach to this definitional problem is based on the difference between self- and external control. Social learning theorists (Bandura, 1976, 1977a, 1978; Kanfer, 1970; Kanfer & Karoly, 1972; Mischel, 1973) focus on this difference maintaining that even though external variables often account for the initial creation of covert self-control behaviors and maintain them by occasional vicarious and direct reinforcement,

much of a person's behavior can be accounted for by covert processes. Thus, an organism "...displays self-control when in the relative absence of immediate external constraints, he engages in behavior whose previous probability has been less than that of alternately available behaviors" (Thoresen & Mahoney, 1974, p. 12). A person is capable of self-control behavior because of the effects of covert processes such as self-reinforcement.

This view is much in dispute. Behaviorists such as Catania (1975) and Rachlin (1974) maintain that self-control is nothing more than a special case of external control where the effects of the contingencies happen to be less obvious because they are extended in time. Further, they dispute the scientific status of covert mechanisms such as self-reinforcement. For example, Catania (1975) suggests that self-reinforcement is not possible maintaining that it might be more profitably considered a form of stimulus control.

Defining self-control in terms of the relative absence or presence of covert mechanisms would be difficult. Aside from the lack of agreement about whether such mechanisms exist, it would appear that there is no obvious way to directly establish whether a behavior is being controlled by distant, external consequences or by covert self-control mechanisms. If the distinction between covert and external variables is not dichotomous but is regarded as a continuum, as Thoresen and Mahoney (1974) suggest, then the problem becomes even more difficult because it must be decided at what point the covert mechanisms contribute enough to the outcome to label the process self-control.

Another way to approach the difference between self-control and external control is to focus on the locus of causality of self-control. In a trivial way, all behavior can be said to be self-controlled since all behavior originates with the self. However, most feel that there is a difference between the source of an action and its cause. The behaviorists solve this problem by saying that the ultimate cause of all behavior is external to the organism (Skinner, 1953). Personality theorists view self-control as caused by cross-situationally invariant internal dispositions. The social learning theorists, perhaps best exemplified by Bandura (1976, 1977a, 1978), see the locus of control as a function of three different types of causes. These are: the organism's behavior, the external environment, and a varied set of covert processes and structures. Bandura assumes that these three aspects of the person reciprocally interact in such a way that there is no one ultimate cause of behavior.

Approaching the problem of deciding when to call behavior self-controlled by using locus of causation as a criterion appears as fruitless as other attempts discussed. If we take the behavioral extreme, there is no such thing as self-control, except in the trivial sense. If we follow the social learning point of view, the theoretical complexity of their approach makes it difficult to formulate a precise definition. If we use a personality approach, we must look for signs of internal dispositions which will, at best, be explanatory fictions and not causes, until they are correlated with some underlying, stable biological mechanism or structure.

Another way to deal with this problem is to analyze the types of problems to which the label self-control is usually applied. A partial list of behaviors which have been described in the literature as self-control problems includes obesity (Ferster, Nurnberger & Levitt, 1962), smoking (Ferraro, 1973), alcoholism (Caddy & Lovibond, 1976), aggression (Camp, Blom, Herbert & Von Doorwick, 1976), physical pain (Levendusky & Pankratz, 1975), drug addiction (Wolpe, 1965), obsessional thinking (Hayes & Waddell, 1976), test anxiety (Deffenbacher & Snyder, 1976), depression (Tharp, Watson & Kaya, 1974), inadequate study habits (Beneke & Harris, 1972), sexual deviations (Davidson, 1968), and disruptive schoolroom behavior (Glynn, Thomas & Shee, 1973).

An examination of many of these studies shows that in each instance the investigators regarded the behavior under study as self-controlled when subjects either waited for a larger but delayed reward or opted for an immediate but smaller punishment. Thus we can generalize from these studies a basic operational definition, which investigators of differing persuasions vis-a-vis more elegant definitions of self-control have actually used in common. That is, self-control situations may be said to occur when an organism is faced with a choice between an immediate, small reward or a delayed, larger reward; or when faced with a choice between an immediate, small punishment or a delayed, larger punishment. Choosing the delayed, larger reward in the first case or the immediate, smaller punishment in the second case would thus be labelled instances of self-control. Thus, over-eating or weight control problems could represent a situation with the required two alternatives; the immediate,

small reward is the satisfaction of hunger, the delayed, larger reward, good health and greater physical attractiveness. Similar analyses could be applied to alcoholism, drug addiction, smoking, and studying.

Two different self-control paradigms emerge when we define self-control in this way. In the externally imposed, delay paradigm, someone else or circumstances control the availability of both rewards in such a way that when one of the rewards is chosen the other automatically becomes unavailable. In the second paradigm, usually called a self-imposed, delay paradigm, only access to the larger, more delayed reward is controlled by circumstances or by someone else; the smaller reward is continuously available (Miller, 1978).

A few examples might serve to make the distinction between these two more clear. A situation similar to the first paradigm might occur when a person is faced with the following two alternatives: he can either quit school and take a job, or he can continue in school and obtain better academic qualifications. It is assumed for the purpose of the example that taking the job will give an immediate, smaller payoff than continuing in school. To some extent, circumstances control the ease with which one can switch from one alternative to the other. Thus, in this case, if going to work is the choice made, going to school becomes more difficult or impossible. Similarly, going to school usually precludes full-time employment.

The problem of being overweight may be used as an example of the second paradigm. The overweight person faces two choices. He can remain overweight and enjoy the immediate but limited pleasures of an unrestricted diet or he can restrict his diet and have a healthy, physically attractive body. When considering the two choices, it is important to note that there are few, if any, external constraints to prevent overeating. Food is almost always freely and continuously available. Choosing to become slim and healthy does not restrict the availability of food; it does, however, require effort, time, and planning and therefore the healthy choice availability is limited by circumstance.

My operational definition of self-control, with its two paradigms, has the advantage of being applicable to a wide range of situations, but not so wide that it would lose its meaning. Nor does the definition appear to eliminate any models. That is, one can be a strict behaviorist or a personality theorist and still live with this approach.

Analysis of a large body of research associated with the concept of self-control reveals three broad categories of variables thought to affect self-control behavior. These may be called external, internal and a combination of external and internal variables.

The first is represented by the behavioral approach, which assumes that the choice between a larger, longer delayed and smaller, less delayed

reward: (1) ultimately is controlled by external variables; (2) is not affected by internal agencies such as will-power or covert processes such as self-reinforcement; (3) can be learned in certain situations and may generalize to others but is not automatically cross-situationally consistent; and (4) is primarily affected by variables such as magnitude, delay, probabilities, and schedules of immediate and delayed reinforcement (Skinner, 1953).

Personality models of self-control emphasize internal variables. Basically, the various personality approaches (e.g., psychodynamic, trait, and generalized expectancy models) view self-control as an internal, stable characteristic of the person; self-control behaviors are considered to be signs of these enduring structures (Mischel, 1968, 1974). Self-control then is considered to be: (1) cross-situationally stable; and (2) measurable by various personality tests.

A third approach includes both internal and external variables and is found among a wide variety of models which emphasize covert processes. In general, these models emphasize internal processes more than behavioral models, but acknowledge the effects of external contingencies and stimuli more than do personality models. Covert models range from those that make very limited assumptions about internal events (e.g., Homme, 1965) through the social learning models of Bandura (1976, 1977a, 1977b, 1978), Mischel (1973), Thoresen and Mahoney (1974), and Kanfer and Karoly (1972) which place more emphasis on process concepts like self-awareness and internal feedback, to cognitive behavioral models like Meichenbaum's (1977) which emphasize self-instructional approaches to behavior. While it is difficult to extract

a set of common assumptions about self-control from these various covert models, they all seem to agree that self-control: (1) is learned behavior that is situationally cued, and (2) involves certain covert processes which are said to be learned early in life through the effects of external contingencies but which achieve a form of control independent of external contingencies. However, they also maintain that this internal control fades over time if there is an absence of external reinforcement for the self-control behavior. Further, they do not posit enduring structures such as those suggested by personality models except for the more limited notion of specific expectancies of reinforcement (Rotter, 1954) or self-efficacy beliefs (Bandura, 1977b) which are viewed as situationally specific.

Given this very broad range of alternative ways of approaching self-control, there is understandably little cohesion in the data. If operant models are reviewed, the research focusses almost entirely on the effects of contingency management and stimulus control on self-control behavior. Personality theorists focus primarily on personality variables, and the social learning theorists emphasize covert processes. Furthermore, each approach tends to create experimental situations which will be most favorable to the kinds of predictions in which they are interested. While conclusions from such experiments are valuable, they often lead to lopsided views of self-control (see, for example, Bandura, 1976 versus Catania, 1975).

Given these competing opinions and the considerable lack of

consistency in the data, there appears no immediate way to decide empirically which of the models is best. What is needed is an experimental design which would allow the important variables of each model to affect behavior in such a way that their relative effects could be measured.

There are a number of problems with this approach. First, there are a large number of alternative variables that each model suggests are important. Second, a number of these variables can be varied over a wide range (e.g., amount of reward). Third, it rarely occurs that one dependent measure is sufficient to capture the effects of various independent variables and therefore a number of suitable dependent measures must be specified to measure an effect. Finally, there is an extremely wide range of experimental situations which could be used to test the adequacy of the models. With such a wide variety of alternatives, it is usually difficult to select an experimental design which would satisfy everyone. In spite of these difficulties the present study will attempt to combine selected variables from personality, behavioral, and social learning approaches in such a way as to allow some estimate of the relative strength of these models under specified circumstances.

The remainder of this review will focus on variables that appear to be of most importance to each of these models. A few will then be selected from each model for comparison.

Models of Self-Control

Behavioral Models of Self-Control

The proponents of behavioral models define all independent variables affecting behavior in terms of environmental contingencies and stimuli impinging upon an organism, and not in terms of internal states or processes. However, it would be erroneous to imply that all behavioral theorists express a uniform opinion concerning the causes of human behavior. Watson (1913) denied the existence of covert structures and processes, while Verplanck (1962) accepts them only as epiphenomena. Skinner (1953, 1974) doesn't deny their existence or the possibility of studying their effects, but he basically regards such efforts as misdirected.

In self-control research, Rachlin (1974) suggests that, historically, internal mediating processes and structures such as ego-strength have been appealed to because psychologists have been hesitant to ascribe unmediated, direct causality to events temporally far apart from one another. In his opinion, such efforts are unnecessary, since it is possible to train rats and pigeons to demonstrate self-control and few would attempt to explain their behavior in terms of constructs like

ego-strength or will-power.

Skinner (1953) sums up the behavioral position on self-control:

When a man controls himself, chooses a course of action, thinks out the solution to a problem, or strives toward an increase in self-knowledge, he is behaving. He controls himself precisely as he would control the behavior of anyone else through the manipulation of variables of which behavior is a function. His behavior in so doing is the proper object of analysis, and eventually must be accounted for with variables lying outside the individual himself.
(p. 229)

The kinds of external variables usually studied in behavioral self-control research fall into two groups. The first are incentive variables which includes delay, magnitude, and probability of reinforcement associated with long and short term rewards. The second focusses on various stimulus control procedures, e.g., stimulus narrowing, conditioning or extinction. The present study will focus on the way incentive variables affect self-control, in both the externally and self-imposed, delay paradigms.

Behavioral self-control research using the externally-imposed delay paradigm. In this paradigm, the behaviorists suggest that self-control is largely a matter of the relative magnitude and delay of an alternative. Considerable effort has been devoted to developing

systematic ways of predicting the effects of these two variables on various dependent measures of choice. It has been found that the relationship between choice and magnitude and delay of reinforcement is regular enough that formulas have been developed which predict the relative value of an alternative given its relative size and delay. Such formulas are based on the concept of a matching law which states that the relative value of a choice or the probability that it will be chosen is determined in a direct way by the size and delay of the reward.

The first matching laws were developed by Baum and Rachlin (1969) and Herrnstein (1970). Other matching laws have appeared in the literature, but these models appear to be the most general and the most frequently used. Of the two, Rachlin's (1971) approach is the simpler. In nonmathematical language, his matching law states that when an organism is faced with two alternative rewards, it decides which is more valuable based on the relative sizes of the rewards and their delays. For example, \$10 is valued twice as much as \$5 if the delays are the same. Alternately, \$10 in a week is valued twice as much as \$10 in two weeks. When both delay and magnitude of each choice are different, it becomes more difficult to determine the relative values of each unless Rachlin's (1971) actual formula is used. Consider the choice of \$2 in one week versus \$15 in two weeks, for example. The matching law would predict that the first reward is one third as valuable as the second and as a result a third as likely to be chosen (See Appendix I for a more

mathematical treatment).

Considerable evidence exists to support the matching law in experiments where subjects are given choices between two rewards in various concurrent schedules of reinforcement. Concurrent schedules function in almost the same way as required by the definition of the externally-imposed delay paradigm. That is, subjects are given a choice between two rewards and the availability of both is controlled by the experimenter. If one reward alternative is chosen, then the other automatically becomes unavailable.

De Villiers (1977) reviewed a large number of studies in which animals were given choices in concurrent schedules that varied in both amount and delay. He found that "...the matching law accounts for over 80% of the variance for 18 of the 23 subjects.... (As well) group data are important, especially for the studies in which only a few points were obtained for each subject. Here the matching relationship accounts for over 80% of the variance in response ratios...for all the experiments" (p. 242). Other studies have led to more varied results.

The effects of reinforcement magnitude alone on matching have been equivocal. Both matching (Catania, 1963; Brownstein & Pliskoff, 1968) and undermatching (Schneider, 1973; Todorov, 1973; Walker & Hurwitz, 1971) have been found. A few studies have varied the quality and nature of the reinforcement in concurrent VI schedules. Holland and Davidson (1971) used electroconvulsive brain stimulation as a reinforcer and found matching. Stubbs and Pliskoff (1969) compared the relative effects of

food and brain stimulation and found matching. A few studies have added punishment to the reinforcement in concurrent VI schedules and found matching (Holz, 1968; de Villiers, 1977; Farley & Fantino, 1978). These experiments support the contention that the effects of positive and aversive stimuli on choice behavior are equal, but opposite in sign. Other research using both avoidance and negative reinforcement paradigms continue to support this conclusion (Baum, 1973; Logue & de Villiers, 1978).

A few studies have used human subjects. Schroeder and Holland (1969) and Baum (1973) found that for concurrent VI schedules using macrosaccadic eye responses, human subjects conformed to the matching law. However, Schmitt (1974) found that undermatching occurred for concurrent VI schedules of monetary reinforcement. Other crude evidence for the matching effect is found in the work of Mischel and his coworkers. Unlike the operant research, these studies usually allow the subjects only a few discrete trials. Grusec (1968), Mischel, Grusec, and Masters (1969), Mischel and Grusec (1967), and Mischel and Metzner (1962) all have found systematic relationships between choosing the smaller, shorter delayed reward and: (1) increasing the delay to the larger, more delayed reward; and (2) decreasing the probability of receiving the more delayed reward.

A number of experimental design problems limit the generality of the findings of Mischel and coworkers. First, in nearly all cases the small reward was only available immediately. Thus, it is unclear

whether their findings persist if the smaller reward is delayed some period greater than zero but less than the interval to the larger reward. The only study that used delay intervals greater than zero for the small reward found significant differences in subjective reward value ratings but only for one condition of delay difference, 1 day versus 21 days (Mischel, Grusec, and Masters, 1969). Other conditions involved smaller delay differences. Thus, it may be that differences in delay exert an effect on relative reward value only when the delay differences are large. Second, no studies have attempted to study the question of differences in sizes of the large and small reward. It may be that subjects respond to reward sizes alone when the differences are large, ignoring delay factors. Third, no research using the paradigms common to the delay of gratification studies with human subjects, has attempted to analyse the effects of systematically varying the size of the relative reward value of alternatives. Fourth, with the exception of one study, no research in this area has used adult human subjects. Finally, the actual rewards and delays in the research have been small and short, respectively. That is, the largest rewards have been in the range of \$2 and the largest delays have ranged as high as 3 weeks. It would be interesting to see if larger reward sizes and delays would lead to matching effects.

Overall, the research in this section does support the conclusion that a subject's choice of either the delayed or immediate reward is based on its relative value. Caution should be exercised in making this statement since it is based on the results of only a few studies using limited subject populations and narrow ranges of reward magnitude

and delay.

Behavioral self-control research using the self-imposed delay paradigm. In this paradigm, the behaviorists again insist that self-control can largely be understood in terms of the relative values of the reward choices. In addition to the stated characteristics of this paradigm, Ainslie (1975) further maintains that the subject must initially prefer the larger, longer delayed reward, but as time passes the subject reverses his preferences (see Figure 1). If self-control is

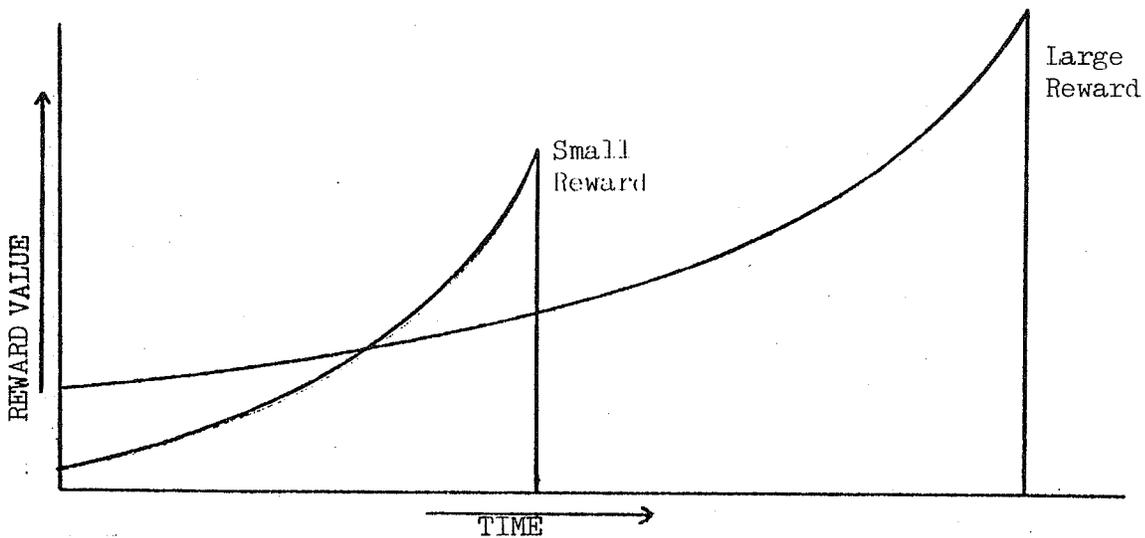


Figure 1. Hypothetical incentive curves that Ainslie maintains represent the self-imposed delay paradigm of self-control.

defined this way, it is clear that the two situations found in Figure 2 are not self-control situations. Even though there is a difference in the delays and sizes of the rewards in these cases, the relative values of the rewards do not reverse over time. Therefore, the subject's choice remains the same over time.

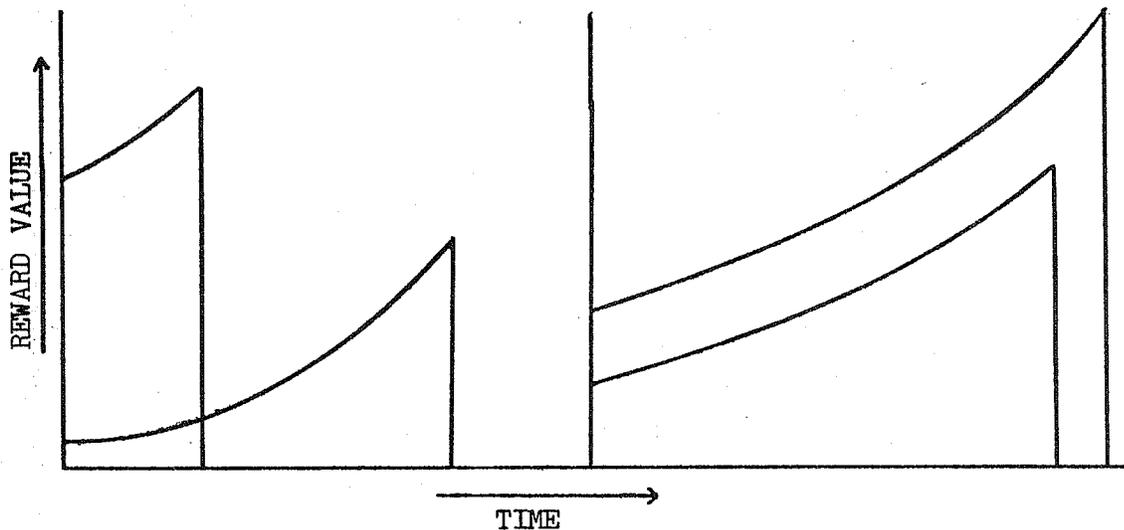


Figure 2. Hypothetical incentive curves that do not represent self-control situations.

There are three sources of evidence supporting Ainslie's model. The first source was reviewed in the last section where it was shown that the relative values of the rewards depended upon their delays and magnitudes. Second, it will be shown that data based on the quantitative law of effect supplies evidence for the particular shapes of the individual curves used in Figure 1. Third, it will be shown that evidence from experiments using self-control schedules support Ainslie's

assumption that there is a reversal of value effect in this paradigm.

The quantitative law of effect states that the absolute rate of a single response for any reward is directly proportional to the reward's size and inversely proportional to its delay. A considerable amount of animal research has shown this to be generally true (Kimble, 1961). There have been a number of attempts to specify this function exactly (Hull, 1943; Logan, 1960, 1965), however, de Villiers and Herrnstein's (1976) more recent approach has been more successful. Over a wide variety of animals, schedules of reinforcement, types of reinforcers, and dependent measures, their simple formulation predicted approximately 80-90% of the effects due to magnitude and delay of reinforcement. Using human subjects, Bradshaw, Szabadi, and Bevin (1976, 1978) and Bradshaw (1977) found that, on VI schedules of monetary reinforcement, the response rate of button presses very closely conformed to that predicted by de Villiers and Herrnstein's law of effect. Similarly, Moffat and Koch (1973) measured the speed of button pressing which restarted a comedy recording at three nonzero levels of delay and they found that de Villiers and Herrnstein's law explained 95% of the variance of speed of pressing.

Based on the law of effect, it is possible to predict the rate of responding for a reward as a function of its size and delay. Assuming that the value of a reward is a similar function of size and delay as Ainslie does, then his curves can be individually derived from the law of effect. Thus, the greater the size of the reward the greater the

value, and the greater the delay the lesser the value. In this way, Ainslie claims good support for his model since the law of effect accounted for so much of the variance of an animal's response.

The final evidence for Ainslie's model is found in recent studies using self-control schedules data which demonstrate that a subject's choice reverses over time. Basically, self-control schedules are modified concurrent-chain schedules in which the organism is provided with an impulsive alternative as well as a chance to commit itself to an alternative that removes the availability of the smaller, shorter-delayed alternative. Such schedules provide a crucial test for Ainslie's model. If the organism prefers the larger, delayed reward and chooses this alternative even if the smaller, more immediate reward is constantly available, then the assumption that the smaller, more immediate reward becomes more attractive over time would not be supported. On the other hand, if the subject avoids the choice which allows both alternatives to be simultaneously available and picks the alternative which only permits a larger, delayed alternative, then Ainslie's model would be supported.

Rachlin and Green (1972) made a detailed study of pigeons' ability to learn a self-control response. They were given a choice of two keys to peck: (1) if the 25th peck fell on one key, there occurred a delay of T seconds followed by two choices: (a) an immediate access to food for 2 seconds, or (b) 4 seconds delay followed by 4 seconds of food access; or (2) if the 25th peck fell on the other key, the same delay T was followed by presentation of a second key, a peck on which led to a

4-second delay followed by 4 seconds of food access. They found that as the interval before the later key(s) was increased in steps from .5 to 16 seconds, three of the five subjects greatly increased their preferences for the second key. When the interval was decreased, pecking on the first key again rose to its initial level. The most important conclusions from this study are: (1) preferences for the two rewards reversed with reversal in value; and (2) subjects learned to avoid the choice that led to both the rewards when the larger, later delayed reward was viewed as more valuable. Together these results support Ainslie's model.

Ainslie (1974) expanded on this research. He felt that Rachlin and Green's (1972) research was not convincing because the 25 pecks that led to either terminal link took longer than the longest delay which they might choose. That is, to obtain the "immediate reinforcement" they would have to start pecking long before the reward was available. Ainslie was concerned as well about the possible effects of chaining such long delays (Logan & Spanier, 1970). To handle these problems, he set up a similar experiment which required only one peck to achieve either the commitment alternative or the choice that resulted in both keys leading to the immediate and delayed rewards. Reinforcement in the terminal link was on a CRF schedule. Further, he designed three control conditions that eliminated the possibilities that: (1) the pecking behavior was specific to the color of the cue lights; (2) the effect was unrelated to the difference in the sizes of the rewards; and (3) the pigeons would choose the longer, larger reward if the smaller, immediate

reward was also available at the same time. His results were similar to Rachlin and Green's providing further support for his model. As well, negative results from his control conditions indicated that these results were not simply artifacts of the experimental design.

Mazur and Logue (1978) studied the effects of reinforcement history on animal behavior using a self-control schedule. They concluded that the self-control response of picking the precommitment alternative is not solely determined by the matching relationship but also is affected by the subject's prior experience with reinforcers in the experimental situation. They also point out, as do many other researchers in this area, that while some animals conform quite well to the predictions of Ainslie's model, many animals behave in entirely unpredictable ways. That is, individual differences appear to have important effects on self-control behavior.

Despite these problems, the few studies available on animal behavior in self-imposed delay situations support Ainslie's model of self-control and confirm to some extent the importance of external variables like magnitude and delay of reinforcement. Unfortunately, there are no studies in this area using human subjects and therefore generalizations to humans would again be risky.

Conclusion. Behavioral models for both the externally and self-imposed delay paradigms of self-control have received a reasonable amount of support. In both, the predominant controlling variables were found to be the magnitude and delay of reinforcement. Other variables

have also been shown by operant research to affect self-control behavior. They are: prior experience with the contingencies (Mazur & Logue, 1978); individual differences (Mazur & Logue, 1978); probability of reinforcement (Mischel & Grusec, 1967); schedules of reinforcement (Gibbon, 1977); time to reinforcement estimation effects (Gibbon, 1977); the absolute delay lengths to both rewards (Navarick & Fantino, 1976; Williams & Fantino, 1978); and presence of cues for either alternative (Navarick & Fantino, 1976).

One of the obvious problems with making generalizations from the behavioral model is the fact that very few studies have used human subjects and most of these have used children. Furthermore, only small rewards and short delay times have been used. In addition to problems limiting the generality of the behavioral approach, it was also found that a number of other variables affected the subject's self-control behavior. Thus, while there is good support for the behavioral explanation, it does not appear to be either complete or sufficient.

Personality Models of Self-Control

Personality models are based on the assumption that cross-situational consistency exists in behavior as a result of pervasive underlying mental structures or inferred dispositions. Usually individual differences in behavior are viewed as signs of these structures. Trait and psychodynamic theories both fall into this general category and researchers representing both points of view have attempted to explain individual differences in

self-control. Shybut (1968), Mischel (1961a, 1961b, 1961c), and Mischel and Metzner (1962) have found evidence supporting the psychodynamic approach. These studies related various measures of ego-strength to a subject's ability to delay gratification, using externally imposed delay paradigms of self-control.

Another approach to self-control assumes that impulsivity is linked to a cognitive inability to plan and organize in an orderly, unhurried fashion (Shapiro, 1965; Kagan, Bosman, Day, Albert, & Phillips, 1964). Reviews by Riddle and Roberts (1977) and Block, Block, and Harrington (1974) conclude that children judged impulsive on an externally imposed, delay paradigm or other measures also appear to do more poorly on cognitive impulsivity measures.

The present study will focus on the large amount of research using Rotter's (1966) internal/external locus of control construct as a measure of impulsiveness even though Rotter does not view his construct in the usual personality sense. Rather,

the basic formulation of the social learning theory states that one of the major predictors of behavior is the subject's expectancy of outcome of his behavior in a given situation. One might refer to such expectancies as self-concepts or say that a person's conception of himself in a given situation is a major determiner of his behavior. In this sense, every time we mention the word expectancy, since expectancy always deals with a person's expectancy of the outcome of his own behavior, one might put in parentheses self-concept. (p. 239-240).

Prociuk (note 1) provides a very clear summary of the meaning of the internal/external locus of control construct as it has evolved over time. It is based on the global concept of freedom of movement which is defined as the:

mean expectancy of obtaining positive satisfactions as a result of related behaviors directed toward obtaining a group of functionally related reinforcements....The mean expectancy for obtaining positive reinforcements is a function of a combination of specific and generalized expectancies....Specific expectancies involve distinct experiences and situational judgments of the likelihood of attaining a reinforcement in a particular situation. In contrast, generalized expectancies are developed from long time experiences with similar behavior-reinforcement sequences, i.e., the individual generalizes from the past experiences in similar situations. (p. 20-21)

The internal/external locus of control construct is one way to explicitly conceptualize these general expectancies.

The internal-external locus of control construct specifies the location of those causal forces a person believes as being responsible for his reinforcements. Such causal forces can be derived from one's own personality, i.e., the potential to respond to a particular social environment

in a given manner (Rotter, 1967), or from the situation in which one finds oneself. As stated by Rotter (1966), the means by which an individual's personality influences an expectancy for success or positive reinforcements are within or beyond his control. A person who has a generalized expectancy that reinforcements are contingent upon his own ability, effort, or capacity is described as an internal. A person described as an external perceives reinforcements as under the control of powerful others, luck, chance, or fate. (p. 21)

There have been a large number of studies, books, and reviews analysing the meaning of the construct and using it to predict a wide variety of behaviors (Joe, 1971; Lefcourt, 1971, 1976; Phares, 1973, 1976). The most widely used measure of this construct is Rotter's (1966) I-E scale. However, there are at least eight other scales currently in use (Lefcourt, 1976). When Rotter's scale was factor analysed, it was shown to be composed of two stable factors (Prociuk, Note 1; Reid and Ware, 1976). The two factors are usually labelled Fatalism which concerns "the respondent's inclination to assign greater or lesser importance to ability and hard work than to luck as influences which determine personally relevant outcomes" (Mirels, 1970, p. 277), and Social Political Control "which refers to the respondent's acceptance or rejection of the idea that a citizen

can exert some control over political and world affairs" (Mirels, 1970, p. 228).

A considerable number of researchers have assumed that internals would be more able to delay gratification than externals reasoning that internals are more accustomed to engaging in and executing long term plans than externals. The activity of planning and working for long term goals is assumed to correlate with the belief of internals that they can control the outcome of their activity. Externals on the other hand do not attempt to delay gratification because they see long term plans as fraught with uncertainty (Phares, 1976). Thus, a correlation is expected between the locus of control measure and the ability to delay gratification.

Reid and Ware (1974) question the validity of the I-E scale to account for all individual differences in self-control. They maintain that there is a difference between personal control over one's environment and over oneself. They maintain it is conceptually possible for a person to be an internal and still rate themselves as having poor self-control. To study this possibility, Reid and Ware designed an additional eight items that they added to the traditional items of the I-E scale. These additional items asked questions like "Do you believe either: A. People cannot always hold back their desires; or B. People can usually control their impulses." When they factor analyzed the responses of a large number of people who responded to the combined scale, they found that the additional self-control questions emerged as a distinct factor. They concluded that the "belief in self-control appears

to differ from both belief in chance determinants of one's outcomes and expectations of control by social-political forces in society" (p. 140). If their factor is included in the I-E scale, it might be expected that there would be an increase in the scale's predictiveness if, indeed, their factor represents additional information about a person's disposition to be self-controlled.

Personality research using the externally-imposed, delay paradigm.

This paradigm has been used about as frequently as the self-imposed, delay paradigm in personality research. In this paradigm, a subject's responses on an I-E scale are correlated with his choices between two reward alternatives. The initial research in this area was done by Bailer (1960). He correlated an adapted I-E measure and three delay of gratification tests. Among other things, he asked children to decide whether they would rather have an automobile immediately or an automobile and a million dollars a year from now. Then he gave them a choice between a small piece of candy immediately or a larger piece a day later. Finally, he gave them a choice between one penny now or ten pennies the next day. He factor analyzed the relationship between chronological age, mental age, locus of control, and performance on the delay of gratification tests. He found that there was a bipolar personality dimension with individuals at one end who tend to perceive events as internally controlled who can delay gratification and individuals at the other end who tend to perceive the outcome of events

as externally controlled who can delay gratification. His results suggested that this effect was independent of age.

Walls and Smith (1970) using disadvantaged and nondisadvantaged children found a low but significant correlation between locus of control as measured by Bailer's scale, and the ability to delay gratification. They also found that the tendency of internally controlled subjects to delay is correlated with their accuracy of time interval judgments and their level of social responsibility.

Erickson and Roberts (1971) provided a more convincing display of the relationship between the I-E score and the ability to delay gratification. They offered incarcerated adolescents a choice between earlier release or attending a public school program off the reformatory grounds but remaining at the reformatory for a longer period of time. All the boys were then asked why they made their choices. Their answers were classified as internal, external, or neutral. Only one (5%) internal attribution was made among nondelayers in comparison to 8 (40%) from among those choosing the public school program. Erickson and Robert's results suggested that those who perceived the environment as under their control were more likely to delay gratification.

Miller (1978) suggested a potential problem with previous personality research using an externally-imposed delay paradigm. He maintains that the reward situations used better fit the definition for the self-imposed delay paradigm because in nearly every case the smaller reward was offered immediately. He feels that both reward alternatives must be

delayed some period of time before the choices accurately represent the externally-imposed delay paradigm. When he tested children's responses to equivalent reward choices in both the self-imposed and externally-imposed delay paradigms he found results supporting his concern. Internals expressed greater frustration than externals about waiting in the externally-imposed delay situation. He found the reverse effect for the self-imposed delay paradigm. He assumed that the greater the level of frustration the less willing subjects would be to wait. He did not test this assumption directly and so it is not clear at this point that in a 'true' externally-imposed delay paradigm internals would be more impulsive than externals.

Together these studies support the conclusion that the generalized expectancy of reinforcement as measured by various I-E scales is predictive of a subject's choice of the delayed or immediate reward. However, recent literature (e.g., Mischel, 1973) indicates that often the predictiveness of global traits is very dependent upon other situational information.

Mischel and Staub (1965) took a slightly different approach to this problem. They had children do self-ratings of their ability to perform academically relative to their peers. They predicted that generalized expectancies for success would be most salient when subjects had no information about how well they did on a task instrumental to achieving the delayed reward. These same global expectancies would be least important when the subjects had prior information about their

success on a task instrumental to achieving the delay and reward. Results bore out their expectations. Global expectancies correlated significantly with choice only when subjects had no other information.

Another variable that has been shown to have situational effects is trust. Zytoskee, Strickland, and Watson (1971) have shown that the less trustworthy the person who controls the rewards, the less likely a subject is to choose the delayed reward no matter what their I-E score.

In conclusion, knowledge of whether or not a person is an internal or an external does appear to improve our ability to predict their reward choice in an externally imposed paradigm. That is, externals are more likely to choose the immediate reward while internals are more likely to choose the delayed reward. It has also been shown that specific situational information will under certain circumstances reduce the correlation between the I-E score and choice. Thus, very careful consideration must be given to the situational aspects of an experimental design when studying the relationship between I-E scores and reward choice.

Personality research using the self-imposed delay paradigm. Two kinds of studies occur using this paradigm. A few studies have attempted to correlate I-E measures directly with both the presence or absence of self-control behaviors and the success or failure of various self-control treatment packages used to change naturally occurring self-control problems such as smoking, drug addiction, obesity, and alcoholism.

Straits and Seechrest (1963) found that smokers were more chance oriented. James, Woodruff, and Werner (1965) found that smokers who quit were more internal than those who did not. Rutner (Note 2), however, found no such relationship for subjects who were more successful in reducing smoking versus those who weren't. Balch and Ross (1975) found significant correlations between being an internal and both completion and success in a weight reduction program. Inconsistent results have been found for the problems of opiate addiction and alcoholism. Results indicate that both addicts and alcoholics are more frequently found to be internals in comparison with a nonaddict population (Berzins & Ross, 1973; Goss & Morosko, 1970). Berzins and Ross suggest that such a result is quite understandable since both alcoholics and addicts are very successful at controlling their environment through the use of drugs. In general, it appears that while there is some support for the validity of the I-E measure in these situations, there is very little research in this area. Drawing strong conclusions about the applicability of the I-E measure would be unwise at this time.

Using this paradigm a few attempts have been made to relate the factor structure of the I-E scale to ability for self-control. Balch and Ross (1975) found that while there was a significant correlation between the overall I-E score and completion of a weight reduction program, neither of the two factors (Fatalism and Social-Political Control) were significantly correlated with completion of the program.

Berzins and Ross (1973) found significant correlations between both factors and opiate addiction. These two studies appear to constitute the sum total of the research analysing the relationship between these two identified factors and self-control. Reid and Ware's (1974) approach has yet to be used in self-control research.

The second approach to studying self-control behavior in this paradigm is best exemplified by Mischel and his coworkers. Mischel (1968) argued that individuals tend to be highly discriminative in their social behavior and that personality measures are not likely to be predictive of behavior unless the relevant situational constraints are taken into account. Mischel, Zeiss, and Zeiss (1974) tested this notion for self-control behavior in preschool children using their own I-E measure. They assumed that "beliefs concerning control over outcomes should be most salient when the situation is structured as one in which the outcomes are contingent upon the subject's performance. Under such conditions, internal subjects are likely to work harder or longer...than external subjects for the delayed but more desirable contingent outcomes" (p. 267). They found with these situational constraints that subjects' scores on their I-E measure correlated between .34 and .66 with subjects' ability to delay gratification. However, if they did not require the subjects to complete a task instrumental to achieving the delayed reward then the correlations fell to near zero levels. They concluded that individual differences in locus of control were important in predicting self-control behavior but only when subjects were required to complete a task instrumental in achieving

it.

Overall, the personality research using the self-imposed paradigm does provide some support for the contention that individual differences in locus of control are predictive of an individual's ability to delay gratification. However, it appears that again specific situational occurrences operate to increase or decrease these correlations.

Conclusions. Three separate lines of research relating personality variables to self-control behaviors have been developed, but Rotter's approach has received the most attention. There appears to be a reasonable amount of support for his approach, but at present its generality is limited in a number of ways. In the externally-imposed delay paradigm, nearly all of the research has been confined to children as subjects and small delays and magnitudes for the reward choices. Thus, little knowledge exists using an adult population and larger, more realistic reward alternatives. Similar limitations exist for research using the self-imposed delay paradigm. Furthermore, various situational variables affect magnitudes of correlations between delay of gratification and locus of control. Finally, no research has attempted to correlate responses to Reid and Ware's (1974) scale with the ability to delay. Overall, there appears to be support for the usefulness of the locus of control dimension in predicting self-control behavior but such a

conclusion must be tempered with the realization that many aspects have yet to be studied, and the size of the correlations has not been great.

Cognitive Models of Self-Control

According to Mahoney (1977) there appears to be a cognitive revolution occurring in psychology. Mahoney states, "Within any given sub-specialty, one can readily detect the impact on theory and research of central mediating processes and cognitive-symbolic mechanisms" (p. 5). Mahoney states that the cognitive approach has the following characteristics:

1. The human organism responds primarily to cognitive representations of its environment rather than to those environments per se.
2. The cognitive representations are functionally related to the processes and parameters of learning.
3. Most learning is cognitively mediated.
4. Thoughts, feelings, and behaviors are causally interactive. (pp. 7-8)

While cognitive representations are seen as causally important, they are not seen as the primary determinants of behavior. Rather "the person continually influences the 'situations' of his life as well

as being affected by them in a mutual, organic, two-way interaction. These interactions affect not only the person's reactions to conditions but also his active selection and modification of conditions through his own cognitions and plans" (Mischel, 1973, p. 278).

While it is clear that this perspective emphasizes mediational processes as determinants of behavior, it remains difficult to specify what exactly mediational approaches are. Mahoney (1974) discusses a number of approaches by various authors and each predictably emphasizes and defines mediational processes in different ways (e.g., Bandura, 1978, 1977; Hommes, 1965; Kanfer & Karoly, 1972; Meichenbaum, 1977) when considering a cognitive approach to self-control. Perhaps the most thorough and developed cognitive approach is provided by Mischel. Beginning in 1958, he has studied this area from a number of perspectives. Mischel (1974) reviewed a number of studies of the cognitive effects of self-control. He concluded that in general self-control is not a "unitary intrapsychic moral agency like the super-ego, nor a unitary trait entity of conscience or honesty..." (p. 256), rather, he "...has come to emphasize the relative specificity of the components of self-control behavior and hence the importance of the cognitive and situational variables that influence them and interact with person variables" (p. 257). Mischel (1973) proposed five cognitive variables that he considers of importance in most human behavior, including self-control. They are:

1. Construction competencies: Ability to construct particular cognitions and behaviors....Refers to what subjects know and can do.
2. Encoding strategies and personal constructs: Units for categorizing events and for self-description.
3. Behavior-outcome and stimulus-outcome expectancies in particular situations.
4. Subjective stimulus values: Motivating and arousing stimuli, incentives, and aversions.
5. Self-regulatory plans: Rules and self-reactions for performance and for organization of complex behavioral sequences. (p. 275)

The remainder of this section will focus primarily on results based on the research of Mischel and his co-workers showing the effects of various cognitive mechanisms on self-control behavior.

Cognitive research using the self-imposed delay paradigm. Early support for Mischel's cognitive emphasis came from a series of studies on the effects of modeled standards of self-reward (e.g., Bandura & Mischel, 1965; Mischel & Grusec, 1966). Essentially, it was found that subjects who saw different levels of modeled standards of self-reward would adopt them even though they could get much higher rates of reward by simply ignoring the modeled standards.

Later research focused on various self-instructional techniques which were designed to study how ideation might directly affect self-control.

How does ideation affect action? How does ideation help the individual free himself from stimulus control--i.e., to generate and maintain difficult behaviors even when environmental presses make such reactions especially hard and difficult? Obviously such a question requires us to understand what is occurring in the "black box" of the organism, and that is exactly what I want to do. (Mischel, 1974, p. 263).

Mischel and his co-workers began by analysing the effects of attention on self-control behavior. They initially thought any procedure that helped the subject attend to either the delayed or immediate reward would improve self-control. Thus, they created instructions that helped the subject attend to the rewards and make them more vivid imaginably. Mischel and Ebbesen (1970) found that attention to the real rewards, delayed or immediately decreased the waiting ability of the subjects. Thus, if either or both the delayed or immediate rewards were physically present, self-control was poor. If both were physically absent, then self-control was much better. It appeared from ad hoc observations that those subjects who were most successful at delaying their choices were most successful at distracting themselves. Contrary to the expectations of the researchers,

when attention was focussed on the more preferred delayed reward by making it physically present, the subject was less able to delay.

Based on these results, Mischel, Ebbesen, and Zeiss (1972) hypothesized that voluntary delay of reward should be enhanced by any overt or covert activities that serve as distractors from the rewards. To test this idea, they asked children to think about fun things, the rewards, or nothing; with the rewards either physically present or absent. They found that thinking about fun things enhanced delay in both conditions, thinking about the rewards reduced their ability to delay, and not thinking of anything resulted in delays that fell between the other two.

Mischel and Moore (1973) studied the effects of symbolically presented rewards on self-control by presenting the rewards as pictures on a screen. There were four conditions: (1) a slide of the relevant rewards; (2) a slide of some irrelevant rewards; (3) an illuminated blank screen; and (4) nothing. In this experiment, children waited longest in the first condition and least in the fourth condition. Such results appear contradictory to earlier studies. That is, physical presence of the actual rewards decreases ability to delay while symbolic presence of the actual rewards increases delay times.

Moore, Mischel, and Zeiss (1976) investigated this problem further by asking children to mentally transform a picture of the rewards into the real thing and vice versa. As well, they asked them to pretend to see either a real reward or a picture of a reward when there was no

reward stimuli actually present. Finally, they asked subjects to attend to either the picture of the rewards or the actual rewards. The results clearly demonstrated that all instructions that required the subjects to imagine the rewards as real produced decreased waiting compared to when subjects were required to pretend the real rewards were pictures. "In sum, the overall results offered strong support for the contention that the effects of a particular reward stimulus on children's waiting behavior may be dramatically and predictably altered by the manner in which the child construes that stimulus. Consistently, the cognitive representations outweigh the effects of the actual stimulus facing the child" (p. 422). Their explanation for these results is based on their supposition that a reward "stimulus may have motivational (consummatory, arousal) and informational (cue) functions. The actual reward stimuli probably tend to motivate or instigate a consummatory response, whereas a picture of the rewards simply reminds the subject of the contingent goal without being so real as to arouse a consummatory response" (p. 422).

Mischel and Baker (1975) further investigated this theory by instructing children to focus on the consummatory or nonconsummatory qualities of relevant immediate, delayed and irrelevant rewards. The results indicated that the subjects who focussed on the consummatory aspects of the relevant rewards were less able to delay than those who focussed on the nonconsummatory aspects of the same rewards. No effect

was found when subjects focussed in either way on the irrelevant rewards. Thus, further support is found for Mischel's contention that subjects respond to the cognitive representations of the rewards and not just to the physical characteristics of the rewards.

Mischel's contention that cognitive mediational processes are important to self-control behavior in the self-imposed, reward paradigm is supported. Unfortunately, his research is limited by the fact that all subjects were children and reward magnitudes and delays were very small. Usually, the delay intervals were, at most, 20 minutes and reward sizes were alternatives like one or two pretzels. It would be very interesting to see if these findings could be extended to an adult population when the rewards and delays involved were much larger.

Cognitive research using the externally imposed delay paradigm.

Few studies have examined the effects of cognitive variables using the externally-imposed delay paradigm. Schwartz and Pollack (1977) and Schwartz (1974) found that when children's moods were manipulated by instructing them to focus on sad or happy thoughts, their choices between an immediate and delayed reward were greatly affected. That is, when subjects had been instructed to imagine happy thoughts, they were more likely to choose a delayed reward than if they had been asked to think sad thoughts.

Another approach can be found in the work of Miller and Karniol (1976a, 1976b). These investigators presume that attention to the rewards in the self-imposed delay situation will have different effects on



delaying ability than in the externally-imposed delay situation. They contend that focussing attention on the consummatory aspects of the choices in the externally-imposed delay situation will result in individuals making fewer impulsive choices rather than more. They base this conclusion on the following reasoning. They assume that waiting for a reward is frustrating and the more frustrated an individual is the more likely he is to make an impulsive choice. However, if an individual has no alternative but to endure the delay for the preferred reward, frustration "is greatly abated if the individuals believe their waiting is a means to an end and if they have a vivid image of what that end is" (p. 311). They tested their hypothesis with young children using the same rewards and delay intervals as Mischel and his co-workers. They found that children in the self-imposed delay situation spent more time in reward-irrelevant activities while children in the externally-imposed delay situation spent more time in reward-relevant activities. They were able to relate their findings to the levels of frustration subjects experienced.

What little research that does exist for this paradigm, continues to support Mischel's hypothesis that cognitive mediational mechanisms affect how a subject will react to rewards and make choices. However, the research in this paradigm indicates that at least one cognitive manipulation may have an opposite effect to that expected in the self-imposed delay paradigm.

Conclusions. Mischel's belief that cognitive variables are important in self-control appears to be supported at least for children in both the self-imposed and externally-imposed delay of reward paradigms. However, it is not clear exactly what are the mechanisms underlying these effects. Mischel and co-workers emphasize the distracting qualities of their cognitive manipulations while Miller and Karniol (1976a, 1976b) prefer a frustration relief approach. It may be that both explanations have some validity depending on the paradigm used. In either case, it is important to note that in the self-imposed delay situation attention to the reward relevant characteristics tends to result in subjects choosing the more immediate reward while in the externally-imposed delay situation the opposite occurs. It would be of considerable interest to see if these results could be extended to an adult population using larger delays and magnitudes of reward.

Summary and Statment of Hypotheses

It is clear from this review that each of the three models has received some support. The behaviorist contention that self-control behaviors are largely affected by external variables such as magnitude and delay of reward alternatives is supported in both self-imposed and externally imposed delay paradigms. However, it is also clear that these variables do not affect behavior in a uniform manner, suggesting the importance of other variables.

The personality theorists reviewed, maintained that differences in impulsiveness were due to individual differences in their generalized expectancies of success. While there is support for this view in both the self- and externally-imposed delay paradigms, it was also noted that these personality measures were situationally sensitive. That is, situational variables like trust or task difficulty often were as much as or more predictive of a subject's choice in a self-control situation than the personality measure.

Cognitive models were also supported but primarily in the self-imposed delay paradigm. It was found that the way a subject thought about a reward stimulus affected his self-control behavior. For example, in the self-imposed delay paradigm, if a subject focussed on the consummatory aspects of the rewards, he was less able to resist taking the immediate reward than if he focussed on the nonconsummatory aspects of the reward.

All of the studies supportive of the three models reviewed had some serious shortcomings. Nearly all of them used either animals or young children as subjects. As a consequence, little can be said with confidence about the behavior of adult humans in similar circumstances. Furthermore, each approach appears to have isolated itself from the others; there is no way to estimate the relative importance of each model in determining self-control behavior.

This study seeks to rectify some of these weaknesses. Adult human subjects will be used, and variables from all three models will

be combined so that an estimate of their relative effectiveness will be possible.

It is apparent from an analysis of the literature that two paradigms can be used. The present study will use the externally-imposed delay paradigm because it is methodologically simpler to use than the self-imposed delay paradigm. Alternatives presented to the subjects can be controlled more precisely because the experimenter controls all parameters of delay and reward. Furthermore, at least one study using adult subjects (Mischel, Grusec, and Masters, 1969) has provided some information about the range of reward choices which may be suitable for this population.

Behavioral hypotheses. The behavioral model assumes that both delay and magnitude of the reward alternatives determine choice. By using the matching law, it is possible to generate systematically any number of reward alternatives with fixed relative value. Thus, five levels of relative reward value were selected first, where the larger reward alternative was: (1) almost twice the value of the smaller; (2) one and a half times the value of the smaller; (3) equal to the value of the smaller; (4) half the value of the smaller; and (5) of no value compared with the smaller. It was expected that if the behavioral

model was effective, then a rating of the relative values of these choices and actual choices would be very similar to that predicted by the matching law.

According to the matching law, given a fixed relative reward value of two alternatives, choices with different delay levels and different reward sizes should all appear equivalent to the subject. The importance of these two assumptions is that they are directly derived from Rachlin's (1971) matching law and should hold true if this law is indeed valid. A violation of either of these two assumptions or the expectation that a subject's choices are determined by relative reward value would undermine the strength of the behavioral point of view as represented by the matching law.

Personality hypotheses. The personality theorists reviewed state that choice in the externally-imposed delay paradigm is determined by the subject's global expectancy of success as measured by the I-E scale. It is believed that internals are more likely to choose the delayed reward while externals are more likely to choose the immediate reward. Thus, a significant correlation would be expected between choices and scores on the scale. If, as Reid and Ware maintain, responses to their self-control dimension provide additional, independent information concerning the disposition to self-control then the combined score for both the locus of control and self-control dimensions should result in even stronger predictions of self-control behavior.

The present study was designed to minimize the effects of trust in the experimenter; other limitations made it impossible to compare the relative effects on the magnitude of correlation of passive waiting versus having to complete a task instrumental to achieving the delayed reward. Only the passive waiting paradigm was used because it was anticipated that the additional self-control dimension would not be affected by passive or instrumental waiting.

Cognitive hypotheses. The cognitive theorists discussed assume that reward choice is controlled by the way a subject perceives the rewards. Thus, in the self-imposed delay paradigm, if a subject focusses his attention on the consummatory aspects of the reward he is more likely to choose an immediate reward than if his focus were neutral. The opposite is expected if an externally-imposed delay of reward paradigm is used. Therefore, subjects in the present study were given two sets of verbal, self-instructions designed to produce either a consummatory focus or a neutral focus. These instructions parallel those used by Mischel and Baker (1975), which emphasized qualities of the rewards that had to do with the pleasure and enjoyment. In the present study subjects were asked to focus on the pleasurable aspects of various objects they could buy with the money they would receive. Subjects were encouraged to keep these instructions in mind while they made their choices, and to further enhance the salience of the instructions a set of visual cues (pictures

of a variety of suitable rewards) were present throughout the experiment. Subjects were questioned at the end of the experiment to see how they reacted to the instructions as a check on the effectiveness of the instructions.

A Brief Summary of the Experimental Hypotheses.

The experimental hypotheses of the present study were:

1. Subjects' choices between and ratings of reward alternatives would be systematically related to the relative reward value of the alternatives.
2. Subjects' choices would be independent of the absolute reward sizes as long as the relative reward values of the alternatives were constant.
3. Subjects' choices would be independent of the absolute sizes of the delays as long as the reward values of the alternatives were constant.
4. Subjects' choices would correlate with their scores on the I-E scale; internals would be less likely to choose the immediate reward while externals would be more likely to choose it and less likely to choose a delayed reward.
5. Reid and Ware's self-control factor as measured by their scale would be predictive of subjects' choices, with high scores on this factor more frequently choosing the delayed alternative and low scorers the immediate alternative.

6. Reid and Ware's self-control factor would be orthogonal to the other two traditional factors of the I-E scale.

7. Subjects who received verbal self-instructions to focus on the consummatory aspects of the rewards would be more likely to make the more immediate choice while those who received neutral instructions would be less likely to choose the immediate reward.

CHAPTER II

MethodSubjects

Two hundred grade X to XII high school students (101 males, 99 females) were used in the present investigation. Ages ranged from 15 years to 26 years with a mean age of 17.12 years. All subjects were recruited using an advertisement offering \$1 to \$10 for one-half hour's work. No experimental credit was given for participation.

Design

One hundred and twenty participated in all phases of the experiment and were randomly assigned to treatment levels. The effects of cognitive instructions, reward size, relative reward value, and delay on preferences for delayed or immediate rewards were tested using an orthogonal, fixed effects, repeated measures design with two between factors and two within factors. Both the within and between factors were completely crossed.

The two between factors were designated Reward Size and Cognitive Instructions. The Reward Size factor had two levels: \$10 and \$1, or \$10 and \$5. The Cognitive Instructions factor had two kinds of verbal, self-instructions: control and consummatory. When these two factors were completely crossed, a total of four different treatment combinations resulted.

The two within factors were Delay and Relative Reward Value. The Delay factor had four levels of delay to the larger, later reward: 2, 12, 20 and 50 weeks. The Value factor had five levels of relative reward value (larger versus smaller reward): almost no value, half as large, equally large, one and one-half times as large, and almost twice as large. When the two within factors were crossed, a total of 20 treatment conditions resulted.

If a subject was randomly assigned to the \$10 and \$5 Reward Size level and either one of the Cognitive Instructions, then he received as part of the experimental treatment 20 questions which combined all of the levels of Delay and Relative Reward Value for this Reward level (see Appendix 2). If, on the other hand, a subject was randomly assigned to rewards \$10 versus \$1 and either one of the cognitive instructions, he received a different 20 questions which combined all the levels of Delay and Relative Reward Value for this Reward Size level (see Appendix 3). The order of presentation of the questions was randomized; thus, no attempt was made to assess effects due to order. Mischel, Grusec, and Masters (1969) failed to find order effects in a similar study. Moreover, even the simplest attempt to detect order effects would have required twice the sample size, which would have proved financially prohibitive.

Dependent Measures

Three dependent measures were used. First was a rating (on a scale from 0 to 10) of the value subjects assigned to each of the 20 choices. This permitted determination of whether or not subjects' valuations of reward alternatives followed the matching law.

The second measure was the actual choice they made between the more immediate and delayed reward. Information from this measure provided the answers to two questions: (1) Do the proportions of rewards chosen follow the matching law predictions? and (2) Do subjects actually choose the rewards they value most? Answers to the second question are important because it is conceivable that even though a subject views the larger, later reward as more valuable, he may not choose it.

The third measure was a rating (on a scale of 0 to 10) of how certain subjects were of their choices. When a subject is faced with a choice which overwhelmingly favours one of the rewards the subject would be expected to experience no hesitation in taking it. However, when the two alternatives were perceived as having equal value subjects would be expected to be less certain of their choices.

Covariate Measures

Four covariate measures were used. The first and foremost was Reid and Ware's (1974) I-E scale. It was assumed that if their

measure of locus of control and self-control is cross-situationally important, it would predict to some degree a subject's reward choices regardless of the experimental treatments. This assumption was tested by correlating subjects' scores on individual and combined subscales with their choices and ratings of reward value.

Three other possible covariates subject's age, sex and the amount of money the subject had to spend on personal pleasures during the month he or she participated in the experiment were also correlated with the subject's choices and self-reported value statements. Prior research has indicated that neither sex (Mischel & Metzner, 1962) nor the amount of money a subject has to spend on personal needs (Shybut, 1968) correlates with self-control behavior, but age has been shown to correlate with self-control behavior in children (Mischel & Metzner, 1962).

Procedure

Subjects were run one at a time in a small room prepared for the experiment. The room contained two desks and chairs, one each for the subject and experimenter. The experimenter was present throughout the experiment.

Subjects were advised at the outset that their participation was voluntary and that they were free to leave at any time without penalty. Then each subject was given the Personal Inventory Questionnaire (see

Appendix 4) which consisted of Reid and Ware's (1974) I-E scale and four biographical questions. It was explained that their answers would help the experimenter to understand some of the processes people use when they make choices. The questionnaire was administered first, to minimize expectancy effects.

To assure an adequate number of subjects for factor analysis of responses to the I-E scale, an additional 80 subjects were asked to complete only the Personal Inventory Questionnaire. These subjects were paid \$1 for their efforts and nothing further was required of them.

When the rest of the subjects had completed this questionnaire, it was replaced with one of the two Values Questionnaires (see Appendices 2 and 3) depending upon random assignment. Then the experimenter placed a blank cheque in front of the subject and filled it out except for the amount and the date. The partially completed cheque was left in front of the subject. This procedure was designed to convince subjects that they would actually receive one of the rewards they chose, thus encouraging them to answer the questions as honestly as possible and to trust the experimenter to deliver.

Next, one of two sets of two 36" x 28" boards were placed in front of them. In the cognitive control condition, both boards were covered with plain white cardboard. For subjects in the consummatory condition, the boards were covered with pictures of items that could be purchased for \$1 or \$10. These boards were left up until the end of the experiment. Their presence was intended to serve as a constant reminder of the cognitive instructions they had received.

Finally, a tape recorder was placed beside the subject and the subjects were told that what they were to do next would be explained by the taped instructions that they were to listen to.

All subjects assigned to reward size \$10 versus \$5 received the following taped instructions:

In the questionnaire on the table in front of you, there are a number of different questions involving choices between \$10 and \$5 at different times.

If the subject was also in the cognitive control condition, additional taped instructions followed:

Now I would like you to read the instructions on the first page of the questionnaire. Once you have read these instructions, turn the page and begin answering the questions. If you are not completely clear about what you are being asked to do please ask for clarification.

If the subject was assigned to the cognitive consummatory condition, the additional taped instructions were:

Before you read the questionnaire, I would like you to spend a little time thinking about some of the things you would like to buy with \$10 and \$5. For example, you might decide to purchase a record or a dinner with the \$10 or go to a movie with the \$5. On the boards in front of you there are

a variety of things that you might purchase with \$10 and \$5. These are just examples, you do not have to buy any of these items with the money you will earn in this experiment. They are simply visual aids to help you think of what you might buy. Now I would like you to look at these different items and choose one you would spend \$5 on and one you would spend \$10 on. If none of the items on the board appeals to you, think up two other things you would like to buy for \$10 and \$5. Tell me when you have made your choices...PAUSE...Now I would like you to picture or imagine as clearly as possible your two choices. Next I would like you to spend a few minutes imagining yourself purchasing them, using them, and enjoying them. Try to picture as clearly as possible the various pleasures you can get from having these items. Do this for a few minutes and tell me when you are done...PAUSE.

The rest of the instructions for this condition are identical to those in the cognitive control condition.

All subjects assigned to the \$10 versus \$1 reward alternatives received instructions identical to those for the \$10 versus \$5 condition except the word \$5 was replaced by the word \$1. All the instructions were taped by a volunteer who was unaware of the experimental hypotheses.

Once the subjects had completed the 20 questions, they were told to return the questionnaire. They were then given a short questionnaire (see Appendix 5) asking a few questions about the cognitive instructions. While this was being completed, the experimenter selected one of their responses from the 20 questions. Selections were designed to minimize the amount of money the experiment would actually cost. That is, the experimenter selected one in which the smaller reward was chosen. However, enough variety was introduced into these selections so that if subjects were to discuss the experiment among themselves, they would have the impression that a large reward was as likely as a small one. When subjects finished the last questionnaire, the cheque was completed for the amount of their choice and dated according to the delay specified for that particular question. Finally, subjects were debriefed and relevant questions were answered.

Data Analysis

A multivariate analysis of variance (MANOVA) involving all three dependent measures was run using the Finn (1975) multivariate program following Josephson's (Note 3) recommendations for its use with a repeated measures design. The per hypothesis error rate was set at .05. Selected post hoc analysis for individual dependent measures were performed using Scheffe's (1958) method as described by Kirk (1969) to determine critical F -ratios with α set at .016 to preserve an overall per hypothesis error rate equal to .05 (Gabriel and Hopkins, Note 3).

The observed F-ratios for the repeated measures effects were calculated using Keselman and Games' (Note 4) technique which eliminates the effects of violations of circularity.

Using the combined sample of 200 subjects, factor analysis was performed on their responses to Reid and Ware's scale following their method. That is, principle factor analysis was used to extract factors greater than one; then the squared multiple correlations were inserted into the diagonals as communality estimates (Lee and Comrey, 1978); and varimax rotation was performed using the BMDP-1977 series programs (Dixon, 1977).

CHAPTER III

ResultsIncentive Variables

Effect of Relative Reward Value. A significant multivariate main effect for relative reward value, $F(12, 105) = 11.8392$, $p < .0001$, was obtained (the complete results of the analysis are presented in Table 1). Figure 3 illustrates how each dependent measure was affected by changes in relative reward value. Scheffe's procedure revealed significant linear trends in subjects' choice behavior and ratings of reward value ($p < .016$). As the matching law predicted, subjects chose and rated as more valuable reward alternatives that had a greater relative reward value.

Subjects did not slavishly conform to matching law predictions. Rachlin's (1971) matching law equation predicts a straight line relationship between relative reward value and choice or subjective ratings such that: $Y = 50X$; where Y is the predicted value of choice or ratings and X is the relative reward value. Least squares linear solutions of the trends in choice and ratings over the five levels of relative reward value yielded the following straight line equations: for choice, $Y = 13.2X + 71.6$; and for self-reported value or ratings, $Y = 12.9X + 68.3$. Kirk's (1968) procedure for testing departures of observed from predicted scores revealed significant differences ($p < .016$), with subjects preferring the larger, later reward more frequently than would be predicted from the matching law.

Table 1
Multivariate Analysis of Variance.

Sources of Variation ^a	<u>df</u>	<u>F</u>	<u>P</u> less than
Between Measures			
Reward Size (A)	3	7.2116	.0002
Cognitive Instructions (B)	3	.4432	.7226
A X B	3	1.3195	.2716
Error	114		
Within Measures			
Relative Reward Value (C)	12	11.8392	.0001
A X C	12	6.9436	.0001
B X C	12	.9140	.5359
A X B X C	12	.9602	.4913
Error	105		
Delay (D)	9	8.8569	.0001
A X D	9	3.0831	.0025
B X D	9	2.1682	.0298
A X B X D	9	.7847	.6310
Error	108		
C X D	36	3.6008	.0001
A X C X D	36	1.6703	.0294
B X C X D	36	1.2627	.1928
A X B X C X D	36	1.4961	.0688
Error	81		

^aMean squares are not tabled because the Finn (1976) program does not output them.

MEAN PERCENT CERTAINTY, RATINGS, AND CHOICES
FOR LARGE REWARD.

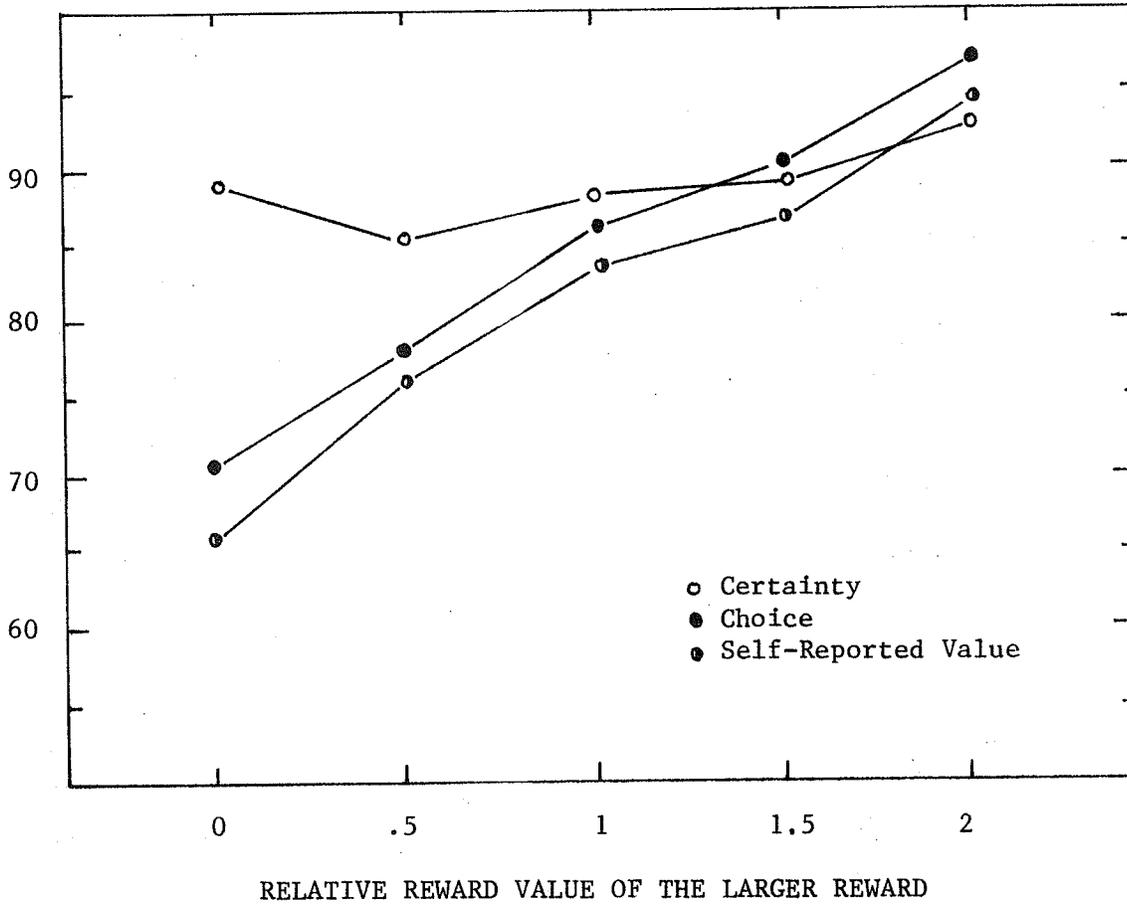


Figure 3. Means for each dependent measure are plotted against the relative reward value of the two reward alternatives. The relative reward value is calculated using Rachlin's (1971) formula.

The effects of relative reward value on certainty provides further support for the matching law. Scheffe's test for a quadratic trend in certainty was significant ($p < .016$) supporting our expectations that subjects would be more certain about their choices as the reward alternatives became less similar in value. Further post hoc analysis revealed an unexpected finding. Scheffe's test for a linear trend in certainty was significant ($p < .016$) suggesting that subjects tended to feel less certain of their choices as the smaller reward became more valuable.

Effects of Reward Size. The MANOVA for the main effect reward size was significant, $F(3, 114) = 7.2116$, $P < .0002$. Scheffe's procedure for both choice and ratings of relative reward value revealed that subjects tended to choose the larger reward more frequently and rate it as more valuable for rewards \$10 and \$1 than for \$10 and \$5 ($p < .016$). Furthermore, the MANOVA for the 2 (reward size) x 5 (relative reward value) interaction was significant, $F(12, 105) = 6.9436$, $P < .0001$. It is apparent from Figure 4 that changes in relative reward value had a greater impact on subjects' choices when they involved rewards \$10 and \$5 than when they involved rewards \$10 and \$1 (a similar relationship is found for subjects' ratings of relative reward value). Scheffe's procedure revealed that the interaction of the linear trends in relative reward value of choice and ratings for the two levels of reward size were significant ($p < .016$).

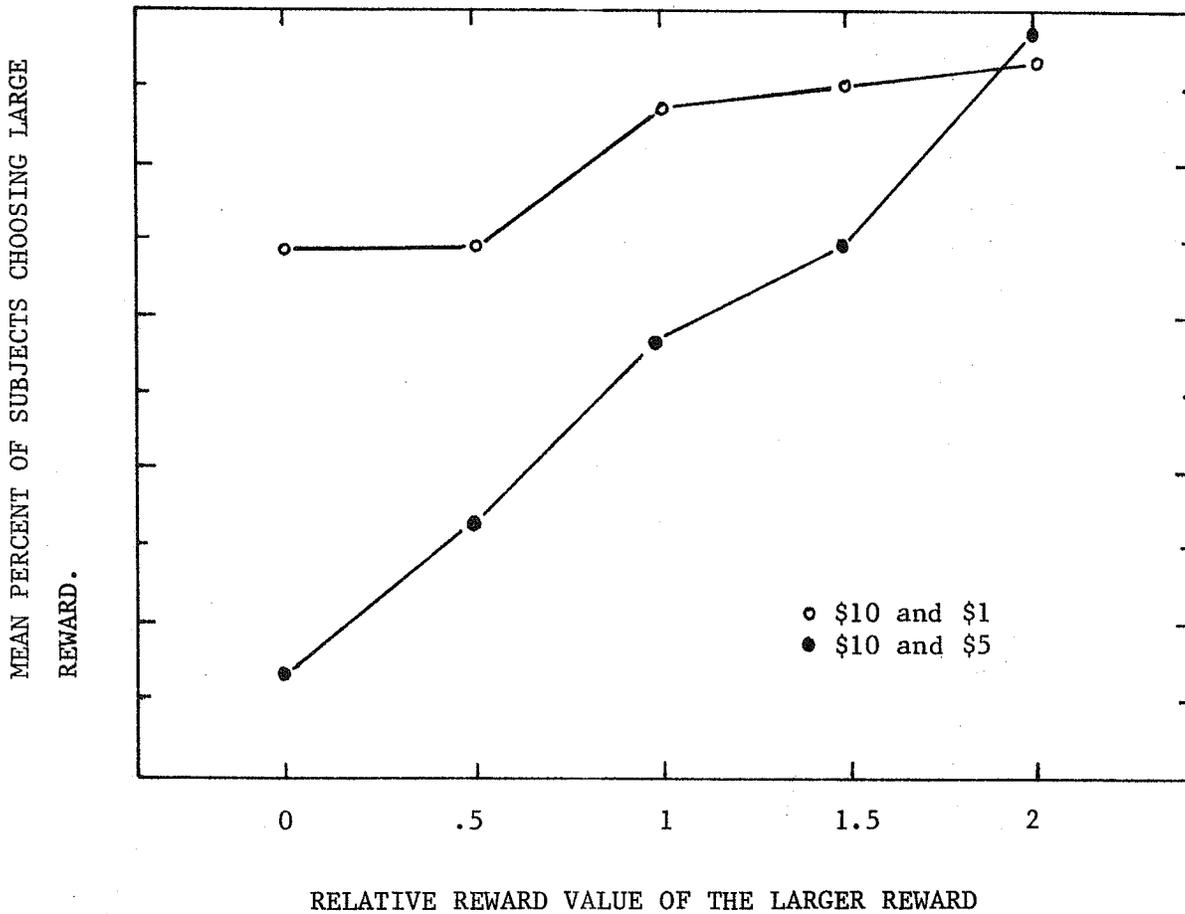


Figure 4. Means for the dependent measure choices are plotted against the relative reward value of the larger reward to the smaller for reward sizes \$10-\$1 and \$10-\$5.

Contrary to matching law predictions, it appears from present results that changes in reward sizes from \$10 and \$1 to \$10 and \$5 for constant levels of relative reward value did affect subjects' choices and ratings, with subjects preferring the \$10 alternative more frequently for the pair \$10 and \$1 than for the pair \$10 and \$5.

Effects of delay. The MANOVA for the delay main effect was significant, $F(9, 108) = 8.8569$, $p < .0001$. Scheffe's procedure for linear trends in both choice and ratings revealed that as delay to the larger reward increased, subjects chose the larger reward less frequently and rated it as less valuable than the smaller reward ($p < .016$). Further analysis revealed that the MANOVA for the 4 (delay) x 5 (relative reward value) interaction was significant, $F(36, 81) = 3.6008$, $p < .0001$. It is apparent from Figure 5 that as delay to the larger, later reward increased, changes in relative reward value had greater effects on subject's choice behavior (a similar relationship is found for subjects' ratings of the value of the larger rewards). Scheffe's procedure indicated that the interaction of the linear trends in relative reward value of choice and ratings over the four levels of delay were significant ($p < .016$). Contrary to matching law predictions, it appears from the present results that changes in delay to the larger, later reward for constant values of relative reward value did affect subjects' choices and ratings, with subjects more frequently preferring the larger reward as delays decreased from 50 to 2 weeks.

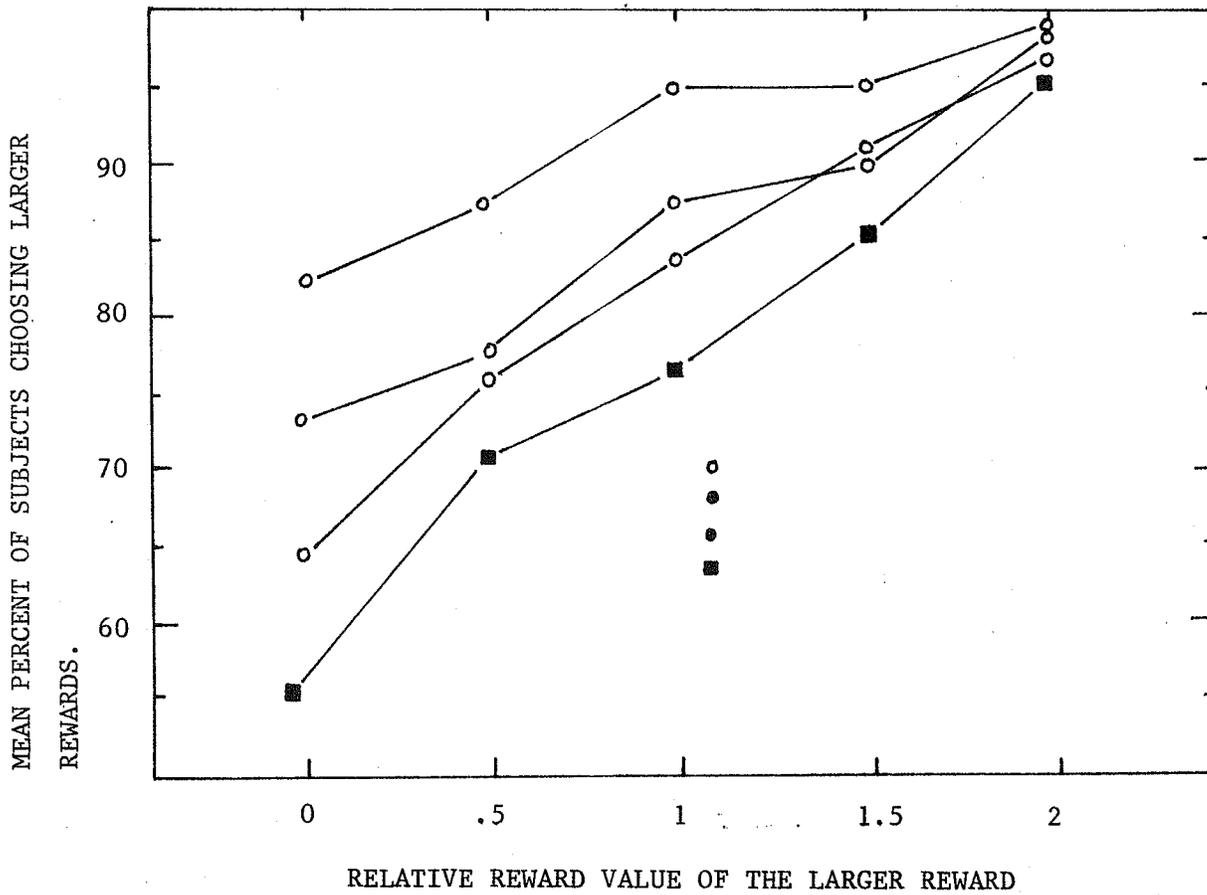


Figure 5. Means for the dependent measure choice are plotted against relative reward value for each of the four levels of delay to the larger, later reward.

Effects of Reward Size, Delay and Relative Reward Value. The multivariate test of the 2 (reward size) x 4 (delay) x 5 (relative reward value) interaction was significant, $F(36, 81) = 1.6703$, $p < .0294$. It is apparent from Figure 6 that the effect of changes in relative reward value on subjects' choices is considerably greater for the rewards \$10 and \$5 with a 50 week delay to the larger, later reward than for the rewards \$10 and \$1 with a 2 week delay to the larger reward (a similar relationship is found for subjects' ratings of relative value of the rewards). Scheffe's tests for differences in linear trends in choice and subjects' ratings for the treatment combinations presented were significant ($p < .016$). These results suggest that subjects are more likely to choose and rate rewards according to the matching law under very specific circumstances, that is, when delays are long and reward differences are not extreme.

Effects of Cognitive Instructions. A MANOVA test of the main effect for cognitive instructions, $F(3, 114) = .4432$, $p < .2716$, was not significant. Further analysis of the data revealed a significant MANOVA test for the 2 (cognitive instructions) x 4 (delay) interaction, $F(9, 108) = 2.1672$, $p < .0298$, however, the meaning of this result is unclear.

Reviewing the univariate ANOVAs for the dependent measures self-reported value and choice did lead to some interesting conclusions. The ANOVA for the 2 (cognitive instructions) x 2 (reward size) x 5 (relative

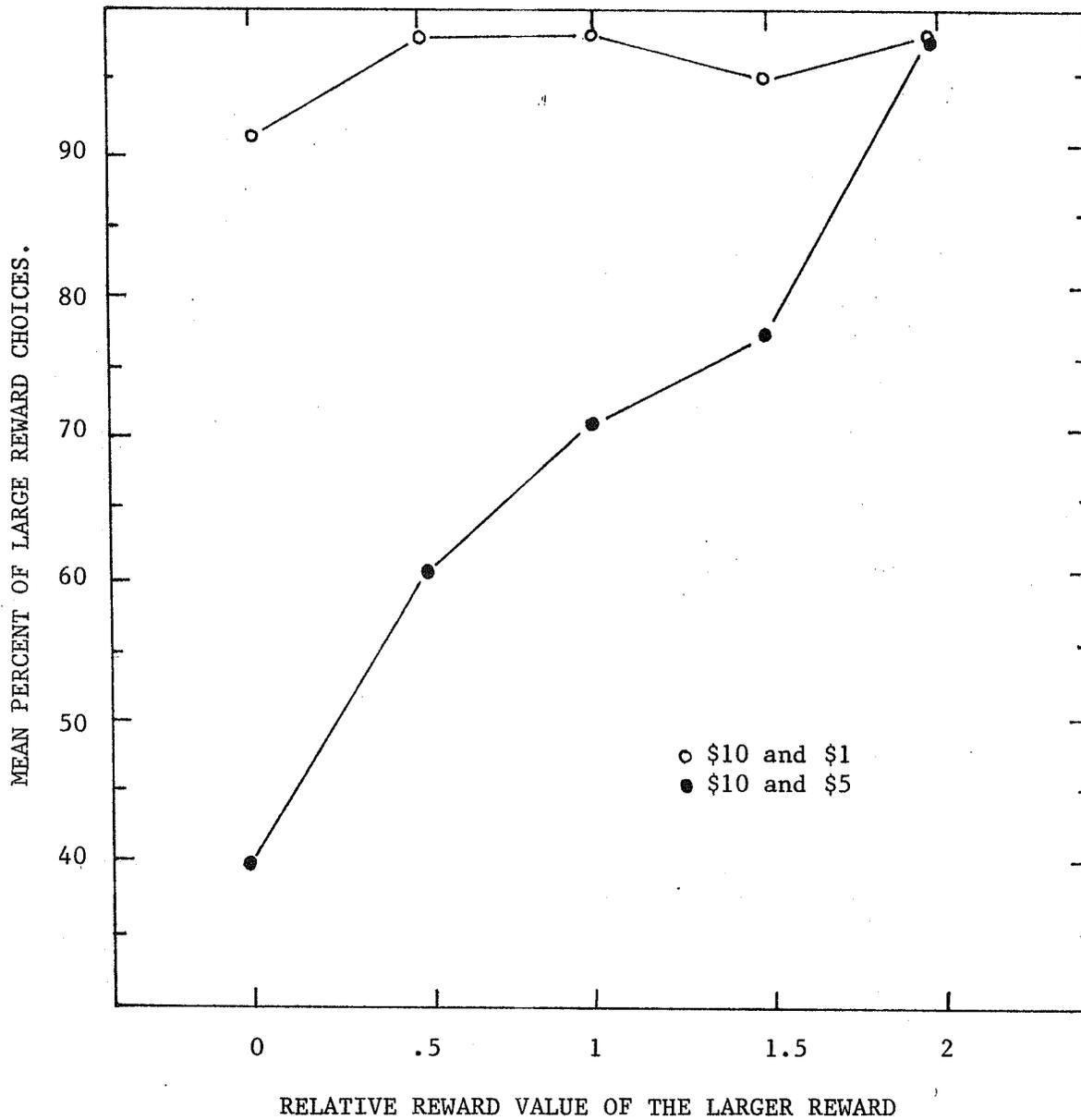


Figure 6. Means for the dependent measure choice are plotted against relative reward value of the larger, later reward for the reward size level \$10 and \$1 for 2 week delays to the larger reward and for the reward size level \$10 and \$4 for 50 week delays to the larger reward.

reward value) interaction was significant, $F(3, 348) = 3.52, p < .0153$, for subjects' ratings of relative reward value. Inspection of the means revealed that subjects receiving the consummatory instructions rated the larger reward as less valuable for reward \$10 and \$1 and more valuable for rewards \$10 and \$5 than subjects receiving the neutral instructions. Furthermore, this effect only occurred for relative reward values where the larger reward was predicted to have: (1) the same value as the smaller reward; (2) half the value of the smaller reward; and (3) no value when compared to the smaller reward. Scheffe's test of this comparison was significant, $p < .016$. A similar effect was found for choice.

The ANOVA for the 2 (cognitive instructions) x 2 (reward size) x 5 (relative reward value) x 4 (delay) interaction was significant, $F(12, 1392) = 2.57, p < .0023$. Scheffe's procedure revealed the subjects receiving the consummatory instructions chose more impulsively when faced with the \$10 and \$1 rewards and less impulsively when faced with the \$10 and \$5 rewards when compared to subjects receiving the neutral instructions ($p < .016$). Furthermore, this effect occurred only when the delay to the larger reward was 50 weeks and when relative reward value of the larger reward was predicted to be the same value as the smaller, half the value of the smaller and of no value when compared to the smaller.

The lack of more obvious effects due to the cognitive instructions does not appear to be a result of difficulties with the taped instructions. One subject claimed to have trouble hearing the instructions, ten had

trouble comprehending them, five felt the instructions had no personal meaning for them, and three said they were unable to comply with them. In sum, only 20 subjects out of 120 had some kind of difficulty with the instructions that may have reduced their effectiveness.

Construct and Concurrent Validity of Reid and Ware's Scale.

Factor analysis of 200 subjects' responses to Reid and Ware's (1974) personality inventory produced three factors accounting for 21 percent of the total variance of the original 32 items. Table 2 presents the item loadings on each factor for both the present study and Reid and Ware's and shows an obvious similarity in the results of the two studies. These results suggest that Reid and Ware's scale is stable and yields in addition to the two traditional I-E factors, the factor labelled Self-control. Thus, from a construct validity standpoint, the hypothesis that the two traditional factors are insufficient to characterize all the personal variance associated with beliefs assumed to affect self-control behavior was supported. Subjects' beliefs about their ability to control the availability of reinforcement is distinct from their beliefs about their ability to control their own impulses.

Correlations between scale responses on items corresponding to each factor and choice or self-reported value were not significant at $p < .05$ (see Table 3). Furthermore, the responses to various combinations of the factors did not correlate significantly with choice or self-reported value. Finally, attempts to find correlations between the scale scores of the factors and choice or self-reported value for different

Table 2

Varimax Rotated Factor Loadings on Scale Items for the Present Study and Reid and Ware's.

Scale Items	I	II	III
	Fatalism	Self-Control	Social System Control
Fatalism Items			
35 ^a	.63 (.55) ^b	0 (0) ^c	0 (0)
41	.57 (.65)	0 (0)	0 (0)
7	.56 (.40)	0 (0)	0 (0)
44	.50 (.52)	0 (0)	0 (0)
15	.45 (.56)	0 (0)	0 (0)
31	.44 (.49)	0 (0)	0 (0)
37	.42 (.44)	0 (0)	0 (0)
13	.40 (.32)	0 (0)	0 (0)
9	.34 (.45)	0 (0)	0 (0)
20	.34 (0)	0 (0)	0 (0)
24	.30 (.36)	0 (0)	.27 (0)
11	.28 (.44)	0 (0)	0 (0)
Self-Control Items			
23	0 (0)	.57 (.51)	0 (0)
10	0 (0)	.52 (.45)	0 (0)
16	0 (0)	.43 (.45)	0 (0)
40	0 (0)	.41 (.58)	0 (0)
38	0 (0)	.38 (.62)	0 (0)
4	0 (0)	.38 (.45)	0 (0)
28	0 (0)	.32 (.36)	0 (0)
19	0 (0)	0 (.43)	0 (0)
Social System Control Items			
39	0 (0)	0 (0)	.76 (.80)
22	0 (0)	0 (0)	.60 (0)
14	0 (0)	0 (0)	.46 (.61)
18	0 (0)	0 (0)	.41 (.59)
27	0 (0)	.41 (0)	.39 (.45)
43	0 (0)	0 (0)	.31 (.34)
3	0 (0)	0 (0)	.26 (.27)
5	0 (0)	.29 (0)	0 (0)
25	0 (0)	.35 (0)	0 (.64)
32	0 (0)	0 (.41)	0 (0)
29	0 (0)	0 (0)	0 (0)
33	0 (0)	0 (0)	0 (0)

^aNumbers correspond to the question numbers in Reid and Ware's inventory

^bNumbers in parentheses are the factor loadings obtained by Reid and Ware

^cFactor loadings less than .25 are excluded for clarity

Table 3

Correlations Between Choice and Self-reported Value and Subjects' Scores on the Three Factors of Reid and Ware's (1974) Personality Inventory.

Factor	Correlations With Choice	Correlations With Self-reported Value
Self-control (SE)	.087 (.346) ^a	.116 (.206)
Fatalism (F)	.099 (.279)	.116 (.206)
Social Systems Control (SSC)	.124 (.178)	.127 (.168)
F + SSC	.127 (.166)	.142 (.122)
F + SSC + SE	.136 (.137)	.159 (.082)

^aNumbers in the parentheses are the probabilities that the correlations are different from zero.

levels of treatment led to no significant results at $p < .05$. Thus, it seems that knowledge of subjects' beliefs about their ability to control the availability of reinforcement and their own impulses did not enhance our ability to predict which rewards subjects would choose.

Are Choices Consistent with Subjective Reports of Relative Reward Value? One question of interest was whether or not subjects chose the rewards they valued. It might be expected that subjects would choose immediate rewards while coveting long term ones. Results did not support this contention. Choice and self-reported ratings of relative reward value correlated, $r(598) = .862$, $p < .000$, over the five levels of relative reward value. Stepwise discriminant function analysis continued to confirm that both choice and self-reported relative reward value were affected in very similar ways by changes in relative reward value. For example, when self-reported value was entered into the discriminant function first, the step down F for the linear trend in self-reported value was significant, $F(1, 116) = 116.69$, $p < .0001$ but the step down F for the linear trend in choice when entered second was not, $F(1, 116) = .0173$, $p < .8957$. From the present results, it appears that choice and self-reported value are affected in very similar ways by changes in relative reward value. Thus, subjects' preferences mirror their valuations of the rewards.

Effects of Age, Sex, and Money. The correlations between sex and choice, $r(118) = .02$; $p < .84$, sex and self-reported value, $r(118) = .1$, $p < .29$; age and choice, $r(118) = .17$, $p < .056$; age and self-reported value, $r(118) = -.17$, $p < .056$, were not significant. Only the correlations between money and choice, $r = -.29$, $p < .001$ and money and self-reported value $r = -.19$, $p < .034$, were significant. It seems that the more money subjects had to spend on personal need the less likely they were to choose the smaller reward over the larger.

CHAPTER IV

DiscussionEffects of Incentive Variables

The most striking effects in the present study were caused by incentive variables. Results indicated strong support for the matching law since subjects tended to choose whichever reward the matching law predicted was more valuable.

The ability of the matching law to predict subjects' choices was markedly affected by differences in reward sizes and delays to the larger reward. For constant levels of relative reward value, subjects were more likely to choose the larger reward if choice involved reward sizes \$10 and \$1 than \$10 and \$5. Similarly, as delay to the larger reward decreased subjects were less likely to choose according to the matching law predictions, and more likely to show a preference for the larger, later reward. Departures from matching law predictions are greatest when these two effects combine. Faced with two sets of choices in which there is a short delay and a larger difference in reward size in one set, and a long delay and small reward difference in the other, subjects are much more likely to follow the matching law for the second set. Taking the results as a whole, subjects exhibited under-matching. They preferred the larger reward to the smaller more often than the matching law would predict.

The present study extends the results of prior research. First

no previous studies (e.g., Mischel & Grusec, 1967) systematically took into account the combined effects of reward size and delay on subjects' choices. The present study found that the matching law applies to a wide range of rewards and delays. Second, no previous attempts systematically measured how changes in reward sizes and delays of alternatives affect subjects' choices. The present study makes it clear that these effects are important determinants of a subject's choice behavior. Without the systematic approach afforded by the matching law these different variables were confounded with one another in the past. For example, Mischel, Grusec, and Masters (1969) found that for all delays to the larger reward, subjects found the immediate reward more attractive. The present study found such an event likely only when the matching law predicts the smaller, immediate reward as more valuable, reward sizes of the two alternatives were not extremely different, and delays to the larger reward were long.

In addition, the judgement process which subjects went through when choosing was affected by incentive variables. Subjects tended to be most certain of their choices when relative reward value of choices greatly favored either the large or small reward alternative. Subjects were least certain when reward alternatives were seen as very similar in value. The matching law gains additional support from this result since subjects might be expected to have less basis for making a decision when reward alternatives are perceived as equal.

Unexpectedly, subjects were also found to be less certain about

their choices, the more valuable the small reward was perceived to be. It seems that there is a bias in favor of the larger reward independent of relative reward value. Perhaps this reflects a general desire to want more than less and size of rewards plays a strong, independent part in this process.

Finally, most prior research used children as subjects. It is important to note that the present study found that adult subjects show very similar behavior.

Overall, the matching law was predictive of self-control behavior of adult subjects when an externally-imposed delay of reward paradigm was used. Thus, the behavioral model received reasonable support.

Effects of Cognitive Instructions

The neutral and consummatory instructions interacted with incentive variables to produce some complex and intriguing results. Subjects who received the consummatory instructions were more impulsive when choosing between \$10 and \$1 rewards and more self-controlled when choosing between \$10 and \$5 rewards, compared to subjects in both conditions who received neutral instructions. Furthermore, these effects only occurred when the larger reward was, according to the matching law of no value compared to the smaller, half the value of the smaller, and of equal value to the smaller; and when the delay to the larger, later reward was 50 weeks.

There is no clear explanation for these contradictory results since both Miller and Karniol (1976) and Mischel (1974) suggest the consummatory

instructions should have either increased or reduced impulsiveness but not both. When Miller and Karniol (1976) used ratios of reward sizes similar to the present study's, they found similar effects. With more extreme values like \$10 and \$1, it may be that there is less frustration associated with waiting for the long term reward because it is regarded as decidedly more valuable. When waiting for the long term reward is no longer frustrating, the consummatory instructions no longer serve to reduce frustration. As Mischel (1974) suggests they may now have the opposite effect, focussing attention on the consummatory aspects of rewards and causing subjects to be more impulsive. The findings that these effects only occur for three levels of relative reward and one of delay may have been due to subjects' greater uncertainty in these conditions. It might be expected that the more uncertain a subject the more open he is to influence.

The lack of main effects and weakness of the interaction effects in the present study may have occurred because the cognitive instructions have weaker effects on adults than they have had on children. Adults have a lot more experience with "sales pitches" and even though they understood and responded to the instructions in the present study, they may be more resistant to instructions that sound like a pitch. Alternately, the fact that subjects made many choices following the cognitive instructions could have weakened their effects. Thus, the effects of the cognitive instructions might be increased by making the instructions more vivid through the use of more dramatic language, increasing a subject's sense of ease, providing more striking visual cues demonstrating the enjoyment to be obtained from a choice. As well, reducing the number of choices

a subject makes might serve to further focus the cognitive effects and thereby increase their strength.

In general, it appears that cognitive instructions do not have simple effects on subjects' self-control behavior. Complex interactions occur, which suggest that cognitive instructions operate in different ways depending on specific conditions of relative reward value, delay, and reward size. Furthermore, in contrast to Mischel's findings the present study concluded that the cognitive instructions did not consistently outweigh the effects of incentive variables.

Effects of Personality Variables

Equivocal results were found using the personality variables. Factor analysis of subjects' responses to Reid and Ware's (1974) scale indicated that individuals' beliefs in their ability to control their own desires for immediate gratification was distinct from their beliefs in their ability to control the availability of reinforcement. Thus, it might be expected that responses on both dimensions would independently predict self-control behavior and that scores on the combined scale would further increase predictiveness. Results from the present study indicated that correlations between choice and either the separate or combined scales were not significant. Attempts to correlate individual or combined scale scores with various subsets of the sample also proved fruitless. Thus, Reid and Ware's contention that the I-E measure should be expanded to include a self-control dimension received limited support.

The lack of correlation between Reid and Ware's measure and subjects' choices was not felt to be due to any obvious situational variables. Every

attempt was made to eliminate situational variables such as trust that might have affected a subjects' belief that they would actually receive the rewards. Still there may have been a failure to create the proper situational constraints for the I-E part of the scale. Recall that Mischel, Zeiss and Zeiss (1974) found correlations of .32 to .66 between locus of control scores and the ability of pre-school children to delay gratification, only when subjects were required to complete a difficult task to obtain the delayed reward. When subjects simply had to passively wait for either reward the correlations were small. In the present study, since no task was required to achieve a reward, weakened correlations may have resulted.

Another cause for the absence of correlations may be that Reid and Ware's (1974) scale is a poor measure of self-control behavior when the choices involve financial reward. Recent discussion has repeatedly suggested that correlations between self-reports and behavior are often low because the scale items are not specific to the measured behavior (e.g., Bandura, 1977). Further research would be necessary to decide these issues.

Overall, the results of the present study provided meagre support for a personality component. Further research would be necessary to determine whether situational limitations, inappropriateness of scale items or both may have contributed to this situation.

Effects of Age, Sex, and Amount of Personal Income

Sex had no effect on subjects' choice behavior as previous research had found (Mischel and Metzner, 1969). Nor did age correlate with self-

control behavior contrary to prior research using children (Mischel and Metzner, 1969). With adult subjects, however, the maturation effects assumed to underlie the correlation for children would not operate, so the lack of results in the present study is not surprising. The amount of money subjects had available to spend on personal needs affected their choices. With increasing income reward alternatives became less important, making the easier alternative more attractive. This was an unexpected finding since Shybut (1968) failed to find a correlation between choice and income for his adult sample. The size of his rewards, however, was small in comparison with his subjects' income while rewards in the present study amounted to approximately 10% of the average monthly income of subjects.

Overall, the results indicate that while age and sex are unimportant in self-control studies for adults, a subject's income is an important consideration. Failure to take this variable into account could lead to spurious findings in an adult sample.

When is Choice Behavior Self-Controlled?

There is little evidence in the present study to suggest that choice behavior is synonymous with self-control behavior. Most choices were controlled by external contingencies, as the matching law would predict. Thus, choosing a small reward does not indicate impulsiveness, nor does choosing a large reward signify self-control in the present study. The fact that subjects' self-reports of relative reward value were consistent with their actual choices indicates they did not covet large rewards

while impulsively choosing the more immediate one. In other words, subjects consistently chose what they wanted. It should be noted that the close correspondence between choice and desire in the present study may have been caused by how subjects were asked to state their preferences. That is, the acts of choosing and valuing were completed almost at the same time. If these two actions were separated in time individuals might show greater differences in their responses.

Even though the incentive variables were responsible for most choice behavior in the present study, it would be inappropriate at this stage to declare under all circumstances that the behavioral models of self-control are best. To begin with, it has already been noted that weaknesses in the methodology of the personality and cognitive approaches would have accounted for lack of effects. Then again, the cognitive variables did show effects under certain circumstances. Given the right conditions, they might be as much or more powerful than incentive variables. A similar case might be made for the personality measures. Finally, results supporting the behavioral models are limited in the present instance to the externally-imposed delay paradigm.

Implications for Future Research

A number of theoretical and clinical implications arise from the present study. From a theoretical standpoint, it appears that, in general, careful attention should be paid to the role of incentive variables in self-control research. The effects of these variables are

very strong and an inadequate appreciation of this fact could easily lead to poorly designed experiments. For example, choices that might be expected to present subjects with a conflict did not do so in the present study. In fact, only choices with very long delays (20 to 50 weeks) and similar reward magnitudes (\$10 vs. \$5) actually seemed to cause subjects to feel uncertainty about their choices. Other alternatives did not create any uncertainty in subjects' behavior. Attempts to measure the effects of nonincentive variables could be easily invalidated if inappropriate reward choices are used since subjects would in these cases be guided by incentive effects alone. Furthermore, the fact that most past studies have not systematically varied the incentive variables, makes it impossible to judge how important other variables are under different incentive conditions.

Another important implication of the present study relates to the behavioral concept of self-control as expressed by Ainslie (1975). Recall that he felt that in the self-imposed delay of reward paradigm, individuals experienced difficulties maintaining their choice for the long term reward because the relative reward values of the two changed over time (see Figure 1). The results of the present study tentatively support this hypothesis since it was found that the same two rewards had different relative reward values with changes in delay (see Figure 6). It would be of great interest to see if such results could be duplicated for the self-imposed delay of reward paradigm. If they can be, then more appropriate clinical applications of incentive variables could be supported.

For example, if a system of relative reward values for an individual could be worked out then more precise reward alternatives could be presented to an individual at critical choice points. In addition, other nonincentive manipulations could be applied at these critical decision points improving the individual's likelihood of displaying self-control.

In my opinion, further efforts in self-control research should be directed towards developing a more precise incentive model of self-control and then towards more effective clinical strategies based on such a model.

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APPENDIX 1

MATCHING LAW MATHEMATICS

Rachlin (1971) suggested a model for predicting how a subject would determine the relative reward value of two alternative rewards which vary in reward size and delay. Simply stated in mathematical terms the model is:

$$\frac{V_1}{V_s} = \frac{RS_1}{RS_s} \cdot \frac{D_s}{D_1} \dots\dots\dots 1$$

where V_1 and V_s are the values of the large and small rewards respectively; RS_1 and RS_s are the absolute reward sizes of the large and the small rewards respectively; and D_1 and D_s are the delays to the large and small rewards respectively. Since all values in the formula are divided by themselves the units of either the reward size or delay are unimportant as long as they are the same for either reward size or delay. Thus, the ratio V_1/V_s is unitless and varies from 0 to ∞ . As a result, in the present study, it is very easy to determine the relative value of any two reward alternatives presented. For example, for the following choice:

- Which would you prefer?
 A. \$10 in 20 weeks, or
 B. \$ 5 in 10 weeks;

formula 1 would predict that the ratio $V_1/V_s = 1$, which means that both rewards have equal value. Other examples can be easily generated.

Based on formula 1, it would be simple to determine which reward alternative a subject would choose. That is, if $V_1/V_s > 1$, then the larger reward will be chosen and if $V_1/V_s < 1$, then random choosing would be expected.

APPENDIX 2

VALUES QUESTIONNAIRE FOR \$10 AND \$5

This questionnaire is a measure of personal preference: Obviously there are no right or wrong answers. Each item consists of a pair of alternatives lettered (A) or (B) and three questions about your reactions to these alternatives. Since there are no right or wrong answers simply give your best answer.

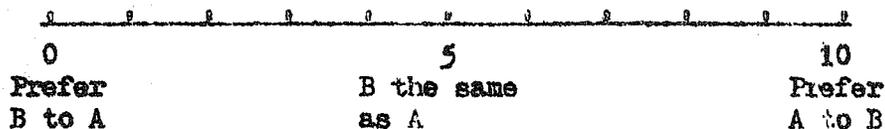
Remember to be as careful as possible in making your choices because you will be given one of these choices. For example, if on the first question you choose the \$10 alternative and this is the same question that the experimenter has chosen by chance, you will receive a cheque for \$10 dated according to the time specified in the question. If you choose the \$5 alternative, then you will receive a cheque dated according to the time specified for it.

If you have any questions concerning these instructions, please ask. If not, turn the page and complete the questionnaire.

YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 50 weeks or
 B. \$ 5.00 in 12.5 weeks.

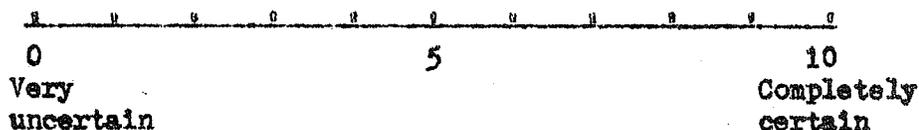
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A B Check one.

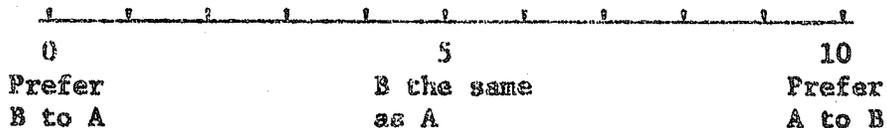
3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 20 weeks or
 B. \$ 5.00 in 5 weeks.

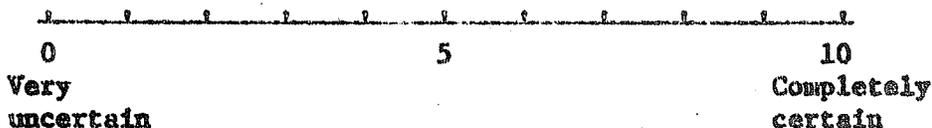
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

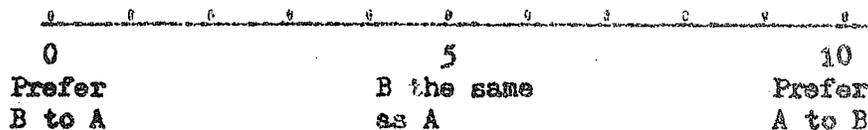


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 2 weeks or

B. \$ 5.00 in 3 days.

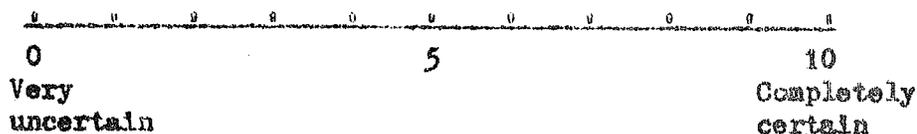
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

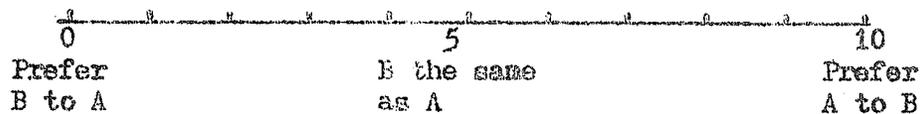


YOU ARE GIVEN A CHOICE BETWEEN

A. \$10.00 in 50 weeks or

B. \$ 5.00 immediately.

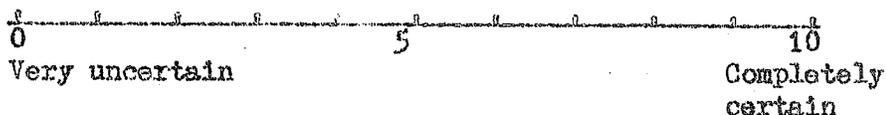
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

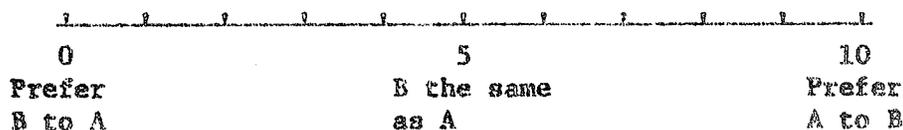


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 12 weeks or

B. \$ 5.00 in 9 weeks.

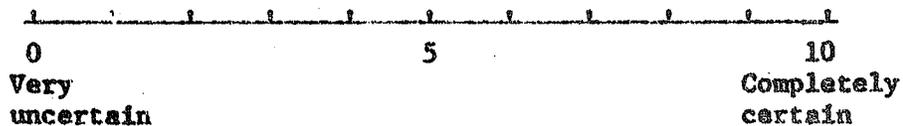
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

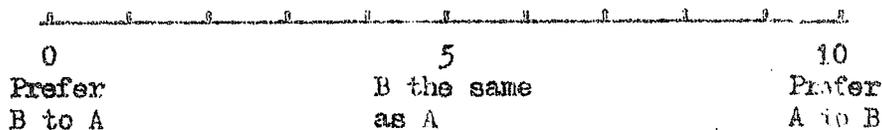


YOU ARE GIVEN A CHOICE BETWEEN

A. \$10.00 in 50 weeks or

B. \$ 5.00 in 25 weeks.

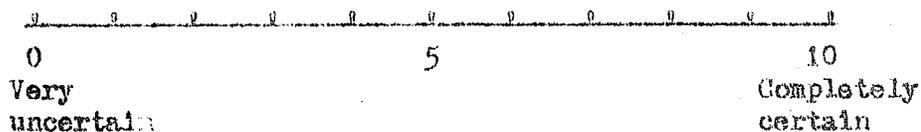
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

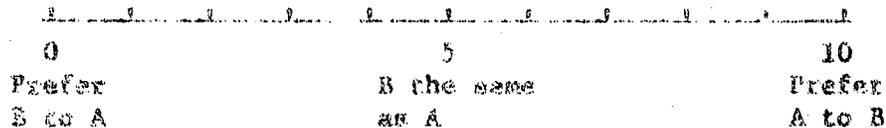
3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 2 weeks or
 B. \$ 5.00 in 10 days.

1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

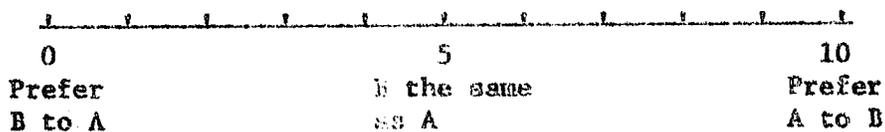


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 20 weeks or

B. \$ 5.00 in 19 weeks

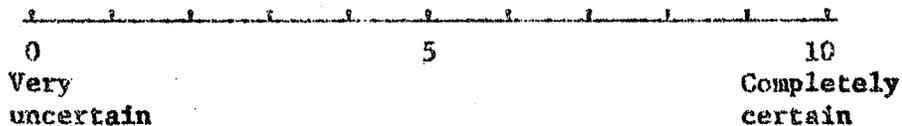
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

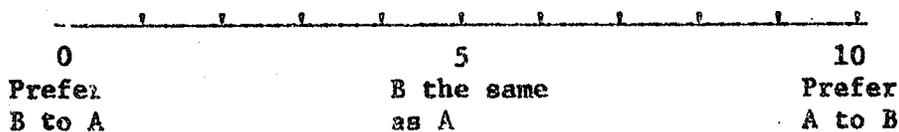


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 12 weeks or

B. \$ 5.00 immediately.

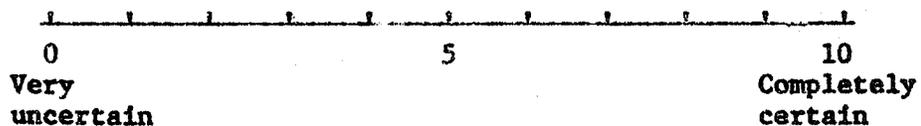
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A B Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

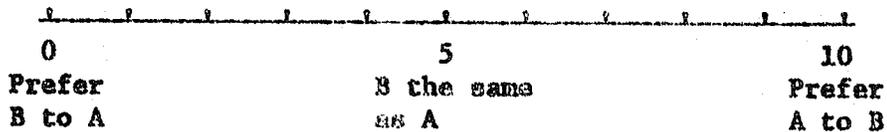


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 2 weeks or

B. \$ 5.00 in 13 days.

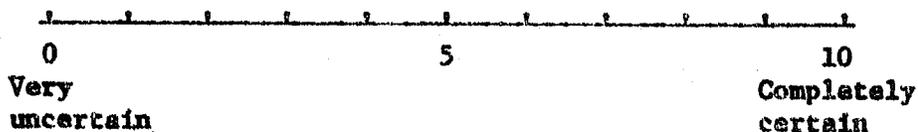
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A B Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

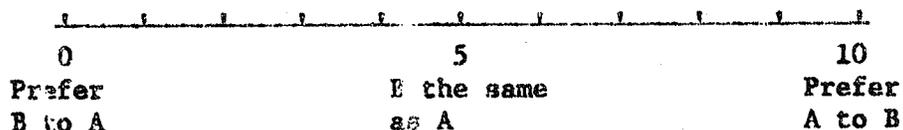


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 12 weeks or

B. \$ 5.00 in 3 weeks.

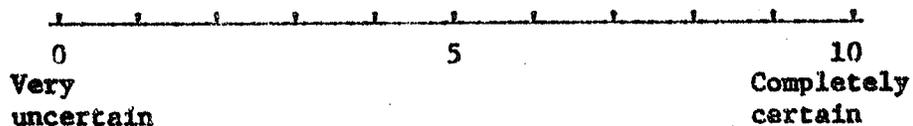
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

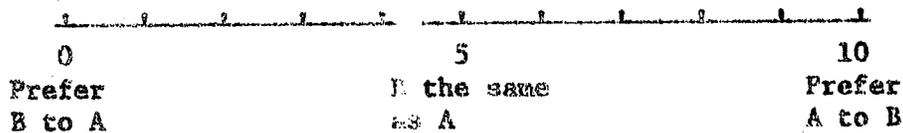
3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 2 weeks or
 B. \$ 5.00 immediately.

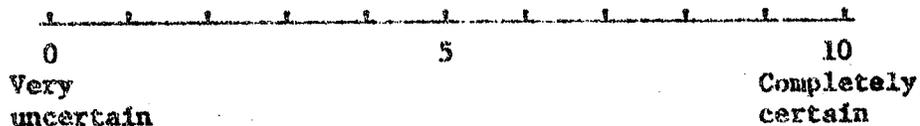
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A B Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



APPENDIX 3

VALUES QUESTIONNAIRE FOR \$10 and \$1

This questionnaire is a measure of personal preference: Obviously there are no right or wrong answers. Each item consists of a pair of alternatives lettered (A) or (B) and three questions about your reactions to these alternatives. Since there are no right or wrong answers simply give your best answer.

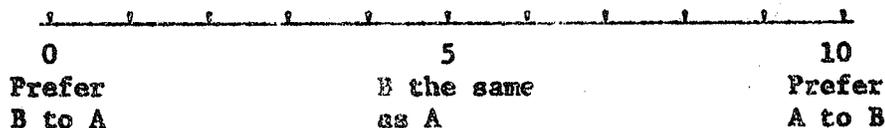
Remember to be as careful as possible in making your choices because you will be given one of your choices. For example, if on the first question you choose the \$10.00 alternative and this is the same question that the experimenter has chosen by chance, you will receive a cheque for \$10.00 dated according to the time specified in the question. If you choose the \$1.00 alternative, then you will receive a cheque dated according to the time specified for it.

If you have any questions concerning these instructions, please ask. If not, turn the page and complete the questionnaire.

YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 2 weeks or
 B. \$ 1.00 in 2 days.

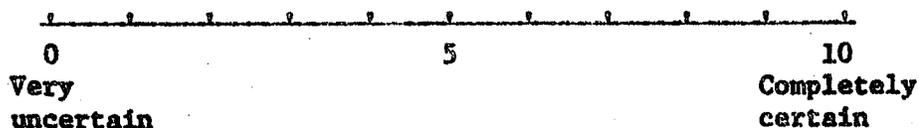
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

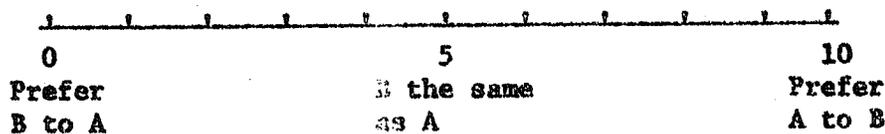
3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 20 weeks or
 B. \$ 1.00 in 1 week.

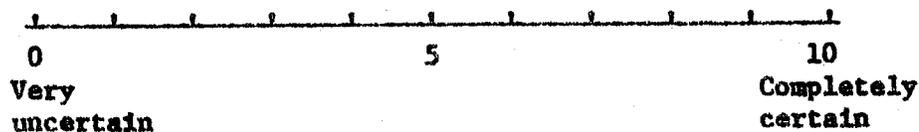
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

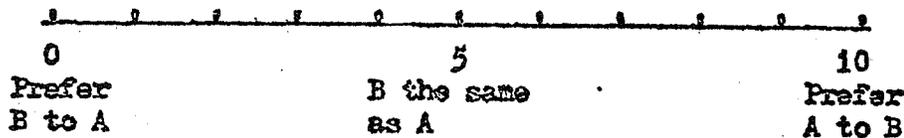


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 50 weeks or

B. \$ 1.00 in 9.5 weeks

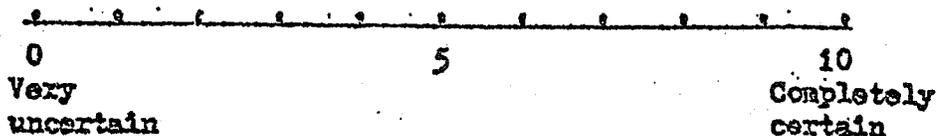
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A B Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

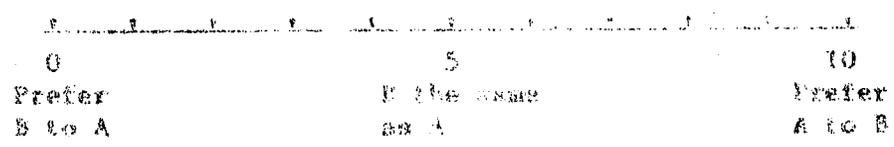


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10 00 in 20 weeks or

B. \$ 1 00 in 20 days.

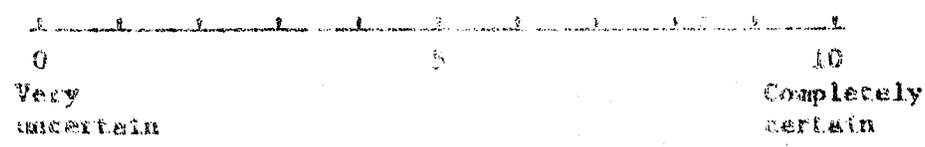
- On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



- If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

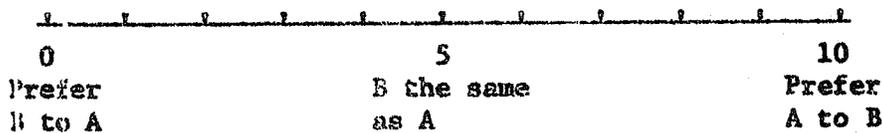
- On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 20 weeks or
 B. \$ 1.00 immediately.

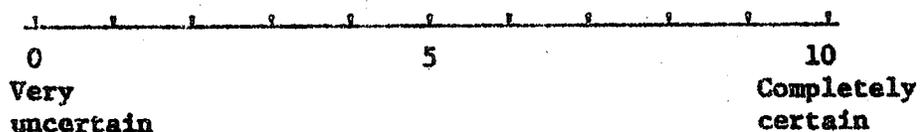
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

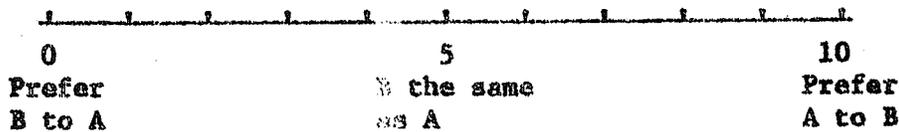


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 2 weeks or

B. \$ 1.00 immediately.

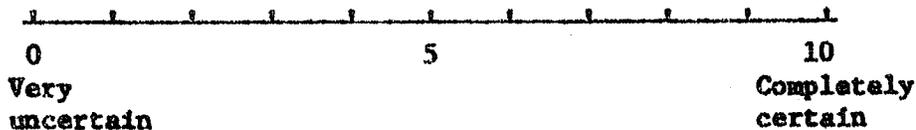
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

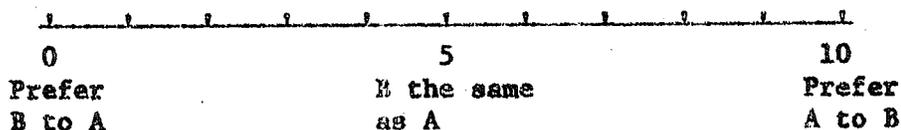


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 20 weeks or

B. \$ 1.00 in 2 weeks.

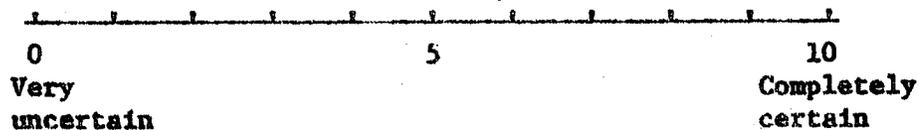
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A B Check one.

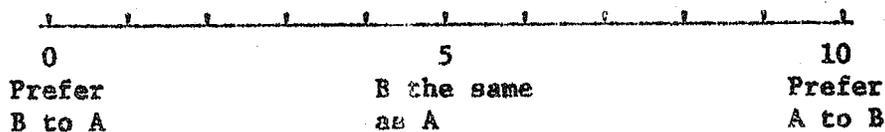
3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 2 weeks or
 B. \$ 1.00 in 1 day.

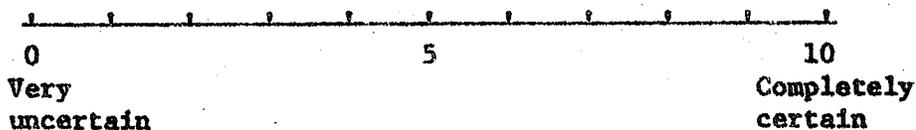
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

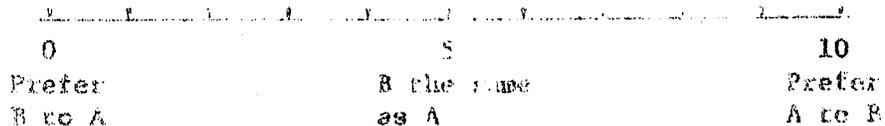
3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 1.00 in 12 weeks or
 B. \$ 1.00 in 8 days.

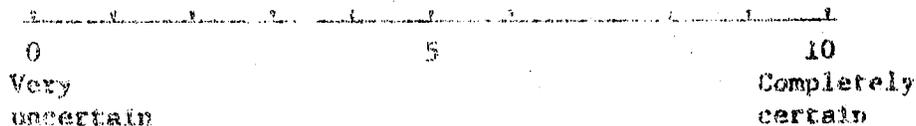
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.

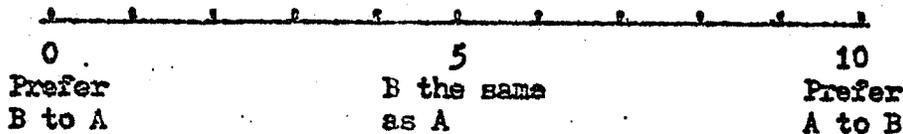


YOU ARE GIVEN A CHOICE BETWEEN

A. \$ 10.00 in 50 weeks

B. \$ 1.00 in 2.5 weeks

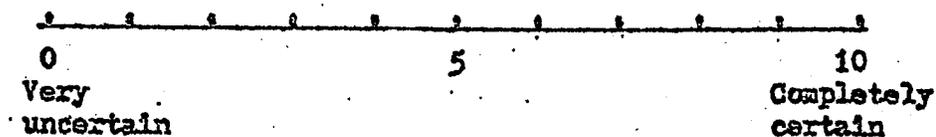
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A _____ B _____ Check one?

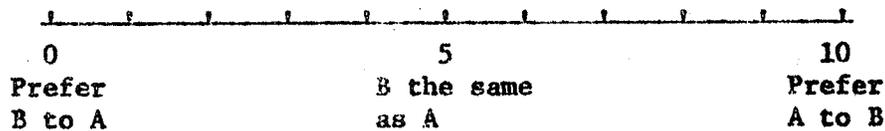
3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



YOU ARE GIVEN A CHOICE BETWEEN

- A. \$ 10.00 in 12 weeks or
 B. \$ 1.00 immediately.

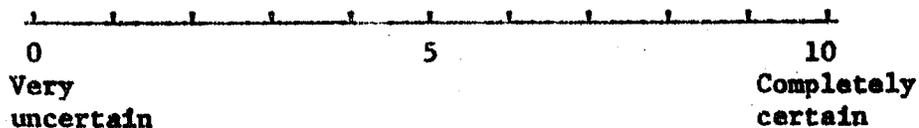
1. On a scale of 0 to 10 rate the relative attractiveness or value to you of A compared to B by drawing a vertical line through the line below. A vertical line through 5 for example would mean you felt they were equally attractive, through 10 would mean you preferred A completely over B, and through 0 would mean you preferred B to the complete exclusion of A.



2. If you had to choose either A or B which would you choose?

A B Check one.

3. On a scale of 0 to 10 rate how certain you would be of your choice. A vertical line through 10 would mean you are completely certain of your choice while a vertical line through 0 would mean you are very uncertain of your choice.



APPENDIX 4

PERSONAL INVENTORY

In answering the following questions it should be stressed that all your answers will be kept confidential and once the experiment is completed this information will be destroyed.

Please answer the following questions:

1. Name _____.
2. Sex M ____ F ____ Check one.
3. Birthdate ____/____/____
 day mo. yr.
4. Estimate the amount of money you will have available to spend on nonessential personal needs over the next 30 days to the nearest \$50.00. _____.

This questionnaire is a measure of personal belief: obviously there are no right or wrong answers. Each item consists of a pair of alternatives lettered (A) or (B). Please select the one statement of each pair (and only one) which you more strongly believe as far as your concerned. Be sure to select the one you actually believe to be more true rather than the one you think you should choose or the one you would like to be true.

Please answer these items carefully, but do not spend too much time on any one item. Be sure to find an answer to every choice. Circle the letter of statement (A or B) which you choose.

In some cases you may discover that you believe both statements or neither one. In such cases be sure to select the one you more strongly believe to be the case as far as you are concerned. Also try to respond to each item independently when making your choice: do not be influenced by your previous choices.

1. (A) Various sports activities in the community help increase solidarity amongst people in the community.
(B) Various sports activities in the community can lead to rivalry detrimental to the solidarity of the community.
2. (A) War brings out the worst aspects of men.
(B) Although war is terrible, it can have some value.
3. (A) There will always be wars no matter how hard people try to prevent them.
(B) One of the major reasons we have wars is because people do not take enough interest in politics.
4. (A) Even when there was nothing forcing me, I have found that I will sometimes do things I really did not want to do.
(B) I always feel in control of what I am doing.
5. (A) There are institutions in our society that have considerable control over me.
(B) Little in this world controls me, I usually can do what I decide to do.
6. (A) I would like to live in a small town or rural environment.
(B) I would like to live in a large city.
7. (A) For the average citizen becoming a success is a matter of hard work, luck has little or nothing to do with it.
(B) For the average guy getting a good job depends mainly on being in the right place at the right time.
8. (A) Patriotism demands that the citizens of a nation participate in any war.
(B) To be a patriot for one's country does not necessarily mean he must go to war for his country.
9. (A) In my case getting what I want has little or nothing to do with luck.
(B) It is not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
10. (A) Sometimes I impulsively do things which at other times I definitely would not let myself do.
(B) I find that I can keep my impulses in control.
11. (A) In many situations what happens to people seems to be determined by fate.
(B) People do not realize how much they personally determine their own outcomes.

12. (A) College students should be trained in times of peace to assume¹⁴⁶ military duties.
(B) The ills of war are greater than any other possible benefits.
13. (A) Most people donot realize the extent to which their lives are controlled by accidental happenings.
(B) For any guy,there is no such thing as luck.
14. (A) If I put my mind to it I could have an important influence on what a politician does in office.
(B) When I look at it carefully I realize it is impossible for me to have any really important influence over what politicians do.
15. (A) With fate the way it is,many times I feel that I have little influence over the things that happen to me.
(B) It is impossible for me to believe that chance or luck plays an important role in my life.
16. (A) When I put my mind to it I can constrain my emotions.
(B) There are moments when I cannot subdue my emotions and keep them in check.
17. (A) Every person should give some of his time for the good of his town or country.
(B) People would be alot better off if they could live far away from other people and never have to do anything for them.
18. (A) As far as the affairs of our country are concerned, most people are the victims of forces they do not control and frequently do not even understand.
(B) By taking part in political and social events the people can directly control much of the country's affairs.
19. (A) People cannot always hold back their personal desires; they will behave out of impulse.
(B) If they want to , people can always control their immediate wishes and not let these motives determine their total behavior.
20. (A) Many times I feel I might just as well decide what to do by flipping a coin.
(B) In most cases I do not depend on luck when I decide to do something.
21. (A) Our federal government should promote the mass production of low rental apartment buildings to reduce the housing shortage.
(B) The best way for our government to reduce the housing shortage is to make low interest mortgages available and to stimulate the building of low cost houses.
22. (A) I do not know why politicians make the decisions they do.
(B) It is easy for me to understand why politicians do the things they do.

23. (A) Although sometimes it is difficult, I can always willfully restrain my immediate behavior.
(B) Something I cannot do is have complete mastery over all my behavioral tendencies.
24. (A) In the long run people receive the respect and good outcomes they worked for.
(B) Unfortunately, because of misfortune or bad luck, the average guy's worth often passes unrecognized no matter how hard he tries.
25. (A) With enough effort people can wipe out political corruption.
(B) It is difficult for people to have much control over the things politicians do in office.
26. (A) Letting your friends down is not so bad because you cannot do good all the time for everybody.
(B) I feel very bad when I have failed to finish a job I promised I would do.
27. (A) By active participation in the appropriate political organization people can do a lot to keep the cost of living from going higher.
(B) There is very little people can do to keep the cost of living from going higher.
28. (A) It is possible for me to behave in a manner very different from the way I want to behave.
(B) It would be very difficult for me not to have mastery over the way I behave.
29. (A) In this world I am affected by social forces which I neither control or understand.
(B) It is easy for me to avoid and function independently of any social forces that may have control over me.
30. (A) It hurts more to lose money than to lose a friend.
(B) The people are the most important thing in this world of ours.
31. (A) What people get out of life is always a function of how much effort they put into it.
(B) Quite often one finds that what happens to people has no relation to what they do, what happens just happens.
32. (A) Generally speaking, my behavior is not governed by others.
(B) My behavior is frequently determined by other influential people.
33. (A) People can and should do what they want to do both now and in the future.
(B) There is no point in people planning their lives too far in advance because other groups of people in our society will invariably upset their plans.

34. (A) Happiness is having your own house and car.
(B) Happiness to most people is having their own close friends.
35. (A) There is no such thing as luck, what happens to me is a result of my own behavior.
(B) Sometimes I do not understand how I can have such poor luck.
36. (A) More emphasis should be placed on teaching the principles of Christianity in public school.
(B) Christianity should not be included in a school curriculum; it can be taught in church.
37. (A) Many of the unhappy things in people's lives are at least partly due to bad luck.
(B) Peoples misfortunes result from the mistakes they make.
38. (A) Self-regulation of one's behavior is always possible.
(B) I frequently find that when certain things happen to me I cannot restrain my reaction.
39. (A) The average man can have influences in government decisions.
(B) This world is run by a few people in power and there is not much the little guy can do about it.
40. (A) When I make up my mind, I can always resist temptation and keep control of my behavior.
(B) Even if I try not to submit, I often find that I cannot control myself from some of the enticements of life such as over-eating or drinking.
41. (A) My getting a good job or promotion in the future will depend a lot on my getting the right turn of fate.
(B) When I get a good job, it is always a direct result of my own ability and motivation.
42. (A) Successful people are mostly honest and good.
(B) One should not always associate achievement with integrity and honor.
43. (A) Most people do not understand why politicians behave the way they do.
(B) In the long run people are responsible for bad government on a national as well as local level.
44. (A) I often realize that despite my best efforts some outcomes seem to happen as if fate planned it that way.
(B) The misfortunes and successes I have had were the direct result of my own behavior.
45. (A) Most people are kind and good.
(B) People will not help others unless circumstances force them to.

APPENDIX 5

INSTRUCTIONS QUESTIONNAIRE

During the experiment you were asked to follow some taped instructions concerning the rewards that you were asked to choose between. I would like you to answer the following questions concerning the taped instructions that you heard.

1. Were you able to clearly hear the taped instructions?

Check one: Yes _____ Some difficulties _____ No _____.

2. Did the instructions make sense to you or have meaning for you?

Check one: Yes _____ In some ways _____ No _____.

3. Were you able to do what the instructions asked?

Check one: Yes _____ Had some difficulties _____ No _____.

4. If you did not answer "yes" to question 3, describe in a few words what were the problems you had with the instructions.

5. If you did not answer "yes" to question 3, describe in a few words what you did instead of following the instructions.