THE EFFECT OF EXPECTANCY, REINFORCEMENT VALUE, AND SKILL VS. CHANCE SITUATIONS ON A SIMPLE PERFORMANCE TASK

By

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TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	ii
LIST OF TABLES	v
LIST OF FIGURES	vi
ABSTRACT	vii
CHAPTER I: INTRODUCTION AND LITERATURE REVIEW	1
Introduction	1
Review of the Literature	3
The Problem	11
CHAPTER II: METHOD	13
Subjects	13
Apparatus	13
Procedure	14
Experimental Hypotheses	17
CHAPTER III: RESULTS	18
Main Effects	18
Interaction Effects	21
Sex Differences	33
CHAPTER IV: DISCUSSION AND CONCLUSIONS	34
Discussion	34
Conclusions	37
APPENDICES	40
APPENDIX A: LOCUS OF CONTROL SCALE	40
APPENDIX B: INSTRUCTIONS	43
APPENDIX C: CANCELLATION TASK	45
APPENDIX D: SUMMARY TABLE OF FIVE-WAY ANALYSIS OF VARIANCE	47
APPENDIX E: SUMMARY TABLE OF THREE-WAY ANALYSIS OF VARIANCE	49
APPENDIX F: MEAN NUMBER OF CORRECT RESPONSES FOR SITUATION X ORDER X TRIALS (NESTED IN CONDITIONS)	50

TABLE OF CONTENTS

Continued

		Page
APPENDIX G:	MEAN NUMBER OF CORRECT RESPONSES FOR SITUATION X LOCUS OF CONTROL X ORDER X TRIALS (NESTED IN CONDITIONS)	51
APPENDIX H:	METHOD AND RESULTS FROM PILOT STUDY: THE EFFECT OF LOCUS OF CONTROL, REINFORCEMENT VALUE AND REINFORCEMENT CONTINGENCY ON A SIMPLE LEARNING TASK.	52
BIBLIOGRAPHY		59
BIOGRAPHICAL SKETCH		61

LIST OF TABLES

Number		Page
1	Mean Number of Correct Responses for Reinforcement Value Conditions.	19
2	Mean Number of Correct Responses for Trials (Nested in Conditions).	19
3	Mean Number of Correct Responses for Situation X Locus of Control.	22
4	Mean Number of Correct Responses for Situation X Reinforcement Condition Order.	22
5	Mean Number of Correct Responses for Situation X Reinforcement Value Conditions.	23
6	Mean Number of Correct Responses for Order X Reinforcement Value Conditions.	23
7	Mean Number of Correct Responses for Situation X Trials (Nested in Conditions).	27
8	Mean Number of Correct Responses for Order X Trials (Nested in Conditions).	28

LIST OF FIGURES

Number		Page
1	Mean Number of Responses for Male, Female, and All Subjects for Trials 1 - 15.	20
2	Mean Number of Responses for Situation by Reinforcement Value Conditions Averaged Over Trials.	25
3	Mean Number of Responses for Order by Reinforcement Value Conditions Averaged Over Trials.	26
4	Mean Number of Responses for Situation by Trials in Order: Baseline/Low/High.	29
5	Mean Number of Responses for Situation by Trials in Order: Baseline/High/Low.	30
6	Mean Number of Responses for Order by Trials in Skill Situation.	31
7	Mean Number of Responses for Order by Trials in Chance Situation.	32

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Following Rotter's model, the present study examined the relationship of Expectancy, Reinforcement Value, and Skill vs. Chance Situations on a simple performance task. Each of the theoretical variables was defined in operational terms as follows: 1) Expectancy was measured by the Rotter Locus of Control Scale; 2) Reinforcement Value was defined as a high number of M&M's (candy) vs. a low number of M&M's awarded; and 3) Skill vs. Chance Situation was defined as whether the candy was given based on the subjects' correct task performance or not. It was hypothesized that none of the main variable effects would prove significant, but rather that the interaction of variables would account for the highest scores. Further, it was proposed that this interaction would support previous findings that congruency between the expectancy of and the occurrence of reinforcement would result in greatest performance rates.

In Phase I of the study subjects responded on the Locus of Control Scale. In Phase II, subjects performed three sets of five, thirty-second trials of a cancellation task. According to their experimental condition, subjects received reinforcement as follows: Skill groups: Reinforcement was administered based on the number of correct responses achieved; Chance groups: Reinforcement was administered based on previously determined amounts (mean per trial achieved by Skill groups), regardless of subject's performance. Within each of these groups, each subject performed in each of the following Reinforcement Value Conditions: Baseline = no reinforcement; Low = one M&M per 25 correct responses (2 M&M's per trial for Chance groups); High = one M&M per correct response (approximately 55 per trial for Chance groups). The order of Low and High Value Conditions was counterbalanced and included in data analyses.

Analysis of the data supported the experimental hypotheses. Specifically:

1) Significant main effect for Reinforcement Value (Baseline, Low, and High); however, the major portion of this variance was accounted for by the difference between reinforcement vs. no reinforcement, not between High vs. Low Value.

2) Another significant main effect was in the factor Trials (nested in Reinforcement Value Conditions), indicating a slight practice effect.

3) The congruency principle was supported by the significant interaction between Skill vs. Chance Situations X Locus of Control. Internal-Skill subjects achieved the highest scores; External-Chance and Internal-Skill subjects achieved higher scores than External-Skill and Internal-Chance subjects, respectively.

4) Additional significant interactions were as follows: Skill vs. Chance X Order; Skill vs. Chance X Reinforcement Value Condition; Order X Reinforcement Value Condition; Skill vs. Chance X Trials (nested in Conditions); Order X Trials (nested in Conditions); Skill vs. Chance X Order X Trials (nested in Conditions); Skill vs. Chance X Locus of Control X Order X Trials (nested in Conditions).

The results of this study emphasized the importance of attending to individual expectancies when administering reinforcements based on performance. Implications for further research are discussed.

CHAPTER I

INTRODUCTION AND LITERATURE REVIEW

Introduction

The attempt by psychological scientists to understand, predict, and control behavior proceeds by identifying, measuring, and manipulating the component variables that at any point, or series of points, in time affect behavior. The discussion of relevant variables has touched on an extremely wide range of possible effectants. This paper is an attempt to examine the effect of three of those variables (expectancy, reinforcement value, and reinforcement contingency) on a performance task.

One systematic approach to this examination is that put forth by Julian B. Rotter, a social learning theorist.[1] Rotter utilizes three basic constructs in the measurement and prediction of behavior: behavior potential, expectancy, and reinforcement value. These three variables provide a model for the examination of the type of behavioral performance addressed in this study.

Rotter states:

"Behavior potential may be defined as the potentiality of any behavior's occurring in any given situation or situations as calculated in relation to any single reinforcement or set of reinforcements" (p. 105). This probability of behavior in a situation is determined

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[1]The following discussion of Rotter's theory is taken from his book Social Learning and Clinical Psychology, 1954 (see References).

where other alternatives exist and is a probability relative to the alternatives.

"Expectancy may be defined as the probability held by the individual that a particular reinforcement will occur as a function of a specific behavior on his part in a specific situation or situations. Expectancy is independent of the value or importance of the reinforcement" (Ibid, p. 107). Expectancy is considered an internal, psychological state of subjective import; an intervening variable that can be observed through verbal behavior, choice performances, etc.

"The reinforcement value of any external reinforcement may be defined ideally as the degree of preference for any reinforcement to occur if the possibilities of their occurring were all equal" (Ibid, p. 107).

Moreover, Rotter considers behavior probability to be a joint function of expectancy and reinforcement value in a given situation (s). The situation itself is an important variable and requires attention now as a fourth factor.

"We mean by s a psychological situation or any part of it to which the individual is responding . . . . We define a situation as that which is experienced by the subject with the meanings that the subject gives it . . . [as well as that which is] describable in objective terms for scientific purposes" (Ibid, p. 111). The psychological context can affect expectancy ("It is presumed that the manner in which a person perceives a given situation will determine for him which behaviors are likely to have reasonable probability or the highest probabilities of leading to some satisfaction," p. 200) and

reinforcement value (". . . the value of a given reinforcement will change if the situation is recategorized," p. 200). In general, however, reinforcement value is not as greatly affected as expectancy.

Review of the Literature

Behavior Potential

Behavior potential, the dependent variable of a study, is idiosyncratic to the task. Tasks which have served to define behavior potential have included decision time on perceptual matchings (Rotter and Mulry, 1965), verbal learning (Watson and Baumal, 1967), and choice behavior (Schneider, 1968), to name a few.

Expectancy

"In social learning theory, a reinforcement acts to strengthen an expectancy that a particular behavior or event will be followed by that reinforcement in the future" (Rotter, 1954, p. 2). It follows from this thesis that generalized sets of expectancies result from such a history. Rotter has classified these sets of expectancies along a continuum identified as "locus of control." The locus of control variable is simply whether a person believes (has expectancies) that reinforcement is contingent upon his own behavior or not. If he believes reinforcement is contingent upon his own behavior (i.e., he has "control" over his own life), he is identified as internal (I). If he believes reinforcement is not contingent upon his own behavior, but instead occurs as a result of chance or other factors (i.e., he has no control over his own life, it is controlled by things external to him), he is identified as external (E).

In addition, Rotter has translated this construct into measurable terms with a paper-and-pencil assessment tool called the Locus of Control, or Internal-External Scale (Rotter, 1966; see Appendix B). This test provides a categorization of verbal descriptions of this construct, and when scored classifies subjects on a continuum from highly internal (Hi I) to highly external (Hi E) in his expectations of his own behavior controlling reinforcement.

In a review of the literature on expectancy, Lefcourt (1966) discussed the locus of control variable as it relates to task structure, intrapersonal variables, conformity, risk-taking and preference. He summarized the section on learning and achievement by saying, ". . . the control construct allows some prediction when the materials are relevant to the subjects' goal strivings. However, successful predictions in this area were found only in male samples" (p. 214). It should be noted that Rotter and Mulry (1965) did not find subject's sex to be a factor in accounting for any of their results. Further, in his discussion of ten validation studies of the Locus of Control Scale, Rotter (1966) said, "Sex differences appear to be minimal except in the case of [one] sample" (p. 14).

Lefcourt (1967) attempted to alter behavior related to external control expectancies. He hypothesized that external control individuals (1) suffer from an inability to recognize cues that might guide them toward success experiences, and (2) are more suggestible and conforming than internal control individuals due to their external dependence. As expected, the results of his study showed that external control subjects were more affected by instructions explicating the purpose of and method by which to succeed than internal control subjects.

Several studies have examined the relationship of locus of control to academic performance. Battle (1965) found that students who were more "inner-directed" than "other-directed" (work for self vs. work for approval from others, respectively) were more persistent at attempting to solve a difficult mathematics problem.

Lesiak (1970) found no relationship between locus of control measures and socioeconomic background or reflective/impulsive problem-solving approaches. However, his data revealed sex differences in as low as third grade, with girls tending to express stronger internal feelings than males. In addition, higher internal control was predictive of higher achievement in reading, but not in arithmetic.

In his review of the locus of control literature, Rotter (1966) cited the results of an unpublished doctoral dissertation on achievement motivation. Franklin (1963) proposed 17 relationships of the Internal-External Scale to reported evidence of achievement motivation (i.e., intention to go to college, amount of time spent doing homework, etc.). He found a significant relationship in the predicted direction for 15 of the 17 relationships.

Further, Rotter (1966) summed the findings of studies discussed in his review:

> . . . the individual who has a strong belief that he can control his own destiny is likely to (a) be more alert to those aspects of the environment which provide useful information for his future behavior; (b) take steps to improve his environmental condition; (c) place greater value on skill or achievement reinforcements and be generally more concerned with his ability, particularly his failures; and (d) be resistive to subtle attempts to influence him.

Reinforcement Value

"Reinforcements are identifiable events that have the effect of increasing or decreasing the potentiality of some behavior's occurring" (Rotter, 1954, p. 148). Further, Ferster and Skinner (1957) reported that lessened amounts of reinforcement resulted in lessened rates of behavior. Two studies directed at the relationship of locus of control to reinforcement appear in the literature.

Baron (1968) examined the effects of locus of control instructions on performance, where the subjects were informed that they could or could not influence reinforcement outcome. The results of the first experiment indicated that where subjects were informed that reinforcement was contingent upon their behavior, they showed an increase in the frequency of reinforced responses over trials. The results of the second experiment indicated that, in the absence of extrinsic reinforcement, there was no evidence for a motivation effect of either internal, external, or neutral locus of control instructions.

The purpose of Waldrip's (1967) study was to investigate the effects of high vs. low reinforcement value, chance vs. skill instructions, and locus of control differences on (1) a task-related expectancy, and (2) motivation, inferred from decision times (response latency). The results indicated that (1) reinforcement value and task expectancy were independent, (2) locus of control differences did not relate to task expectancy, (3) high reinforcement value related to lowered motivation (response latency) for internal subjects, and (4) little relationship existed between task expectancy and decision times.

Psychological Situation

Williams (1970) demonstrated the importance of both generalized expectancies (the locus of control variable) and situationally determined expectancies. He proposed to demonstrate that (1) behavioral predictions based on locus of control differences may depend on either situational determinants of internal-external behavior or on generalized determinants, and also that (2) Negro subjects, generally believed to be non-achievement and externally oriented, would behave in an internal, achievement-oriented manner under conditions of appropriate expectancies and reinforcements. The results supported both hypotheses. Related to generalized determinants, internals sought more information than externals. Related to situational determinants, the following results were obtained: with high perceived task utility, high expectancy for success and reinforcement values, Negro subjects studied Black history longer and harder than they studied the vice-presidency or the Vietnam War, regardless of generalized locus of control differences.

A series of investigations (Holden and Rotter, 1962; James and Rotter, 1958; Phares, 1957, 1962; Rotter, Liverant, and Crowne, 1961) demonstrated predictable differences in the behavior of subjects' who perceived the reinforcements they were receiving were a result of their performance (skill situation) or were not (chance situation). Rotter and Mulry (1965) studied the effects of situational expectancy (chance vs. skill instructions) and generalized expectancy (Locus of control) on decision times (response latency) in a perceptual matching task. The results of their study indicated that neither main effect was significant, but there was a significant interaction of the two variables. Internals

took much longer to decide when instructed that the task was a matter of skill than when instructed the task was a matter of chance.

Congruency

The results of the studies already cited have led more recent investigators to pose additional questions. These questions may be stated as follows: How might the variables of external reinforcements, expectancy, and the situation interact in affecting these subjects' performances? Specifically, what is the relevance of belief, or expectancy, in learning as it is compared to contingency of reinforcement? Is the fact of contingency more, less, or equally as important as the expectation of contingency? An additional question relates to congruency between expectation and occurrence of contingency. Is congruency more critical than contingency?

Two articles examined this latter question as it affects preference. Schneider (1968) proposed the hypothesis that a subject's expectation as measured by the Locus of Control Scale is related to his preference for situations which involve different potential for internal or external control. He hypothesized that external subjects would be more likely to choose a game of chance (greater potential for external control) than a game of skill (greater potential for internal control). This hypothesis was supported for both males and females (1) when the sex of the subject and the sex identity (masculine activity or feminine activity) of the skill activities were congruent, and (2) on a sexually neutral form.

Julian et al. (1968) raised the question of whether the locus of control dimension determines differential preference for conditions that appear to offer maximum control of task outcomes. Experiment I results revealed that high internal subjects chose positions from which they had greater control of their performance. Their second hypothesis, that internals have a greater need for control, was not supported; however, this may have been due to the chance nature of the task, where externals have a greater need to achieve.

Further review of the literature reveals studies examining the principle of congruency as it affects performance (vis a vis preference, discussed above).

Diner (1969) categorized schizophrenic, paraplegic, and orthopedic subjects on the basis of their intrapersonal (generalized) locus of control scores and subjected them to a motor learning task in which the situational locus of control was varied. The degree of congruence between intrapersonal and situational locus of control accounted for the most meaningful results. The significant results were accounted for by the interaction but not by main effects, and Diner pointed to the importance of considering both intrapersonal and situational variables simultaneously.

Watson and Baumal (1967) discussed the findings that "individuals perform most efficiently in situations in which the actual environmental locus of control and the person's preference for, or appraisal of, the locus of control are congruent" (p. 212). Their study was based on the thesis that individuals in incongruent situations become anxious and hence perform more poorly than in congruent situations. Subjects in the

skill-outcome groups were informed that they could avoid shock on a second task according to their ability to recall words learned on a first task. Subjects in the chance-outcome groups were told that they would receive random shock on the second task regardless of their performance on the first task. The results indicated internal control subjects made more errors and required more trials in the chance situation while external control subjects made more errors and required more trials in the skill situations. Earlier, Rotter and Mulry (1965) had found that internal control and external control subjects exhibited longer decision times on skill and on chance tasks, respectively. They had hypothesized that internals place greater value on rewards obtained on a skill task, and that externals place greater value on rewards obtained on a chance task. Watson and Baumal, therefore, suggested a two-variable explanation for subjects' with lessened efficiency: the outcome must be valued by the subject, and there must be incongruence between locus of control and means of attainment.

Locus of control variables have been examined in a classical conditioning experiment by Gold (1967). She demonstrated the effects of situation-specific (instructions) and generalized locus of control experiments on eyelid conditioning. Although there were no differences between groups for the main effects, when situational expectancy and generalized expectancy were congruent, differences in conditioning appeared as expected.

The Problem

Thus we have reviewed Rotter's four original classes of variables involved in prediction: the subject's behavior, his expectations that his behavior will be followed by particular kinds of reinforcements, the value of reinforcements, and the psychological situation in which the behavior occurs. Further, as in the case of congruency, we have found relationships between these variables to be predictive of performance. This latter finding substantiates Waldrip (1967) who concluded that the predictive value of each variable is increased as each is studied in interaction with the other variables. The present study is organized and discussed within Rotter's model, not because it is assumed to be exclusively true, but because it provides a clear and efficient framework that also appears to have validity.

In addition to being a functionally efficient model, this framework provides an opportunity for further clarification of the principles of behavior. The operant approach to learning stresses behavioral change dependent on the occurrence of reinforcement. Reinforcement dimensions (contingency, frequency, amounts, etc.) are considered the major points of study. Rotter's model presents another variable (expectancy) as being at least as significant a factor as reinforcement, and that the interaction of variables, not the operation of one alone, is the most potent effectant of behavioral performance. This has been articulated by Diner (1969), Watson and Baumal (1967), and Gold (1967) as the operation of a congruency principle. These authors found congruency between expectation and occurrence of reinforcement promoted both verbal and motor learning, with no main effects showing in either

study. Since neither Diner nor Watson and Baumal varied the amount of reinforcement as a major part of their designs it is unclear what the interactive effects of amount of reinforcement might have been had this been included.

The problem for the present study, then, is the systematic examination of the independent and interactive effects of expectancy, reinforcement value, and the psychological situation on performance on a simple psychomotor task.

CHAPTER II

METHOD

Stating the problem in Rotter's framework, this study examined the effects of three variables (independently and interactively) on performance. Expectancy was measured by Rotter's Locus of Control Scale. Reinforcement value was operationally defined in terms of amount of M&M candy awarded. The psychological situation manipulated was reinforcement awarded contingent upon the subject's correct performance or simply for his participation in the experiment (skill vs. chance conditions, respectively). The behavior potential measured as the dependent variable was the number of correct responses achieved by the subject on a performance task (cancellation task).

Subjects

The data for the basic analysis of variance were based on the performance of 120 subjects, undergraduate students from the University of Florida, Gainesville, Florida. The original subject population was 137 subjects (59 male and 78 female); however, 7 subjects were randomly eliminated to provide for equal numbers of subjects in each statistical cell. The investigations of possible sex differences were based on the data from 137 subjects.

Apparatus

1. The Locus of Control Scale (I-E Scale) by Julian B. Rotter (1966) was administered to groups of subjects. (See Appendix A.)

2. The experimental task was a cancellation task in which subjects were instructed to mark a slash through vowels on a page of letters (Starch, 1915; Whipple, 1914; Bronner, 1927; Paterson et al., 1930).

To obtain some confidence in the reliability of the task, a pre-test of ten 30-second trials was administered to 30 subjects at the beginning of a class (x-scores) and again at the end of class (y-scores). The mean score for each subject was computed for session x and for session y for 1) all ten trials, and 2) for the last nine trials. The difference between x and y was smaller when the data from the first trial was omitted. The first trial was considered a practice trial, and further calculations were performed without first trial scores. A correlation coefficient for the two sets of scores (x,7) for all subjects, trials 2-10, was computed: $r = .80$. A correlation coefficient for the two sets of scores (x,y) for all subjects, trials 2-6, was computed and proved more reliable: 4 = .83. Thus, it was decided to administer six 30-second trials per phase, and base statistical computations on the data from trials 2-6.

The response page consisted of lines of 38 letters each (15 vowels per line), and a place for sex and identification number. (See Appendix C for a copy of the response sheet for the cancellation task.)

3. M&M candy (plain) was used as reinforcement.

Procedure

The basic design was constructed from procedures used in a pilot study examining the relationships of the variables discussed above (Sokolof, 1972). [See Appendix H for a description of the Method and Results of that study.] Modifications of those procedures for this study resulted in a three-factor design with factors: 1) Situation: Skill vs. Chance; 2) Locus of Control: Internal (I), Midrange (M), and External (E); 3) Reinforcement Value: Baseline (no reinforcement), Low (one M&M per 25 correct responses), and High (one M&M per correct response). Two repeated-measures factors were also included in the analysis: 1) Order (Baseline-Low-High vs. Baseline-High-Low); and 2) Trials (five trials per condition within each order).

Phase I

Each subject was given an identification number to insure confidentiality and facilitate data analysis. A short introduction and explanation of the procedure was given by the experimenter and questions were answered. Each subject then was given a Locus of Control Scale with instructions. (See Appendix B for the explanation of the procedure and instructions for Phase I.) After all subjects completed the questionnaire, there was a brief rest period.

Phase II

Baseline.--Each subject was given a response sheet. They were informed that there would be six 30-second trials during which they were to mark a slash through every vowel (a, e, i, o, and u). (See Appendix B for exact instructions for Phase II.) Questions were answered. Six timed trials of 30 seconds each were given.

Reinforcement conditions.--Subjects were informed that they would be repeating the same procedure as before; however, during this part of the experiment they would receive M&M's. Further instructions were given at the beginning of each trial as follows, depending on experimental condition: Skill group: "You will receive M&M's based on how well you perform." For the reinforcement conditions: 1) Low Reinforcement: "You will receive one M&M for every 25 correct responses at the end of each trial;" 2) High Reinforcement: "You will receive one M&M for every correct response at the end of each trial." Chance group: "You will receive M&M's at the end of each trial, regardless of how well you perform." For the reinforcement conditions: 1) Low Reinforcement: "You will receive two M&M's at the end of each trial;" 2) High Reinforcement: "You will receive x M&M's at the end of the trial" (for trial 1, $x = 54$; trial 2, $x = 55$; trial 3, $x = 58$; trial 4, $x = 56$; trial 5, $x = 56$; trial 6, $x = 59$).

In the remainder of Phase II, subjects in the above groups were given two additional sets of six 30-second trials each. The order of Reinforcement Value conditions for both skill and chance groups was counterbalanced and was included in the analysis of variance as a repeated-measures variable. For the Skill groups, number of correct responses was counted at the end of each trial and appropriate reinforcement was given. For Chance groups, predetermined reinforcement was given at the end of each trial. The number of reinforcements administered per trial to the Chance groups was based on the mean number of reinforcements per trial awarded to the Skill groups calculated on the performance of the first 40 Skill-group subjects. This was done to minimize the differences in amount of reinforcement administered to the groups.

At the conclusion of the experiment, subjects were thanked for their participation, given a brief description of the study, asked not to discuss the experiment with anyone, and dismissed.

A five-way analysis of variance was performed on the data (Skill vs. Chance; Locus of Control; Order; Reinforcement Value; and Trials). An additional three-way analysis of variance was performed to investigate possible sex differences (Skill vs. Chance; Locus of Control; and Sex.)

Experimental Hypothesis

The experimental predictions for this study were as follows:

1. Significant results would be obtained in the interaction of main variables, not in the main effects.

2. The significant interactions would support the congruency principle. Specifically, subjects in the Internal-Skill and External-Chance conditions would achieve higher scores than subjects in the Internal-Chance and External-Skill conditions, respectively.

CHAPTER III

RESULTS

Main Effects

As predicted, analysis of the data revealed no significant main effects for any of the factors identified in the experimental question [Expectancy, Reinforcement Value, and Situations (Skill vs. Chance)]. (See Appendix D for a Summary Table of the Five-Way Analysis of Variance.) This finding is congruent with the results obtained in the pilot study (Sokolof, 1972; see Appendix H). There were two significant main effects that were not part of the primary experimental predictions:

1. Analysis of the Baseline, Low, and High reinforcement conditions revealed significant differences ($p < .01$). However, examination of the mean scores for each condition indicated that the major portion of the variance was accounted for by the difference between no reinforcement and reinforcement. (See Table 1.) The difference between Low and High reinforcement was not significant.

2. The second significant main effect was found in the factor Trials, nested in Conditions ($p < .01$). Examination of these data indicated a slight practice effect (trial 5 scores compared with trial 1 scores); however, it appeared that the major contribution to this variance was a result of the difference between conditions rather than between trials (see Table 2). Additional examination of mean scores for all subjects trials 1-15, substantiated a slight practice effect. Mean scores for all subjects trials 1-15, are shown in Figure 1.

Table 1--Mean Number of Correct Responses for Reinforcement Value Conditions*.

	Mean Score
Baseline	46.7383
Low	54.2316
High	55.6499

*N = 120 per cell

Table 2--Mean Number of Correct Responses for Trials (Nested in Conditions)*.

Condition	Trials				
	1	2	3	4	5
Baseline	46.6750	46.1410	46.6166	47.1417	47.1083
Low	53.2583	53.8833	54.3083	54.6917	55.0167
High	54.7083	55.59910	55.4500	55.7500	56.7416

*N = 120 per cell

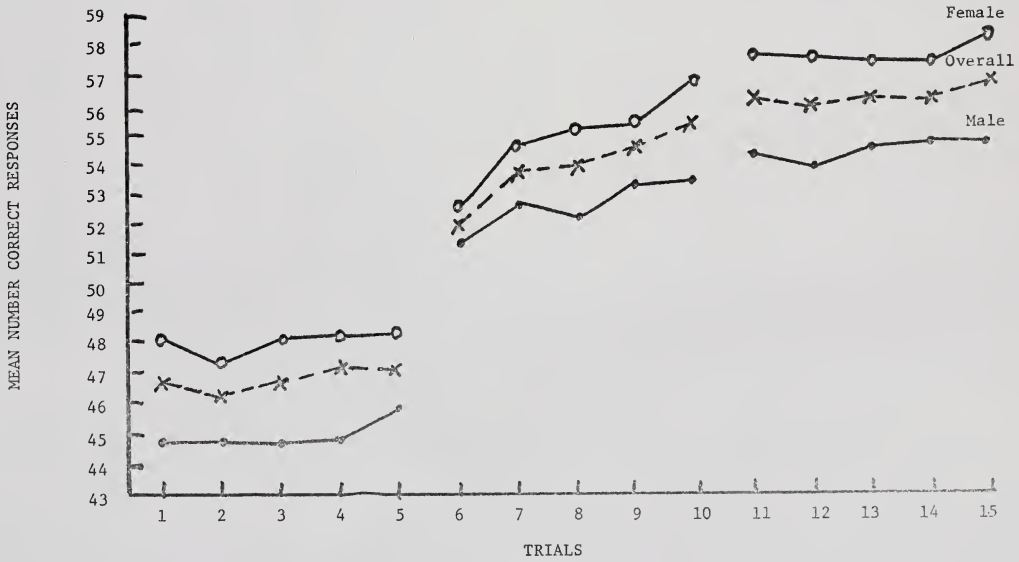

Figure 1--Mean Number of Responses for Male, Female and All Subjects for Trials 1 - 15.

Interaction Effects

Analysis of the data revealed significant two-way, three-way and four-way interaction effects as follows:

1. It was predicted that those subjects who experienced a congruency between their expectation of and the occurrence of reinforcement would achieve high scores than those subjects in incongruent situations. Analysis of the interaction Situation X Locus of Control supported this hypothesis ($p < .05$). This finding is congruent with results obtained in the pilot study (Sokolof, 1972; see Appendix H). Scores for subjects in the Internal-Skill group accounted for the most difference in the predicted direction. Subjects in the Internal-Chance and External-Skill groups achieved lower scores than subjects in the Internal-Skill and External-Chance groups, respectively (see Table 3).

2. A significant interaction occurred between Situation X Order ($p < .05$). Analysis of the data revealed that the subjects in cells Skill-Baseline/Low/High and Chance-Baseline/High/Low achieved mean scores higher than the subjects in cells Skill-Baseline/High/Low and Chance-Baseline/Low/High. Although none of the pairwise differences proved significant on post-test comparisons, the cell means are completely crossed (see Table 4).

3. Analysis of the data indicated a significant interaction between Situation X Reinforcement Value Conditions ($p < .01$) (see Table 5). Post-test comparisons of the mean scores in Skill and in Chance groups revealed that both reinforcement conditions (Low and High) were significantly different from no reinforcement (Baseline), but not from each other ($p < .01$). Post-test comparisons also revealed no

Table 3--Mean Number of Correct Responses for Situation X Locus of Control*.

	Locus of Control		
Situation	Internal	Midrange	External
Skill	54.3633	51.4567	51.5300
Chance	49.5410	53.9567	52.3833

*N = 20 per cell

Table 4--Mean Number of Correct Responses for Situation X Reinforcement Condition Order*.

	Order	
Situation	Baseline-Low-High	Baseline-High-Low
Skill	53.9511	50.9489
Chance	50.7533	53.1733

*N = 30 per cell

Table 5--Mean Number of Correct Responses for Situation X Reinforcement Value Conditions*.

Reinforcement Value Conditions	Situation	
	Skill	Chance
Baseline	45.9567	47.5110
Low	55.2010	53.2533
High	56.1833	55.1166

*N = 60 per cell

Table 6--Mean Number of Correct Responses for Order X Reinforcement Value Conditions*.

Reinforcement Value Conditions	Order	
	Baseline/Low/High	Baseline/High/Low
Baseline	46.6333	46.8433
Low	53.3633	55.0910
High	57.0600	54.2310

*N = 60 per cell

significant differences between Chance and Skill subjects in either Baseline, Low, or High Conditions (see Figure 2).

4. A significant interaction occurred between Order X Reinforcement Value Conditions ($p < .01$) (see Table 6). Post-test comparisons of the mean scores in Skill and in Chance groups revealed that both reinforcement conditions (Low and High) were significantly different from no reinforcement (Baseline), but not from each other ($p < .01$). Examination of the mean scores averaged over Trials for Conditions revealed that both Baseline/Low/High and Baseline/High/Low subjects achieved higher scores in the Low Reinforcement Condition than in Baseline; however, the Baseline/High/Low group showed less acceleration in scores between the second and third Condition than did the Baseline/Low/High groups (see Figure 3).

5. Examination of the data indicated a significant interaction between Situation X Trials (nested in Conditions) ($p < .05$) (see Table 7). Interpretation of this interaction can best be made by looking at the three-way interaction of Situation X Order X Trials, represented in Figures 4, 5, 6, and 7. The mean scores for Skill vs. Chance Situations over Trials 1-15, are plotted in Figure 4 (Order: Baseline/Low/High) and in Figure 5 (Order: Baseline/High/Low).

6. Analysis of the data revealed a significant interaction between Order X Trials (nested in Conditions) ($p < .01$) (see Table 8). The mean scores for Order: Baseline/Low/High and Baseline/High/Low over Trials 1-15, are plotted in Figure 6 (Skill Situation) and in Figure 7 (Chance Situation).

7. The significant three-way interaction found between Situation X Order X Trials (nested in Conditions) ($p < .05$) permits clarification of

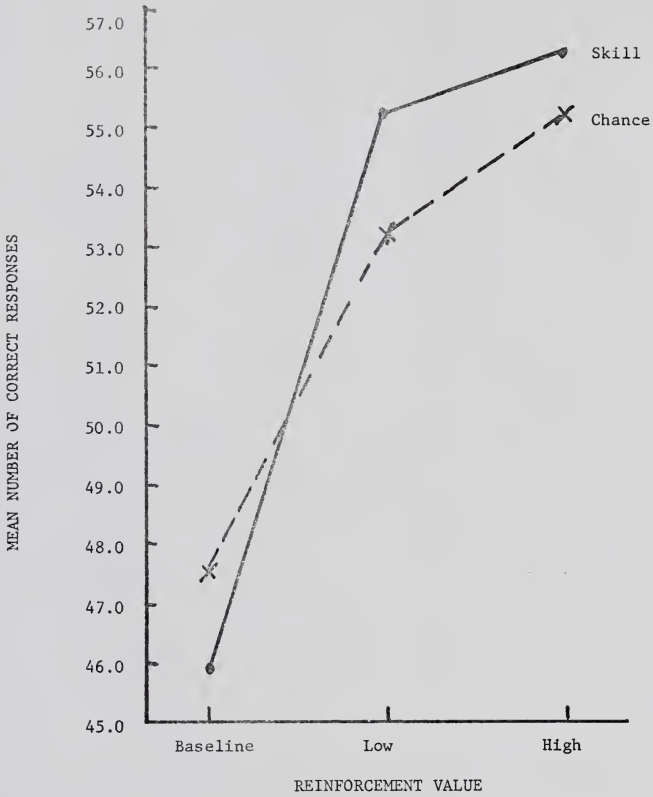

Figure 2--Mean Number of Responses for Situation by Reinforcement Value Conditions Averaged Over Trials.

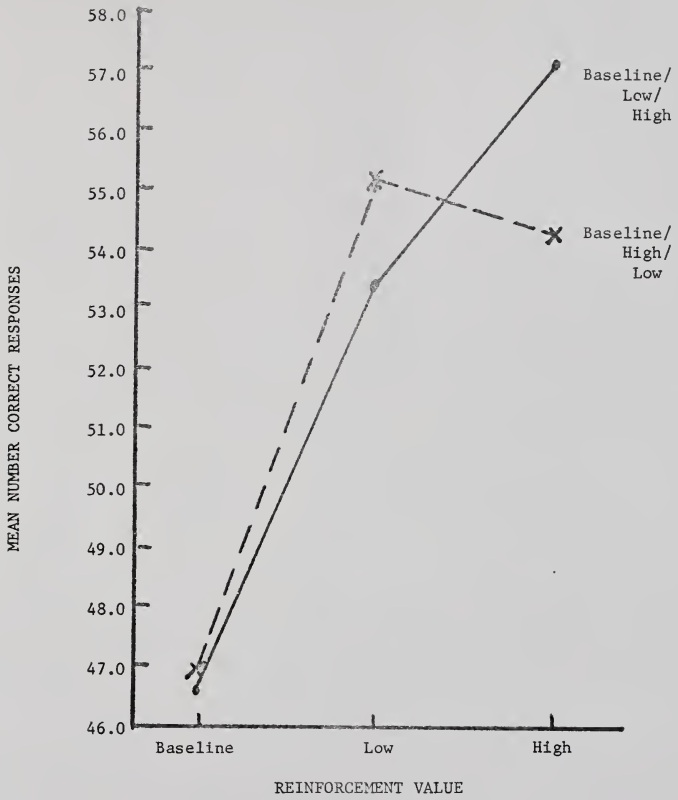

Figure 3--Mean Number of Responses for Order by Reinforcement Value Conditions Averaged Over Trials.

Table 7--Mean Number of Correct Responses for Situation X Trials (Nested in Conditions)*.

Trials		Situation: Skill	Situation: Chance
Baseline	1	45.6333	47.7166
	2	44.8333	47.4666
	3	46.0166	47.2166
	4	46.8499	47.4333
	5	46.4500	47.7666
Low	1	53.6666	52.8499
	2	54.7000	53.0666
	3	55.7500	52.8666
	4	55.8833	53.5000
	5	56.0499	53.9833
High	1	54.6666	54.7500
	2	56.8833	54.8166
	3	55.8833	55.0166
	4	56.3167	55.1833
	5	57.6666	55.8166

*N = 60 per cell

Table 8--Mean Number of Correct Responses for Order X Trials (Nested in Conditions)*.

Trials		Order: Baseline/Low/High	Order: Baseline/High/Low
Baseline	1	46.3833	46.9666
	2	45.6333	46.6666
	3	46.7333	46.5000
	4	47.2833	47.0000
	5	47.1333	47.0833
Low	1	51.5910	54.9166
	2	52.7910	54.9666
	3	53.2833	55.3333
	4	54.3166	55.0666
	5	54.8166	55.2166
High	1	57.0190	52.3166
	2	56.6333	54.5666
	3	56.7500	54.1499
	4	56.9666	54.5333
	5	57.8499	55.6333

*N = 60 per cell

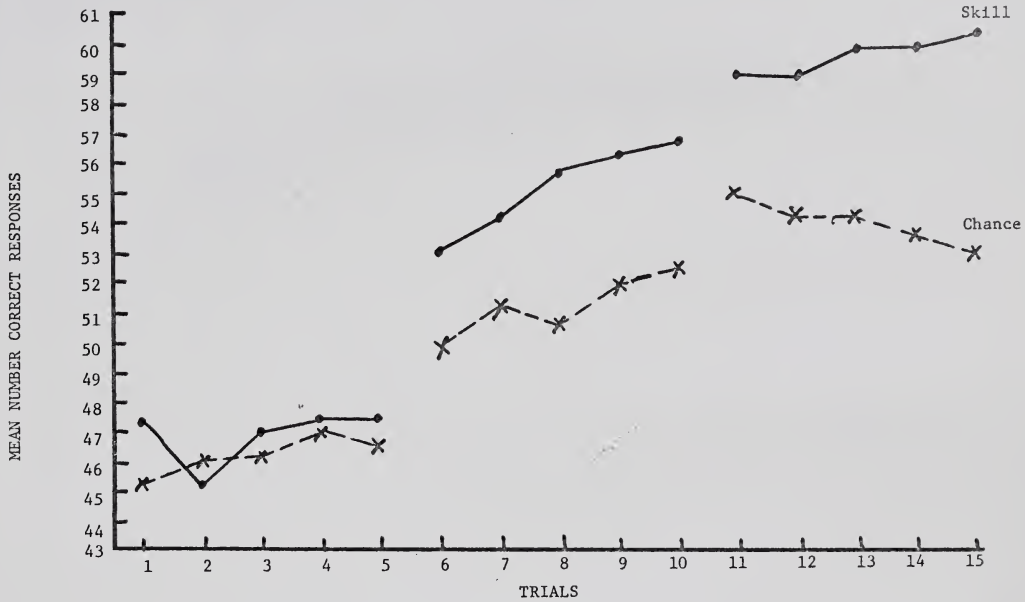

Figure 4--Mean Number of Responses for Situation by Trials in Order: Baseline/Low/High.

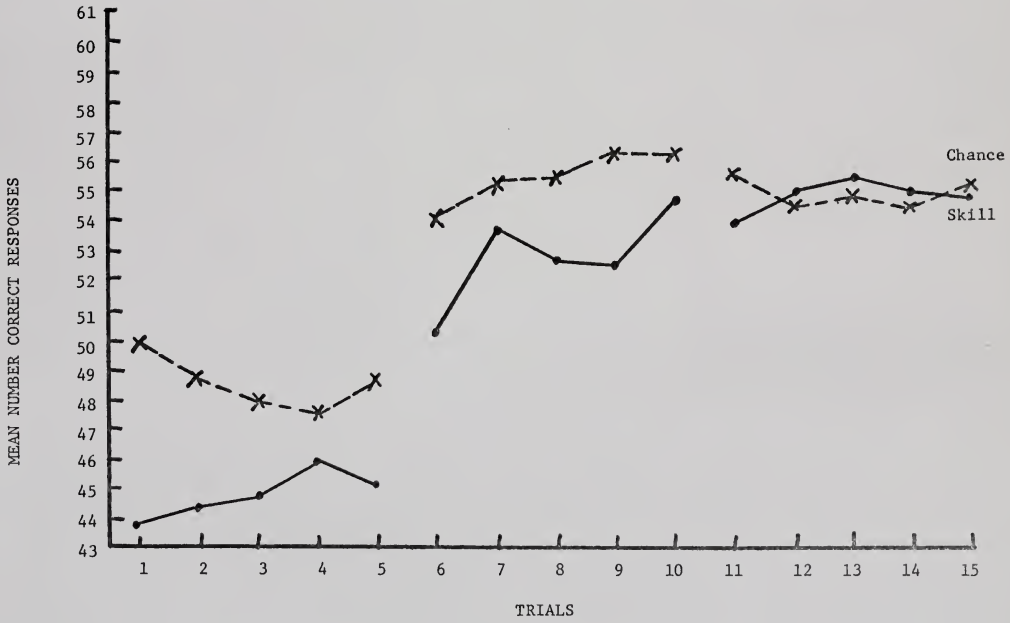

Figure 5--Mean Number of Responses for Situation by Trials in Order: Baseline/High/low.

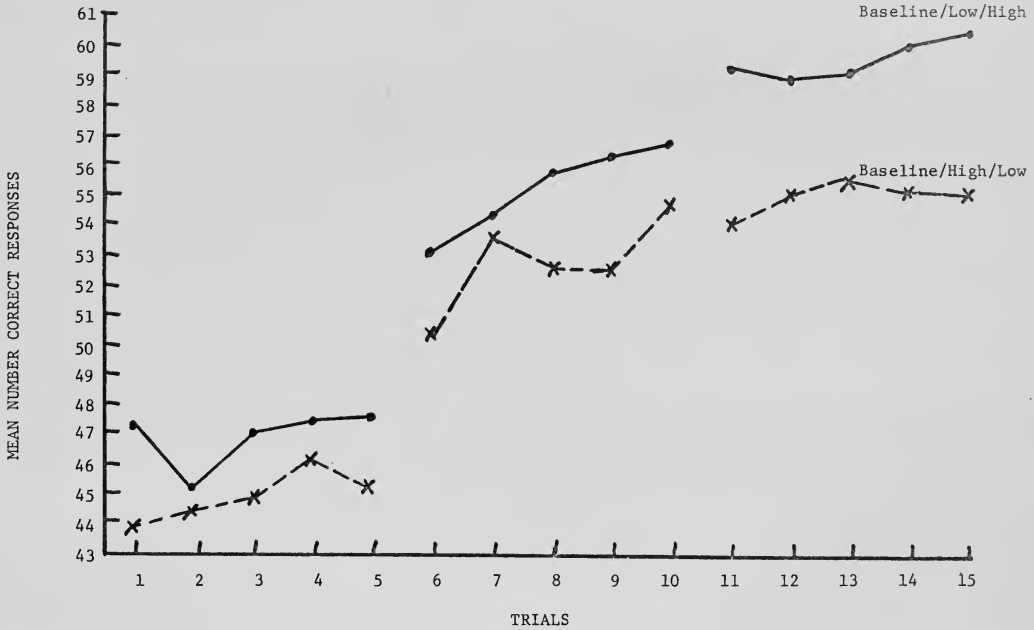

Figure 6--Mean Number of Responses for Order by Trials in Skill Situation.

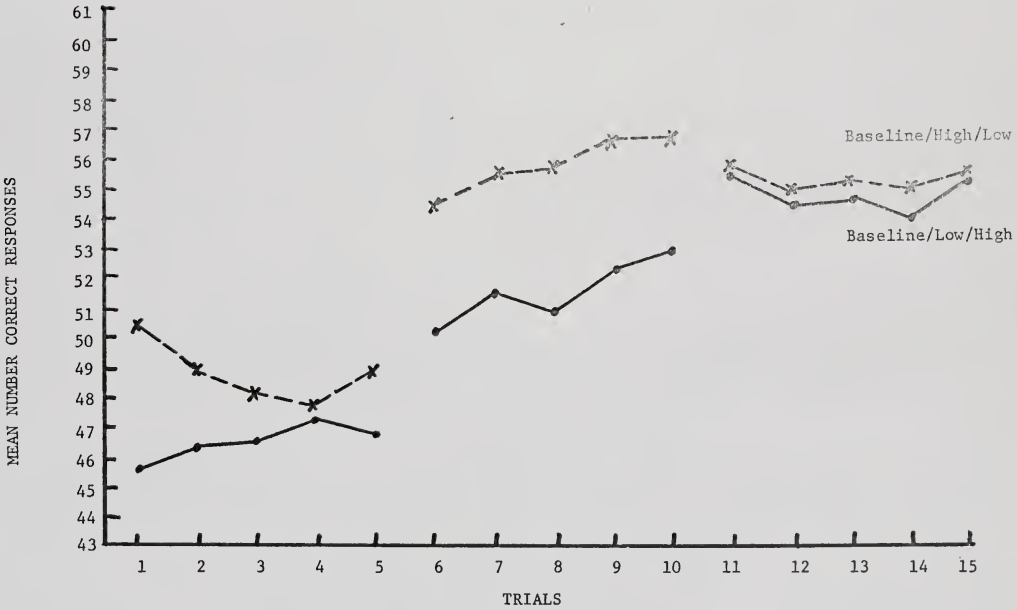

Figure 7--Mean Number of Responses for Order by Trials in Chance Situation.

the two-way interactions discussed above and represented in Figures 4, 5, 6, and 7. (See Appendix F for mean number of correct responses per cell.) The difference between Chance and Skill Situations is greater in Baseline/Low/High Order than in Baseline/High/Low, especially in the last five trials (Figures 4 and 5). This may also be seen in Figures 6 and 7, where the difference between the two orders is greater in the last five trials of the Skill Situation than in the last five trials of the Chance Situation.

8. A significant four-way interaction occurred between Situation X Locus of Control X Order X Trials (nested in Conditions) ($p < .05$). (See Appendix G for cell means for this interaction.)

Sex Differences

A three-way analysis of variance with factors Skill vs. Chance, Locus of Control (Internal, Midrange, External), and Sex (male vs. female) was performed to investigate possible sex differences. The data for this analysis were based on the performance of 137 subjects, 59 males and 78 females. Analysis of this data revealed no significant main or interaction effects. (See Appendix E for Summary Table of the Three-Way Analysis of Variance.) Mean socres for trials 1-15, for males and for females can be seen in Figure 1. Inspection of this figure reveals no interaction between sex and trials.

CHAPTER IV

DISCUSSION AND CONCLUSIONS

Discussion

The results of this study supported both experimental hypotheses. Significant results were found in the interaction of factors rather than in the main effects. Moreover, significant interactions supported the congruency principle discussed. The Reinforcement Value effect was accounted for by the difference between reinforcement and no reinforcement. No significant difference was found between High and Low Reinforcement Values. The inclusion of a non-reinforced (Baseline) condition was added as a control procedure for experimental purposes and was not relevant to predictions derived from Rotter's theory.

The congruency principle proposes that congruency between expectancies of and occurrence of reinforcement will result in greater effects than will be found in noncongruent situations. This principle is validated by the significant interaction of Situation X Locus of Control. Although none of the paired comparisons proved significant, examination of the cell means revealed that Skill-Internal subjects achieved the highest scores, and that Skill-Internal and Chance-External subjects achieved scores higher than Skill-External or Chance-Internal subjects, respectively. Further, if one assumes that the Midrange Locus of Control subjects were less affected by expectancy factors than either of the more polarized groups (Internal and External) and remove their scores

from comparison, all four of the remaining cell scores are in the predicted directions. These findings are consistent with the predictions derived from the congruency principle discussed by Diner (1969), Watson and Baumal (1967) and Gold (1967). Those authors examined the independent and interactive effects of situational and generalized Locus of Control. The results of those three studies indicated no main effects, but significant interaction effects; where significant interactions occurred, highest scores were achieved where there was congruency between situational and generalized Locus of Control. Thus, the results of this study provide a further validation of the congruency principle.

Several significant effects appeared that were not part of the experimental hypotheses. First, a slight practice effect appeared. This result was expected, due to the simple, psychomotor nature of the cancellation task; however, it was not so potent as to overshadow other factor effects.

The interaction of Situation X Order points to the relationship of perceived, or situational, locus of control and reinforcement conditions. Subjects in the Skill situation perceived that their reinforcements occurred contingent on their performance. As their correct performance increased over trials, Skill subjects in the Baseline/Low/High condition experienced a consistency between their own behavior and changes in the reinforcement conditions. This was consistent with their expectations. However, Skill subjects in the Baseline/High/Low condition experienced an incongruence between the accelerating of their performance (practice effect) and the decrease in reinforcement. For Chance subjects, there was no perceived relationship between their performance and reinforcement; however, the results indicate that these subjects' performances

remained consistent with their first reinforcement condition. This could be explained in terms of "superstitious behavior," where the probability of responding increases when a reinforcer is repeatedly presented, even though the presentation is not contingent upon the occurrence of the behavior (Reynolds, 1968). Had the reinforcement been contingent upon the subject's performance, the change in value would have been more likely to result in changed performance.

Further clarification of the order effect found for Skill subjects above is possible through analysis of two other interaction effects. The interaction Order X Reinforcement Value Condition, as shown in Figure 3, also indicated that subjects in the Baseline/Low/High Order achieved accelerating numbers of correct responses from the first to last Conditions; however, this acceleration was slowed for subjects in the Baseline/High/Low Order. Further, the three-way interaction of Situation X Order X Trials (nested in Conditions) revealed a greater difference between the Skill and Chance Conditions and a greater difference between the Skill and Chance Situations in Order: Baseline/Low/High, especially in the last five trials. Where motivational factors appeared to be operating (Skill Conditions), performance rates continued to increase. However, where no such motivational variables appeared to be operating, rates either leveled off or declined. In addition, such an effect can be discussed in an operant framework in terms of rates of performance in one phase affecting rates of performance in the following phase (Ferster and Skinner, 1957).

The significant four-way interaction does not appear to have relevance to any of the predictions of this study.

It should be noted that the results of this study supported the findings obtained in a pilot study examining the independent and interactive effects of the main factors under consideration here: Locus of Control, Reinforcement Value, and Reinforcement Contingency (Sokolof, 1972). Modification in the procedures for more precise control has resulted in further validation of principles derived from Rotter's theories as well as those proposed more recently as a congruency effect. The differences in results between the pilot study and this study were found primarily in variables added as controls (trials, condition order, no reinforcement condition), not in factors directly related to the experimental hypotheses.

Conclusions

The experimental predictions for this study have been validated, and the results obtained in the pilot study have been supported: 1) no main effects in any of the hypothesized variables appeared, and 2) where an interaction between generalized and situation Locus of Control occurred, the congruency principle was supported. A factor level that was originally instituted as a control rather than as part of the experimental predictions proved to have a significant effect in several interactions. Specifically, it was found that the occurrence *per se* of a reinforcer produced the most significant increases in performance. Further, the appearance of an Order effect when different levels of reinforcement are presented sequentially points to the need for an Order effect (e.g., counterbalancing; using larger number of trials per reinforcement level phase).

Additionally, where a simple, psychomotor task was used as the dependent variable measure, practice effects appeared. Further experiments addressing this problem should include some measures to counteract the practice effect, for example: 1) distributing the trials with longer inter-trial intervals; 2) using different though reliable tasks, or 3) presenting brief intervening tasks between trials.

Also, although not a confounding factor within this study, the subject population used here was composed of college students, who probably are more competitive (both with themselves and peers) than in other populations. It would be of value to further investigate this problem in different populations.

The results of this study have added information necessary to make more precise predictions about behavior, especially as it related to a simple performance task. First, the congruency effect found by Diner (1969), Watson and Baumal (1967), and Gold (1967) has been validated. Since the task presented here was different from the other studies, congruency appears to be a general, rather than a task-specific, effect. Such a finding indicates the necessity of future incorporation of interaction effects in experimental designs concerned with generalized Expectancy, Reinforcement Value, Situational Expectancy, and simple performance.

Clearly, single variable studies will not account for as much of the variance in behavior as will the more complex factorial designs. In addition, this study has implications for the practical application: when administering reinforcements, it is important to attend to both historical and current variables. A student's generalized expectancy of reinforcement will interact with the current reinforcement situation.

Thus, reinforcement based on his performance may not result in his achieving a higher level of performance; in fact, it may reduce his level of performance.

APPENDIX A

LOCUS OF CONTROL SCALE

PLEASE MARK OVER THE LETTER THAT CORRESPONDS TO THE STATEMENT WHICH BEST FITS HOW YOU FEEL. CHOOSE ONLY ONE ANSWER, A OR B. IF YOU CHANGE AN ANSWER, BE SURE TO ERASE COMPLETELY. YOU MAY BEGIN NOW.

1. a. Children get into trouble because their parents punish them too much.
   b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.
   b. People's misfortunes result from the mistakes they make.

3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.
   b. There will always be wars no matter how hard people try to prevent them.

4. a. In the long run people get the respect they deserve in this world.
   b. Unfortunately an individual's worth often passes unrecognized no matter how hard he tries.

5. a. The idea that teachers are unfair to students is nonsense.
   b. Most students don't realize the extent to which their grades are influenced by accidental happenings.

6. a. Without the right breaks one cannot be an effective leader.
   b. Capable people who fail to become leaders have not taken advantage of their opportunities.

7. a. No matter how hard you try some people just don't like you.
   b. People who can't get others to like them don't understand how to get along with others.

8. a. Heredity plays the major role in determining one's personality.
   b. It is one's experience in life which determines what they are like.

9. a. I have often found that what is going to happen will happen.
   b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10. a. In the case of the well prepared student there is rarely if if ever such a thing as an unfair test.
    b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
    b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.
    b. This world is run by the few people in power and there is not much the little guy can do about it.

13. a. When I make plans I am almost certain that I can make them work.
    b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain people who are just no good.
    b. There is some good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.
    b. Many times we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
    b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control.
    b. By taking an active part in political and social affairs the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
    b. There really is no such thing as luck.

19. a. One should always be willing to admit mistakes.
    b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.
    b. How many friends you have depends upon how nice a person you are.

21. a. In the long run the bad things that happen to us are balanced by the good ones.
    b. Most misfortunes are the result of lack of ability, ignorance, laziness or all three.

22. a. With enough effort we can wipe out political corruption.
    b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.
    b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.
    b. A good leader makes it clear to everybody what their jobs are.

25. a. 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.

26. a. People are lonely because they don't try to be friendly.
    b. There's not much use in trying hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high schools.
    b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.
    b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.
    b. In the long run the people are responsible for bad government on a national as well as on a local level.

APPENDIX B

INSTRUCTIONS

Explanation of the Study

There will be two parts to this experiment. The first part involves responding on an attitude questionnaire; the second part is a simple paper and pencil task. During the second part you will receive M&M's.

Instructions for Phase I

This is an attitude questionnaire; there are no right or wrong answers, so please respond honestly. Your responses are completely confidential, as each of you are known only by your experiment numbers; I have no record of your names. There is an "a" and "b" statement that goes with each number on this questionnaire. Read them both and choose whichever one best fits how you think or feel, and mark over the corresponding letter "a" or "b." It is important to answer every statement; it will be difficult to make a choice on some of them, but choose whichever answer best fits. Also, please circle "male" or "female" at the top of the form.

Instructions for Phase II

(Baseline): I am going to give you 6 timed trials, 30-seconds long each. During each trial, put a slash mark through every vowel that you come to--a, e, i, o, and u. If you finish one line, go down to

the next and the next, etc., until I say stop. For each of the following trials, begin on the next line that has no slashes in it, and number one through six on the first line of each trial. Any questions? Ready? Go.

(Low Value): You will be performing the same task as before (slash through every vowel for 30-second trials); however, at the end of each trial you will receive some M&M's.

Skill Group: You will receive one M&M for every 25 correct responses. At the end of each trial the experimenters will count the number of correct responses and give you the candy you have earned. Any questions? Ready? Go.

Chance Group: You will receive two M&M's at the end of each trial. At the end of each trial, the experimenters will give you your candy. You will receive two M&M's regardless of how well you perform. Any questions? Ready? Go.

(High Value): You will be performing the same task as before. At the end of each trial you will receive M&M's.

Skill Group: You will receive one M&M for every correct response. At the end of each trial, the experimenters will count the number of correct responses and give you the candy you have earned. Any questions? Ready? Go.

Chance Group: You will receive x M&M's at the end of each trial. (Trial 1, x = 54; trial 2, x = 55; trial 3, x = 58; trial 4, x = 56; trial 5, x = 56; trial 6, x = 59.) You will receive the M&M's regardless of how well you perform. Any questions? Ready? Go.

APPENDIX C

CANCELLATION TASK

Number: SEX (circle one): MALE FEMALE

A H E T N A E D E T H F O S T S I S N O C L O H I C S E T A U D A R G E H T

E H T D N A L I C U N O C E T A U D A R G E H T S A N E D T N A T S I S S A

D N A T S D N A S E I C I L O P L A R E N E G Y T L U C A F E T A O D A R G

B D E H S I L B A T E S E R A L U O H C S E T A I D A R G E H T F O S D R A

R S I L E C H O S E T A D I A R G E H T Y T L U C A F E T A U D A R G E T H

N E G M U M I N I M F A N E M E C R O F N E E H T R O F E L B I S N O P S E

E V I N E U H T I N I K R O W E T I L D A R G O F S D R A D N A T S L A R E

U P E T A R G A R G E H T F O N O I T A N I D O R O C R O F D N A Y T I S R

S N O I S I V I D D N A S E G E L L O C O U S I R A V E T H F O S M A R G P

E T H R O F Y T I L I B I S N O P S E R E H T A T I S R E V I N U E H T F O

I S M A R G O R P E T A U D A R G F O S N B I T A R E P N O D E L I S T E D

N H I S I V I D S E G E L L O C L A U D I V I D N I E H T N I D E T S E V S

S A N A S E G E L L O C E H U F O T S O M N I S T N E M T R A P E D I N A S

R Y L I T C E R I D S I L A I C I F F O R E H T O R O N A E D T N A T S I S

E G E L L O C S I H N I Y D U T S E T N U D A R G R O F E L A I S N O P S E

I A H A S I N C E D E H T H C I H W F O L I C U N O C E T A L D A R G E H T

D A R G E H T F O T N E G A H E T U N I E B N I M I H S O S I S S A N A M R

D E T A L E R Y C I L O P F O N O S T U C E X E R O F Y T L U C A F E T A N

H T U C R A E S E R D E T A I C O S S A S N A Y D U T S E T A L D A R G O T

D N E M I O C E R D N A S N O I T I T E P S R E D I D S N O C L I C N U C E

E H T F O S R E B M E M E S A R G E D E T E U D A R G F O D R A W A H E T S

I T I D D A N I D E T I N O P A P E R L O H W Y T L U C A F E T T U D A R G

E F A T S O N S N O I T A T R E S S I D L A R O T C O D T C E R I D O T N O

N U F E S E H T F O Y N A M R O F R E P O T D E T A E P X E S I R E B M E M

G E H T O T D E T N I O P P A N C E B G N I V A H T U O H T I W S N O I T E

R E T D N A L I C U N O C E T A U D A R G E H T S A N E D T N A T S I S S A

B D E H S I L B A T E S E R A L U O H C S E T A I D A R G E H T F O S D R A

N E G M U M I N I M F A N E N E C R O F N E E H T R O F E L B I S N O P S E

U P E T A R D A R G E H T F O N O I T A N I D O R O C R O F D N A Y T I S R

E H T R O F Y T I L I B I S N O P S E R E H T A T I S R E V I N U E H T F O

N H I S I V I D S E G E L L O C L A U D I V I D N I E H T N I D E T S E V S

A H E T N A E D E T H F O S T S I S N O C L O H I C S E T A U D A R G E H T

E H T D N A L I C U N O C E T A U D A R G E H T S A N E D T N A T S I S S A

D N A T S D N A S E I C I L O P L A R E N E G Y T L U C A F E T A O D A R G

B D E H S I L B A T E S E R A L U O H C S E T A I D A R G E H T F O S D R A

R S I L E C H O S E T A D I A R G E H T Y T L U C A F E T A U D A R G E T H

N E G M U M I N I M F A N E M E C R O F N E E H T R O F E L B I S N O P S E

E V I N E U H T I N I K R O W E T I L D A R G O F S D R A D N A T S L A R E

U P E T A R G A R G E H T F O N O I T A N I D O R O C R O F D N A Y T I S R

S N O I S I V I D D N A S E G E L L O C O U S I R A V E T H F O S M A R G P

E T H R O F Y T I L I B I S N O P S E R E H T A T I S R E V I N U E H T F O

I S M A R G O R P E T A U D A R G F O S N B I T A R E P N O D E L I S T E D

N H I S I V I D S E G E L L O C L A U D I V I D N I E H T N I D E T S E V S

S A N A S E G E L L O C E H U F O T S O M N I S T N E M T R A P E D I N A S

R Y L I T C E R I D S I L A I C I F F O R E H T O R O N A E D T N A T S I S

E G E L L O C S I H N I Y D U T S E T N U D A R G R O F E L A I S N O P S E

I A H A S I N C E D E H T H C I H W F O L I C U N O C E T A L D A R G E H T

APPENDIX D

SUMMARY TABLE OF 5-WAY ANALYSIS OF VARIANCE

WITH ONE NESTED FACTOR AND TWO REPEATED MEASURES (N = 120).

Source*	SS	dF	MS	F
A	106.5800	1	106.5800	0.1486
B	224.9999	2	112.4999	0.1569
C	38.13554	1	38.13554	0.0532
D	27515.90	2	13757.95	381.0696***
E(D)	563.7070	12	46.97559	7.1109***
AXB	4415.367	2	2207.684	3.0781**
AXC	3307.555	1	3307.555	4.6117**
BXC	844.8572	2	422.4285	0.5890
AXD	1004.949	2	502.4746	13.9176***
BXD	259.4531	4	64.86328	1.7966
CXD	1613.730	2	806.8652	22.3487***
AXE(D)	217.5937	12	18.13281	2.7448**
BXE(D)	198.6406	24	8.276692	1.2529
CXE(D)	355.3594	12	29.61328	4.4827***
AXBXC	8.591553	2	4.2985776	0.0060
AXBXD	131.1484	4	32.78711	0.9081
AXCXD	308.5933	2	154.2966	4.2737
BXCXD	175.5022	4	43.87555	1.2153
S(AXBXC)	77459.31	108	717.2158	

APPENDIX D

Continued

Source*	SS	dF	MS	F
AXBXE(D)	265.8945	24	11.07894	1.6771
AXCXE(D)	231.6914	12	19.30762	2.9227**
BXCXE(D)	165.5937	24	6.899739	1.0444
AXBXCXD	201.2097	4	50.30243	1.3933
SXD(AXBXC)	7798.352	216	36.10347	
AXBXCXE(D)	264.2517	24	11.01049	1.6667**
SXE(AXBXCXD)	8561.566	1296	6.606147	

*A: Situation, Skill vs. Chance; B: Locus of Control, Internal vs. Midrange vs. External; C: Order, Baseline-Low-High vs. Baseline-High-Low; D: Reinforcement Value, Baseline vs. Low vs. High; E(D): Trials (nested in conditions), 1 vs. 2 vs. 3 vs. 4 vs. 5.

**Significant at the .05 level.

***Significant at the .01 level.

APPENDIX E

SUMMARY TABLE OF 3-WAY ANALYSIS OF VARIANCE (N = 137).

Source*	SS	dF	MS	F
Sex	166.6698	1	166.6698	3.6522
A	11.4898	1	11.4898	.2518
B	6.0239	2	3.0119	.0659
Sex X A	34.3705	1	34.3705	.7531
Sex X B	41.5145	2	20.7573	.4548
A X B	87.1982	2	43.5991	.9554
Sex X A X B	130.4607	2	65.2303	1.4294
ERROR	5704.4903	125	45.6359	
TOTAL	6182.2176	136		

*Sex, Male vs. Female; A: Situation, Skill vs. Chance; B: Locus of Control, Internal vs. Midrange vs. External.

APPENDIX F

MEAN NUMBER OF CORRECT RESPONSES FOR SITUATION X ORDER X TRIALS

(NESTED IN CONDITIONS)*

		Situation			
		Skill		Chance	
Trials		B/L/H**	B/H/L	B/L/H	B/H/L
Baseline	1	47.3666	43.8999	45.3810	50.0333
	2	45.2000	44.4666	46.0666	48.8666
	3	47.0990	44.9333	46.3666	48.0667
	4	47.4666	46.2333	47.0910	47.7666
	5	47.5910	45.2910	46.6666	48.8666
Low	1	53.2000	54.1333	50.0000	55.7000
	2	54.3333	55.0666	51.2666	54.8666
	3	55.8999	55.5999	50.6666	55.0666
	4	56.5333	55.2332	52.0910	54.8910
	5	56.8910	55.2000	52.7332	55.2333
High	1	59.0333	50.2910	55.1666	54.3333
	2	59.0000	53.7666	54.2666	55.3666
	3	59.0333	52.7333	54.4666	55.5666
	4	60.0333	52.5910	53.8910	56.5666
	5	60.5666	54.7555	55.1333	56.5000

*N = 30 per cell

**B/L/H = Baseline/Low/High; B/H/L = Baseline/High/Low

APPENDIX G

MEAN NUMBER OF CORRECT RESPONSES FOR SITUATION X LOCUS OF CONTROL X ORDER X TRIALS (NESTED IN CONDITIONS)*.

		Skill						Chance					
		Internal		Midrange		External		Internal		Midrange		External	
Trial		BLH**	BHL	BLH	BHL	BLH	BHL	BLH	BHL	BLH	BHL	BLH	BHL
Baseline	1	47.9	47.3	47.6	40.4	46.6	44.0	43.3	45.3	46.3	54.9	47.6	49.9
	2	46.0	46.1	43.3	42.0	46.3	45.3	44.2	45.7	47.5	52.6	46.5	48.3
	3	46.7	47.0	45.3	42.9	49.3	44.9	43.5	46.6	47.4	49.9	48.2	47.7
	4	48.8	47.9	45.5	45.7	48.1	45.1	45.7	44.2	47.4	50.4	48.2	48.7
	5	49.9	47.8	45.3	43.6	47.6	44.5	45.4	46.9	46.0	50.6	48.6	49.1
Low	1	54.7	55.5	52.3	55.0	52.6	51.9	46.3	53.8	51.6	57.8	52.1	55.5
	2	55.5	57.5	42.8	55.5	57.4	52.2	47.3	53.7	53.0	56.8	53.5	54.1
	3	57.5	58.4	55.1	55.6	55.1	52.8	47.7	54.1	51.7	57.3	52.6	53.8
	4	57.2	58.4	55.0	55.7	57.4	51.6	49.8	53.1	53.2	57.7	53.3	53.9
	5	57.9	58.1	55.9	56.6	56.9	50.9	49.7	54.2	55.0	56.7	53.5	54.8
High	1	59.3	52.4	57.8	49.1	60.0	49.4	52.5	53.0	57.3	56.1	55.7	53.9
	2	60.9	56.9	57.5	52.6	58.6	51.8	51.4	54.3	56.0	57.3	55.4	54.5
	3	61.6	55.1	58.0	52.0	57.5	51.1	50.7	54.5	57.0	58.3	55.7	53.9
	4	61.4	57.5	59.2	51.6	59.5	48.7	48.7	54.5	57.8	58.8	55.2	56.1
	5	62.2	57.5	59.6	55.2	59.9	51.6	52.5	55.2	57.6	58.7	55.6	55.6

*N = 10 per cell

**BLH = Baseline/Low/High
BHL = Baseline/High/Low

APPENDIX H

METHOD AND RESULTS FROM PILOT STUDY: THE EFFECT OF LOCUS OF CONTROL, REINFORCEMENT VALUE AND REINFORCEMENT CONTINGENCY ON A SIMPLE LEARNING TASK

Method

Expectancy was measured by Rotter's Locus of Control Scale. Reinforcement value was the number of points exchanged for classroom extra credit. The psychological situation manipulated was the announcement that reinforcement would be contingent upon the subject's correct performance or simply would be given as a result of his participation in the experiment. The behavior potential measured as the dependent variable was the subject's number of correct responses on a simple learning task.

Subjects

The subjects were undergraduate students from the University of Florida, Gainesville, Florida.

Although the Locus of Control Scale was administered to 240 students, the data were based on a sample of 96 subjects. This reduction resulted from: (1) approximately 80 subjects not showing up for the second phase of the study; (2) the removal of 24 subjects' scores which centered around the median score [this was to insure that the groups (Internal vs. External) would be sufficiently disparate for comparison]; and (3) the random elimination of 43 subjects' scores to provide equal numbers of subjects in each cell.

Apparatus

1. The Locus of Control Scale by Julian B. Rotter (1966) was administered to groups of students.

2. The experimental task required that subjects look at a list of paired items for 30 seconds, then write down the missing item on a list of half the pairs. Three different sets of the paired stimulus items were used: Set I = names of colors paired with numbers; Set II = shapes paired with letters; Set III = names of animals paired with symbols. Each set consisted of ten pairs of stimuli (each item in one column paired with one different item in the other column). The items comprising each set were different from all other sets. The paired stimulus items were printed on three sheets of vinyl overlay for use with an overhead projector.

3. Response sheets for each of the three sets were composed of a list of the items in one column only, with the subjects being required to write down the appropriate paired response. The response sheets for Set I listed names of colors; Set II, shapes; and Set III, names of animals. The response sheets were arranged face down to prevent subjects from observing any items before they were projected onto the screen.

4. Red pens for marking answers correct when the paired lists were reprojected were used. The bright visibility of these pens improved the experimenter's ability to make sure no cheating occurred.

5. Overhead projector and screen.

Procedure

The study was carried out as a 2 x 2 x 2 deisng, with factors: (1) Locus of Control, Internal (I) vs. External (E); (2) reinforcement

value, high vs. low number of points; and (3) contingent vs. noncontingent reinforcement. Thus, there were eight factor level combinations.

Because it was assumed that the subjects were all of relatively high intelligence (college students), a simple learning task should have been equally appropriate for each subject, thereby removing relative difficulty of the task as a potential confounding variable.

A practice trial and two test trials of the task were presented. The experimental data is based on the sum of the scores from the last two trials.

Phase I

Each subject was given an identification number to insure confidentiality and facilitate data analysis. A short introduction and explanation of the procedure was given by the experimenter and questions were answered. The subjects were notified of the time and place for Phase II. Each subject then was given a Locus of Control Scale with instructions.

Phase II

As each subject arrived, he or she was given a red pen and a response sheet booklet. Depending upon the experimental condition group, reinforcement information was given as follows:

"Each of you has earned one-half extra credit point for having filled out the questionnaire previously.

[for High-Contingent (HiC) groups] You now have the opportunity to earn the rest of your extra credit. You will receive two working points for each correct answer you achieve; for every ten working points, you will get an additional half credit.

[for High Non-Contingent (HiNC)] You need ten working points for each additional half-credit. You are being given 20 working points. Thus, you will receive an additional one whole extra credit for coming here tonight.

[for Low-Contingent (LoC)] You now have the opportunity to earn the rest of your extra credit. You will receive one working point for every two correct answers you achieve; for every ten working points, you get an additional half-credit.

[for Low-Non-Contingent (LoNC)] You need ten working points for each additional half-credit. You are being given ten working points. Thus, you will receive a half-credit for coming here tonight."

Reinforcement instructions for each group were repeated. The experimental task procedure was then explained, and questions were answered. The Phase II tasks proceeded as follows:

The stimulus items for Set I were projected on the screen for thirty seconds. When the projector light was cut off, subject tore off the top sheet of the response booklet (Response sheet--Set I), turned it over and completed as many of the pairs as possible. As each one finished working, pencils were put down. When all subjects had finished, the stimulus pairs were projected onto the screen again, and subjects put a check by each correct answer, using the red pen, and wrote the total number correct at the top of the page.

This procedure was repeated for Set II and for Set III of the paired stimulus items. When the response sheets for Set III had been collected, each subject was dismissed and given a slip of paper which read as follows:

"Thank you for participating in this experiment. Regardless of prior instructions, all subjects will receive x number of extra credit points (as prescribed by classroom policy) regardless of your actual performance. Please do not discuss this experiment with anyone. Thank you once again."

A 2 x 2 x 2 x 2 analysis of variance with repeated measures on the fourth factor (task: trial 2 vs. trial 3) was performed on the data.

Results

Main Effects

Analysis of the data revealed no significant main effects for any of the four factors (Expectancy, Reinforcement Value, Reinforcement Contingency, and Test Trials). No trends were noticeable since all of the main factor variances were low.

Correlation coefficients for all three trials were computed. The correlation coefficients were low ($r_{1x2} = .291$, $r_{1x3} = .288$, $r_{2x3} = .282$); however, reliability between trials cannot be expected, as each of the three sets of items were different from each other.

Interactive Effects

Analysis of the data revealed neither significant four-way nor three-way interaction effects. However, analysis of data collapsed across two variables revealed significant results ($p < .05$) in two two-way interactions relating to experimental hypotheses.

It was predicted that those subjects who experienced a congruency between their expectation of and the occurrence of reinforcement would achieve high scores than those subjects in incongruent situations. Where

Locus of Control and Reinforcement Contingency interacted, the groups achieving the highest to lowest scores were: Internal-Contingent ($\bar{x}$ = 8.08), External-Non-Contingent ($\bar{x}$ = 7.20), External-Contingent ($\bar{x}$ = 6.85), and Internal-Non-Contingent ($\bar{x}$ = 6.79).

It was predicted that those subjects who received High Value, Contingent reinforcement would achieve the highest scores and thos who received Low Value, Non-Contingent reinforcement would achieve the lowest scores. Analysis of the data partially supported this prediction. Where Reinforcement Value and Reinforcement Contingency interacted, the groups achieving the highest to lowest scores were Low-Contingent ($\bar{x}$ = 7.75), High-Non-Contingent ($\bar{x}$ = 7.58), High-Contingent ($\bar{x}$ = 7.18), and Low-Non-Contingent ($\bar{x}$ = 6.41).

APPENDIX H

SUMMARY TABLE OF 2 x 2 x 2 x 2 ANALYSIS OF VARIANCE

WITH REPEATED MEASURES ON THE FOURTH FACTOR

Source*	SS	dF	MS	F
A	7.922	1	7.922	1.04
B	4.380	1	4.380	<1
C	10.547	1	10.547	1.39
A x B	19.380	1	19.380	2.55
A x C	32.505	1	32.505	4.28**
B x C	35.880	1	35.880	4.73**
A x B x C	9.631	1	9.631	1.27
$\underline{S}_2$	667.708	88	7.588	
D	13.547	1	13.547	<1
A x D	3.255	1	3.255	<1
B x D	1.172	1	1.172	<1
C x D	.422	1	.422	<1
A x B x D	2.755	1	2.755	<1
A x C x D	.047	1	.047	<1
B x C x D	.047	1	.047	<1
A x B x C x D	2.755	1	2.755	<1
D x $\underline{S}_2$	10219.05	88	116.125	
TOTAL		191		

*A: Locus of Control, Internal vs. External; B: Reinforcement Value, High vs. Low; C: Reinforcement Contingency, Contingent vs. Non-Contingent; D: Test Trials, Trial 2 vs. Trial 3.

**Significant at the .05 level

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BIOGRAPHICAL SKETCH

Marilyn Toby Sokolof was born February 6, 1946, in Brooklyn, New York. She received her elementary and secondary education in Miami, Florida. Admitted to the University of Florida, she received the Bachelor of Arts degree, with a major in psychology, in 1968. As a graduate student in psychology at the University of Florida, she received the Master of Arts degree in 1971. In 1972, she was awarded the First Annual Florence Schafer Award for the Most Outstanding Student Therapist. During the 1971-72 academic year, she was an intern in clinical psychology at the Guidance Center, Inc., an outpatient community mental health clinic in Daytona Beach, Florida. She has been awarded a post-doctoral fellowship in community student mental health at the Department of Student Mental Health, University of Florida.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Jacquelin Goldman

Jacquelin Goldman, Chairman
Associate Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Audrey Schumacher

Audrey Schumacher
Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy

Madelaine Ramey

Madelaine Ramey
Assistant Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Vernon Van De Riet

Vernon Van De Riet
Associate Professor of Clinical Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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This dissertation was submitted to the Department of Psychology in the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

December, 1972

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