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The multidimensionality of illusory judgments: Reexamination of illusion of control research

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THE MULTIDIMENSIONALITY OF ILLUSORY JUDGMENTS: REEXAMINATION OF ILLUSION OF CONTROL RESEARCH

BY

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DISSERTATION

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DEDICATION

This project is dedicated to Victor Benassi. My appreciation for your friendship and guidance over the last five years is impossible to express fully. I hope this paper and my future endeavors will make your efforts seem worthwhile. Thank you for everything.

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ABSTRACT

THE MULTIDIMENSIONALITY OF ILLUSORY JUDGMENTS: REEXAMINATION OF ILLUSION OF CONTROL RESEARCH

by

Paul Keith Presson
University of New Hampshire, May 1997

The present dissertation examines the well-established research paradigm known as the illusion of control. Until now, researchers have employed one basic paradigm which has addressed the illusion of control as a unidimensional phenomenon. In Study 1, 91 female undergraduates were presented with three induction conditions used by previous researchers. Factor analyses showed that judgments from these tasks did not tap into a single process, but rather fell into two types of illusory judgments -- belief- and contingency-based. In Study 2, 182 female undergraduates were exposed to the same three induction conditions used in Study 1 plus two additional contingency tasks. As in Study 1, the results from factor analyses demonstrated a multidimensional factor structure in which contingency judgments were differentiated from performance judgments. In addition, judgments based on time-line contingency tasks loaded separately from contingency judgments from the key and light task. Study 2 identified two groups of behavior. Participants' self-reported likelihood of voting in the 1996 presidential election and frequency of prayer were labeled as control-based behavior. Frequency of reading

published horoscopes and giving higher validity rating to them were labeled as belief-based behavior. The results showed that the different illusion factors interacted differentially with desire for control and level of belief in the paranormal when predicting belief-based and control-based behavior. Judgment type also interacted differentially with desire for control and paranormal belief when predicting reports of overall happiness. Finally, methodological implications for future research were discussed.

INTRODUCTION

People's desire to control the environment can be readily inferred from everyday observation of their behavior. Thousands of people marching on Washington in an attempt to change governmental policy, public participation in the election process, the use of "systems" designed to beat state lotteries or other games of chance, financial analysts tracking trends in the stock market, people's use of controversial medical regimens to combat AIDS or cancer, and the reliance on astrological advice to guide one's behavior are only a few examples of how people often try to increase the level of control in their lives. From an evolutionary standpoint, organisms that demonstrated the most control over the environment would be the most likely to survive and reproduce. From a psychological standpoint, a desire to control the environment combined with the feeling that one is in control of his or her life, would result in greater feelings of well-being.

The belief that one can control life events has consistently been the emphasis of psychological theorists. Adler (1920) argued that humans are motivated to overcome feelings of inferiority and helplessness that develop during infancy. In their striving for superiority, individuals often attempt to influence social situations by tapping into an inherent potential that Adler (1939) referred to as social interest. A person who develops strong social interest will strive to better society, whereas one who does not will strive only for personal superiority. One who exerts a striving for superiority toward others will be more successful in adapting to life's demands. Similarly, White (1959) argued that

humans are motivated to interact effectively with the environment. The motive behind this motivation to demonstrate competence is not the acquisition of any external rewards that may accompany the control, but rather the sense of mastery over the environment for its own sake.

One of the main tenets of Heider's (1958) "naive psychology" was that both scientists and lay people strive to understand, predict, and control events that are of interest to them. Both use their observations to form and modify theories about the environment. Kelley (1972, p. 2) stated that a person will not only strive to understand, but also attempt to apply that understanding "in order to exercise control of his world."

Many researchers have focused on the positive consequences of believing that one has control over life events. Lefcourt (1973, p. 424) argued that a "sense of control, the illusion that one can exercise personal choice, has a definite and a positive role in sustaining life." In his review of the literature, Averill (1973) suggested that cognitive factors associated with personal control, such as the appraisal of stressful situations, are as important in determining the effects of life events on an individual as is one's actual level of influence on the situation. Lazarus and Folkman (1984) argued that the degree to which one persists in believing that he or she can control the environment determines, in part, the likelihood that a stressful situation will be perceived as a challenge rather than a threat. Challenge appraisals are more likely to be dealt with in a constructive manner than are threat appraisals.

Taylor and Brown (1988) argued that positive illusory perceptions, including exaggerated perceptions of control, promote mental health, as demonstrated by the ability

to care about others, happiness, and the ability to be creative and productive at work. This theory is not without its critics, however, and although these critics do not agree with Taylor and Brown's overall hypothesis, some admit that positive illusions can "function in an individual as a short-term and even long-term fix to avoid confronting personally threatening self-recognitions" (Colvin & Block, 1994, p. 17). Perceptions of control have also been associated with better physical health (Schmale & Iker, 1966), greater adherence to medical regimens (Janis & Rodin, 1979), better adaptation to life changes (Mullen & Suls, 1982), and a greater perception of procedural justice in the legal system (Thibaut & Walker, 1975; LaTour, 1978).

Other researchers have focused more on the negative consequences resulting from one's perception of a lack of personal control. Mandler (1975) hypothesized that the inability of an organism to complete a well-organized plan of action, and the lack of any alternate plan, can lead to helplessness and disorganization. "The organism does not 'know' what to do" (p. 199). He argued that this perception of helplessness and disorganization defines anxiety. He further claimed that any alternate plan can serve to control anxiety regardless of its direct relevance or value to the situation. What is important is that the plan of action be well-organized by the organism.

In contrast to Mandler's (1975) theory, Seligman (1975) argued that helplessness results from repeated exposure to negative outcomes that are noncontingent upon one's responses. Learned helplessness is demonstrated by a failure to respond to aversive stimuli and a decrease in learning ability. In a revision of Seligman's theory, Abramson, Seligman, and Teasdale (1978) hypothesized that attributional processes determined the

consequences of perceived helplessness. Other theorists have suggested that attributional processes not only affect the outcomes of a perceived lack of control, but they are the result of an individual's need to achieve a sense of control (Kelley, 1967, 1971).

Whether the topic of the research is learned helplessness, locus of control, self-efficacy, depression, social influence, intrinsic motivation, attribution theory, or desire for control, psychologists have identified personal control as a central concept in social and personality psychology research. According to Burger (1992), in general, most people prefer to exert control over the environment and this desire for control has an important influence on human behavior.

Rothbaum, Weisz, and Snyder (1982) conceptualized control along two dimensions, primary control and secondary control. Primary control refers to efforts that are intended to have a direct influence on the environment. Secondary control is demonstrated when a person attempts to maintain control over a situation by aligning him or herself with environmental forces that are believed to be controlling agents. Although this distinction is an interesting one, few measures have been designed to assess individual differences along these dimensions. Thus, I have limited my focus to the concept of primary control.

Illusion of Control

Because control beliefs are commonplace, and because the consequences of a lack of control are so potentially negative, individuals often behave as if they have control in chance situations. A "chance" situation is one in which the objective probability of one of the possible outcomes occurring is the same as the probability of any of the other

outcomes occurring. These chance events are by definition uncontrollable. In contrast, a skill situation is one in which there exists a connection between responses and outcomes, and therefore, is to some extent controllable. Langer (1975) labeled the failure to distinguish between "chance" and "skill" events as an illusion of control. Specifically, she defined an illusion of control as "an expectancy of a personal success probability inappropriately higher than the objective probability would warrant" (p. 313). She argued that in everyday life, the distinction between skill and chance situations is often not clear. She further hypothesized that when factors normally associated with skill situations are present in chance situations, people will often perceive contingency between actions and outcomes where none exists. According to Langer, skill-related factors are those commonly associated with an increase in the probability of achieving nonrandom outcomes. Skill-related factors include, but are not limited to choice, stimulus or response familiarity, active involvement in the task, and competition.

Langer's (1975) initial research consisted of six experiments in which skill-related factors were introduced into objectively uncontrollable situations. In experiment 1, 36 male participants were placed in competition with a confederate. In the "dapper" condition, the confederate was well dressed and behaved in a confident, outgoing manner. In the "schnook" condition, the confederate behaved in a shy and awkward fashion, had a nervous twitch, and was dressed in a sport coat that was too small for him. Participants wagered between 0 and 25 cents on each of four rounds in which both the participant and the confederate selected a card from a standard deck of cards, with the higher card winning the round. The dependent variable was the amount of money wagered. Langer

found that individuals in the schnook condition wagered more money on average than did participants in the dapper condition. Langer concluded that in a competitive situation, the characteristics of one's opponent affect his level of confidence in his ability to succeed.

In other experiments, Langer (1975) allowed one group of participants to choose their own lottery tickets while a second group was given tickets by the experimenter. She found that individuals in the choice group required more money in order to sell their tickets than did those who had no choice. She also found that participants whose lottery tickets contained familiar symbols (letters of the alphabet) were less likely than participants with unfamiliar tickets (line drawings of novel symbols) to trade their ticket for one in a game with better odds. Finally, Langer found that active involvement and response familiarity (practice) produced responses suggesting illusory judgments of control.

Langer concluded that the presence of skill-related factors makes chance situations appear similar to skill situations and, consequently, increases the likelihood that a person will approach the situation with a skill orientation. Langer suggested that when factors are introduced that shift the individual's focus back to the chance elements in a situation, the illusion of control will dissipate. Langer referred to these factors as "intrusions of reality" (p. 327).

Langer and Roth (1975, p. 952) hypothesized that because people want "to see" themselves as the cause of their successes (see Adler, 1930; deCharms, 1968; Lefcourt, 1973), they are likely to attend to and employ cues from the environment that support this notion. One such cue would be a consistent pattern of task outcomes. According to

Langer and Roth, people assume that if a situation is controllable, one will be successful or fail rather consistently depending on his or her ability to perform the task. In contrast, one's performance on a chance task would be characterized by a random series of successes and failures. According to Langer and Roth, "the motivation to see events as controllable is so strong that the introduction of just one cue, a fairly consistent sequence of wins (with runs of no more than four in a row), is enough to induce an illusion of control" (p. 955).

To test the hypothesis that outcome sequence can induce an illusion of control, Langer and Roth (1975) asked participants to predict the outcome of coin flips. In all conditions participants received feedback that indicated 15 correct and 15 incorrect predictions. The outcome sequence for each condition was rigged so that participants in the descending outcome group received the majority of hits during the first 15 trials, in the ascending group during the last 15 trials, and those in the random group received an equal number of hits in both halves of the 30 trials.

Langer and Roth (1975) found that participants who received the descending sequence of outcomes rated their prediction ability higher than did people in the ascending and random groups, and claimed more correct predictions than did the participants in the other two groups. When asked to predict their performance on another 100 trials, people in the descending group predicted greater success than did participants in the other two groups. According to Langer and Roth, people decide whether a task is skill or chance oriented early in a sequence of outcomes and dismiss inconsistent information after the attribution has been made. Although participants in the ascending group also received a

consistent sequence of outcomes early in the task, people prefer to attribute their failures to situational factors and it was probably easy for them to accept the chance nature of the coin flipping task as a preferred explanation for the outcomes.

As mentioned earlier, Langer (1975) defined an illusion of control as a judgment of personal success higher than the objective odds would warrant. Langer, however, did not test this operationalization. All of Langer's conclusions are based on comparisons between responses of participants in an induction group and those in a control group. She did not test her participants' judgments of control against any preestablished criteria for success. For example, Langer and Roth (1975) found that participants in the descending group estimated that they would correctly predict an average of 54 out of 100 future coin flips, while those in the random group estimated only 51 and in the ascending group only 49. The estimate of individuals in the descending group was statistically significant from those in the other two groups, but what the authors did not report was whether any of the estimations differed significantly from the 50 hits that a chance model would predict.

In a replication of Langer and Roth's (1975) experiment, Sweeney, Benassi, and Drevno (1980) also found that participants in the descending group provided significantly higher estimates of future performance than did those people in the ascending group. However, when tested against a chance model of 50 correct predictions, the mean of the participants in the descending group was not significantly different. In contrast, the mean of the participants in the ascending group was significantly lower than 50, suggesting a kind of negative illusion of control. Langer's (1975) definition of illusion of control did not address individuals who systematically underestimate their level of performance.

The abundant body of research that has examined the illusion of control phenomenon was modeled after Langer's (1975) initial work, and although researchers claimed to have based their studies on Langer's definition of illusion of control, only Sweeney, Benassi, and Drevno (1980) have employed a direct test of Langer's definition. Most researchers, including Langer, have inferred an illusion of control when participants in an induction group provide higher scores on some indirect control measure than do participants who are not exposed to the experimental manipulation. Only if one can assume that individuals who are not exposed to the induction manipulation will provide estimations of personal success that are consistent with some objective standard is a between groups design a valid assessment of an illusion of control as defined by Langer.

In Langer's (1975; Langer & Roth, 1975) classic papers, an illusion of control was inferred from factors such as participants' willingness to trade a lottery ticket, estimations of performance and predictions of future success. It is interesting that no direct measure of control was included in these experiments. That is, participants were not asked to indicate the degree of control they believed they had over the task outcomes. Benassi, Sweeney, and Drevno (1979) had college students participate in a psychokinetic (PK) task in which they were asked to attempt to manipulate a colored die by concentrating their mental energy on making a target color land up after tossing the die. They found that the induction groups not only reported greater confidence in their performance but also judged their degree of control over the die to be higher than did individuals in the control groups.

Although the differences found by Benassi et al. (1979) were statistically

significant, the effect sizes were smaller for the direct measures of control than for the confidence estimates. The difference in effect sizes may be due to Langer's (1975) notion that intrusions of reality, such as specifically asking a person how much control they had over the task outcome, serve to focus participants' attention back to the chance aspects of the situation and, consequently, lessen the effect of the induction factors. This idea was supported by Presson and Benassi's (1996) meta-analytic review of the illusion of control literature. They found that measures designed to directly assess one's perception of personal control produced smaller mean effect size estimates than did indirect ones.

Other researchers have focused on factors that suppress an illusion of control. Dunn and Wilson (1990) found that when the consequences of a risky decision were high, participants were less susceptible to an illusion of control induction. They argued that the higher the stakes, the more carefully an individual will analyze the probability of achieving a desired outcome. Gollwitzer and Kinney (1989) found that individuals who are contemplating whether or not to act on their wishes (predecisional) differ in their judgment of control over a task than individuals whose focus is on accomplishing a chosen goal (postdecisional). They suggested that predecisional conditions result in a deliberative mind-set which directs the individual's cognitive functioning toward the consequences of, as well as the likelihood of, achieving a desired goal. On the other hand, postdecisional conditions result in an implemental mind-set which directs one's cognitive functioning toward such issues as when and how to act on the chosen goal. Consequently, persons with a deliberative mind-set tend be less prone to an illusion of control.

The fact that so much research has been devoted to identifying the conditions

under which individuals misjudge objective contingencies, or identifying the factors that tend to moderate illusory judgments, gives credence to the validity of the illusion of control phenomenon. However, the plethora of methodological approaches to studying the phenomenon raises the question of whether researchers are measuring a single construct or many constructs with some common underlying connection.

If illusion of control is a unidimensional phenomenon, then the presence of skill-related factors in any chance-oriented situation would induce illusory judgments of control. The first goal of this paper is to determine whether an illusion of control, as assessed by previous researchers, is a unidimensional construct or if people differ in susceptibility to various factors shown to induce illusory judgments. In other words, to what degree are the induction conditions used in illusion of control research interchangeable?

Langer's (1975) illusion of control definition focused solely on individuals' estimations of personal success that are higher than objective odds would warrant. The second goal of this paper is to assess whether participants who underestimate their performance and/or contingencies also differ with regard to their judgments on other tasks.

The third goal of this paper is to determine whether individuals' susceptibility to illusion of control inductions is related to behavior outside the laboratory. If illusion of control is a unidimensional process, then the behavioral manifestations of illusory perceptions will be related to all forms of induction conditions.

CHAPTER II

STUDY 1

Various researchers have proposed different conceptualizations of illusion of control. Few researchers have actually measured participants' perception of their direct influence over task outcomes. Instead they measured individuals' judgments of their prediction ability, judgments of contingency, or some other indirect measure such as the amount of money one required in order to sell a lottery ticket, and then inferred participants' perceptions of personal control.

Researchers have also operationalized the concept of illusion of control in many ways (Presson & Benassi, 1996). A few experimenters directly asked participants how much influence they felt they had over the task outcome (e.g., Benassi et al., 1979). Other researchers employed an indirect, qualitative measure (e.g., participants' willingness to trade one lottery ticket for another with better odds; Langer, 1975, Experiment 3). Still others used an indirect, quantitative measure (e.g., participants' prediction of success given an additional 100 coin flipping trials; Langer & Roth, 1975).

A typical illusion of control research paradigm consists of a single task designed to induce an illusion of control. Langer's (1975) initial research consisted of gambling situations such as card games and lottery tasks. Since then, illusion of control research has consisted largely of prediction tasks (e.g., predicting the outcome of coin flips, Langer & Roth, 1975), psychokinesis tasks (e.g., mentally influencing the outcomes of die tosses,

Benassi et al., 1979), or contingency judgment tasks (e.g., judging the relation between a key and light, Alloy & Abramson, 1979). As mentioned earlier, the dependent measures in these studies varied from participants' willingness to sell their lottery ticket to their perception of their performance to their judgments of personal influence over the task outcome. There is little doubt that an illusion of control type of effect can be obtained from this type of research design.

The purpose of the present study is to identify whether various measures of illusory judgments tap one single construct or various types of illusory perception. All participants received the experimental conditions designed to induce an illusion of control. On the key and light contingency task, all participants received a high frequency outcome condition in which the probability of an outcome is 75% on the trials on which the key is pressed as well as 75% on the trials on which it is not pressed (Alloy & Abramson, 1979). On the die tossing and coin flipping tasks, all participants received a descending series of outcomes in which the majority of correct outcomes occur during the first half of the task (Benassi et al., 1979; Langer & Roth, 1975). My hypothesis is that different illusion of control measures tap into different types of illusory judgments.

Method

Participants

Ninety-one female undergraduate psychology students participated in exchange for partial course credit. Only females were included because, based on the large body of illusion of control literature, I had no reason to expect gender differences. Also, the population of potential participants consisted of approximately 70% female.

Materials

I assessed participants' general belief in the paranormal (e.g., extrasensory perception and psychokinesis) on a scale created for this study (see APPENDIX A). The scale was created using nine items adapted from the Belief in the Paranormal Scale (Jones, Russell, & Nickel, 1977) and 11 items created for this study. Participants responded on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The Chronbach's alpha coefficient for the paranormal belief scale was .92.

I used probability generators and conventional relay circuitry to program outcome frequencies for a task in which participants were asked to judge the relation between pressing a telegraph key and the onset of a blue light. The circuitry was located in one room and the telegraph key and the box with yellow and blue lights were located in another room with the participant. On each of the 40 trials, if the participant pressed the telegraph key within the two seconds that the yellow light was lit, one probability generator was sampled. If no key press was made, the other generator was sampled. The probability of an outcome (the blue light coming on) occurring following either a press or no-press response could be independently programmed. The relay circuitry was programmed to control stimulus presentation and to record data.

A device called a die funnel was constructed in such a way that trial outcomes were hidden from the participants (see Benassi, et al., 1979). Each participant sat at one end of the die funnel and tossed a die into the chute. The experimenter retrieved the die from a door in a box at the other end, recorded the outcome of the toss, and returned the die to the participant.

Design

I tested each participant individually. Each session was conducted in a laboratory setting and lasted approximately 45 minutes. After signing an informed consent form, participants were given the paranormal belief scale. Each participant was allowed to complete the questionnaire at her own pace and was instructed to request any clarification she felt necessary.

After each participant completed the questionnaire, I showed her the telegraph key and the box with blue and yellow lights on it and informed her that her task was to learn the relation between the key and blue light. I explained that the yellow light signaled the start of each new trial and would stay on for two seconds during which she had the option of either making a key press response or not making a key press response. I specifically told each participant that it was in her best interest to press on some trials and not on others in order to learn the relation between the key and the blue light.

I next informed each participant that she would have 40 trials in which to learn the relation between the key and the blue light and that, following the 40 trials, she would be asked to indicate her judgment of the relation on a scale from 0 (No Relation) to 100 (Perfect Relation). Finally, I informed each participant that she might discover that there was no relation between the key and the blue light, or that there might be some relation, either moderate or perfect. When she indicated that she understood the instructions, I left the room and activated the apparatus. The apparatus was programmed so that the probability of the blue light onset on the trials on which the participant pressed the telegraph key was 75% as well as on 75% on the no-press trials. After the participant

completed the 40th trial, I returned and obtained the participant's judgment of contingency.

I next informed each participant that the second task was a prediction task. I showed each participant a 50 cent piece and told her that I would flip the coin 30 times. Her task was to attempt to guess the outcome of each coin flip and I would inform her whether her guess was correct. I explained that I would sit behind her while flipping the coin so as not to hurry her prediction or somehow indicate to her what the outcome was. In actuality, I positioned myself behind each participant so as to hide the fact that the task was rigged. Each participant was given a prearranged pattern of feedback as to their performance. The set pattern of feedback of 15 correct and 15 incorrect predictions with 10 correct responses occurring in the first 15 trials was based on the one used by Langer and Roth (1975). After the 30 trials I asked each participant to write down how many correct predictions she thought she would make if given another 100 trials.

I next explained to each participant that in the final task her job was to attempt to influence, rather than merely predict, the outcome. I showed her two dice, each of which had three sides painted red and three sides painted green. I explained that she was to select one of the two dice and, for each of the 20 trials, select a color and for five seconds focus all her mental energy on making the target color land up at the end of the die funnel. I explained that I would keep track of the time and after five seconds I would tell her to begin at which time she was to throw the die into the die funnel. I would record the result of each trial, inform her as to the outcome, and return the die to her. As in the previous task, the feedback was rigged so that each participant received 10 correct and 10 incorrect

outcomes with seven correct responses occurring in the first half of the trials. After the 20 trials, I asked each participant to indicate on how many of the trials she felt the target color landed up and how much control she felt she had over the outcome of the trials. Her control estimate was indicated on a scale ranging from 0 (No control) to 10 (Complete control). All data were coded with participant numbers to maintain anonymity.

Following the final task, I verbally debriefed each participant. I emphasized that the outcome of each task was predetermined and did not necessarily reflect her actual performance. I allowed each participant to ask any questions about the study and provided her with a written explanation of the procedure and goals of the study before she left the laboratory. I also provided each participant with the information necessary to contact me should she have any future questions regarding the study.

Results and Discussion

All variables were examined for characteristics of normalcy. No major violations of the assumptions required for inferential statistics were observed.

The apparatus used in the key and light task was programmed to deliver an outcome probability of 75% on the key-press trials and 75% on the no-press trials. Ideally, participants were presented with a zero contingency task. However, the actual level of contingency for any given session was based on probability and depended in part on how many trials each participant pressed the key. Therefore, in order to determine whether participants' estimation of contingency was accurate, it was necessary to compare their judgment against the actual contingency. The percentage of outcomes on no-press trials was subtracted from the percentage of outcomes on key-press trials. The absolute value of

this number was then multiplied by 100 to obtain the actual level of contingency. Each participant's judgment accuracy was determined by subtracting the actual contingency from her judgment of contingency (Δ). Higher positive values of Δ indicate an overestimation of contingency. Values of Δ were correlated with number of key press trials, in that more key presses were associated with greater overestimation of contingency, r (87) = .32, p. < .05.

Table 1 shows the zero-order correlations among the dependent measures from all three illusion of control tasks. Participants' predictions of their performance on 100 additional coin flips was positively correlated with their perception of how well they performed on the 20 die toss trials, r (89) = .37, p. < .05, and how much control they had over the die, r (89) = .21, p. < .05. Higher estimates of performance on the die toss task were also associated with reports of greater control over the outcomes of the die tosses, r (89) = .40, p. < .05. There was no statistically significant relation between Δ values and the other three measures.

Table 1 Zero-Order Correlations Among the Four Dependent Variables from the Three Illusion of Control Tasks

	1	2	3	4
(1) Die toss Performance	1.00			
(2) Next 100 Coin Flips	.37	1.00		
(3) Control Over Die	.40	.21	1.00	
(4) Δ	.04	.08	.05	1.00

I analyzed the four dependent measures from the illusion induction tasks using principle components factor analyses with varimax rotation. In order to test the notion that illusion of control is a unidimensional phenomenon, I forced all four measures to load onto

a single factor (see Table 2). The resulting factor was an illusion of control index. If all illusion of control tasks are tapping into a single dimension, then combining scores from multiple measures is a valid approach to assessing one's susceptibility to illusion induction conditions.

Table 2 Rotated Factor Loadings of the Responses to the Four Illusion of Control Measures When Forced Onto a Single Factor.

Variable	Factor 1
Die toss Performance	.81
Next 100 Coin Flips	.71
Control Over Die	.69
Δ	.19

One can assume that a person's judgments of control on a psychokinesis task are based, at least in part, on one's belief in the paranormal. Consequently, if all illusion of control tasks are tapping into a single construct, then participants' responses to the dependent measures should be equally related to factors such as one's level of paranormal belief. To test this hypothesis, I compared individuals with a high level of paranormal belief with those reporting low levels of belief, based on a median split, Mdn = 53. Participants in the high belief group produced a significantly higher mean index score (.30) than did those in the low belief group (-.35), t (88) = 3.22, $p < .05$.

I ran another factor analysis in which the number of factors was not prespecified. I used a factor loading value of .50 as a cutoff criterion. When the four illusion of control measures were not restricted to loading onto one factor, two factors emerged (see Table 3).

Table 3 Rotated Factor Loadings of the Responses to the Four Illusion of Control Measures When Allowed to Load Onto Two Factors.

Variable	Factor 1	Factor 2
Die toss Performance	.83	-.01
Next 100 Coin Flips	.70	.14
Control Over Die	.68	.10
Δ	.10	.99

Illusion of Control Factor 1 (IOCF1) consisted of participants' judgment of their performance on the 20 die toss trials, their prediction of their performance on 100 additional coin flip trials, and their judgment of their degree of psychokinetic control over the die. Illusion of Control Factor 2 (IOCF2) consisted of Δ values.

In order to test whether the two illusion of control factors are tapping separate dimensions, I again ran a series of analyses comparing those individuals reporting high levels of paranormal belief with those reporting low levels of belief. Participants in the high belief group produced a significantly higher mean IOCF1 score (.30) than did the low belief group (-.36), t (88) = 3.27, $p < .05$. In contrast, IOCF2 scores did not differ significantly as a function of paranormal belief, t (88) = .08, $p > .05$. Based on these results, I feel confident in labeling IOCF1 as belief-based illusions and IOCF2 as contingency-based illusions.

People in the high paranormal belief group reported higher estimates of performance (M = 11.27) on the 20 die toss trials than did those in the low belief group (M = 9.67), t (89) = 3.67, $p < .05$. These results are similar to those of previous researchers who found that higher levels of paranormal belief are associated with greater

illusory control estimates (e.g., Benassi et al., 1979). However, a between-groups difference does not necessarily indicate an illusion of control. When compared to the mean of 10 successes that the objective standards of chance performance would dictate, the high belief group's mean of 11.27 is significantly higher, indicating an illusion of control, t (48) = 5.27, $p < .05$. The low belief group's mean of 9.67 was not statistically different from the objective odds, t (41) = .88, $p > .05$.

Individuals in the high belief group also reported a higher degree of personal control over the die toss task (M = 2.82) than did participants in the low paranormal belief group (M = 1.83), t (89) = 1.99, $p < .05$. These results are also supported by earlier research (e.g., Benassi et al., 1979). If one assumes that the outcomes of a series of die tosses are random, then an objective chance model would dictate that no personal control exists. When compared to an objective standard of zero, both high and low belief groups demonstrated an illusion of control, t (48) = 7.89, $p < .05$ and t (41) = 5.49, $p < .05$, respectively.

Participants' prediction of their performance on 100 future coin flips did not differ significantly as a function of their level of paranormal belief, t (89) = 1.13, $p > .05$. Also, neither the high belief group (M = 50.35) nor the low belief group (M = 47.17) differed significantly from an objective standard of 50, t (48) = 1.24, $p > .05$ and t (41) = .20, $p > .05$, respectively. One possible explanation for the similarity of performance estimates is that the coin flip task was specifically presented as a prediction task and not a paranormal task as was the die toss task.

Δ values did not differ based one's level of paranormal belief, t (88) = .36, $p > .05$.

As Δ refers to the difference between participants' judgment of contingency and actual contingency, Δ values significantly greater than zero can be considered illusory. The mean Δ values of both high and low belief groups (M = 14.56 and 12.53, respectively) were significantly higher than the expected Δ value of zero, t (48) = 3.95, $p < .05$ and t (40) = 2.90, $p < .05$, respectively.

Researchers have typically approached illusion of control as if it were a unidimensional phenomenon based on the assumption that induction factors and dependent measures are interchangeable. The results of Study 1 showed that, although all participants received the illusion inductions, not all participants showed elevated judgments across all tasks. There exist at least two underlying bases for illusory judgments of control: (1) belief-based illusions and (2) contingency-based illusions. What was not examined here is the participants' ability to accurately judge contingent relations. Were they accurately perceiving the lack of contingency or do they tend to judge most relations as noncontingent?

CHAPTER III

STUDY 2

Study 1 showed that illusory control is not a unidimensional phenomenon. Although many types of illusory perceptions may exist, Study 1 tapped two: (1) those that are associated with one's belief in paranormal ability and (2) those that are based on contingency judgments. In order to explore the issue of multidimensionality further, the present study includes two belief-oriented tasks and three basic contingency judgment tasks. Also, the present study will obtain three measures of illusory judgments for each of the belief-oriented tasks. In contrast to the belief-oriented tasks in Study 1, the three dependent measures used in Study 2 will be the same for each of the tasks.

Although all participants in Study 1 received the induction conditions in the key and light tasks, some accurately reported the lack of contingency associated with the tasks. What was not assessed in Study 1 was whether these individuals would accurately report contingencies when they exist or do some people merely fail to notice contingent outcomes in all situations. In the present study, I will assess whether participants who report no contingency are actually discriminating between contingent and non-contingent situations.

As with the contingency tasks, participants' performance estimates from the coin and die tasks indicated that some people accurately judged their performance even under the induction conditions. Also, those who did not provide accurate estimates were divided

between those who overestimated and those who underestimated their performance. Langer's (1975) definition of illusion of control did not account for judgments of personal success lower than the objective odds would warrant. She analyzed participants who underestimated their performance as if they perceived a complete lack of control over task outcomes. The present study will examine whether overestimators differ from underestimators systematically. Performance estimates that are significantly lower than the objective odds would warrant will be treated as equally illusory to those that are significantly higher than the odds would predict. Also, in an attempt to determine whether an illusion of control has implications beyond behavior in the laboratory, the present study will assess participants' responses to questions regarding their day-to-day behavior.

Taylor and Brown (1988) argued that individuals who demonstrate illusory perceptions of personal control also tend to display certain characteristics commonly associated with mental health. Among these characteristics is happiness. Researchers have shown that most people report feeling reasonably happy most of the time (see Diener & Diener, 1996). Freedman (1978) concluded, based on over 52,000 responses to a published survey, that the more one perceives a degree of personal control over life events, the happier one tends to be. Freedman also found that those who perceive a high degree of personal control in their lives are most likely to indicate they are currently happy. In the current study I will examine the association between susceptibility to illusion induction conditions and participants' reported level of overall happiness.

In the present study I will also assess participants' desire for control. According to

Burger (1992), desire for control refers to the extent to which a person wants to have control over life events. Not surprisingly, there appears to be a relation between one's desire for control and one's susceptibility to an illusion of control. Research has shown that individuals with a high desire for control were more likely than low desire for control participants to attribute successful outcomes to skill rather than luck even though performance was at a chance level (Burger, 1985, 1986; Zenker & Berman, 1982). Individuals high in desire for control also predicted better performance on similar tasks in the future. Burger (1992) found that people with a high level of desire for control preferred to choose their own lottery numbers rather than have them chosen for them and expressed more confidence in their chances of winning.

Research has also shown that one's level of desire for control is associated with differences in day-to-day behavior. For example, Burger (1992) found that individuals high in desire for control were more likely to become involved in activities and organizations. More importantly, Burger and Cooper (1979) found that desire for control interacted with participants' perception of situational variables, such as illusion of control induction conditions, to produce significant differences in behavior. The present study was designed to assess the relation between participants' desire for control, susceptibility to illusion of control, and self-reported behavior.

Method

Participants

One hundred eighty-two female undergraduate psychology students participated in exchange for partial course credit. As in Study 1, only females were included because I

had no reason to expect gender differences and the population of potential participants consisted of approximately 70% female.

Materials

I developed a behavior inventory (see Appendix B) for this study in which participants indicated how many days a week, on average, they read their horoscope. Participants were also asked to indicate how valid they believed published horoscopes to be. Responses were made on an eight-point scale ranging from Completely Invalid to Completely valid. Participants also indicated whether they would prefer to choose their own lottery numbers of have them chosen for them. Next, I asked them to indicate how often, on average, they prayed. Participants responded on an six-point scale ranging from Never to Very often. Next, participants indicated on a nine-point scale ranging from Definitely will not to Definitely will how likely they were to vote in the 1996 presidential election. Next, I asked participants to indicate how often, on average, they wore seat belts. Participants responded on an seven-point scale ranging from Never to Always.

Using items taken from Freedman's (1978) happiness survey, participants indicated their level of happiness over the past few months, the past five years and in general. Responses on each of the three items were made on a nine-point scale from Extremely Unhappy to Extremely Happy. They also indicated how optimistic they were about their future on a seven-point scale from Very Optimistic to Very Pessimistic. Next, I asked each participant to indicate how much control they felt they had over the good things that happen in their lives as well as over the bad things. For both items, the four response options ranged from Great Deal of Control to Almost No Control. Next, I asked

participants to indicate whether they felt their lives had meaning and direction. Responses were made on a four-point scale ranging from Yes, Definitely to No, Little or No Direction and Meaning.

Freedman (1978) asked participants to indicate how important various life factors were to their happiness. In addition to rating these items as to importance, participants in the present study indicated their judgment of the degree to which each of these items are generally controllable, personally controllable, and controllable by persons other than themselves.

General belief in the paranormal was assessed on the scale created for Study 1 (see APPENDIX A).

Finally, participants were asked to complete the Desirability of Control (DC) scale (Burger & Cooper, 1979). The DC scale was designed to assess one's general desire for control over life events. Participants judge the degree to which each of 20 statements applies to her. Responses are made on a 7-point scale ranging from 1) This statement doesn't apply to me at all to 7) This statement always applies to me. Responses are summed with higher scores indicating higher desire for control.

Apparatus

The equipment used was the same as in Study 1.

Design

I tested each participant individually. Each experimental session was conducted in a laboratory setting and lasted approximately 45 minutes. After signing an informed consent form, participants were given a packet of three questionnaires. Each packet

contained a behavior inventory, the paranormal belief scale, and the Desirability of Control Scale (Burger & Cooper, 1979). Each participant was allowed to complete the questionnaires at her own pace and was encouraged to request clarification on any items that were confusing.

After each participant completed the questionnaires, I demonstrated the key and light apparatus used in Study 1 and gave her instructions for completing the first task. The instructions and procedure for the first task were the same as those used in Study 1 except that participants were given only 24 trials. The apparatus was programmed so that the probability of the blue light onset occurring on any of the trials on which the participant pressed the telegraph key was 70% and 70% on any of the no-press trials.

The instructions and procedure for the second task were the same as for the die toss task used in Study 1 except that the task was presented as a prediction task rather than a psychokinesis task. I specifically informed each participant was that this task was not designed to assess paranormal ability. After the 20 trials I asked each participant to indicate in writing how many correct predictions she thought she made and, based on her performance on the present 20 trials, how many correct predictions she would make if given another 100 trials.

I next gave each participant the instructions for completing the third task. I explained that the participant's job was to judge contingency levels. In contrast to the first contingency task, the 24 trials were presented on a partitioned time line (see Appendix C; Wasserman & Shaklee, 1984). I provided each participant with a sheet containing the instructions, the scenario, a time line, and a rating scale. The instructions presented a

scenario in which a woman, Kim, has purchased a radio only to find that it emits a buzzing sound every now and then. Upon investigation Kim suspects that a loose wire may be the cause of the buzzing. In an effort to troubleshoot the problem, she taps on the wire to see if it has any effect on the buzzing. The time line indicates the results of the 24 troubleshooting trials. On some trials she taps the wire and on others she does not. Sometimes her tapping results in the buzzing and other times it does not. On some trials the buzzing occurs without her tapping on the wire. The actual level of contingency was zero as the buzzing occurs on 67% of the tap trials as well as on 67% of the no-tap trials (67/67). After hearing the scenario, I asked each participant to indicate her judgment of the contingency between the tapping and the buzzing on a scale from -10 (prevents sound) to +10 (causes sound) with a midpoint of 0 (has no effect).

The fourth task was the same as the coin flipping task in Study 1 except that the task was presented as a precognition task and consisted of only 20 trials. I instructed each participant to focus her mental energy on trying to foresee the outcome prior to the coin flip. Following the 20 trials, I asked each participant to indicate the number of trials on which she felt she correctly predicted the outcome and, based on her current precognition performance, how many correct predictions she would make if given another 100 trials.

The final task again consisted of the tap and buzz problem used in the second task. The instructions and procedure were the same as in the second task. This time, however, the time line illustrated a 50% contingency, in that the buzz occurred on 92% of the tap trials and on 42% of the no-tap trials (see Appendix D). Participants indicated their judgment of contingency on the same type of scale used in the second task. All data was

coded with participant numbers to maintain anonymity.

Following the final task, I verbally debriefed each participant. I emphasized that the outcome of each task was predetermined and did not necessarily reflect the participant's actual performance. I gave each participant the opportunity to ask any questions about the study and I provided her with a written explanation of the procedure and goals of the study. I also provided each participant with the information necessary to contact me should she have any future questions regarding the study.

Results and Discussion

All variables were examined for characteristics of normalcy. No major violations of the assumptions required for inferential statistics were observed.

I analyzed the seven dependent measures from the illusion induction tasks using principle components factor analyses using varimax rotation. Table 4 shows the factor loadings when all seven measures were forced to load onto a single factor.

Table 4 Rotated Factor Loadings of the Responses to the Seven Illusion of Control Measures When Forced to Load Onto a Single Factor.

Variable	Factor 1
Next 100 Coin Tosses	.83
Next 100 Die Flips	.80
Coin Flip Performance	.76
Die toss Performance	.71
50% Contingency Time Line	.23
Δ	.17
0% Contingency Time Line	-.13

Participants' accuracy of judgment on the key and light tasks (Δ) was calculated in the same manner as in Study 1. Accuracy measures were similarly calculated for the 0% and

50% contingency time-line problems. The factor loading values of the coin and die task measures were considerably larger than those from the contingency task scores.

Table 5 shows the factor loadings for the seven illusion of control measures when they were forced to load onto two factors using .50 as a minimum loading criterion. Although the two factor model supports the notion that performance tasks and contingency tasks are not tapping into the same process, the current two factor model also suggests that a distinction exists between contingencies presented in a time-line format and those presented as a key and light task.

Table 5 Rotated Factor Loadings of the Responses to the Seven Illusion of Control Measures When Allowed to Load Onto Two Factors.

Variable	Factor 1	Factor 2
Next 100 Coin Tosses	.83	.15
Next 100 Die Flips	.80	.05
Coin Flip Performance	.76	.03
Die toss Performance	.71	-.03
50% Contingency Time Line	.23	.82
0% Contingency Time Line	-.13	.81
Δ	.17	.38

When analyzed with a factor loading cutoff criterion of .50 but without a prespecified number of factors, three factors emerged (see Table 6). The three factor structure supports the multidimensional conceptualization of illusion of control. It also shows that apparently similar types of illusory induction conditions, such as contingency judgment tasks, can tap into separate processes.

Rotated performance estimates on the die-toss task and the coin-flipping task, ability judgments from the die-toss and coin-flipping tasks, and future performance

predictions made up IOC Factor 1. Rotated accuracy measures from the time-line tasks made up IOC Factor 2. Finally, rotated Δ scores made up IOC Factor 3.

In Study 1 I was unable to determine whether participants that reported a lack of contingency on the key and light task were accurately assessing the contingency level or merely bad at judging contingency in all situations. The fact that participants' accuracy scores on the 0% and 50% contingency tasks were highly correlated indicated that they were able to discriminate between contingent and non-contingent situations, r (180) = .75, $p < .05$

Table 6 Rotated Factor Loadings of the Responses to the Seven Illusion of Control Measures.

Variable	Factor 1	Factor 2	Factor 3
Die toss Performance	.74	.02	-.26
Coin Flip Performance	.75	-.06	.17
Next 100 Die Tosses	.81	.02	-.01
Next 100 Coin Flips	.82	.05	.20
0% Contingency Time Line	-.17	.85	.04
50% Contingency Time Line	.18	.84	.06
Δ	.06	.09	.94

Participants' responses to the behavior questionnaire were analyzed using principal components factor analysis with varimax rotation. Of the 182 participants, 125 indicated that they always wore seat belts. Likewise, 148 participants stated that they would prefer to choose their own numbers when playing the lottery. Because of the relative lack of variance in these variables, they were eliminated from this and future analyses. An analysis of the remaining variables produced a two-factor structure (see Table 7). Behavior Factor

1 (BF1) consisted of participants' reports of how often they read their horoscope and how much validity they ascribe to astrological forecasts. Behavior Factor 2 (BF2) included participants' report of frequency of prayer and likelihood of voting in the 1996 presidential election.

Factor scores on BF1 differed as a function of one's belief in the paranormal. The mean score for low believers was -.33, whereas the mean score for high believers was .28, t (174) = 4.26, $p < .05$. Scores on BF2 did not differ significantly as a function of paranormal belief. The mean scores for low and high believers were -.02 and .02, respectively, t (174) = .24, $p > .05$. Based on these findings, I labeled BF1 belief-based behavior and BF2 control-based behavior.

Table 7 Rotated Factor Loadings of the Responses to the Four-item Behavior Questionnaire.

Variable	Factor 1	Factor 2
Horoscope	.83	.15
Valid	.77	-.19
Vote	.22	.81
Pray	-.31	.67

Table 8 shows the correlations among the two behavior factors and the three illusion of control factors. Unlike the results from Study 1, the only statistically significant relation was between IOC Factor 3 and belief-based behavior. In other words, less accurate contingency judgments were associated with greater likelihood of reading published horoscopes and higher validity ratings.

As mentioned earlier, IOC Factor 1 consisted of participants' estimations of

performance on the 20 die toss trials and the 20 coin flip trials as well as their predictions regarding their performance on 100 future die and coin trials. Given that participants were given performance feedback that indicated chance level performance, response accuracy was computed by comparing participants' estimations to the objective odds. I then trichotomized the accuracy scores to create measures that differentiated among those people that underestimated, accurately judged, and overestimated their performance.

Table 8 Correlation Coefficients Among the Two Behavior Factors (Belief-based & Control-based) and the Three Illusion of Control Factors.

	(1)	(2)	(3)	(4)	(5)
(1) Belief-based	1.00				
(2) Control-based	.00	1.00			
(3) Die & Coin Tasks	.02	-.01	1.00		
(4) Time-line Tasks	-.01	.05	.00	1.00	
(5) Key & Light Task	.15	.05	.00	.00	1.00

Scores falling more than one standard deviation below zero were categorized as underestimators, between one standard deviation below and one standard deviation above zero were categorized as accurate, and greater than one standard deviation above zero were categorized as overestimators. I also created similar indices from the accuracy scores from the two time-line tasks and the key and light task.

Belief-based behavior increased significantly as a function of accuracy scores on the key and light contingency task, $F(2, 160) = 4.43$, $p < .05$. The mean factor scores for the underestimators, accurate, and overestimators were -.26, .03, and .26, respectively. Belief-based behavior was not significantly related to IOC Factors 1 or 2, $F(2, 162) = .15$, $p > .05$ and $F(2, 162) = .41$, $p > .05$, respectively. Control-based behavior did not differ significantly as a function of IOC Factors 1, 2, or 3, $F(2, 162) = .12$, $p > .05$, $F(2, 162) =$

.18, $p > .05$, and $F(2, 162) = .08$, $p > .05$, respectively.

Moderating Variables - Desire for Control and Paranormal Belief

Burger and Cooper (1979) found that individuals with a high desire for control wagered more on a dice throwing game than did those with a low desire for control even though both groups received the same illusion of control induction condition. They also found that a high desire for control was associated with reports of greater feelings of depression than was a low desire for control following learned helplessness induction conditions. Finally, Burger and Cooper observed that when participants were led to believe that they were in control of their own behavior under hypnosis, those with a high desire for control responded to hypnotic suggestions more often than low desire for control participants. In all three experiments, Burger and Cooper concluded that individual differences in desire for control interacted with participants' perceptions of the situational variables to produce significant differences in behavior.

The present study examined the moderating effects of desire for control and paranormal belief, on the situational variables associated with illusion of control tasks. I ran a series of analyses of variance in which behavioral measures were analyzed as a function of paranormal belief, desire for control, and each of the three illusion of control factors. When significant results ($a = .05$) were observed from analyses including one of the three illusion of control factors, figures showing the results of similar analyses including all three factors will be presented in addition to reporting the results in the text. When the results were not statistically significant for all three illusion of control factors, results will be reported without the accompanying figures. Differential interactions among

the three illusion factors would support the multidimensional conceptualization of illusion of control.

As demonstrated earlier, higher levels of belief-based behavior were associated with greater levels of belief in the paranormal but not as a function of desire for control, F (1, 160) = 17.90, $p < .05$ and F (1, 160) = .41, $p > .05$, respectively. In contrast, control-based behavior differed as a function of desire for control but not as a function of paranormal belief, F (1, 162) = 15.70, $p < .05$ and F (1, 162) = .20, $p > .05$, respectively. Individuals with a high level of desire for control had a mean control-based factor score of .25, whereas those with a low level of desire for control had a mean factor score of -.31.

With regard to control-based behavior, the interaction between desire for control and paranormal belief was interesting (see Figure 1), F (1, 170) = 3.65, $p > .05$. The overall pattern was similar to the main effect for desire for control in that high desire for control participants scored higher than did those in the low desire for control group. However, among the high belief group, low desire for control individuals produced a mean factor score of -.41 compared to the high desire for control group's mean of .40, t (92) = 4.08, $p < .05$. In contrast, among the low paranormal belief group, the low desire for control individuals' mean factor score of -.19 was not significantly different from the high desire for control group's mean of .09, t (78) = 1.30, $p > .05$.

In contrast to control-based behavior, the interaction between desire for control and paranormal belief was less noticeable with regard to belief-based behavior (see Figure 2), F (1, 162) = 2.80, $p > .05$.

Figure 1 The Interactive Effects of Desire for Control and Paranormal Belief on Control-Based Behavior

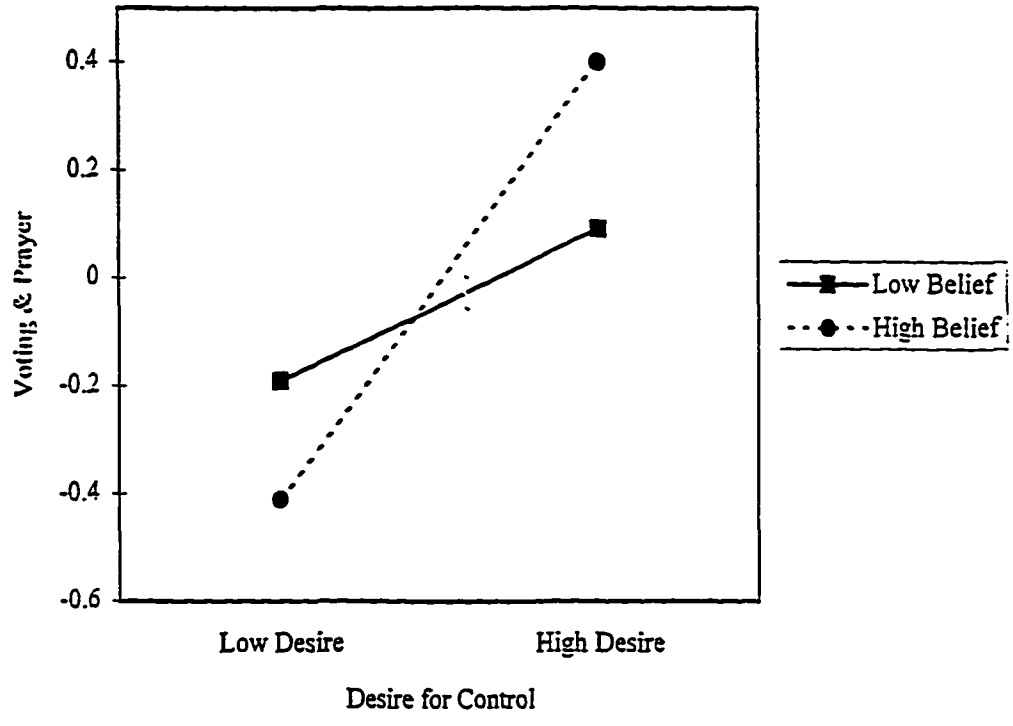
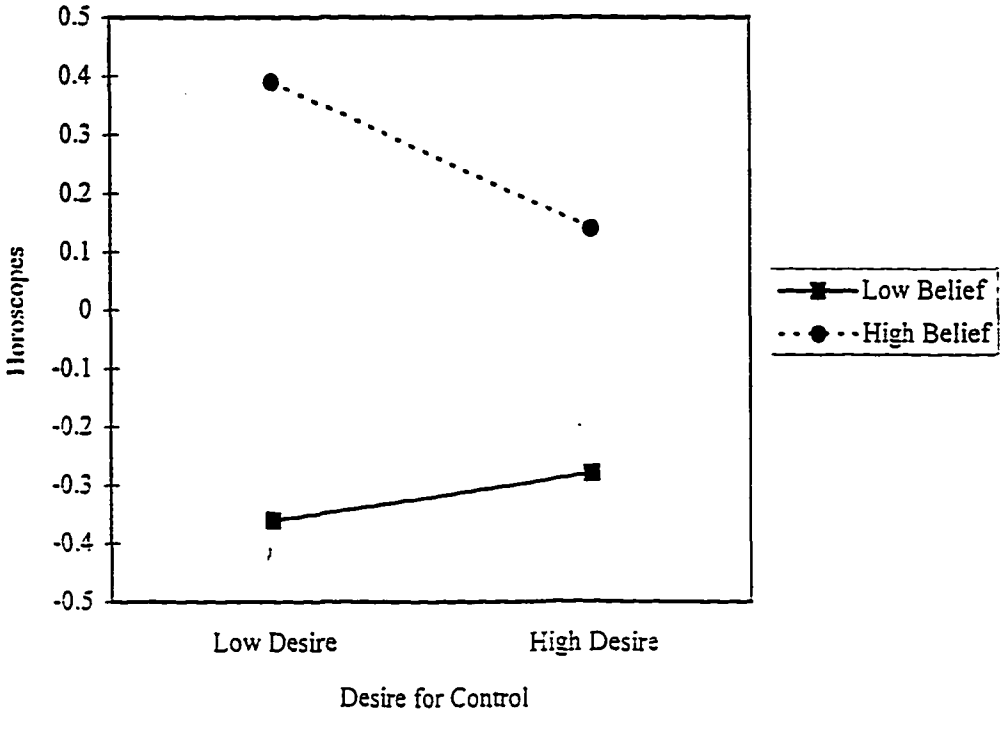


Figure 2 The Interactive Effects of Desire for Control and Paranormal Belief on Belief-Based Behavior



Although the effect of paranormal belief was somewhat moderated by desire for control, paranormal belief still predicted significantly different levels of belief-based behavior.

Among those participants reporting a low desire for control, those with a low level of belief in the paranormal produced a mean factor score of -.36 compared to the mean of .39 for those with a high level of belief, t (80) = 3.96, $p < .05$. Participants with a high desire for control and a low level of paranormal belief produced a mean factor score of -.28 compared to the mean of .14 for those participants with a high level of paranormal belief, t (90) = 2.00, $p < .05$.

As mentioned above, differences in control-based behavior were not associated with level of paranormal belief. However, Figure 3 shows that belief in the paranormal interacted with performance estimates on the die toss and coin flip tasks to predict control-based behavior, F (2, 162) = 3.65, $p < .05$. Participants who underestimated their performance on the tasks did not differ noticeably as a function of paranormal belief. Those who accurately judged their performance level and had a high level of paranormal belief produced a higher control-based factor score (M = .18) than did those individuals who accurately judged their performance and had a low level of paranormal belief (M = -.16). The pattern for those who overestimated their performance was opposite that of the participants in the accurate group. Those who overestimated and reported a high level of belief produced a mean factor score of -.26 compared to a mean of .20 produced by the participants in the low belief group. No noticeable interaction was observed between participants performance estimates and desire for control, F (2, 162) = .06, $p > .05$.

If illusion of control is a unidimensional phenomenon, then one would expect to

observe a similar interaction pattern between judgments obtained from all three induction conditions and moderating variables such as belief in the paranormal.

Figure 3 The Interactive Effects of Paranormal Belief and Performance Estimates on Die and Coin Tasks on Control-Based Behavior

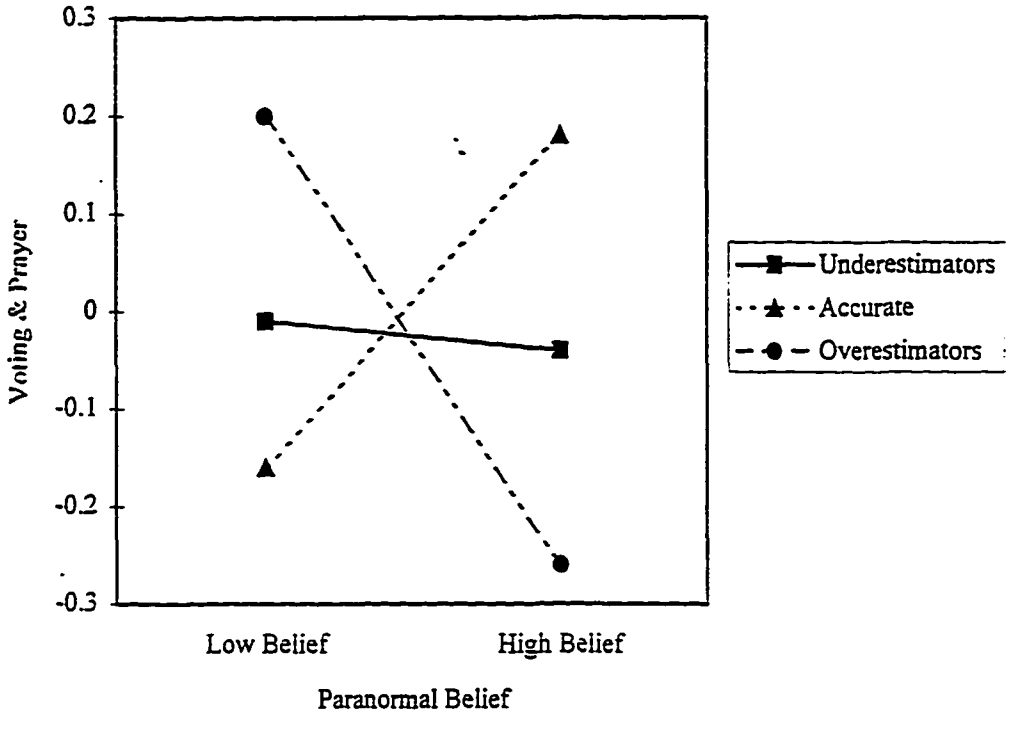


Figure 4 shows the interaction between paranormal belief and contingency judgments from the time-line tasks on control-based behavior, F (2, 162) = .34, $p > .05$. A comparison of the interactions between belief in the paranormal and accuracy judgments on the coin and die tasks and the time-line tasks lends support to the conceptualization of illusion of control as a multidimensional phenomenon. Whereas Figure 3 shows that overestimators and accurate judges on coin and die tasks reversed their control-based behavior scores as a function of paranormal belief, Figure 4 shows that the patterns for the two groups were similar when paranormal belief interacted with time-line contingency judgments.

Figure 4 The Interactive Effects of Paranormal Belief and Contingency Judgments from the Time-line Tasks on Control-Based Behavior

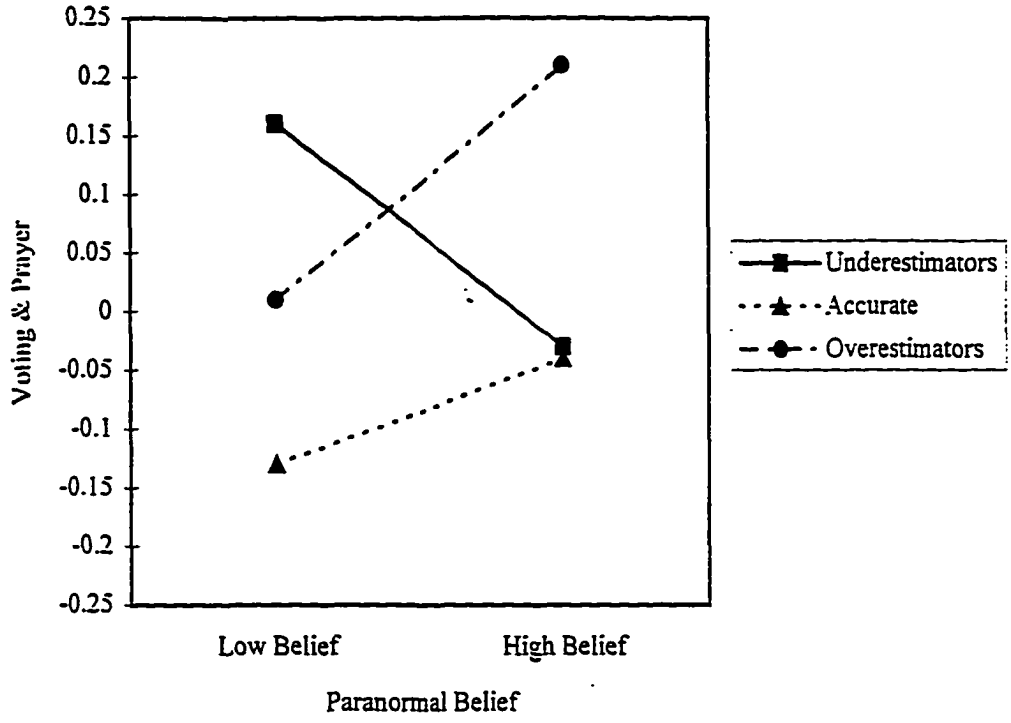
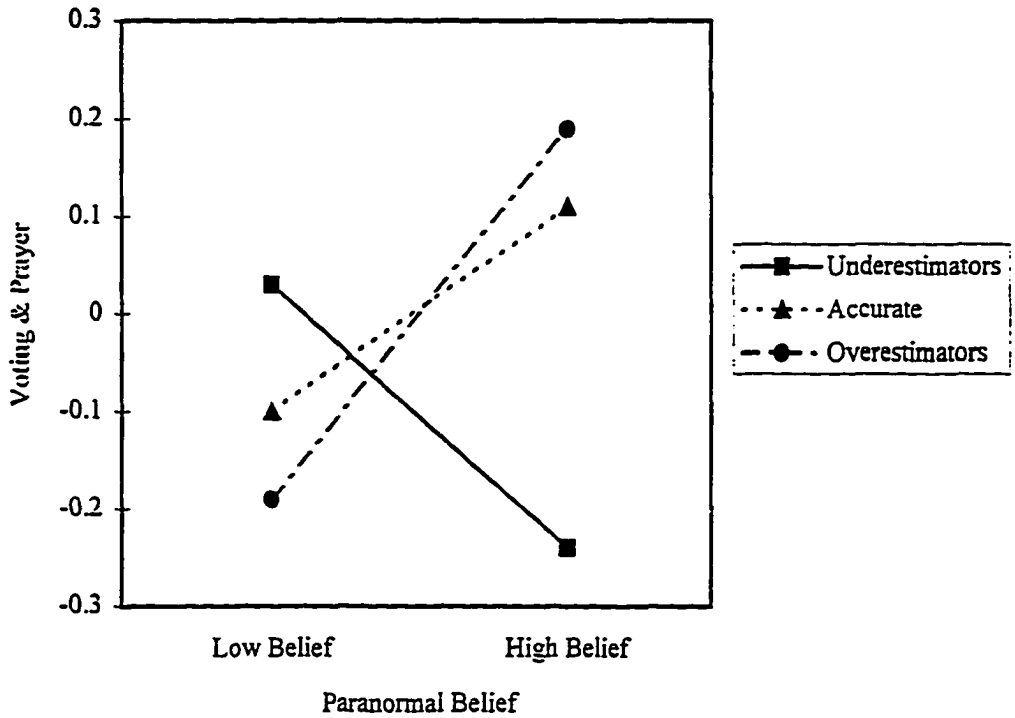


Figure 5 shows that with regard to control-based behavior, paranormal belief interacted with accuracy scores from the key and light task in a similar manner as with judgments from the time-line tasks, F (2, 168) = 2.03, $p < .05$. No noticeable interaction was observed between participants time-line contingency judgments and desire for control, F (2, 162) = .92, $p > .05$. or key and light scores and desire for control, F (2, 162) = .51, $p > .05$.

Not surprisingly, level of belief in the paranormal was the best predictor of belief-based behavior, F (1, 160) = 17.90, $p < .05$. No noticeable interaction was observed between paranormal belief and coin and die task performance estimates, F (2, 162) = .46, $p > .05$, between belief and time-line contingency judgments, F (2, 162) = .30, $p > .05$. or between belief and key and light task scores, F (2, 162) = .19, $p > .05$. Likewise, no

interactions were found between desire for control and coin and die task performance estimates, F (2, 162) = .17, p > .05, between belief and time-line contingency judgments, F (2, 162) = .25, p > .05, or between belief and key and light task scores, F (2, 162) = .34, p > .05.

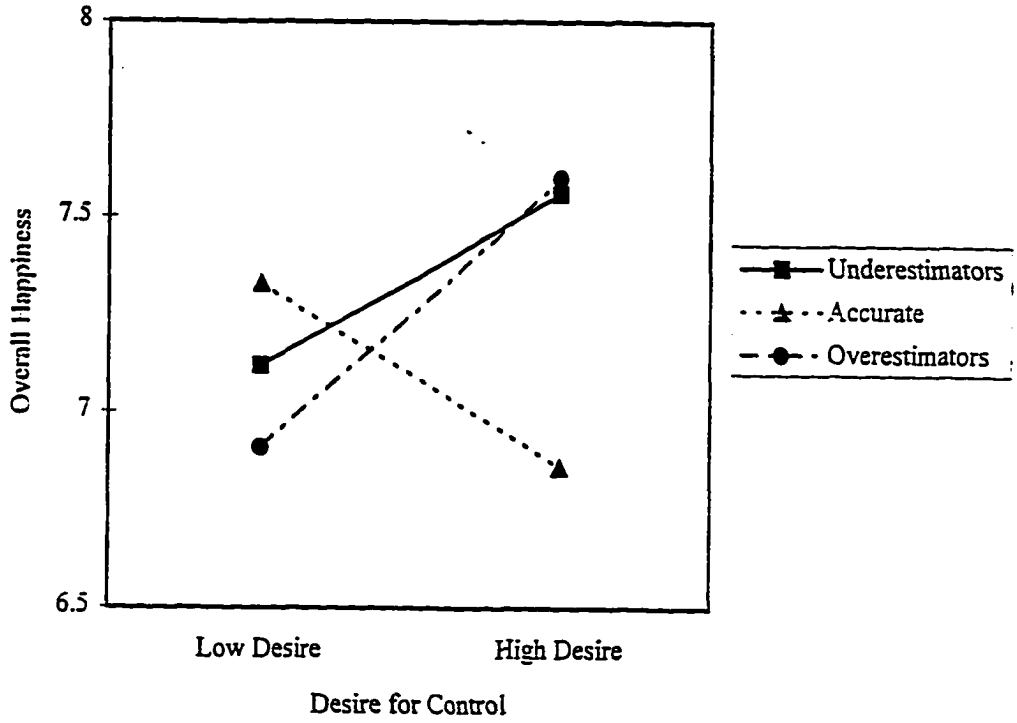
Figure 5 The Interactive Effects of Paranormal Belief and Contingency Judgments from the Key & Light Tasks on Control-Based Behavior



Freedman (1978) found that beliefs about personal control played a role in one's overall level of happiness. In the current study, overall happiness did not differ significantly as a function of desire for control, F (1, 168) = .05, p > .05, level of paranormal belief, F (1, 168) = .53, p > .05, accuracy scores from the die and coin tasks, F (2, 168) = .90, p > .05, the time-line tasks, F (2, 168) = 1.21, p > .05, or the key and light task, F (2, 168) = 1.95, p > .05. No interaction was found between desire for control and paranormal belief, F (1, 168) = .21, p > .05.

Accuracy scores on the time-line contingency tasks interacted with desire for control to predict overall happiness (see Figure 6), $F(2, 168) = 4.25$, $p < .05$.

Figure 6 The Interactive Effects of Desire for Control and Time-line Contingency Judgments on Reports of Overall Happiness

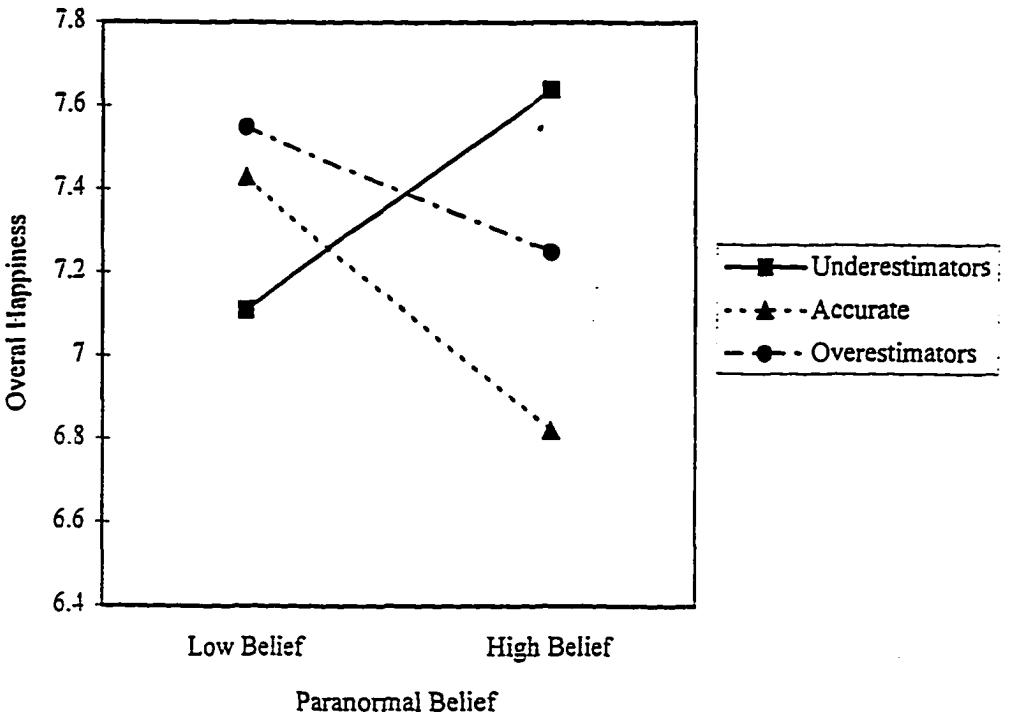


Participants reporting a low desire for control did not differ noticeably on overall happiness. In contrast, those individuals reporting a high desire for control who accurately judged the contingency level on the two time-line tasks reported a lower overall happiness score than either the overestimators or underestimators. These findings lend a degree of support for Taylor and Brown's (1988) notion that illusory perceptions of control are associated with greater happiness, but only when one is motivated by a high desire for control. In addition, Taylor and Brown's theory only included those who overestimate their level of personal control. Perhaps more importantly, the current findings add further support to Burger and Cooper's (1979) theory that one's desire for

control interacts with perceptions of situational variables to produce differences in behavior, in this case, reports of overall happiness.

Figure 7 shows that accuracy scores from the time-line contingency tasks interacted with paranormal belief in a somewhat similar manner as with desire for control, $F(2, 168) = 4.07$, $p < .05$. The most noticeable difference can be seen among those participants who overestimated the contingency level. Those who reported a low level of paranormal belief reported being happier overall than did those in the high belief group.

Figure 7 The Interactive Effects of Paranormal Belief and Time-line Contingency Judgments on Reports of Overall Happiness



Participants' performance estimates on the die and coin tasks did not interact with either paranormal belief or desire for control, $F(2, 168) = .35$, $p > .05$ and $F(2, 168) = .38$, $p > .05$, respectively. No significant interactions were found between accuracy scores

from the key and light task and either paranormal belief or desire for control, F (2, 168) = .98, $p > .05$ and F (2, 168) = 1.04, $p > .05$.

As in Study 1, the present study showed that illusion of control is a multidimensional phenomenon. In addition, the current results showed that illusory judgments include those that are lower than the objective odds would warrant. Moderating variables interacted differentially with type of illusory judgment as well as direction of illusion. Previous researchers may have missed or underestimated their magnitude of effect by failing to remove underestimators from the nonillusory of control group.

CHAPTER IV

GENERAL DISCUSSION

Langer (1975) defined an illusion of control as an estimate of the probability of personal success higher than objective probability would warrant. She argued that one's judgment of personal control is not determined by the objective contingency between one's behavior and the task outcomes. Rather, she claimed that it is the presence of skill-related factors that often blurs the distinction between chance- and skill-oriented events. She also claimed that in any chance-oriented situation, skill-related factors make the event appear more like a skill-oriented situation and increase the likelihood that an individual will perceive the event as personally controllable. Langer and Roth (1975) argued that humans are so strongly motivated to control life events that even the presence of a single skill-related cue is enough to induce an illusion of control.

Since Langer's (1975) introduction of the illusion of control concept, the basic research paradigm has remained unchanged. All participants are presented with a chance-oriented task. One group is exposed to what Langer referred to as skill-related factors. Skill-related factors are those that are commonly associated with improved performance on skill-related tasks (e.g., practice, choice, involvement). After completion of the task, a behavioral measure is assessed (e.g., money wagered, performance on the task estimated, future performance predicted). Based on observed differences in these behavioral measures, Langer and other researchers have inferred differences in participants'

perceptions of personal control over the task outcomes.

Although not directly claimed, experimental design and the conclusions derived from them have suggested that the type of experimental task was more or less irrelevant to the illusion induction. Illusion of control research was conducted as if all that was required to produce an illusion of control was the introduction of skill-related factors into any chance-oriented task. Also, a person who is susceptible to one illusion induction condition would also be susceptible to other induction conditions.

The results of Study 1 challenged the commonly held assumption that illusion of control is a unidimensional phenomenon. By presenting participants with multiple experimental tasks, I addressed the question of whether the introduction of skill-related factors into all experimental tasks tap into a single process resulting in an illusion of personal control. A factor analysis of the dependent measures supported a multidimensional conceptualization of illusion of control in that two factors emerged. The present research indicated that different tasks tap into different judgmental processes. Individual differences on performance estimates on tasks such as the coin flip and die toss were associated with difference in paranormal belief whereas judgments on the key and light contingency task were not.

Study 2 confirmed the multifactor structure observed in Study 1 in that the coin and die tasks were distinguished from the contingency tasks. The three factor structure that distinguished contingency judgments on the key and light task from those on the time-line tasks indicated that apparently similar tasks can tap into different processes. In Study 2 I examined the notion that, like overestimators, individuals who report judgments lower

than the objective odds would warrant are also illusory. The results showed that, although the judgments of underestimators and overestimators were often equally deviant compared to accurate participants, they often demonstrated different behavior patterns. Langer (1975) limited her definition of what constitutes illusion to overestimators and, in doing so, possibly missed identifying the entire range of effects associated with illusory judgments. The findings presented in this paper show that some illusory judgments are associated with control issues, such as desire for control. However, the present paper extends findings of previous researchers to include the notion that illusory judgments are multidimensional and that research into this area has a wider range of implications than previously demonstrated.

The finding that various types of illusion inductions interact differentially with certain moderating variables suggests that researchers may overlook the effects of certain well designed induction tasks due to a failure to account for individual differences in factors such as paranormal belief and desire for control. Future researchers should attempt to identify additional moderating variables such as self-efficacy and self-esteem.

Illusion of control effects have been found across a wide variety of tasks and in many different situations. However, some researchers have questioned whether the vast body of illusion of control research has addressed a single underlying construct (see Presson & Benassi, 1996). Until now, Rothbaum, Weisz, and Snyder (1982) were the only researchers who had proposed a multidimensional model of the illusion of control phenomenon. Although they agreed with Langer (1975; Langer & Roth, 1975) that humans are strongly motivated to control their environment and this motivation may cause

individuals to perceive control in chance-oriented situations, they differentiated between perceptions of primary control and secondary control. Primary control refers to a person's efforts to directly influence the environment. Secondary control refers to one's attempt to control a situation by aligning oneself with powerful external forces such as chance. Rothbaum and his colleagues argued that illusion of control theorists have limited their conceptualization of control to primary control only and have virtually ignored secondary control.

Researchers interested in illusory control as defined by Langer (1975) might profit if they focus their measures on perceptions of direct personal influence over outcomes -- i.e., primary control. This is not to say that Rothbaum's concept of secondary control should be dismissed. After all, if people who appear to be relinquishing control to chance, fate, or other external forces are actually attempting to maintain control through an alliance with what are perceived to be controlling agents, then theorists will need to rethink their conception of personal control and, perhaps more important, how they define illusory perceptions. I believe that the distinction between primary and secondary control is an interesting one and should be addressed in future research. However, for purposes of this paper, control was conceptualized in terms of actions or choices that have a direct influence on the environment.

Langer (1975) and other illusion of control researchers have claimed that the presence of skill-related factors blurs the distinction between chance- and skill-related events. In contrast, Rothbaum et al. (1982) argued that most people are quite capable of accurately perceiving the chance nature of situations. It is the perception of the role that

chance plays in the outcome of an event that provides one with the opportunity to exert secondary control. It is by recognizing that chance is the controlling factor and aligning oneself with it that one is able to maintain a degree of control over the situation. Rothbaum and his colleagues acknowledged the fact that in some chance-oriented situations people's illusory judgments may reflect perceptions of their level of personal control. They suggested, however, that in most cases, an illusion of control may involve aspects of both primary and secondary control.

The results of Study 1 support the hypothesis that illusion of control is not a unidimensional construct. They indicated that at least two forms of illusory perceptions exist. One form of illusory perception was associated with one's level of belief in paranormal phenomena, the other was based on one's ability to accurately judge contingencies. Although the results of Study 1 do not support Rothbaum et al.'s (1982) suggestion that most people can accurately judge the lack of contingency in chance situations, they do show that even when participants were all given the illusion of control induction, they responded with an extreme range of judgments. These results suggest that all induction techniques do not evoke the same underlying process. Instead of illusion of control, Presson and Benassi (1996, p. 14) suggested that illusory judgment is a more appropriate label for the phenomena presented in this area of research.

Rothbaum et al. (1982) claimed that secondary control is evidenced by the fact that people often treat chance as a powerful external agent. They argued that this can be seen in people's belief in supernatural powers, psychics, and astrology. Study 1 demonstrated that paranormal belief is a key factor in one type of illusory judgment. Also, belief-based

illusions were shown to differ from contingency-based illusions primarily in that belief did not play a role in determining whether or not participants proved to be susceptible to illusory contingency judgments. These findings lend support, at least in part, to Rothbaum et al.'s multidimensional concept.

Methodological Implications

Alloy and Clements (1992) examined whether individual differences in susceptibility to an illusion of control induction condition predicted subsequent depressive symptoms following naturally occurring stressors. They concluded that an illusion of control decreased the likelihood that participants would experience an increase in depressive symptoms one month following the initial experimental session. Their conclusion was reached after exposing participants to an illusion induction condition similar to the key and light task used by Alloy and Abramson (1979) and in the current paper. In Alloy and Clements' study, the trials were presented on a computer screen and participants were to judge how much control their responses (pressing or not pressing the space bar) had on the appearance of a white square. The computer was programmed to present the white square on 20 of the 40 trials. The trials on which the white square was presented were selected randomly by the computer program. Participants were told that they would receive a quarter each time the square came on the screen so it was in their best interest to learn how to influence its appearance. Because all participants were presented with the white square on 50% of the 40 trials, all won $5.00 noncontingently.

Following the completion of the task, participants were asked to indicate the degree of control their responses had over the onset of the white square by placing an X

on the Judgment of Control Scale (Alloy & Abramson, 1979). The scale ranged from 0 to 100 in units of 5, with 0 labeled no control and 100 labeled complete control. The 50% point was labeled intermediate control. According to Alloy and Clements (1992), because the appearance of the white square was not contingent on the participants' responses, the higher their judgment of control, the greater the illusion of control they showed. Participants' level of depression was assessed twice, at the initial session and one month later. In a prospective design in which stress level and initial level of depression were statistically controlled for, Alloy and Clements found that illusion of control interacted with number of negative life events to predict subsequent depressive symptoms one month after the initial session. They concluded that an illusion of control served to protect participants from increases in depressive symptoms after experiencing a high number of stressors during the one month interval between experimental sessions.

Based on the findings of the present paper, one could argue that the effects observed by Alloy and Clements (1992) could have been missed had they used a different induction condition. For example, in Study 2 I found that belief-based behavior increased significantly as a function of accuracy scores on the key and light contingency task. However, scores from the time-line contingency tasks were not associated with differences in belief-based behavior. Therefore, it is possible that even a different contingency task would have failed to produce the differences in subsequent depression found by Alloy and Clements.

Alloy and Clements (1992) explicitly defined an illusion of control as a person's judgment of control over an uncontrollable outcome. The uncontrollable outcome in their

study was the onset of a white square on a computer screen. As mentioned earlier, the computer was programmed to present the white square on 50% of the 40 trials regardless of the participants' responses (pressing or not pressing the space bar). Thus, in actuality, the outcome was uncontrollable and the higher one's judgment of control, the greater the illusion of control being demonstrated. However, in order for the researchers to know that a participant has experienced a zero contingency task, they must take into account the number of trials on which the participant pressed the space bar and received the outcome as well as the number of trials on which the bar was not pressed and the outcome was presented. For example, if the participant pressed on 10 of the 40 trials and did not press on 30 and then received the white square on five of the press trials and 15 of the no-press trials, then the actual contingency of the task would be zero. However, if that same participant received the white square on eight of the 10 press trials and 12 of the no-press trials, then the actual contingency would be 40%. Alloy and Clements' computer was programmed to present the white square on 20 randomly selected trials. Depending on the number and pattern of space bar presses, the actual contingency level of the task could theoretically range from 0 to 100%.

In Study 2, the key and light contingency task, which is similar to the one used by Alloy and Clements (1992), consisted of a relay apparatus which was programmed to deliver a 70% probability of an outcome presentation on each key press trial and a 70% probability of an outcome on each no-press trial. Ideally, participants experienced a zero contingency task. Table 9 shows the range of actual contingencies observed. The actual contingencies ranged from 0 to 60%, with only 6 out of 180 cases at 0%. Of the 182

participants in Study 2, 67 judged the key/light contingency as 0% and only two were accurate.

Of the 67 who reported 0% contingency, 20 underestimated actual contingency by at least 20%.

If I had employed Alloy and Clements' criteria for determining illusory judgments, two of the five participants who received the 20% contingency would have been misclassified. One correctly judged the contingency level and, therefore, should have been included in the accurate group. Another reported the contingency as zero and would have been classified as completely accurate even though she had underestimated the contingency by 20%. The extreme judgment in Study 2 was 70% and, according to Alloy and Clements, would be the most illusory participant. The actual contingency experienced by that particular participant was 60.87% . Therefore, her actual degree of overestimation was 9.13% rather than 70%. The effect found by Alloy and Clements may have been even greater had they removed those participants who underestimated the contingency level and included those individuals who were accurate but were classified as illusory. On the other hand, Alloy and Clements' (1992) findings may have been due to participants' judgments of control whether illusory or not. Perhaps it was the judgment of control that protected the participants from subsequent depressive symptoms. If true, then their method of measure of control is fine but it isn't necessarily illusory and may have disappeared had they actually measured degree of illusory judgments.

Table 9 Actual Contingencies from the 70/70 Key and Light Task Used in Study 2

Contingency	Frequency	Contingency	Frequency	Contingency	Frequency
.00	6	14.69	2	32.86	1
.70	1	15.56	1	33.33	5
1.43	1	15.71	5	34.27	1
2.10	1	16.18	1	34.29	2
2.22	3	16.67	6	35.29	1
2.80	1	17.39	1	37.50	2
2.86	1	17.48	2	38.89	1
3.16	1	17.78	4	40.00	1
3.50	3	18.18	1	41.43	3
4.20	1	18.57	1	43.75	1
4.29	1	18.75	2	45.00	1
4.44	5	18.88	1	48.57	1
4.90	2	19.05	1	50.00	1
5.04	2	19.33	1	52.86	1
5.56	2	20.00	5	53.33	1
5.71	1	20.28	2	60.87	1
6.25	4	20.98	1		
6.29	1	21.43	1		
6.67	4	22.22	6		
6.72	3	22.38	2		
7.14	1	22.86	1		
7.56	1	23.08	1		
8.33	9	23.81	1		
8.57	4	24.29	1		
8.89	1	24.44	2		
9.09	1	25.00	3		
10.00	1	25.71	1		
10.49	1	26.57	1		
11.03	1	27.78	1		
11.11	2	27.97	2		
11.19	2	28.57	2		
11.43	4	29.37	1		
11.58	1	30.07	2		
12.50	3	30.43	1		
12.59	1	31.09	1		
12.61	1	31.11	2		
12.86	1	31.25	1		
13.29	1	31.43	1		
13.99	1	31.47	1		
14.29	2	31.58	1		

Study 2 showed that underestimators often behave differently than do accurate judges of contingencies. Alloy and Clements (1992) may have missed an additional aspect of their study by failing to identify participants who underestimated the contingency level.

The present paper identified two types of illusory judgments. Future research should examine other induction conditions, such as the gambling tasks used by Langer (1975) as to additional processes that result in illusory judgments. Also future research should further examine the role of what Langer referred to as "intrusions of reality." In their meta-analysis, Presson and Benassi discovered that some researchers informed their participants of the possible chance nature of the task outcomes while others did not. None, however, manipulated this variable. Langer claimed that factors that draw the person's attention toward the chance aspects of the situation can suppress the illusion induction conditions. It would be interesting to discover whether intrusions of reality can suppress underestimations as well as overestimations.

In conclusion, the results of this paper showed that illusion of control is a more complex phenomenon than previously thought. The theoretical assumption that the conditions under which an illusion of control can be induced are interchangeable and one's susceptibility to such an induction is common to all conditions needs to be reexamined. In addition, the idea that the effects observed from the induction conditions are the result of a change in one's perception of personal control is at best an overstatement, and at worst, totally incorrect. The results of the current paper suggest that illusion of control type effects are the result of at least three processes, one of which involves personal control. In addition to the three factors observed in the current paper, others probably exist. Although

there is little doubt that the traditional illusion of control paradigm produces a consistent effect, researchers may be missing certain aspects of the complex phenomenon by treating it as unidimensional. Researchers would benefit from identifying the full range of processes that result in illusory judgments. I will close by restating the suggestion of Presson and Benassi (1996) that illusion of control be relabeled as illusory judgments because of its allowance for a wider range of processes.

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APPENDIX

APPENDIX A

GENERAL BELIEF IN THE PARANORMAL SCALE

After reading each of the 20 statements below, indicate your degree of agreement with its contents using the following rating scale:

1 = strongly disagree
2 = disagree
3 = undecided
4 = agree
5 = strongly agree

PUT RATING HERE

_____ 1. It is likely that many phenomena such as ESP (Extra Sensory Perception) will one day be proven to exist.

_____ 2. I believe that, at least on some occasions, I can read another person's mind through ESP.

_____ 3. ESP is a gift that many people have, and should not be confused with the elaborate tricks used by entertainers.

_____ 4. All of the reports of scientific proof for the existence of psychic phenomena are sensationalism with no factual basis.

_____ 5. With proper training anyone could learn to read other people's minds.

_____ 6. Plants can sense the feelings of humans through a form of ESP.

_____ 7. ESP has been scientifically proven to exist.

_____ 8. I believe that psychic phenomena are real.

_____ 9. Some people can make physical objects move or cause them to change shape by their powers of concentration.

_____ 10. Some people have the power to bend objects (e.g. spoons) with only their thoughts.

_____ 11. Some people can accurately predict the outcomes of dice throws.

_____ 12. There may be some validity to psychic phenomena.

_____ 13. With proper training, I could develop ESP.

_____ 14. I believe that I have precognitive ability.

_____ 15. I believe that I can project my thoughts to another person.

_____ 16. Dice throwing depends entirely on chance.

_____ 17. Some people can accurately visualize things before they happen.

_____ 18. If I concentrate enough I could learn to bend objects (e.g. spoons), using only my thoughts.

_____ 19. Premonitions never have a psychic basis to them.

_____ 20. If I wanted to see what the future had in store for me, I could use tarot cards or an astrology chart.

APPENDIX B

BEHAVIOR QUESTIONNAIRE USED IN STUDY 2

1. On average, how many days a week do you read your horoscope?

   0 --- 1 --- 2 --- 3 --- 4 --- 5 --- 6 --- 7

2. To what extent do you believe that horoscopes are valid?

   _____ Completely Invalid
   _____ Very Invalid
   _____ Moderately Invalid
   _____ Slightly Invalid
   _____ Slightly Valid
   _____ Moderately Valid
   _____ Very Valid
   _____ Completely Valid

3. If given a choice when playing the state lottery, would you prefer to choose your own numbers or have your numbers chosen for you (computer generated)?

   _____ choose your own numbers _____ numbers are chosen for you

4. On average, how often do you pray?

   _____ Never
   _____ Very Seldom
   _____ Seldom
   _____ Occasionally
   _____ Often
   _____ Very often

5. How likely are you to vote in the upcoming presidential election?

_____ Definitely Will Not
_____ Very Unlikely
_____ Moderately Unlikely
_____ Somewhat Unlikely
_____ Unsure
_____ Somewhat Likely
_____ Moderately Likely
_____ Very Likely
_____ Definitely Will

6. On average, how often do you wear seat belts.

_____ Never
_____ Very Seldom
_____ Seldom
_____ About 1/2 of the time
_____ Often
_____ Very often
_____ Always

7. In general, over the past few months how happy have you been?

_____ Extremely Unhappy
_____ Very Unhappy
_____ Moderately Unhappy
_____ Slightly Unhappy
_____ Neutral
_____ Slightly Happy
_____ Moderately Happy
_____ Very Happy
_____ Extremely Happy

8. In general, over the past five years how happy have you been?

_____ Extremely Unhappy
_____ Very Unhappy
_____ Moderately Unhappy
_____ Slightly Unhappy
_____ Neutral
_____ Slightly Happy
_____ Moderately Happy
_____ Very Happy
_____ Extremely Happy

9. In general, during your life up to now how happy have you been?

_____ Extremely Unhappy
_____ Very Unhappy
_____ Moderately Unhappy
_____ Slightly Unhappy
_____ Neutral
_____ Slightly Happy
_____ Moderately Happy
_____ Very Happy
_____ Extremely Happy

10. How optimistic or pessimistic are you about your future?

_____ Very Optimistic
_____ Moderately Optimistic
_____ Slightly Optimistic
_____ Neutral
_____ Slightly Pessimistic
_____ Moderately Pessimistic
_____ Very Pessimistic

11. How much control do you think you have over the good things that happen to you in life?

_____ Great Deal of Control

_____ Moderate Amount of Control
_____ Only a Little Control
_____ Almost No Control

12. How much control do you think you have over the bad things that happen to you in life?

_____ Great Deal of Control
_____ Moderate Amount of Control
_____ Only a Little Control
_____ Almost No Control

13. Do you feel you life has meaning and direction?

_____ Yes, Definitely
_____ Yes, Moderately
_____ Yes, Somewhat
_____ No, Little or No Direction and Meaning

14. Here are parts of life that other people have considered important to their happiness. Consider each one and decide how important it is to your happiness. Rate each on the following 5-point scale:

1 = Not Important
2 = Slightly Important
3 = Somewhat Important
4 = Moderately Important
5 = Very Important

Financial Situation _____

Job or Occupation _____

Friends _____

Community (where you live) _____

Romantic Relationship in General _____

Being in Love _____

Being Loved _____

Sex Life _____

Marriage _____

Children _____

Achievement (of any kind) _____

Success in Career _____

Feeling of Accomplishment _____

Health _____

Religion (organized) _____

Religious or Spiritual Beliefs _____

15. Now rate the degree to which you feel these items can be controlled (in general, by anyone). Rate each on the following 5-point scale:

1 = No Control
2 = Little Control
3 = Moderate Control
4 = Considerable Control
5 = Complete Control

Financial Situation _____

Job or Occupation _____

Friends _____

Community (where you live) _____

Romantic Relationship in General _____

Being in Love _____

Being Loved _____

Sex Life _____

Marriage _____

Children _____

Achievement (of any kind) _____

Success in Career _____

Feeling of Accomplishment _____

Health _____

Religion (organized) _____

Religious or Spiritual Beliefs _____

16. Now rate how much personal control you have over each item. Rate each on the following 5-point scale:

1 = No Personal Control
2 = Little Personal Control
3 = Moderate Personal Control
4 = Considerable Personal Control
5 = Complete Control

Financial Situation _____

Job or Occupation _____

Friends _____

Community (where you live) _____

Romantic Relationship in General _____

Being in Love _____

Being Loved _____

Sex Life _____

Marriage _____

Children _____

Achievement (of any kind) _____

Success in Career _____

Feeling of Accomplishment _____

Health _____

Religion (organized) _____

Religious or Spiritual Beliefs _____

17. Now rate how much control you feel other people have over these items in your life. For example, how much control other people have over your financial situation. Rate each on the following 5-point scale:

1 = No Control
2 = Little Control
3 = Moderate Control
4 = Considerable Control
5 = Complete Control

Financial Situation _____

Job or Occupation _____

Friends _____

Community (where you live) _____

Romantic Relationship in General _____

Being in Love _____

Being Loved _____

Sex Life _____

Marriage _____

Children _____

Achievement (of any kind) _____

Success in Career _____

Feeling of Accomplishment _____

Health _____

Religion (organized) _____

Religious or Spiritual Beliefs _____

APPENDIX C

ZERO % CONTINGENCY TIME LINE USED IN STUDY 2 (67/67)

In the diagram below, each dash on the time line represents one unit of time. Time units come in pairs, which are separated from each other by a vertical line. The first dash in a pair is an opportunity for a response (Tap or No Tap) and the second is an opportunity for an outcome (Buzz or No Buzz). Thus, pairs of successive intervals can be of four types: Tap-Buzz (T B), Tap-No Buzz (T _), No Tap-Buzz (_ B), No Tap-No Buzz (_ _).

After carefully examining the time line below, please rate the relation between Kimbs tapping and the radio's buzzing, from "prevents the sound from occurring" to causes the sound to occur."

TB|_B|T_|T_|_B|TB|T_|_B|TB|__|TB|TB|_B|TB|_B|TB|_ _|__|T_ |__|_B|_B|TB|_B

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1	0	1 2 3 4 5 6 7 8 9 10
Prevents Sound	Has no Effect	Causes Sound

On the scale below, please circle the number that describes your degree of confidence that your judgment on the above scale is accurate.

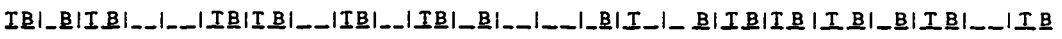
1	2	3	4	5
Not at all Confident		Moderately Confident		Completely Confident

APPENDIX D

50 % CONTINGENCY TIME LINE USED IN STUDY 2 (92/42)

In the diagram below, each dash on the time line represents one unit of time. Time units come in pairs, which are separated from each other by a vertical line. The first dash in a pair is an opportunity for a response (Tap or No Tap) and the second is an opportunity for an outcome (Buzz or No Buzz). Thus, pairs of successive intervals can be of four types: Tap-Buzz (T B), Tap-No Buzz (T _), No Tap-Buzz (_ B), No Tap-No Buzz (_ _).

After carefully examining the time line below, please rate the relation between Kimbs tapping and the radio's buzzing, from "prevents the sound from occurring" to causes the sound to occur."



-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

Prevents Sound — Has no Effect — Causes Sound

On the scale below, please circle the number that describes your degree of confidence that your judgment on the above scale is accurate.

1	2	3	4	5
Not at all Confident		Moderately Confident		Completely Confident