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DIFFERENTIATION OF REAL PREDICTION AND REAL CONTROL BY DEGREE

BY

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ABSTRACT

This study examined the possibility of separating prediction and control when varied by degree. Subjects matched a preset pattern of letters to win a prize. Their prediction was based on their foreknowledge of correct matches, their control on their selecting the letters to make a match.

Results indicated that under certain conditions prediction and control operated independently. Analysis of six rating scales indicated that knowing, predicting, and feeling responsible for knowing an outcome as well as influencing, controlling, and feeling responsible for influencing an outcome intercorrelated positively. In addition, although ratings of luck and helplessness correlated positively, they correlated negatively with the other six rating scales. Suggestions for further research were made.

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Introduction

The effect of having prediction and control over situations has been a topic of considerable interest in the psychological literature (e.g., Seligman, 1975; Lefcourt, 1973; Miller, 1979). The research, however, has been consistently contaminated by a confounding of the two variables. As well, most of the studies deal only with the two possible extremes, that is, either having or not having prediction and control. This study hypothesizes that prediction and control can be separated, and that this can be done in terms of degree.

Traditional View of Prediction and Control

Research has shown that both animals (Badia, Harsh, & Abbott, 1979) and humans (e.g., Lanzetta & Driscoll, 1966) prefer having prediction over not having it. There are no data indicating that humans prefer having control over not having control (Miller, 1979), except for one study in which subjects exposed to both escapable and inescapable shock expressed preference for being able to escape. Having control, however, does reduce both physiological and self-reported arousal (Miller, 1979; Szpiler & Epstein, 1976). As well, having control also reduces self-reported pain-ratings of aversive stimuli (Miller, 1979; Staub et al., 1971).

Additional research deals with the conflicting effects of either having or not having prediction or control. Some studies have found that having prediction produces greater anticipatory arousal than not having it (Geer & Maisel, 1972). Other studies have found the opposite effect, that is, greater anticipatory arousal with no prediction (Averill & Rosenn, 1972). Still other studies have failed to find any differences (Furedy & Chan, 1971; Glass et al., 1969).

One distinction that helps to explain the conflicting data is the difference between real prediction and control on the one hand and perceived prediction and control on the other. Real prediction and real control of an event are defined in terms of conditions present according to either "natural law" or "experimental arrangements" (Geer, Davison, & Gatchel, 1970). However, whether or not prediction and control are really operating may not be the critical factor. Rather, what may be crucial for reducing aversiveness is the perception or belief in the amount of prediction or control in a situation regardless of the real status of prediction and control. Seligman (1975) stated that it is not necessarily the real uncontrollability of events that results in learned helplessness, but instead the perception that events are uncontrollable. Other research has also suggested that it is the perception or belief in the amount of prediction or control in a situation that is important for reducing the aversiveness (Bandura, 1977; Lefcourt, 1973; Miller, 1979; Wortman, 1976). Unfortunately, many studies manipulating real control failed to measure perceived control (Burger & Arkin, 1980; Geer & Maisel, 1972; Lerner & Matthews, 1967; Wortman, 1975).

Reconceptualized View

Until recently, prediction and control have been consistently confounded in the literature, primarily because it was assumed that there could be no logical separation of the two. It was thought to be possible to have prediction in a situation without control, but having control inherently implied that prediction must also be present (Averill, 1973; Miller, 1980, 1981; Mineka & Kihlstrom, 1978; Seligman, 1975).

Nickels (1980) has re-examined this notion and suggested that a separation of the two concepts is possible. Under the new conceptualization, to have prediction implies that an individual has information by which a future event can be anticipated. Conversely, having control implies that someone, in some way, has an impact upon the occurrence, non-occurrence, or expression of an event, whether or not the individual is aware of the direction or result of the impact. There have been several attempts to separate the effects of prediction and control. Geer and Maisel (1972) gave subjects either prediction with control, prediction with no control, or no prediction with no control. However, no subjects were given control without prediction. The researchers found that the subjects with control had lower GSR's towards aversive stimuli than subjects in either of the other two groups. As well, subjects indicated a preference for having control over having predictability.

Schultz (1976) studied elderly people in nursing homes, and found that those whose visitors arrived on a predictable or predictable and controllable schedule showed positive behavioural changes. Subjects with visitors on a random schedule showed no significant behaviour changes. Again no group was given control without prediction.

Burger and Arkin (1980) attempted to isolate the effects of prediction and control by exposing subjects to a loud noise while they solved anagrams. Subjects were assigned to unpredictable-controllable, predictable-controllable, predictable-uncontrollable, and an unpredictable-uncontrollable conditions. Only the uncontrollable-unpredictable group showed significantly poorer performance on a subsequent memory task. As well, this group displayed greater depressive affect. Results suggest that having at least one of the two variables (prediction/control) greatly reduces the aversiveness of a situation. Unfortunately, however, subjects in this study controlled one event, but predicted another, a confusion which makes these conclusions tenuous.

Another study which attempted to separate prediction and control was done by Wortman (1975). In this study, one group of subjects selected blindly one of two coloured marbles from a coffee can, each marble representing a different outcome. Although these subjects did not know which marble they were choosing, they did feel more responsible and in control than subjects who had the marble chosen for them by the experimenter, or those who were allowed to select the marble but did not know what each colour represented. Unfortunately, Wortman failed to include a group that had neither predictability about what each choice would mean nor control over the selection. As well, the dependent measures were taken after subjects already knew whether they had succeeded, so their responses were undoubtedly contaminated due to hindsight (Fischhoff, 1976).

Degrees of Prediction and Control

The notion that different degrees of prediction and control are possible has been implied in the literature, but not well researched. Seligman has noted that the degree of control allowed in the situation determines whether or not there is subsequent interference of escape/avoidance learning (Seligman & Maier, 1967; Overmaier & Seligman, 1967). As well, Roth and Bootzin (1974) suggested that there is a curvilinear relationship between the degree of control experienced by subjects and their future behaviour.

Although there are many studies in which predictive feedback is varied by degree (see Nickels, 1980), there is only one study which has claimed to have manipulated degrees of control. In this study (Alloy and Abramson, 1979) subjects were to either press or not press a button. If a button press resulted in a green light 75% of the time and no press resulted in a green light 0% of the time, then the resulting group (75-0) was deemed to have 75% control. If a button press resulted in a green light 75% of the time and no press resulted in a green light 50% of the time, then the resulting group (75-50) was considered to have 25% control. The results indicated that depressed subjects were more accurate in their perception of how much control they had than were non-depressed individuals.

But looking at this study from the reconceptualized viewpoint, an individual in, for example, the 75-50 condition actually has 100% control, as it is always within the subject's power to affect the result (though the subject may not know on any one trial the result of a press or no press). Degrees of control (in the reconceptualized sense) were not really manipulated at all. Actually, degrees of prediction were manipulated. More specifically, the greater the difference between the effects of a press and a no press, then the greater the ability of a subject to predict the advantage of pressing over not pressing. For example, a subject in the 75-0 group has much greater predictability than a subject in the 75-75 group.

<u>Variables Related to Prediction and Control</u>

Using the reconceptualization of prediction and control, Tan (1981) and Echols (1983) found that, contrary to the traditional viewpoint (Mineka & Kihlstrom, 1978; Seligman, 1975), the effects of having prediction in a situation could be separated from the effects of having control. That is, prediction apparently affects ratings of certain prediction-related variables such as perceived confidence (Echols, 1983), and control apparently affects ratings of certain control-related variables such as perceived control (Echols, 1983) and perceived responsibility (Echols, 1983; Tan, 1981).

As well, a substantial body of literature has demonstrated a tendency of individuals to attribute positive or successful events to themselves, and negative or failing events to external causes (Bradley, 1978). That is, "ability" and "effort" are generally used to explain onés success on a task, whereas "luck" and "task difficulty" are used to explain onés failure (Goldberg, 1976; Kovenklioglu & Greenhaus, 1978; Lefebvre, 1979; Weiner, Nierenberg, & Goldstein, 1976). Since novel situations lead individuals to search for attributions (Wong & Weiner, 1981), it is expected that, under the conditions of this research, subjects will have some interpretations about the reasons for their particular outcome in the study.

Although Echols (1983) failed to find a relationship between prediction/control and effort, certain relationships do appear to be intuitively plausable. Thus, it is expected that having higher control and higher prediction will increase the attribution that an outcome is due to onés ability. Similarly, it is anticipated that having higher control and lower prediction will lead individuals to find the task more difficult and, subsequently, that less effort will be expended. This seems reasonable as prediction gives efficient, corrective feedback, so without it subjects will neither find the task easy nor try as hard to succeed. Finally, it is expected that having lower prediction and lower control will lead individuals to perceive luck as having a greater influence on the outcome because the outcome is almost completely caused by unknown forces external to them. And, not being able to either predict or control an outcome would be expected to lead someone to an emotional state of helplessness, as has been evidenced in previous research (Seligman, 1975).

Hypotheses

On the basis of the previous research, it is hypothesized that:

1) increasing the levels of real prediction will increase perceived knowing, perceived confidence of knowing, and perceived responsibility for knowing.

2) increasing the levels of real control will increase perceived influence, perceived confidence of influence, and perceived responsibility for influence.

3) increasing the levels of real prediction while increasing the levels of real control will increase perceived ability.

4) decreasing the levels of real prediction while increasing the levels of real control will increase perceived task difficulty and decrease perceived effort.

5) decreasing the levels of real prediction while decreasing the levels of real control will increase perceived luck and perceived helplessness.

Method

Subjects

The final group of subjects used in the analysis were 45 males and 45 females in Introductory Psychology at the University of Manitoba. Three subjects were discarded from analyses as they were defined as suspicious on the basis of a questionnaire given during the experiment. Two subjects indicated that they were aware of the procedure, and one was not specific but indicated that he thought "something was going on." There were 10 subjects, five males and five females, randomly assigned to each of nine experimental conditions. All were volunteers who obtained course credit for their participation.

Apparatus and Materials

Subjects were told that their task was to learn a pattern of two letters (A and B) in a series of sixteen, for which a sufficiently high success rate would win them an unknown prize. A single practice series was run, followed by an identical test series. Through information given about the correct letter on different practice trials, subjects had varying degrees of prediction of their level of pattern matching (and thus prize-winning) on the test trials. Through opportunities given the subjects to select the counting letter on each practice trial, subjects had varying degrees of control over their level of pattern matching (and thus prize-winning) on the test trials. However, because the opportunity to select (control) the counting letter on a specific trial occurred <u>before</u> obtaining the information about the correctness of the selection (prediction), prediction and control were not confounded. That is, at the time each letter selection was made, a particular subject might control the counting letter (and thus, to some extent, the level of pattern matching success), but the subject would do so without predicting (knowing) beforehand what the correct letter was.

Prediction and control information was provided on a Data Sheet (see Appendix A). This information had been pre-written in invisible ink to indicate on which trials the subject would select the letter response (control) and on which trials the subject would know the correct letter response (prediction). On those trials when prediction information was given, the correct letter was pre-written on the Data Sheet. On those trials where no prediction information was given, the correct letter was not pre-written on the Data Sheet. After each selection had been made, any information that had been pre-written on the Data Sheet was revealed using a special decoder pen. The entire sequence of letters (BABBAABBAABBABAA) was not revealed until after the experiment was completed.

To indicate on which practice or test trials the subject had control, the letter "Y" (representing "you" and indicating that the subject had control) or the letter "D" (representing "disk" and indicating that the subject did not have control since a tossed disk determined the outcome) were pre-written on the Data Sheet in invisible ink. This information was decoded using a special pen prior to each trial. If the subject had control, the subject was allowed to select the counting response. If the subject did not have control, the experimenter used one of three disks (each measuring 2.5 cm) to determine the response for that trial. Two disks had the same letter on each side (either both A's or both B's) and were used to fix the disk tosses according to each experimental condition. The third disk (with an A on one side and a B on the other) was used whenever a fair disk was required.

On the completion of the practice series, the subjects filled out a Task Evaluation Questionnaire (see Appendix B).

Procedure

Subjects were run individually. They sat at a table as the experimenter read the Instruction Sheet. (See Appendix C.) Subjects followed along on their copy of the instructions. Subjects were asked to anticipate a pre-set 16-letter pattern. They were told that if they identified the correct letter on a sufficient number of the 16 trials, they would win a prize. The criterion number was written on a card and placed inside an envelope that remained in full view of the subject at all times. Neither the criterion for success nor the nature of the prize was indicated until the end of the experiment.

Practice and Test Series. During the 16 trial practice and test series, subjects had control and/or prediction as indicated by invisible codes pre-printed on the Data Sheet. Before each trial, subjects used the special decoder pen to reveal whether (a) they had control and could select the letter, or (b) they did not have control and would have their counting response determined by the toss of a disk. When the subject had control in the practice series, their selections were guesses as they had no information about the pattern. Once the subject had selected either A or B, the experimenter circled the appropriate letter on the Data Sheet. When the subject did not have control in the practice series, the experimenter shook a disk in a plastic cup, and the result of the disk toss was then circled on the Data Sheet by the experimenter.

To maintain equivalency across all conditions, the outcome of the disk toss was made to agree with a preset schedule of correct and incorrect responses. This preset schedule assured that the counting response would have an equal number of A's and B's, and an equal number of success and failures (i.e., 8 or 50%). In order to do this, the experimenter stood slightly behind the subject and switched to the appropriate disk while the subject used the decoder pen to reveal who had control. That is, when an A disk toss was required by the experimental condition, the disk with "A" on both sides was used. If on the next trial, a "B" disk toss was required, the experimenter unobtrusively slipped the "A" disk into a pocket and removed the "B" disk. The experimenter had the schedule on a piece of paper on a clipboard, disguised as a list of subjects (where a male subject name meant an "A" disk toss was required, and a female subject name meant a "B" disk toss was required).

After each selection (whether by the subject or the disk), the experimenter used the decoder pen which either revealed the correct letter (if the subject was to be able to predict the correct letter on that trial in the test series) or revealed nothing (if the subject was not to be able to predict the correct letter on that trial in the test series.)

On completion of the practice series, subjects filled out the Task Evaluation Questionnaire based on what they expected to occur in the test series.

Although subjects had been told that the test series would count towards their obtaining or not obtaining a prize, the basic data had already been collected so no test series was required by the experiment. However, in order to be fair to subjects, the option was given to them of either using the score from the practice series or of going through the test series and using the score from that to determine if they were to win a prize. In the former case, no test trial was run at all. However, if a test series was run, the procedure paralled that of the practice series, except that the use of the decoder pen was unnecessary so the fair disk was used (as it was impossible to switch disks without detection when subjects did not have the decoding action to distract them).

Distribution of Prizes and Debriefing. To determine if a subject had won a prize, the experimenter removed the criterion card from the envelope and tallied the number of correct responses in the counting series. Subjects were required to get at least eight responses correct to win a prize. This meant that they had to "guess" correctly on 50% of the trials where they had control, for the design assured that they would be correct on 50% of the trials where the disk toss selected the counting response (i.e., the "no control" trials). If the subject's score reached or exceeded the criterion, they were awarded a ball point pen as a prize.

Prior to subjects leaving the experimental room, the purpose of the experiment was again described; and they were given the opportunity to ask questions. No mention was made about the switching of the disks because of possible contamination of later subject sessions.

<u>Independent Variables</u>. This study manipulated three levels of prediction and three levels of control as its independent variables resulting in a 3 x 3 design. Subjects were randomly divided into nine experimental groups combining three levels of the two variables. The three levels of predictability (PP) were based on the number of trials out of sixteen on which the correct letter was given, namely, 4, 8, or 12. The three levels of control (CC) were based on the number of trials out of sixteen on which subjects selected the counting response, namely, 4, 8, or 12. For example, subjects in a 4PP-12CC group were given the correct letter on only four of the sixteen trials and were able to control the counting response on twelve of the sixteen trials. (See Table 1.)

Patterns of prediction and control were developed on the basis of series of eight trials, because this was the shortest series which included all possible pairings of prediction and non-prediction with control and non-control. However, a sixteen trial pattern was used as the experimental series since a series of eight was considered to be too brief.

There are numerous ways that predictability (PP) and non-predictability (NP) could have been arranged with

Table 1

Number of Trials Under Each Experimental Condition

Condition	4PP/4CC	4PP/8CC	4PP/12CC	8PP/4CC	8PP/8CC	8PP/12CC	12PP/4CC	12PP/8CC	12PP/12CC
Number of prediction and control trials (PP/CC)	2	2	2	2	6	6	2	6	10
Number of prediction and no control trials (PP/NC)	2	2	2	6	2	2	10	6	2
Number of no prediction and control trials (NP/CC)	2	6	10	2	2	6	2	2	2
Number of no prediction and no control trials (NP/NC)	10	6	2	6	6	2	2	2	2
Total number of trials	16	16	16	16	16	16	16	16	16

control (CC) and non-control (NC). Because of the advantage of having all four possibilities in any given series, only those 8 trial series with at least one incidence of each of PP-CC, PP-NC, NP-CC, and NP-NC were considered for use in the study.

The final series and letter pattern (see Appendix A) controlled for five distinct variables. First, there was an equal number of prediction trials in each half of the pattern for each group type (i.e., 4PP, 8PP, or 12PP). Secondly, there was an equal number of control trials in each half of the pattern for each group type (i.e., 4CC, 8CC, or 12CC). Third, there was an equal number of A's and B's in each half of the letter pattern (i.e., 8 A's and 8 B's in each half). Fourth, there was an equal number of PP/NP shifts (3) across each pattern, regardless of group. Lastly, there was an equal number of CC/NC shifts (3) across each pattern, regardless of group.

One variable that was not controlled for was the number of shifts between A and B in each half of the letter pattern. This lack of control was designed to eliminate any possible clues to the correct letter pattern.

<u>Dependent Variables and Other Measures</u>. On completion of the practice series, subjects were asked to fill out the Task Evaluation Questionnaire based on their expectations regarding the test series (see Appendix B). The dependent

variables measured by this Questionnaire were: perceived prediction using the term "know" (question 1), perceived confidence in predicted trials (question 2), perceived control using the term "influence" (question 3), perceived confidence in controlled trials (question 4), perceived responsibility for predicted trials (question 5), perceived responsibility for controlled trials (question 6), perceived ability (question 7), perceived effort (question 8), perceived task difficulty (question 9), perceived luck (question 10), perceived helplessness (question 11), and perceived success (question 12).

On a separate page, two additional variables were measured: perceived prediction using the term "prediction" (question 13), and perceived control using the term "control" (question 14). This was done in order to detect whether the terms "prediction" and "control" mean the same to subjects as the terms "know" and "influence." These questions were asked at the end of the Questionnaire so that answers would not be similar merely due to their proximity, and also so that these extra variables would not affect the results of the other questions on hypothesized variables.

A final page (see Appendix B) asked about subject perceptions of the experiment, its goals, and whether there was anything suspicious in the procedure. The last question requested the subject's most proficient language so that only English-first subjects would be included in the analysis.

Two additional variables were created in order to see if they could add further clarification to the results. The first variable was a practice-test variable. It measured whether subjects chose to accept their practice series score or whether they opted to take the test series and use that score to determine their winning or not winning a prize. This variable was designed to see whether the decision to take the test series was affected by the experimental condition in which subjects had worked.

The second variable was percent success. This variable measured the amount of success subjects had on those practice series trials where they were allowed to both select (guess) the letter and learn immediately of the correctness of their selection (i.e., PP-CC trials). The other three categories of trials either did not allow the subject to guess (PP-NC) or did not allow the subjects to know the correctness of the selection (NP-CC and NP-NC). In other words, since success was preset at 50% for PP-NC trials and was unknown for NP-CC and NP-NC trials, level of success was controlled.

On PP-CC trials, however, success was uncontrolled, yet experimental conditions with higher levels of prediction and control (8PP/8CC, 8PP/12CC, 12PP/8CC, and 12PP/12CC) necessitated a higher number of PP-CC trials (see Table 1). Therefore, if it could be shown that the experimental manipulations affected the number of correct guesses during PP-CC trials, a possible source of bias would be identified. Accordingly, percent success was created in order to see whether the experimental manipulations were, in any way, associated with better or worse guessing on the PP-CC trials.

Results

Initially, a one-way MANOVA was performed on all dependent variables with subject sex as the independent variable. The resulting MANOVA was non-significant at the .05 level, F (14,75)=.642, p =.821, with univariate F's (all non-significant) ranging from F (1,88)=.006, p =.939 to F (1,88)=2.882, p =.093. Therefore, the data on both sexes were combined for further analyses.

In subsequent analyses, the dependent variables were analyzed in three different packages according to whether these variables were theoretically related (a) to prediction, (b) to control, or (c) to other variables of interest. Because the hypothesized comparisons were non-orthogonal, a priori statistical tests were not used. Instead, a Hotellings multivariate analysis of variance (MANOVA) was performed on all dependent variables in each package, with the number of prediction trials (i.e., 4, or 8 or 12) and the number of control trials (i.e., 4 or 8 or 12) as the independent variables. Extended paired-comparison Scheffé tests (Timm, 1975) were performed after a significant MANOVA. The .05 level of significance was set for all analyses. Finally, although not incorporated into the hypotheses, intercorrelations among all dependent variables were carried out in order to detect other relationships in the data. (See Table 2.)

Table 2

Summary of Intercorrelations

Among Dependent Variables

	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Know (a)	-.016 (.879)	.377 (.001)	.149 (.160)	.293 (.005)	.423 (.001)	.249 (.018)	.196 (.064)
Confidence of knowing (b)		-.074 (.489)	.391 (.001)	.159 (.133)	-.065 (.546)	.126 (.236)	.041 (.698)
Influence (c)			.012 (.910)	.224 (.034)	.254 (.016)	.092 (.389)	.097 (.365)
Confidence of influence (d)				.227 (.031)	.187 (.078)	.220 (.037)	.264 (.012)
Responsibility for knowledge (e)					.277 (.008)	.438 (.001)	.350 (.001)
Responsibility for influence (f)						.365 (.001)	.396 (.001)
Ability (g)							.755 (.001)
Effort (h)							

Note: Each coefficient is based on a Pearson product moment correlation for 90 subjects. Levels of significance are presented in parentheses.

Table 2 (cont'd)

	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)
Know (a)	.073 (.496)	-.338 (.001)	-.246 (.019)	.323 (.002)	.717 (.001)	.473 (.001)	.193 (.068)	.172 (.105)
Confidence of knowing (b)	-.116 (.275)	.062 (.561)	-.122 (.253)	.062 (.562)	.112 (.292)	.094 (.381)	.019 (.861)	.069 (.518)
Influence (c)	.062 (.560)	-.117 (.271)	-.112 (.295)	.158 (.136)	.437 (.001)	.533 (.001)	.188 (.076)	.049 (.644)
Confidence of influence (d)	.085 (.425)	-.221 (.037)	-.320 (.002)	.248 (.019)	.245 (.020)	.291 (.005)	.092 (.390)	.152 (.152)
Responsibility for knowing (e)	.072 (.501)	-.279 (.008)	-.394 (.001)	.437 (.001)	.407 (.001)	.433 (.001)	.285 (.007)	-.080 (.455)
Responsibility for influence (f)	.235 (.026)	-.178 (.092)	-.177 (.096)	.269 (.010)	.285 (.007)	.364 (.001)	.261 (.013)	.133 (.212)
Ability (g)	.467 (.001)	-.317 (.002)	-.319 (.002)	.318 (.002)	.343 (.001)	.296 (.005)	.313 (.003)	.066 (.537)
Effort (h)	.494 (.001)	-.280 (.007)	-.226 (.032)	.216 (.041)	.223 (.034)	.224 (.034)	.261 (.013)	.109 (.305)

Note Each coefficient is based on a Pearson product moment correlation for 90 subjects. Levels of significance are presented in parentheses.

Table 2 (cont'd)

	(j)	(k)	(l)	(m)	(n)	(o)	(p)
Difficulty (i)	-.192 (.069)	-.019 (.863)	.068 (.525)	.035 (.747)	.174 (.102)	.128 (.229)	-.133 (.213)
Luck (j)		.396 (.001)	-.323 (.002)	-.369 (.001)	-.448 (.001)	-.281 (.007)	-.060 (.575)
Helplessness (k)			-.354 (.001)	-.353 (.001)	-.437 (.001)	-.127 (.232)	-.108 (.311)
Feelings of success (l)				.389 (.001)	.400 (.001)	.041 (.699)	.127 (.234)
Prediction (m)					.710 (.001)	.257 (.015)	.190 (.072)
Control (n)						.302 (.004)	.087 (.413)
Test Trial selected (o)							-.082 (.443)
% success on PC trials (p)							

Note: Each coefficient based on a Pearson product moment correlation for 90 subjects. Levels of significance are presented in parentheses.

Since there were no significant interactions between real prediction and real control in any of the three MANOVA packages, focus turned to significant main effects for prediction and for control using all variables in each dependent variable package. Means and standard deviations for all dependent variables are contained in Tables 3, 4, and 5.

Prediction Package

The prediction package consists of four dependent variables: know (question 1), confidence of knowing (question 3), responsibility for knowing (question 5), and prediction (question 13). The MANOVA for the first independent variable, namely the tri-level prediction conditions, was found to be significant, F (8,154)=15.807, p <.001. Subsequent extended Scheffé tests indicated that the variable "know" and the variable "prediction" could be distinguished by degree. In general terms, the higher the level of real prediction, the higher the level of perceived prediction, regardless of whether the term used was "know" or "prediction." The only exception to this was that the lowest and middle levels of real prediction did not differ in their effects on ratings of "prediction." No levels were distinguished for either "confidence of knowing" or for "responsibility for knowing."

The MANOVA for the second independent variable, namely

Table 3

Means (Standard Deviations) of Variables in the Prediction Package

for Each Experimental Condition

Dependent Variable	4PP/4CC	4PP/8CC	4PP/12CC	8PP/4CC	8PP/8CC	8PP/12CC	12PP/4CC	12PP/8CC	12PP/12CC
Know	3.5 (1.841)	3.7 (1.059)	4.3 (3.234)	6.3 (1.494)	7.1 (2.424)	6.7 (2.497)	9.3 (2.946)	11.2 (2.530)	10.9 (2.885)
Confidence of knowing	5.5 (1.179)	4.3 (1.947)	4.7 (2.263)	4.0 (1.826)	3.7 (1.567)	3.4 (1.897)	4.2 (1.619)	5.1 (.568)	4.1 (1.663)
Responsibility of knowing	3.1 (.994)	2.6 (.966)	3.4 (1.838)	3.3 (1.636)	2.4 (1.430)	3.3 (1.418)	3.0 (1.414)	4.3 (1.337)	4.5 (1.716)
Prediction	4.4 (1.647)	5.1 (2.378)	4.1 (2.234)	5.6 (2.459)	6.0 (2.309)	7.6 (2.171)	7.0 (4.137)	11.6 (3.026)	10.6 (2.716)

Table 4

Means (Standard Deviations) of Variables in the Control Package

for Each Experimental Condition

Dependent Variable	4PP/4CC	4PP/8CC	4PP/12CC	8PP/4CC	8PP/8CC	8PP/12CC	12PP/4CC	12PP/8CC	12PP/12CC
Influence	5.9 (3.510)	5.7 (2.214)	7.1 (5.087)	4.9 (1.449)	6.7 (1.160)	9.1 (3.542)	5.2 (2.781)	9.9 (2.644)	9.8 (3.327)
Confidence of influence	4.0 (1.563)	4.0 (.943)	3.9 (2.132)	3.8 (1.229)	3.6 (1.350)	3.6 (1.776)	4.2 (1.398)	4.3 (.675)	4.4 (1.506)
Responsibility of influence	3.3 (1.337)	2.9 (1.449)	2.6 (1.955)	3.2 (1.814)	4.6 (1.647)	3.6 (1.897)	3.5 (1.509)	4.7 (1.252)	4.9 (1.370)
Control	4.8 (4.662)	4.5 (2.461)	3.9 (3.348)	4.0 (2.828)	5.3 (3.199)	7.0 (3.432)	4.4 (3.026)	9.9 (2.807)	10.8 (2.150)

Table 5

Means (Standard Deviations) of Variables in the Other Variables Package

for Each Experimental Condition

Dependent Variable	4PP/4CC	4PP/8CC	4PP/12CC	8PP/4CC	8PP/8CC	8PP/12CC	12PP/4CC	12PP/8CC	12PP/12CC
Ability	3.3 (1.337)	2.5 (1.179)	2.4 (1.713)	2.1 (.876)	2.8 (1.549)	3.0 (1.333)	2.6 (1.578)	4.5 (1.354)	3.7 (1.567)
Effort	3.0 (1.700)	2.6 (1.430)	2.9 (2.470)	1.9 (.876)	2.8 (1.619)	3.3 (1.160)	3.0 (1.886)	4.1 (.994)	3.6 (1.578)
Task Difficulty	3.3 (1.636)	2.4 (1.897)	2.6 (1.955)	2.2 (1.317)	3.6 (2.066)	3.5 (1.434)	2.5 (1.650)	3.0 (1.491)	3.2 (1.398)
Luck	5.6 (1.647)	6.1 (.876)	6.1 (.876)	6.0 (1.054)	6.1 (1.524)	5.6 (1.075)	5.3 (2.214)	4.7 (1.636)	4.8 (1.814)
Helplessness	4.6 (1.776)	4.7 (1.767)	4.5 (2.068)	4.5 (1.841)	5.0 (1.054)	5.3 (1.252)	5.1 (1.449)	3.2 (.632)	3.8 (1.398)
Feelings of success	3.7 (1.418)	2.9 (1.197)	3.1 (1.197)	3.8 (1.135)	3.5 (1.269)	3.8 (.919)	3.4 (1.430)	4.5 (.850)	4.8 (1.398)
Test	1.4 (.516)	1.8 (.422)	1.4 (.516)	1.4 (.516)	1.8 (.422)	1.9 (.316)	1.7 (.483)	1.9 (.316)	1.9 (.316)
PC Success	40.0 (39.441)	70.0 (25.820)	50.0 (33.333)	30.0 (25.820)	51.6 (18.518)	28.2 (13.579)	60.0 (45.947)	46.5 (15.357)	60.0 (15.635)

the tri-level control conditions, was not significant, F (8,154)=1.920, p =.061, so no extended Scheffé tests were done.

Control Package

The control package consists of four dependent variables: influence (question 2), confidence of influence (question 4), responsibility for influence (question 6), and control (question 14). The MANOVA for the second independent variable, namely the tri-level control conditions, was found to be significant, F (8,154)=3.101, p =.003. Subsequent extended Scheffé tests indicate that only the highest and lowest degrees of real control significantly affected ratings of "influence." In general terms, the higher the level of real control, the higher the level of perceived control. No levels were distinguished for the other three variables ("confidence of influence," "responsibility for influence," or "control").

The MANOVA for the first independent variable, namely the tri-level prediction conditions, was found to be significant, F (8,154)=4.210 p <.001. Subsequent extended Scheffé tests indicated that only the highest and lowest levels of real prediction significantly affected ratings of "control." In general terms, the higher the level of real prediction, the higher the level of perceived control. No significant differences relating to the other three variables ("influence," "confidence of influence," and "responsibility for influence") were found.

Other Variables Package

The variables included in the third package were: ability (question 7), effort (question 8), task difficulty (question 9), luck (question 10), helplessness (question 11), perceived success (question 12), test (whether subjects chose to take the test trial or whether they chose to keep the score of the practice series) and percentage success (a measure of degree of success on trials where subjects had both prediction and control). The MANOVA for the first independent variable, namely the tri-level prediction conditions, was significant, F (16,146)=2.097, p =.011. None of the subsequent extended Scheffé tests found any significant differences relating to any of these variables, so a more complicated effect (beyond significant paired comparisons) is probably operating.

The MANOVA for the second independent variable, namely the tri-level control conditions, was not significant, F (16,146)=1.198, p =.276, so no extended Scheffé tests were done.

Intercorrelations

Intercorrelations between all 16 dependent variables (see Table 2) yielded 64 significant relationships which formed three clusters. The first cluster contained variables from both the prediction package (know, responsibility for knowing, and prediction) and the control package (influence, responsibility for influence, and control). All six of these variables were intercorrelated positively. The second cluster contained variables from the other package (ability, effort, test, and perceived success). All of these four variables intercorrelated positively; and, as well, almost all correlated positively with the variables in the first cluster. The exceptions to this were that "know" did not significantly correlate with "effort" and that "influence" failed to be significantly correlated with the other variables.

The third cluster contained the variables "luck" and "helplessness," which correlated positively with each other. However, these two variables correlated negatively with "know," "responsibility for knowing," "prediction," and "control." Finally, "confidence of influence" was correlated positively with the variables "responsibility for knowing," "confidence of knowing," "prediction," and "control." The variable "confidence of knowing" was not significantly correlated with any of the other variables, except for "confidence of influence."

Discussion

One of the most important aspects of this study was to show that prediction and control, as defined by the researcher, are two independently operating variables. There are at least two ways in which this can be done. (a) One way is to see if prediction and control affect different kinds of variables (Echols, 1983; Tan, 1981). In the present study, the prediction manipulations affected the dependent variables "know" and "prediction," while the control manipulations did not. Control manipulations, on the other hand, affected the dependent variable "influence," while the prediction manipulations did not. (b) The other way was to show that prediction and control affect a specific variable without any "combination effect" (Burger & Arkin, 1980). This seems to be clearly illustrated in the present study as, in all analyses, there were no significant interactions between real prediction and real control.

As well, since changes in real prediction (knowing what will happen) and real control (influencing what will happen) were consistently followed by expected changes in subjects' ratings of "knowing" and "influence," respectively, this study lends additional support to the reconceptualized notion of prediction and control (Nickels, 1980). Finally, confirmed hypotheses indicate that prediction and control can, in certain cases, be differentiated by degree.

Hypothesis 1: Perceived Knowing, Perceived Confidence of Knowing, and Perceived Responsibility for Knowing

Hypothesis 1 predicted that increased levels of real prediction would result in increases in perceived knowing, perceived confidence of knowing, and perceived responsibility for knowing. All three levels of real prediction affected ratings of "know" differently with higher levels of real prediction resulting in higher ratings of "know." No differentiation was found for either "confidence of knowing" or "responsibility for knowing." Therefore, in one of three circumstances, the first hypothesis was well supported by the data. This finding suggests that it is not only possible to manipulate levels of real prediction, but that this manipulation is recognizable by subjects.

Although not included in Hypothesis 1, the finding that real prediction similarly affects ratings of "prediction" implies that these two terms ("know" and "prediction") are interpreted to mean about the same thing since both are rated higher under higher levels of real prediction. In fact, Table 2 indicates a high correlation between them ($r=.72$). Thus, further credence is added to the first portion of Hypothesis 1.

There are at least two possible reasons that might explain why real prediction did not affect perceived confidence of knowing. The first possibility is that neither "confidence" question (i.e., neither question 2 nor 4) were phrased in the future tense as were the other questions. Question 2 asked "how confident _are_ you," not "how confident _will you be_." This difference might account for the lack of findings.

The second possibility is that the phrasing of the second question (as well as question 4), suggested a different target than that in each of the other questions. That is, question 2 asked subjects how confident they were of the answer in the previous question (i.e., How _confident_ are you about your answer in the above question?). It essentially asked subjects whether they were certain of the number of trials on which they had prediction or whether they had basically guessed the number of trials. In contrast, none of the other questions was focussed on onés assessment of an answer given to a previous question. Perhaps if the current study had used a different focus for confidence (as suggested above), the results might have replicated those of previous studies (Tan, 1981). As it was, the question may have been incorrectly focussed and, therefore, did not yield the expected findings.

As well, real prediction did not affect "responsibility for knowing." Perhaps this could be attributed to the fact that prediction information is generally _given_, whereas control is generally <u>used</u>. There is thus an important difference between passive and active situations, respectively. One may not feel responsible for what another chooses to give. It is, therefore, probable that this difference would explain why no levels of real prediction were found to affect this variable.

Although not hypothesized, previous research (Echols, 1983) suggests that there will be no relationship between real prediction and the dependent variables theoretically related to control. Thus, it was expected that real prediction would not affect variables related to control (i.e., "influence," "responsibility for influence," and "confidence of influence"). This expectation was confirmed.

Hypothesis 1, then, was partially supported by the data, and leads to the suggestion that alterations in design be made in order to further examine the variables that failed to reach significance.

<u>Hypothesis 2: Perceived Influence, Perceived Confidence of Influence, and Perceived Responsibility for Influence</u>

Hypothesis 2 predicted that increased levels of real control would result in increases in perceived influence, perceived responsibility for influence, and perceived confidence of influence. Results indicate that real control affects ratings of "influence" differently with the highest level of real control resulting in higher ratings of "influence" than the lowest level of real control. The middle level of real control was not found to affect "influence" any differently than either of the other two levels. However, as before, no differentiations for either of the other two variables ("responsibility for influence" and "confidence of influence") were found. Therefore, in one of three circumstances, the second hypothesis was supported. This finding suggests that it is possible to manipulate extreme levels of real control, and that this manipulation is recognizable by subjects.

The middle level of real control did not differentiate ratings of "influence." Perhaps this can be at least partially explained by noting that subjects were less accurate overall in their perceptions of real control than in their perceptions of real prediction. The experimental levels of both variables were set at either 4, 8, or 12 trials out of a total of 16. The overall means of "know" for the lowest to highest levels of real prediction were 3.8, 6.7, and 10.5, respectively. These were very close to the amounts of prediction that subjects really had. However, the overall means of "influence" for the lowest to highest levels of real control were 5.3, 7.4, and 8.7, respectively. It is understandable, then, that the three levels were not distinguished because the highest level was underestimated by subjects, and the lowest was overestimated.

One possible reason for this could be that in scanning the Data Sheet (see Appendix A), subjects find it easier to detect the amount of prediction they have than the amount of control they have. On the Data Sheet, prediction versus no prediction is distinguished by letters versus spaces. However, control versus no control is distinguished by two different types of letters (either D or Y). A cursory glance of the Data Sheet can give an immediate, overall sense of prediction due to the number of unfilled spaces across the row. Letters have to be analytically identified, however, to see which letter is which in order to arrive at the same conclusion for control. Because of this difference in accurately estimating the amount of control one has, subjects may have given more global estimates for control than for prediction. And, if these estimates of control were more global, they might be expected to hover about, or regress to, the centre of the response scale (viz., 4 on the present 7-point scale). This might explain why low control subjects overestimated control, and high control subjects underestimated control.

Contrary to the hypothesis, real control was not related to perceived responsibility for influence. This finding is counter to those of previous research (i.e., Rothbaum, 1981; Tan, 1981; Wortman, 1975). The means of "responsibility for influence" for the lowest to highest levels of real control were between between 3.3 and 4.1 (with 4 as the midpoint of the 7-point scale). It seems as if subjects were uncertain about their responsibility, regardless of the amount of control they actually had. Perhaps it was the impact of the chance (non-control) trials that caused the problem. Maybe subjects feel they may control a "blind" or "presently unpredicted" event, but they cannot be held responsible for it unless prediction is available before (rather than after) the control is exercised. On no trial was this permitted.

Similarly, the hypothesis was not confirmed for "confidence of influence." As was noted in Hypothesis 1, the phrasing of the question may have suggested a different target than that in each of the other questions. This might explain the failure to find a relationship. Again, a re-phrasing of the question might yield quite different results in favour of the hypothesis.

Hypothesis 2, then, was partially supported by the results. The highest and lowest levels of real control affected ratings of perceived influence, although similar effects were not found for either of the other two variables in this hypothesis ("responsibility for influence" and "confidence of influence").

Hypothesis 3: Perceived Ability

Hypothesis 3 predicted that increased levels of real prediction with increased levels of real control will result in increased perceived ability. This hypothesis was not confirmed as perceived ability did not significantly change with changes in real prediction and real control.

Previous research has found that ratings of ability are related to onés success on a task, wherein a good performance is perceived as being due to an internal factor such as ability (Goldberg, 1976; Kovenklioglu & Greenhaus, 1978;). This study, however, rather completely controlled for subject success, so results should reflect various degrees of real prediction and real control.

Findings seem to imply that perceived ability requires that one first know the ultimate criterion one must reach to win a prize. In this study, no one knew the criterion for prize-winning, that is, on how many trials a correct match was necessary. Although subjects were given various levels of information on how well they were matching the pattern (and thus had some basis upon which to estimate their probable success in the test series), subjects did not know how many matches were required to win. Perhaps subjects did not feel that they could judge their ability without knowing the ultimate criterion (which was not revealed until the end of the experiment). In other words, subjects may have felt that a judgement of their ability was based on whether or not they eventually won a prize, and this information was not known at the time they filled out the Questionnaire.

In addition, perhaps levels of ability were rather constant in the present study. Since the opportunity to select the letter on more trials would not affect the amount of ability required, different degrees of control might not affect perceptions of ability. If selecting a letter to match a preset pattern is a relatively simple task, a greater or lesser number of trials on which one has an opportunity to perform this simple task would not change onés ability to do the task. Therefore, in this study, ability may not be related to different levels of real control.

In conclusion, then, Hypothesis 3 is not supported by the data. Here, as before, the need for further investigation is evident.

Hypothesis 4: Perceived Task Difficulty and Perceived Effort

Hypothesis 4 predicted that decreased levels of real prediction and increased levels of real control would increase perceived task difficulty and decrease perceived effort. Neither hypothesis was confirmed in this study as there were no significant relationships between real prediction and real control and ratings of either "task difficulty" or "effort."

Although it would seem logical that having more prediction would make the task less difficult, the results do not indicate that this is so. Research by Echols (1983) similarly did not find support for this hypothesis. The reason here is perhaps because subjects were unaware of any of the other conditions of the experiment and so only knew the one they were in. Under such conditions, what they were required to do was quite easy--a matter of, basically, guessing letters, and then (supposedly) using any gained information in the second test stage. Isolated like this, the task may not have been sufficiently difficult. Perhaps, if subjects had been allowed to compare themselves to other groups, they could have ranked their experience in relation to others. In this case, however, such a simple chore would not likely be rated as difficult by many. Such a result seems to be reflected in the data.

Likewise, there was no support for the "effort" hypothesis. Only one previous study (Echols, 1983) directly looked at effort in relation to prediction and control, and it obtained similar results. In both cases, the task was basically effortless. Subjects needed to exert themselves a little to get results. In fact, there really was no way to "try hard." These variables, then, may be related as hypothesized, but the experiment did not allow them to be evidenced. Another study, perhaps using the same basis but a more complex task, might support the hypothesis.

Hypothesis 4, then, was not supported for either variable. It seems, however, that a change in design to a more difficult task might very well result in quite different findings.

Hypothesis 5: Perceived Luck and Perceived Helplessness

Hypothesis 5 predicted that decreased levels of real prediction with decreased levels of real control would result in increased perceived luck and increased perceived helplessness. The hypothesis was not supported as neither perceived luck nor perceived helplessness changed significantly with similar changes in real prediction and real control.

Previous research indicates that luck is deemed to be an important factor when results are unfavourable (Goldberg, 1976; Kovenklioglu & Greenhaus, 1978; Lefebvre, 1979; Weiner, Nierenberg, & Goldstein, 1976). Again, as success was controlled to a high degree, it was expected that the data would reflect the amounts of prediction and control given to subjects. The subjects, however, appeared to feel that luck played a very great part in how well they did, regardless of which condition they were in. The midpoint of the 7-point scale was 4, yet the "luck" scores of all nine groups of subjects ranged from 4.7 to 6.1 with a mean of 5.6. Thus, regardless of the condition that they were in, subjects felt greatly influenced by luck. Here again the result may be explained by the way the letters were selected when subjects did not have control. Because at least a part of their score (at least 25% and up to 75%) was determined by a disk toss, it may be that subjects strongly felt the impact of luck and responded accordingly.

The results for the "helplessness" variable are very unusual, as the opposite was expected according to the learned helplessness model (Seligman, 1975). Perhaps, as with task difficulty and effort, the nature of the task did not evoke feelings of helplessness. Although subjects with low real prediction and low real control may have recognized this fact (as evidenced in the tests of Hypotheses 1 and 2), subjects may not have perceived a sufficient level of either to bring about emotional feelings of helplessness. As well, there may have been nothing very aversive about being helpless in this study. If a subject was not successful in the task, it did not mean physical or emotional pain, but merely that a prize (of unknown value) would not be obtained. Although subjects may have wanted to win, as winning is intrinsically better than losing, failing to get the prize would not have been devastating.

It is reasonable, however, that since luck was not found to be significant, that helplessness would not have been found to be significant either, as helplessness can be derived from luck--particularly bad luck. Thus, even had the "luck" variable been significant, it would not necessarily follow that "helplessness" would also be significant. A distinction between the two forms of luck (bad and good) would be necessary before assuming that helplessness is also perceived.

Hypothesis 5, then, was not supported by the data. A change in procedure to eliminate chance factors (e.g., use of the disc) might have lowered the consistently high luck attributions across all conditions thereby allowing greater discrimination between prediction and control by means of luck ratings. On the other hand, the outcome would probably have to be much more aversive for the helplessness hypothesis to be confirmed.

Additional Analyses

Additional analyses were conducted to examine non-hypothesized relationships.

"Know" and "influence" versus "prediction" and "control." One finding was that the word "predict" seems to be comparable in meaning to the word "know," for both are influenced in the same way by manipulations of real prediction and correlate highly in Table 2. The terms may, therefore, be interchangeable. However, "influence" and "control" do not seem to bear quite the same relationship. Although these concepts seem to be highly correlated in

Table 2 (r=.53), "control" is not as strongly affected by manipulations of real control as "influence." Although the means of the control variable increased with higher levels of real control, they were not significantly different. Perhaps this may be because, to most people, "influence" implies a slightly lesser degree of causal involvement than "control." As it is possible to influence an event without causing it, perhaps subjects interpreted "control" more in the sense of "cause" than of "influence." Thus, in the present study, as real control increased subjects perceived themselves as having a greater influence but not as making the outcome occur all by themselves (i.e., cause).

An unexpected (unhypothesized) finding was the significant relationship between real prediction and one of the variables theoretically related to control (namely "control"). Results indicate that the highest and lowest levels of real prediction affected ratings of "control" differently with the highest level of real prediction resulting in higher ratings of control than the lowest level of real prediction. That is, although no interactions were found between prediction and control, subjects felt more control for what they were doing if they had information about it. It seems that individuals who know they are going to be informed (even though not informed until after making a selection) feel that they have more of a part to play in a task. Thus, although subjects with both prediction and control exercised their control before they knew the consequences of it, they at least knew on how many trials they would be so informed. This may have made them feel that they had an informational advantage; and, therefore, they felt more "in control" of the outcome.

Since increases in real control did not lead to higher ratings of "control," the above finding suggests that people, in general, conceptualize "control" in terms of knowing what will happen rather than influencing what will happen. Such an hypothesis was not completely testable in the present study for every subject had at least some real prediction and some real control at some point during the 16 trials. A full test of the hypothesis would require that one group of subjects perform the matching task under 16 NP/CC trials and another group perform the task under 16 PP/NC trials. The expectation would be that the former group would have a high sense of "control," whereas the latter group would have a low sense of "control." Such a test would be interesting in that a) the typical view holds that "control" requires both knowing what will happen and influencing what will happen whereas b) the reconceptualization holds that "control" requires only influencing what will happen. Maybe there is a third possibility, namely that "control" requires only knowing what will happen.

Choice of practice or test series. Another variable that was analyzed examined whether there were any differences between groups on whether or not subjects selected to take the test series. There were no significant differences between the levels indicating that the experimental condition in which subjects were placed did not affect their decision as to take or not take the test series. Thus, this manipulation check indicates that the condition in which a subject was placed did not affect the choice concerning the test series.

Percent success. A third variable tested to see if subjects' success in guessing letters was, in any way, affected by the experimental condition in which they worked. This variable thus measured percent success on trials where subjects were allowed to both select the letter and learn immediately of the correctness of their guess. As there were no differences between groups, success did not seem to be affected in any way by the experimental conditions or to be an obvious source of bias.

Correlations. The correlations between all dependent variables were computed to see if this would further enhance understanding of the other results. The correlations tended to cluster together in three groupings.

1. The first cluster included three variables in the

prediction package (know, prediction, and responsibility for knowing) and three variables in the control package (influence, control, and responsibility for influence). All six of these variables were intercorrelated positively with each other. As correlations between perceived prediction and perceived control have also been found in previous research (Echols, 1983; Tan, 1981), it would seem that these variables will covary as long as the levels of real prediction and real control (under which such ratings are taken) have been equated (as they are when correlations are computed across all combinations of experimental manipulations).

2. Almost all of the six variables in the first cluster correlate positively with a second cluster containing the variables ability, effort, test, and feelings of success. The exceptions to this are that "know" did not correlate significantly with "effort" and that "influence" was not always correlated with the rest. This seems to indicate, however, that although not evident in the primary analyses, there are relationships in the data that might well be further investigated in future research.

3. The variables in the third cluster (luck and helplessness) were correlated positively with each other. This would seem to imply that feelings of helplessness are higher when one feels that luck is an operating variable.

This pair of variables also correlated negatively with "know," "prediction," "responsibility for knowing," and "control." This seems to suggest that the feeling that one has a lack of information about an event and the feeling that one is unable to do anything about an event coincide with the perception that one is helpless and a victim of fate or luck. As well, subjects seem to feel lower responsibility for knowing when the two variables in this cluster are operating.

It is interesting to note that "confidence of knowing" was not correlated with anything except "confidence of influence." "Confidence of influence," however, correlated positively with "control," "prediction," "responsibility for knowing," and "confidence of knowing."

Suggestions for Further Research

The notion that prediction and control, as defined by the experimenter, can be separated was supported in this study. As well, levels of the two variables were found to be distinguishable. Prediction was clearly differentiated across three levels, and control was similarly differentiated across the extreme levels. However, there are some improvements that might be made in future research.

One such improvement might be a different practical definition of "no control." In this study, not having control meant that the counting response was selected by the toss of a disk. The implications seem to be that there was no control whatsoever in the selection. One possible change might be to define "no control" by taking it from one subject and giving it to another. Although the lack of influence would be the same, perhaps the determination of the event by another person, and not by a disk toss, would alter subject feelings of not being in control.

An expansion of present measurements would be to include two additional subject groups. One group would perform the matching task under 16 trials of PP/NC, whereas the second group would have 16 trials of NP/CC. Such groups of 100% prediction but 0% control and 0% prediction but 100% control would permit testing how far present findings can be carried. In particular, such extreme groups would provide a test of the hypothesis that actual prediction by itself brings about a sense of "control" in most people.

Unfortunately, most of the other variables were not found to be significantly related as hypothesized. It would seem that the main reason for this rests on the nature of the task. Subjects were asked to do very little--the task was exceedingly easy. Thus, measures of effort or ability, for example, could not be well discriminated for only a bare minimum of either was necessary to do as well as the task allowed. Another task, using the same theories, but requiring more from subjects, would probably yield more from subjects.

As well, additional questions might be asked on a future questionnaire. Unfortunately, subjects in this study were not asked how hard they tried. This information could be very helpful in determining the effects of each condition on motivation, and if, perhaps, the amount of motivation had any effect on the results.

A further consideration might be to run the test trial for all subjects, and give a second questionnaire (identical to the first) afterwards. This alteration in method would permit an experimenter to investigate whether subjects actually experienced the feelings they expected during the series that was going to count towards a prize.

Finally, this study dealt with hypotheses employing only three of the four possible combinations of high prediction/low prediction and high control/low control. The fourth possibility (high prediction and low control) had no dependent variable associated with it. It is suggested that fear and hope might be associated with this condition. For example, if subjects were able to predict a threatening (aversive) event, and yet be unable to do anything about it, they might experience fear. However, if the predicted event were promising (desirable), subjects might experience hope. Future research might explore these possibilities.

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Appendix A

Data Sheets

DATA SHEET

----
name (please print)

----
student number

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	D	D	D	Y	D	D	D	Y	D	Y	D	D	D	D	D	Y
CORRECT RESPONSE	---	A	---	---	---	---	---	B	---	---	---	B	---	---	---	A
PRACTICE SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B
TEST SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B

4PP/4CC

----
name (please print)

DATA SHEET

----
student number

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	D	D	Y	Y	D	D	Y	Y	D	Y	Y	D	D	D	Y	Y
CORRECT RESPONSE	---	A	---	---	---	---	---	B	---	---	---	B	---	---	---	A
PRACTICE SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B
TEST SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B

4PP/8CC

name (please print) ______________________________

DATA SHEET

student number ______________________________

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	Y	Y	Y	D	Y	Y	Y	D	Y	D	Y	Y	Y	Y	Y	D
CORRECT RESPONSE	---	A	---	---	---	---	---	B	---	---	---	B	---	---	---	A
PRACTICE SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B
TEST SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B

4PP/12cc

DATA SHEET

name (please print): ------------------------------

student number: ------------------------------

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	D	D	D	Y	D	D	D	Y	D	Y	D	D	D	D	D	Y
CORRECT RESPONSE	---	A	B	---	---	---	A	B	---	---	B	B	---	---	A	A
PRACTICE SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B
TEST SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B

8PP/4CC

DATA SHEET

-------------------------------- name (please print)

-------------------------------- student number

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	D	D	Y	Y	D	D	Y	Y	D	Y	Y	D	D	D	Y	Y
CORRECT RESPONSE	---	A	B	---	---	---	A	B	---	---	B	B	---	---	A	A
PRACTICE SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B
TEST SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B

8PP/8CC

DATA SHEET

----
name (please print)

----
student number

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	Y	Y	Y	D	Y	Y	Y	D	Y	D	Y	Y	Y	Y	Y	D
CORRECT RESPONSE	---	A	B	---	---	---	A	B	---	---	B	B	---	---	A	A
PRACTICE SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B
TEST SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B

8PP/12CC

DATA SHEET

-------------------------------- name (please print)

-------------------------------- student number

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	Y	D	D	D	Y	D	D	D	Y	D	D	D	D	D	Y	D
CORRECT RESPONSE	---	A	B	B	A	A	---	B	---	A	B	B	---	B	A	A
PRACTICE	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
SEQUENCE	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
TEST	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
SEQUENCE	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

12PP/4CC

DATA SHEET

______________________________ name (please print)

______________________________ student number

<table>
<tr><td>TRIAL NUMBER</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr>
<tr><td>RESPONSE SELECTOR</td><td>Y</td><td>Y</td><td>D</td><td>D</td><td>Y</td><td>Y</td><td>D</td><td>D</td><td>Y</td><td>Y</td><td>D</td><td>D</td><td>D</td><td>Y</td><td>Y</td><td>D</td></tr>
<tr><td>CORRECT RESPONSE</td><td>---</td><td>A</td><td>B</td><td>B</td><td>A</td><td>A</td><td>---</td><td>B</td><td>---</td><td>A</td><td>B</td><td>B</td><td>---</td><td>B</td><td>A</td><td>A</td></tr>
<tr><td>PRACTICE
SEQUENCE</td><td>A
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<tr><td>TEST
SEQUENCE</td><td>A
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B</td></tr>
</table>

12PP/8CC

DATA SHEET

-------------------------------- name (please print)

-------------------------------- student number

TRIAL NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
RESPONSE SELECTOR	D	Y	Y	Y	D	Y	Y	Y	D	Y	Y	Y	Y	Y	D	Y
CORRECT RESPONSE	---	A	B	B	A	A	---	B	---	A	B	B	---	B	A	A
PRACTICE SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B
TEST SEQUENCE	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B	A B

12 PP / 12 CC

Appendix B

Task Evaluation Questionnaire

Task Evaluation Questionnaire

1. On how many of the 16 test trials will you know whether the selected letter matches the preset pattern? (circle one number)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

2. How confident are you about your answer in the above question? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

3. On how many of the 16 test trials will you influence whether the selected letter matches the preset pattern? (circle one number)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

4. How confident are you about your answer in the above question? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

5. Throughout all 16 test trials, how responsible will you be for knowing whether the selected letter matches the preset pattern? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

6. Throughout all 16 test trials, how responsible will you be for influencing whether the selected letter matches the preset pattern? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

7. Throughout all 16 test trials, how much will your <u>ability</u> affect the number of trials on which the selected letter matches the preset pattern? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

8. Throughout all 16 test trials, how much will your <u>effort</u> affect the number of trials on which the selected letter matches the preset pattern? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

9. Throughout all 16 test trials, how much will the <u>difficulty of the task</u> affect the number of trials on which the selected letter matches the preset pattern? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

10. Throughout all 16 test trials, how much will <u>luck</u> affect the number of trials on which the selected letter matches the preset pattern? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

11. Throughout all 16 test trials, how <u>helpless</u> will you feel? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

12. Throughout all 16 test trials, how <u>successful</u> will you feel? (circle one number)

Not at all 1 2 3 4 5 6 7 To a great extent

13. On how many of the 16 test trials will you be able to <u>predict</u> whether the selected letter matches the preset pattern? (circle one number)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

14. On how many of the 16 test trials will you be able to <u>control</u> whether the selected letter matches the preset pattern? (circle one number)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Additional Questions

In order to draw more accurate conclusions and to plan more appropriate follow-up studies, we need to know how various aspects of the present study were viewed by you.

a) What were your most significant thoughts and feelings while you were engaged in the study?

b) What do you think the goal of this research is?

c) Was there any part of the experiment which bothered you?

d) Do you feel that the experimenter somehow cheated to affect your winning a prize? (Please explain.)

e) In what language are you MOST proficient?

Appendix C

Instruction Sheet

Here is the Data Sheet which will be used in this study, and here is a copy of the instructions. Would you please read the instructions with me?

Instruction Sheet

This is a study to see how well you can do on a letter pattern task. If you do well enough on this task, you will win a useful prize. In this study there is a single preset pattern of two letters (A and B) sixteen trials long. Your task is to duplicate the preset letter pattern as closely as you can. A Criterion Sheet inside this envelope indicates the correct letter for each trial and also indicates the number of trials you must get correct to win a prize.

On some trials you will be able to select the letter you want to count; whereas on the other trials the choice will be made for you by my tossing this disk (which has A on one side and B on the other). A symbol has already been written in invisible ink below each trial number to indicate whether you or the disk will select the response to be counted. Before each trial, you will be able to use this decoder pen to reveal whether the response will be selected by you (indicated by a Y) or whether the response will be selected by the disk toss (indicated by a D). When the selection has been made, whether by you or the disk, I will circle the appropriate letter on the Data Sheet. Then I will use the decoder pen to reveal whether the correct letter for that trial is an A or B or whether it is not to be known by you until later, in which case the correct response will not have been written in.

You will have a practice series of sixteen trials followed by an identical test series. After the practice series you will be asked some questions about the test series which will follow. It is your performance on the test series that will count towards your winning a prize.

After we have completed the test series we will open the envelope and compute the total number of trials on which the letter was correctly selected, regardless of whether it was selected by you or the disk. If this number reaches or surpasses the criterion indicated on the Criterion Sheet, you will win a prize.

Do you have any questions?

Now I will put your Data Sheet on this table while you fill out the Task Evaluation Questionnaire which asks some questions about the test series which we will do next. Since you will be using the very same Data Sheet during the test series, the information that has already been revealed by the decoder pen in the practice series will indicate how to proceed in the test series.

In other words, on each trial the selector and the feedback will be identical to that in the practice series.

Please answer the questions in terms of what you expect to occur in the test series.