Journal of Personality and Social Psychology
1989, Vol. 56, No. 4, 531–542

0022-3514/89/$00.75

Effects of Deliberative and Implemental Mind-Sets on Illusion of Control

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Subjects completed a contingency learning task that involved estimating the degree of personal control exerted over target light onset. In Experiment 1, subjects worked on two identical apparatuses in an attempt to turn on the target light by pressing or not pressing a button. Both apparatuses produced noncontingent onsets of the target light either frequently or infrequently. Half of the subjects were told to alternate working on the two apparatuses before deciding on which apparatus they would be more successful in achieving target light onset. The other half were asked to first decide on a particular sequence of alternation between the two apparatuses and then try to achieve as many target light onsets as possible. The former showed rather accurate control judgments for both frequent and infrequent light onset conditions, whereas the latter subjects showed accurate control judgments in the infrequent light onset condition but inaccurate illusionary judgments in the frequent light onset condition. In Experiment 2, the first experimental group was asked to complete a mental exercise that requested the deliberation of an unresolved personal problem, whereas a second experimental group was requested to plan the implementation of a personal goal. Subjects in both groups were then asked to find out how to turn on the target light on an apparatus that produced frequent noncontingent outcomes. A control group worked on this contingency task without any pretreatment. The control judgments of the first experimental group were much more accurate than those of the second experimental group or the control group. Overall findings suggest that people who are trying to make decisions develop a deliberative mind-set that allows for a realistic view of action–outcome expectancies, whereas people who try to act on a decision develop an implemental mind-set that promotes illusionary optimism.

The ability to make accurate estimates of personal control over outcomes (i.e., void of optimistic biases or illusions) has generally been considered an indicator of normal human cognitive functioning. However, an extensive body of research (for a comprehensive review, see Alloy & Abramson, 1988) has revealed that healthy, nondepressed individuals claim to possess control over desired outcomes that occur noncontingent to subjects' actions, whenever these outcomes occur frequently. In conjunction with this unexpected finding, a debate (see Alloy & Abramson, 1988; Taylor & Brown, 1988) has been triggered over whether such unrealistic or inaccurate control inferences are to be viewed as adaptive or maladaptive.

In this article, we argue that illusionary optimism (in estimating personal control) promotes effective goal striving, whereas a realistic perspective is beneficial to sound decision making. Most important, we postulate that individuals who deliberate a decision readily adopt a realistic, accurate view of action–outcome contingencies, whereas individuals who focus on issues of implementation (in order to accomplish the chosen goal) are characterized by an illusionary, optimistic perspective.

Our conceptual analysis is guided by the Rubicon model of action (Heckhausen, 1986) that segments the course of action into various distinct phases. The action phases of immediate relevance to our argument are the predecisional phase and the postdecisional phase. According to this model, the *predecisional phase,* in which individuals contemplate whether to act on their wishes, is the starting point of the course of action. By making change decisions (i.e., choosing to pursue particular goals), individuals progress to the *postdecisional phase.* There, an obligation to accomplish the chosen goal is experienced and issues of proper implementation are addressed. This obligation ceases only when individuals either reach the intended goal or disengage from goal pursuit altogether, possibly because the chosen goal has become too difficult to attain or unattractive.

Heckhausen and Gollwitzer (1987; Gollwitzer & Heckhausen, 1987) postulated that attempting to solve the tasks characteristic of each of these phases elicits a distinct *mind-set.* Because predecisional individuals need to choose between goal options, they are expected to develop a *deliberative mind-set*[1]

We greatly appreciate the help of Gabi Dubbert and Erika Regnet in collecting the data. Thanks are due to Heinz Heckhausen, Peter Leppmann, Robert A. Wicklund, and three anonymous reviewers for the valuable comments made on earlier drafts of this article. Fiorello Banci, Karl-Heinz Honsberg, and Markus Lutz constructed the hardware and wrote the software for the contingency task.

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[1] In other places, we labeled the deliberative mind-set the *motivational state of mind.* We did this in recognition of expectancy value theorists of human motivation, who postulate that people who try to make a decision deliberate on expected value and action–outcome expectancy. Similarly, we referred to the implemental mind-set as the *volitional state of mind.* This was intended as a tribute to German will psy-

that tunes cognitive functioning toward the potential positive and negative consequences of achieving the intended goal (expected value), as well as the likelihood of reaching that goal (action–outcome expectancy). Because postdecisional individuals attempt to promote goal attainment, an *implemental mind-set* is expected to emerge that gears cognitive functioning toward issues such as when, where, and how to act on the chosen goal.

Recent research supports the assertion that predecisional subjects and postdecisional subjects focus, as a rule, on these fundamentally different kinds of information, respectively. In a thought-sampling study (Heckhausen & Gollwitzer, 1987, Study 1), subjects who were interrupted just prior to making a decision listed more thoughts related to action–outcome expectancy and expected value than subjects who were interrupted immediately after they had made a decision; the reverse was found for thoughts related to implemental issues. Predecisional subjects also memorized information related to expected value better than information related to implemental issues, whereas postdecisional subjects showed superior memory performance for implementation-related information (Gollwitzer, Heckhausen, & Steller, 1987, Study 2).

However, simply focusing one's attention on expected value or action–outcome expectancy is not sufficient to ensure sound decisions. Similarly, concentrating only on when, where, and how to act on a decision does not guarantee the achievement of chosen goals. Rather, how individuals process such key predecisional and postdecisional information is critical to sound decision making and effective goal attainment. Sound decisions require that the associated positive and negative consequences be analyzed in an impartial manner so as to avoid, for example, rash decisions or judgments stemming from a one-sided focus on only positive consequences. In addition, sound decisions must be based on an accurate analysis of information relevant to action–outcome expectancies in order to prevent, for instance, the choosing of goals that are perhaps too difficult to achieve.

Accordingly, we postulate that the deliberative mind-set orients people toward a realistic scrutiny of available information, thus hindering illusionary optimism with respect to action–outcome expectancies and favoring an impartial analysis of both the positive and negative consequences of a particular decision. The initial research (Gollwitzer & Heckhausen, 1987, Studies 2 and 3) on this issue revealed that subjects who were asked to consider making a change decision with respect to an unresolved personal problem actually showed impartiality. Although subjects first thought exclusively about positive consequences, they quickly came up with a counterplea that pointed to the negative consequences. However, no research, to our knowledge, has tested the postulated accuracy of action–outcome expectancies.

After the decision to pursue a certain goal has been made, successful goal attainment requires that one focus on implemental issues. Accordingly, negative thoughts concerning the desirability and attainability of the chosen goal should be avoided, because they would only undermine the level of determination and obligation needed to adhere to goal pursuit. An effective way to suppress such thoughts would be to construe the goal's desirability and attainability in a positive light. That is, people in an implemental mind-set are expected to emphasize the positive consequences and disregard the negative consequences of goal attainment; moreover, an implemental mind-set should yield optimistic estimations of the degree of personal control over intended outcomes.

The hypothesis that postdecisional individuals emphasize the positive aspects of the chosen alternative and minimize the negative aspects has received ample support in studies investigating postdecisional dissonance reduction (Wicklund & Brehm, 1976, chap. 5). Jones and Gerard (1967, chap. 5, pp. 180–181) spoke of an "unequivocal behavior orientation" as a product of such a positive bias. Postdecisional individuals were also found to selectively expose themselves to information that highlights the positive aspects of the chosen alternative (Frey, 1986). However, the question of whether postdecisional estimates of action–outcome expectancy are also positively biased, in the sense of overestimation, remains unanswered.

In the present two studies, we explored the thesis that a deliberative mind-set induces accuracy in estimating action–outcome expectancy, whereas an implemental mind-set produces illusionary optimism. An adequate test of these hypotheses required, as a dependent measure, a task that allowed for objective assessment of the accuracy of subjects' action–outcome expectancies. We chose a contingency learning task designed by Alloy and Abramson (1979), in which subjects perform numerous trials on a single stimulus apparatus. In this task subjects are to determine the degree to which they can influence the onset of a target light (intended outcome) by choosing to press or not press a button (alternative actions). By observing whether the target light turns on, subjects are asked to form a judgment of action–outcome contingency (i.e., estimate how much influence or control they had over target light onset). The experimenter can vary the actual degree of control by manipulating the frequency of light onset associated with each of the two action alternatives (pressing or not pressing). The smaller the difference between these two frequencies, the less objective control subjects have over target light onset.

By placing subjects into the pre- or postdecisional action phase and ensuring that they tackle the respective tasks of choosing between action goals or implementing the intended goal, it should be possible to create a deliberative or an implemental mind-set. The deliberative mind-set should become more pronounced when people thoroughly contemplate the choice of an action goal. Similarly, a stronger implemental mind-set should emerge when individuals become highly involved in the pursuit of the chosen goal. In order to induce pronounced deliberative and implemental mind-sets in Experiment 1, we modified the Alloy and Abramson (1979) paradigm by adding a second apparatus and by asking subjects to work on five sets of 20 trials.

To create a deliberative mind-set, the experimenter told subjects that their objective in the first part of the experiment would

chology, which had its heyday at the turn of the century. Along with William James, theorists in this tradition referred to the willful implementation of an action goal as a problem of volition.

be to decide (on completion of the five sets) which of the two available apparatuses they wanted to use during the second part of the experiment. Subjects were instructed to base their decision on whether they found it easier to accomplish frequent light onset with Apparatus A or Apparatus B, because the second part of the experiment would require that they try to accomplish as many light onsets as possible. To stimulate thorough deliberation, subjects were encouraged to alternate between the two apparatuses. They were told to complete a set of 20 trials on one apparatus before deciding whether to continue using the same apparatus or switch to the other for the next set. We attempted to create an implemental mind-set by having subjects decide on the sequence of alternation between the apparatuses with respect to all five sets of trials before starting the first set. To stimulate a strong implemental orientation, the experimenter asked subjects to try to accomplish as many light onsets as possible.

There is ample evidence (Alloy & Abramson, 1979, Study 2; Benassi & Mahler, 1985, Studies 1 & 2; Vázquez, 1987, Study 2) that nondepressed individuals make rather accurate control judgments when noncontingent outcomes occur infrequently (e.g., in the 25–25 problem, the target light comes on in 25% of pressing and in 25% of nonpressing actions) but that they overestimate their degree of control when noncontingent target light onsets are frequent (the 75–75 problem). Apparently, subjects falsely assume that a high frequency of intended outcomes is indicative of control over their onset. We therefore chose a contingency schedule that presented noncontingent but frequent outcomes (i.e., the 75–75 problem) and hypothesized that individuals within a deliberative mind-set would be less vulnerable than implemental mind-set subjects to making inaccurate control estimates. We also explored whether subjects operating within an implemental mind-set would show an illusion of control not only when working on tasks with frequent noncontingent outcomes but also on tasks with infrequent noncontingent outcomes. That is, their obligation toward goal achievement may even compel them to hold up illusionary optimism in situations in which (noncontingent) light onset seldom occurs. Accordingly, we added a 25–25 problem condition.

Experiment 1

Method

Subjects

Sixty-four male students at the University of Munich participated in the study in exchange for DM 15 (approximately $8). A wide range of academic majors was represented. The average age of the sample was 24.6 years.

Experimental Design

The experiment was a two-factor between-subjects design with two levels for each factor. Subjects either worked on the infrequent light onset or on the frequent light onset problem. In the infrequent light onset problem, the target light came on 25% of the time when the button was pressed and 25% of the time when it was not pressed (the 25–25 condition). In the frequent light onset problem, the target light came on for 75% of the press and nonpress actions (the 75–75 condition). In addition, the experimenter told subjects to freely alternate between the two available apparatuses after each set of trials in order to determine the one on which they were more successful in achieving light onset (deliberative mind-set condition), or they were asked to decide on a certain pattern of alternation between apparatuses before trying to achieve as many light onsets as possible (implemental mind-set condition).

Dependent Measures

The major dependent measure was subjects' judgment of control over light onset, obtained for each of the five sets of 20 trials. Subjects were presented with a scale marked off in increments of 5 ranging from 0% to 100%, which were labeled *no control* and *high control*, respectively; the 50% mark was labeled *intermediate control*. Subjects placed an *X* on the scale to indicate the degree of control their actions (pressing or not pressing the button) had over the appearance of the target light. Subjects also rated their degree of certainty in the accuracy of their control judgments, using a 10-point scale with endpoints labeled *not certain* (0) and *very certain* (10).

Apparatuses and Materials

The contingency task was conducted in a two-room suite. Stimuli were presented on two separate but identical upright metal display panels (23 cm × 23 cm) facing the subject and placed slightly to the subject's right and left, respectively. A green and a red light were positioned 5 cm from the top of both panels, equidistant from the vertical center, and 11.5 cm apart. The push-button apparatuses consisted of two metal boxes, identical in size (5.5 cm × 7 cm × 4 cm), with a spring-loaded black button located in the center of the top and a miniature pilot lamp in the upper left-hand corner of the top. One box was positioned in front of each display panel and connected by an electrical cord.

A third vertical display panel (25 cm × 25 cm) was also used that was made of wood, covered with a white magnetic surface, and divided into five equal-sized (5 cm × 5 cm) quadrants positioned 5 cm from the top of the panel and aligned horizontally across the entire width of the panel. The panel was placed to the far left facing the subject and was used to display round white magnets embossed with either the letter *A* or *B*, representing the two stimulus display panels. All of the equipment just described was located in the experimental cubicle.

The degree of contingency between the subject's actions (press or no press) and the outcome (light onset or no light onset) was preprogrammed using a microcomputer.[2] The computer controlled stimulus

[2] In attempting to establish nearly constant and identical action–outcome contingency for each of the action alternatives (pressing and not pressing), we encountered the problem of attaining a prescribed contingency even though subjects' pressing behavior was unpredictable. Two possible procedures were considered in order to overcome this problem and accomplish our objective: randomizer and algorithm. We chose not to use a randomizer, because pilot studies revealed that the actual contingency generated often varied from the prescribed contingency, depending on subjects' pressing behavior and chance. By applying an algorithmic program, however, the deviation of the actual contingency from the prescribed contingency approaches zero even after few trial runs (<15).

Whether light onset occurred on any given trial was determined in the following fashion. After subjects had acted (i.e., press or no press), the actual contingency between this action and light onset (up to this point in time) was instantaneously calculated. Prescribed contingency for press and no press is, for example, 75% light onset (the 75–75 problem). Assuming that the actual contingency of light onset (for the action just executed) would amount to 80% if light onset should occur on this trial, and the actual contingency of light onset (for the action just exepresentation and recorded subject's actions, as well as whether these actions were followed by presentation of the red light. The experimenter communicated with subjects by use of a two-way intercom system. This equipment was located in the control room.

Procedure

Subjects were tested individually. When the subject arrived at the institute, he was greeted by a female experimenter (Experimenter 1) who explained that the study was designed to explore how much control the subject could gain over certain action outcomes. The subject was then escorted to the experimental room and seated in front of the two contingency apparatuses. Subjects in the deliberative mind-set condition were read the following instructions over an intercom system:

> Facing you are two apparatuses, *A* and *B*. Each apparatus is equipped with a green and red light and is connected to a black push button. During the first part of the experiment, your task is to find out on which of the apparatuses you can more readily influence the appearance of the red light. To do so, you can either choose to press the button or not press the button and observe whether light onset occurs. Some people do better on Apparatus A, others on Apparatus B. You should choose the apparatus on which you feel you have comparatively more control over light onset. In the second part of the experiment, you'll be allowed to work on the apparatus of your choice, and your task will be to maximize the onset of the red light.
>
> In Part 1, you will work on five sets, consisting of 20 trials each. A set lasts approximately 5 min and is to be completed on the apparatus on which it was started. Once you have decided with which apparatus you want to start and have completed the first set, you have the option of either staying with that apparatus or switching to the other. Similarly, after each set of trials you will be given the opportunity to switch apparatuses. There are many different sequences possible (e.g., AABBA or BABAB). After finishing each set, you will be asked whether you want to continue with the same apparatus or switch to the other. It may be possible to learn more about the degree of control you have over one apparatus if you switch to the other; yet it may be better sometimes to continue working on the apparatus on which you have just completed a set of trials.
>
> Facing you to your left, you will find a board divided into five consecutive squares representing the five sets of 20 trials, as well as 10 magnets, five of which are marked with the letter *A* and five with the letter *B*. After you have decided with which apparatus (i.e., *A* or *B*) you would like to complete the next set of 20 trials, please place the respective magnet onto the square corresponding to that set of trials. In this way, you will be able to keep track of the way in which you proceeded.
>
> Each single trial consists of three different parts: First, a signal will appear (i.e., the green light comes on) indicating the beginning of a new trial. After this signal has disappeared, you may either choose to press the button or not press it. If you decide to press the button, please do so within 3 s after the green light has been turned off, otherwise the trial will be counted as a no-press action. Following your actions, one of two outcomes will occur: Either the red light will come on or it will remain off. Between each trial there will be a short break, as indicated by the onset of the miniature pilot light mounted on the push-button box. I'll now give you three practice trials on Apparatus A so that you can get a feel for how the apparatus works.

After the practice trials had been run, the experimenter informed subjects that a separate judgment of control would be obtained following each set of 20 trials. Subjects then indicated with which apparatus they wanted to begin, and the experimenter started the chosen apparatus. Depending on the problem type to which subjects had been randomly assigned, the noncontingent red light appeared either frequently (the 75–75 problem) or infrequently (the 25–25 problem).

On completing the first set of trials, subjects were instructed to fill out the questionnaire for that set. It contained the judgment of control scale and the certainty scale, along with a detailed description of both. For the control scale, the following explanation was provided:

> "High control" means that the onset of the red light on any given trial was frequently or always influenced by your choice of action with respect to pressing or not pressing. "Intermediate control" means that the onset of the red light was only occasionally influenced by your choice of action. "No control" means that the onset of the red light was seldom or never influenced by your choice of action.

On completing the judgment of control scale, subjects marked their degree of certainty (10-point scale) in the accuracy of their control estimates on a separate sheet. The completed questionnaire was then deposited in a box. The experimenter then asked subjects which of the two apparatuses they wanted to use on the next set of trials. After making their decision, subjects placed the appropriate magnet on the board and worked on the chosen apparatus. This procedure was followed for all five sets of trials.

After subjects had completed their judgment of control for the fifth set of trials, they were introduced to a male experimenter (Experimenter 2) who first administered the Desire for Control Scale (Burger & Cooper, 1979). This scale is designed to assess people's general readiness to control the events in their environment. Questionnaire items cover diverse contextual settings such as political participation, leadership initiative, automobile maintenance, decision making, and problem solving. Subjects rated the degree to which each of 20 statements applied to themselves, using a response scale ranging from 1 (*doesn't apply to me at all*) to 7 (*applies to me*). When subjects had finished this questionnaire, the experimenter asked subjects to choose the apparatus they would prefer to use, assuming the experiment was now to continue with only one apparatus (Apparatus A, Apparatus B, or neither). Thereafter, subjects wrote a short statement justifying their choice. Finally, Experimenter 2 thoroughly debriefed subjects.

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cuted) would amount to 68% if light onset should not occur on this trial, these values are compared with the prescribed contingency (75%). The contingency value that deviates less from the prescribed contingency determines whether light onset will occur on this trial. Thus, according to our example, |75%–80%| = 5% and |75%–68%| = 7%, it follows that light onset will occur on this trial, because 5% is the smaller deviation from 75%.

In order to ensure that objective target contingencies are actually generated, studies using randomization procedures (see Alloy & Abramson, 1979) need to determine whether frequency of pressing and nonpressing is about equal across all trials. The algorithmic procedure faces a different challenge because it creates regular patterns of light onset within pressing or nonpressing behavior, respectively. This may allow subjects to recognize the working of the algorithm, which, in turn, may systematically affect perceived control. Recognition is facilitated particularly when certain systematic patterns of pressing and nonpressing are used. Accordingly, we isolated two such action strategies (i.e., frequency of alternation and rationality of action strategy) and correlated adherence to these strategies with perceived control. However, no systematic correlations were revealed in our studies. In future attempts to establish specific target contingencies, researchers may want to use a combination of the randomization and algorithmic procedure, thus circumventing the limitations inherent to each separate procedure.

The instructions given to subjects in the implemental mind-set condition also started with a description of the two apparatuses. The experimenter then stated the following:

> Your task is to attempt to turn on the red light as often as possible by pressing or not pressing the respective push button. Altogether, you will complete five sets of 20 trials. Before you begin work on the first set of trials, you must decide on the order in which you want to work on the two apparatuses available. To your left, you will find 10 magnets marked with either the letter *A* or *B*, referring to Apparatus A and Apparatus B, respectively. We have also prepared consecutive squares representing the five sets of 20 trials. You should place the appropriate magnets on these squares, in the order in which you prefer to work on the two apparatuses. Please note that there are many different sequences possible (e.g., AABBA, BABAB). The amount of control a person is able to exert over the onset of the red light frequently depends on the sequence in which the apparatuses are used. Some people do better when choosing a sequence that does not demand much alternation, whereas others perform better when they alternate quite often.

The experimenter then asked subjects to choose the sequence they considered most appropriate, mark it on the board, and inform the experimenter over the intercom. As in the predecisional condition, the experimenter then gave more detailed instructions on how to work the apparatus and ran three practice trials. Before starting the first apparatus in the chosen sequence, the experimenter informed subjects that after each set of 20 trials they would be asked to judge their degree of control over the onset of the red light.

After subjects had made their judgment of control for the first sequence, the experimenter started the second apparatus in the sequence, and so forth. For half of the subjects, the noncontingent intended outcome (onset of the red light) appeared frequently (the 75–75 problem); for the other half, it appeared infrequently (the 25–25 problem). After subjects had completed the fifth set of trials and made their judgment of control, they were introduced to Experimenter 2, who proceeded as described for the deliberative mind-set condition.

Results

Equivalence of Groups

Under certain conditions, people's desire for control has been found to influence their judgments of control over outcomes that were objectively uncontrollable (Burger, 1986; Burger & Schnerring, 1982). In order to check for any such preexisting differences between groups, we performed a 2 (type of problem: 25–25 vs. 75–75) × 2 (mind-set: deliberative vs. implemental) analysis of variance (ANOVA) on subjects' Desire for Control scores. However, neither significant main effects nor a significant interaction effect (all $Fs < 1.1$) were found.

Deliberative mind-set subjects also did not differ from implemental mind-set subjects with respect to the alternation between apparatuses. We observed two types of alternations: (a) Subjects worked just once on one of the apparatuses and four times on the other. Only 14.1% of the subjects adhered to this strategy. (b) Subjects worked twice on one of the apparatuses and three times on the other. Most of the subjects (85.9%) used this strategy. A chi-square analysis revealed that the two mind-set groups did not differ in their preference for one of these strategies, $\chi^2(1, N = 64) = 0.1$.

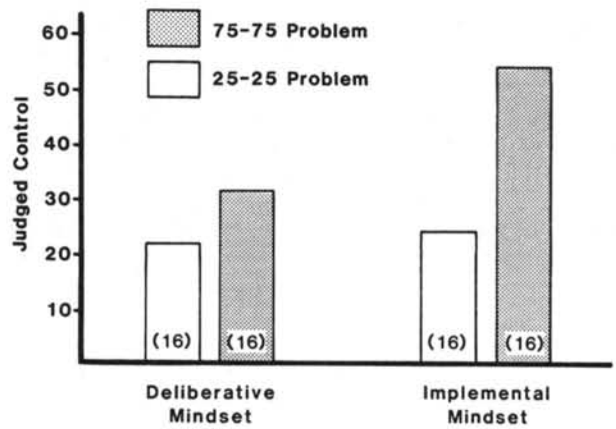

Figure 1. Judged control as a function of problem type and mind-set in Experiment 1.

Dependent Variables

We computed a 5 (time of assessment: five repeated measures) × 2 (problem type: 25–25 vs. 75–75) × 2 (deliberative vs. implemental mind-set) ANOVA on subjects' control judgments. It revealed a significant main effect for the between factor of problem type, $F(1, 60) = 15.5, p < .001$, and for the between factor of mind-set, $F(1, 60) = 5.0, p < .03$. More important, these main effects were qualified by an interaction effect of the two between factors, $F(1, 60) = 4.6, p < .04$. All of these effects remained significant when subjects' desire for control scores were covaried ($ps < .05$).

The within factor of time of assessment neither showed a significant main effect nor produced an interaction effect with either of the two between factors or with their interaction. Accordingly, we computed all further analyses on subjects' mean judgment of control.

As can be seen from Figure 1, both deliberative ($M = 21.6$) and implemental mind-set subjects ($M = 22.1$) claimed to possess moderate control when the noncontingent outcome appeared infrequently (the 25–25 problem). However, a drastic increase in judged control was found for implemental mind-set subjects ($M = 53.9$) when the outcome was frequent (the 75–75 problem). The respective contrast was highly significant, $t(60) = 4.3, p < .001$. Deliberative mind-set subjects working on the 75–75 problem showed a much less drastic increase in judged control. Their control judgments were still moderate ($M = 31.0$) and did not differ significantly from those of deliberative mind-set subjects working on the 25–25 problem, $t(60) = 1.3, p > .20$. In addition, deliberative mind-set subjects working on the 75–75 problem claimed to possess significantly less control over the onset of the intended outcome than did implemental mind-set subjects, $t(60) = 3.1, p < .003$.

We also computed a 5 (time of assessment) × 2 (problem type) × 2 (mind-set) ANOVA on subjects' certainty ratings (i.e., how certain subjects felt that their control judgments were correct). Neither significant main effects nor an interaction effect of the two between factors of problem type and mind-set emerged ($ps > .16$). However, a significant main effect was found for the within factor of time of assessment, $F(4, 240) = 4.7$, $p < .05$, indicating that, over time, subjects became increasingly more certain that their judgments of control were correct. This main effect was not qualified by any interactions with one of the two (or both) between factors (all *ps* > .25). Thus, it appears that deliberative and implemental mind-set subjects were about equally certain of their control judgments in the 25–25 and 75–75 conditions, suggesting that the observed differences in perceived control cannot be explained by differences in degree of certainty.

Action Strategies

It is conceivable that the difference in accuracy of control judgments for deliberative and implemental mind-set subjects in the 75–75 condition is attributable to differences in action strategies (i.e., to different ways of performing the assigned tasks). We therefore analyzed the extent to which three major action strategies differed between groups: frequency of button press, frequency of action alternation, and rationality of action strategy.

The frequency of button presses correlated positively with perceived control, $r(63) = .27$, $p < .02$. We therefore checked whether deliberative mind-set subjects differed from implemental mind-set subjects with respect to the frequency of button presses in the 75–75 condition. Deliberative mind-set subjects ($M = 57.1$) did tend to button press more often than implemental mind-set subjects ($M = 49.6$), $t(29) = 1.7$, $p < .10$. However, when the number of button presses was used as a covariate, the contrast comparing the control judgments of deliberative and implemental mind-set subjects still remained significant ($p < .03$). Thus, it appears that the comparatively accurate control judgments of deliberative mind-set subjects cannot be attributed to their tendency to button press more often than implemental mind-set subjects.

To examine whether the two groups differed in the frequency of alternation between action alternatives, we simply counted the number of changes (i.e., the number of alternations from pressing to nonpressing plus the number of changes from nonpressing to pressing). The correlation between alternation and perceived control reached significance, $r(63) = .36$, $p < .01$. However, comparing deliberative mind-set subjects ($M = 34.6$) with implemental mind-set subjects ($M = 33.8$) on this measure clearly failed to reveal a significant difference, $t(29) = 0.15$, *ns*. The observed high frequency of alternation (overall $M = 34.2$) also implies that subjects switched, on average, from pressing to nonpressing on less than every third trial, a strategy that should have made it difficult for subjects to detect the programmed sequence of light onset. Assuming that infrequent alternations put subjects in a comparatively better position to perceive the regularity of light onset generated by the algorithm, the observed positive correlation between number of alternations and perceived control suggests that recognizing the working of the algorithm may possibly favor judgments of low control. However, in Experiment 2 the respective correlation coefficient was close to zero.

Finally, we explored whether deliberative mind-set subjects used a more *rational strategy* than implemental mind-set subjects. We computed a rationality index based on the mean percentage of "stay when win" (i.e., subjects repeated the action alternative of the preceding trial, whether press or no press, if this was accompanied by target light onset) and "change when lose" (i.e., subjects switched to the other action alternative, whether press or no press, if the alternative pursued on the preceding trial was not accompanied by target light onset). The correlation between this index and perceived control was not significant, $r(63) = .06$. There were also no significant differences in degree of rationality between deliberative ($M = 48.5\%$) and implemental ($M = 50.6\%$) mind-set groups, $t(29) = 0.64$. Not surprisingly, then, the contrast between control judgments of deliberative and implemental mind-set subjects in the 75–75 condition remained significant regardless of whether the rationality of action strategy ($p < .002$) or the number of alternations ($p < .01$) were used as a covariate.

In the 75–75 condition, subjects who adhered strictly to the rational strategy put themselves in a comparatively better position to recognize the working of the algorithm; in the 25–25 condition, this was true for subjects pursuing the opposite strategy (i.e., change when win and stay when lose). Nevertheless, we did not observe significant positive or negative correlations between the rationality index and perceived control, respectively: 75–75 condition, $r(32) = .05$; 25–25 condition, $r(31) = -.05$. It therefore seems unlikely that recognizing the algorithmic procedure systematically affected perceived control.

Postexperimental Questionnaire

When subjects were asked with which of the two apparatuses they would prefer to work if the experiment were to continue, 23.4% chose Apparatus A, 32.8% chose Apparatus B, and 43.8% did not prefer one over the other. These percentages did not differ significantly between conditions, $\chi^2(6, N = 64) = 10.3$, $p > .10$. We analyzed the justifications subjects gave for their preference in an attempt to locate subjects who recognized the working of the algorithm. Two subjects working on the 25–25 problem in the deliberative mind-set condition were identified. When these subjects were eliminated from the analysis, the ANOVA showed the same significant main and interaction effects of the mind-set and problem type factors (*ps* < .05).

Discussion

Confirming our hypotheses, deliberative mind-set subjects' judgments of control were rather modest for both the infrequent and the frequent noncontingent outcome problem. It appears that a deliberative mind-set suppresses illusionary optimism induced by a high frequency (the 75–75 problem) of the intended outcome. Implemental mind-set subjects reported inaccurately high illusionary judgments of control when the intended outcomes were frequent. Thus, they did not recognize that a high frequency of intended outcomes is not a valid indicator of one's degree of influence over outcome appearance. Rather, their orientation toward goal achievement (i.e., maximal light onset) promoted the belief that the noncontingent outcome may be controllable. Nonetheless, implemental mind-set subjects reported significantly lower judgments of control when the intended outcomes were infrequent (the 25–25 problem). Because of the experience of frequent failure in achieving light onset, it appears that these subjects were readily influenced by the constraints of reality. Thus, individuals operating within an implemental mind-set do not blindly or universally perpetuate a belief in the controllability of intended outcomes.

It is important to note that the pattern of data observed can be explained neither by subjects' trait-related desire for control nor by different action strategies applied while subjects worked on the contingency problems. The latter finding is particularly relevant, as implemental mind-set subjects might simply have acted in a manner different from the deliberative mind-set subjects and therefore ended up with different control judgments. However, a closer look at subjects' action strategies (i.e., frequency of button presses, frequency of action alternation, and rationality of action strategy) revealed no differences between groups. Apparently, the differences observed between deliberative and implemental mind-set subjects' control judgments were not based on soliciting different information by proceeding in different ways.

Although the observed pattern of data supports the hypotheses deduced from a deliberative versus implemental mind-set distinction, one could argue that subjects simply behaved in a manner instrumental to task performance. Because deliberative mind-set subjects were told to choose the apparatus on which they were more successful in achieving target light onset, making accurate control estimates seems instrumental to solving this task. Implemental mind-set subjects, however, were told to achieve target light onset as frequently as possible. For this task a tendency to overestimate the degree of personal control over outcomes would seem instrumental to persistence and thus aid task achievement.

Yet, the mind-set notion implies that the associated cognitive orientation can also be demonstrated in a context for which it is not immediately instrumental to task performance. As pointed out by Gibson (1941) in a comprehensive review of the concept of set, the demonstration of a potent mind-set requires that its cognitive orientation generalize to tasks not responsible for its induction. In other words, demonstrating a mind-set necessitates that it be shown to be more than a task-set. Thus, deliberative and implemental mind-sets need to be created independent of the (in this case, contingency learning) task at hand. Moreover, the associated cognitive orientation should carry over to and prevail on subsequent tasks.

In the second experiment we investigated this issue. To create a deliberative mind-set, we had subjects indicate an unresolved personal problem and asked them to contemplate whether they should make a change decision (e.g., whether to move from home). Subjects were instructed to carefully deliberate the expected value of making or not making the potential change decision in question, as well as the respective action–outcome expectancy. To create an implemental mind-set, we had subjects indicate a chosen goal or project (e.g., to move from home) and asked them to make specific plans for implementing this goal. Subjects were requested to commit themselves to exactly when, where, and how they wanted to exert implemental efforts. Once subjects had finished the respective mental exercise, they were asked to work on a contingency learning task that presented frequent noncontingent outcomes (target light onsets). The instructions for completing this task were identical for both groups of subjects; that is, they had to find out how to produce target light onset (the same instructions as those used by Alloy & Abramson, 1979, Study 2). We also added a control group that did not go through any of the mental exercises but worked only on the contingency problem. We predicted that deliberative mind-set subjects would show the most accurate judgments of control (i.e., lower than those of control and implemental mind-set subjects). In turn, we expected implemental mind-set subjects to evidence control judgments even more illusionary than those of control subjects.

Experiment 2

Method

Subjects

Sixty-one female students enrolled at the University of Munich received payment for their participation. Subjects had a wide variety of majors. The average age of the sample was 23.4 years.

Experimental Design

The experiment consisted of three groups of subjects, two experimental groups and one control group. One of the experimental groups was asked to engage in predecisional mentation (the deliberative mind-set condition); the other engaged in postdecisional mentation (implemental mind-set condition). After this manipulation, experimental subjects worked on a contingency task with frequent intended outcomes. The control group worked on the contingency task without any preceding manipulation.

Dependent Measures

As in Experiment 1, subjects were asked for control judgments and certainty ratings. In addition, subjects wrote a short statement explaining how they arrived at their judgment of control.

Apparatus and Materials

For the contingency task, a stimulus display panel and push-button box identical to those used in Experiment 1 were used. Similarly, a microcomputer was programmed to control the appearance of the intended outcome according to a 75–75 contingency schedule (i.e., the target light came on in 75% of pressing actions and in 75% of nonpressing actions).

For the predecisional and postdecisional mentation exercises, three-part booklets were used. These consisted of a description of the exercise to be completed, a sample questionnaire, and a blank questionnaire to be completed by the subject. The mental exercises and the contingency task were conducted in separate but adjacent rooms.

Procedure

Subjects were tested individually. When the subject arrived at the experimental room, she was greeted by Experimenter 1, who introduced herself and then explained the following:

> Today, you will take part in two independent experiments. The first experiment will be conducted by my colleague. He'll ask you to complete a questionnaire on either the choice of personal goals or

> their implementation. In the second experiment, which I will conduct, we will proceed as follows: First, before my colleague arrives, I'll instruct you on how to operate the apparatus. Then, I'll introduce you to the other experimenter so that he can complete his experiment with you in the room next door. Finally, you will return here to work on the apparatus.

After these introductory remarks, the subject was seated in the experimental room. The apparatus for the contingency task was placed on a table in front of the subject. All subjects were given the following instructions over the intercom system:

> I will now explain the operation of the apparatus. It is equipped with two lights, green and red, and your task is to find out how you can influence the appearance of the red light. There are only two possible actions you can pursue: Either press the button mounted on the box or just sit back and do nothing. It is to your advantage to press on some trials and not on others, so that you can see what happens when you *don't* press, as well as when you *do* press. Altogether, you will complete 40 trials.

The experimenter then gave more detailed instructions on the sequence of stimuli presentation and ran three practice trials on the apparatus (see Experiment 1). Thereafter, the experimenter escorted the subject to an adjacent cubicle, where she introduced the subject to Experimenter 2, who explained the following:

> Researchers here at the Max-Planck-Institut are also studying the psychological processes that determine people's choice of certain goals and their implementation. The findings of this research have led to the construction of various exercises, designed to help people pursue their personal goals more effectively. In the present study, the effectiveness of these exercises will be explored. For this purpose, you will be asked to work through one or the other predesigned exercise.

Deliberative mind-set condition. Subjects were handed a three-part booklet. In Part 1, subjects were told that personal problems of the following type would be appropriate for the exercise: Should I do X or not? The problem should be of present concern, and subjects should not yet have reached a decision on the matter. In addition, making a change decision with respect to this problem should not be a trivial matter but instead confront the person with concrete implemental difficulties (e.g., breaking up with one's partner). In Part 2, subjects were provided with a sample booklet containing an example of how the exercise should be completed. Subjects were told that the sample booklet had been completed by a former subject, who faced the decisional problem of going on a vacation or not. Subjects were asked to study it carefully. In Part 3, an unmarked exercise booklet was provided so that subjects could apply the exercise to their own problems. They were requested to first list the immediate and then the delayed positive and negative consequences, along with the likelihood (expressed in percentage) that each of these consequences would actually occur. Subjects were then asked to indicate the potential hindrances and to estimate the probability that these could be overcome. Finally, subjects listed the positive and negative (immediate as well as long-term) consequences of failing to make a change decision and estimated the probability that these consequences would occur.

Implemental mind-set condition. These subjects also received a three-part booklet. In Part 1, subjects were told that only personal goals, which they planned to execute in the near future (i.e., during the upcoming summer break), were appropriate for this exercise. These goals should be rather complex and difficult to implement (e.g., leaving home). In addition, subjects were to indicate a goal that they had planned to execute for some time instead of thinking up a new goal. In Part 2, subjects were provided with a sample booklet (reportedly completed by a former subject) to give them an idea of how the mental exercise should be applied to their own goals. The sample exercise addressed the question of how to implement the goal of going on a vacation. In Part 3, subjects were provided with an unmarked exercise booklet. They were then instructed to list five distinct elemental steps required to reach the intended goal. Finally, for each of these steps, subjects had to write down concrete plans as to when, where, and how these were to be implemented.

Once deliberative and implemental mind-set subjects had completed their mental exercises, they were asked to fill out a final questionnaire (manipulation check) that consisted of four items: (1) "On the line below, please mark the point which best indicates how close you are (in time) to the act of making a change decision." (For this purpose, a horizontal line 13 cm in length was provided. The endpoints were labeled *far from making a change decision* and *past having made a change decision.* The midpoint was labeled *act of making a change decision.*) (2) "How determined do you feel at the moment with respect to the decision at hand?" (3) "Do you feel that you have committed yourself to a certain course of action?" (4) "Do you feel that you have committed yourself to utilizing certain occasions or opportunities to act?" (Items 2 through 4 were accompanied by 9-point scales.) Finally, deliberative mind-set subjects were asked to indicate the importance of the personal problem they had pondered during their mental exercise (on a 9-point scale). Implemental mind-set subjects, however, were asked how much they would mind if their goal, for one reason or another, could not be implemented (on a 9-point scale).

After completing this questionnaire, Experimenter 2 escorted subjects to the cubicle where the contingency apparatus was located. Experimenter 1 then continued with her study by reminding subjects of the following:

> Your task is to learn how to turn on the red light. You will complete 40 trials, requiring a total of 10 min. You will then be asked to judge how much control you had over the onset of the red light. Any questions?

The experimenter then started the apparatus. After the last trial, subjects were instructed to fill out the judgment of control scale, as well as the certainty scale (see Experiment 1). Finally, subjects were asked to write a short statement explaining how they arrived at their judgment of control. After completing this statement, subjects were returned to Experimenter 2, who then administered the Desire for Control Scale. Thereafter, subjects were thoroughly debriefed.

Control condition. The procedure for control subjects was the same as for experimental subjects, except that no mental exercise was requested. That is, subjects began the contingency task immediately after the three practice trials had been run. Control subjects first encountered Experimenter 2 on completion of the contingency task and the respective scales.

Results

Equivalence of Groups

Subjects' scores on the Desire for Control Scale did not differ between conditions, $F(2, 52) = 0.83, p = .44$. In addition, deliberative and implemental mind-set subjects did not differ with respect to the contents of the issues they tackled in their mental exercises. Unresolved personal problems (deliberative mind-set subjects) and personal goals (implemental mind-set subjects) were classified according to three categories: career related, lifestyle related, and interpersonal. A chi-square analysis revealed that these different contents were distributed about equally across the three groups of subjects, $\chi^2(2, N = 61) = 2.2, p = .32$.

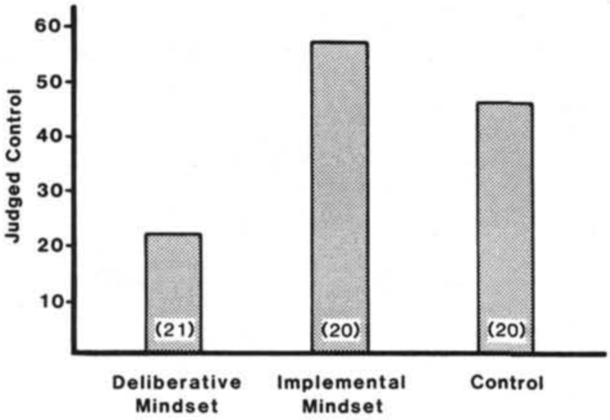

Figure 2. Judged control as a function of mind-set in Experiment 2.

Manipulation Check

Subjects indicated how close they were (in time) to the act of making a change decision on the horizontal line provided. Nearly all (20 of the 21) deliberative mind-set subjects indicated that they had not yet made the respective change decision. The reverse was found for implemental mind-set subjects: 19 of the 20 subjects indicated that they had made the respective change decision. In addition, implemental mind-set subjects ($M = 7.3$) felt more determined than did deliberative mind-set subjects ($M = 4.8$), $F(1, 37) = 15.2$, $p < .001$. Implemental mind-set subjects ($M = 7.0$) also felt more committed to executing a certain course of action than did deliberative mind-set subjects ($M = 4.9$), $F(1, 37) = 8.8$, $p < .006$; the same pattern held true for the commitment to make use of certain occasions or opportunities to act (*M*s = 7.5 vs. 4.1), $F(1, 37) = 22.5$, $p < .001$.

Dependent Variables

Figure 2 displays subjects' judgment of control as a function of mind-set. Deliberative mind-set subjects' judgment of control was moderate and thus relatively accurate ($M = 22.8$), whereas control subjects ($M = 46.0$) and particularly implemental mind-set subjects ($M = 57.0$) greatly overestimated the degree of control exerted.

A one-factor ANOVA on subjects' judgment of control revealed a highly significant overall difference, $F(2, 58) = 7.8$, $p < .001$. Follow-up contrasts showed that deliberative mind-set subjects differed significantly from implemental mind-set subjects, $t(58) = 3.9$, $p < .001$, as well as from control subjects, $t(58) = 2.6$, $p < .015$. The difference between implemental mind-set and control subjects did not reach significance, $t(58) = 1.2$, $p = .23$.

When subjects' scores on the Desire for Control Scale were entered into an analysis of covariance, the pattern of results did not change. The overall F was still highly significant ($p < .002$). The same held true for the contrasts comparing deliberative mind-set subjects with control subjects ($p < .04$) and with implemental mind-set subjects ($p < .001$). The contrast between implemental mind-set and control subjects again failed to reach significance, $F(1, 33) = 2.1$, $p = .16$.

Subjects also rated how certain they were about the accuracy of their control judgments. A one-factor ANOVA on subjects' certainty ratings did not yield a significant overall difference, $F(2, 57) = 1.4$, $p > .24$. Subjects were about equally certain of their judgments of control in all groups; the mean certainty rating for all subjects was 6.7.

Correlational Analyses

Deliberative mind-set subjects' judgment of control correlated negatively, $r(21) = -.34$, $p = .06$, with the personal importance of the problem pondered during the predecisional mentation exercise. Apparently, the more involved subjects became in predecisional analysis while performing the mental exercise, the more moderate were their subsequent judgments of control on the contingency task. For implemental mind-set subjects, judgments of control were positively related to subjects' determination to implement their personal goal (i.e., "How much would you mind if, for whatever reason, it were not possible to implement the indicated personal goal?"), $r(20) = .30$, $p = .10$.

Action Strategies

The frequency of pressing correlated slightly negatively with perceived control, $r(60) = -.11$, *ns*. Deliberative mind-set subjects ($M = 19.8$) did not differ from implemental mind-set subjects ($M = 20.0$) and control subjects ($M = 22.1$) with respect to the frequency of button presses, $F(2, 52) = 0.52$, *ns*. Moreover, the action strategies of the three groups did not differ much in terms of the degree of rationality (*M*s = 49.7%, 48.3%, and 43.8%, respectively), $F(2, 57) = 1.8$, $p = .17$. The correlation between the rationality index and perceived control was not significant, $r(60) = -.12$. Thus, given that adherence to the rational strategy under a 75–75 contingency placed subjects into a comparatively better position to recognize the algorithm, it appears that this had no systematic effect on perceived control.

As in Experiment 1, the overall frequency of alternation was quite high ($M = 14.0$); on average, subjects switched from pressing to nonpressing or vice-versa on less than every third trial, thus hindering easy recognition of the algorithm. In addition, frequency of alternation did not correlate significantly with perceived control, $r(60) = .04$, indicating that being in a better position to recognize the algorithm (through infrequent alternations) did not affect subjects' control judgments. Both of these findings suggest that subjects were not in a position to recognize the algorithmic procedure. Finally, significant differences were observed between groups with respect to the frequency of alternation, $F(2, 57) = 4.0$, $p < .03$. Control subjects ($M = 11.3$) showed less alternations than deliberative mind-set subjects ($M = 14.2$), $t(57) = 1.6$, $p = .12$, and implemental mind-set subjects ($M = 16.6$), $t(57) = 2.8$, $p < .01$. However, this pattern of data is not in agreement with the observed judgment of control data. Accordingly, it is unlikely that differential frequency of alternation accounts for the data observed. This also holds true for the other two action strategies considered (i.e., frequency of button presses and rationality of action strategy). Not surprisingly, then, the difference in judgment of control between control subjects and deliberative mind-set subjects remained significant, regardless of which action strategy was covaried (all $ps < .025$); the same held true for the difference between deliberative and implemental mind-set subjects (all $ps < .002$).

We classified subjects' written explanations of how they had arrived at their judgment of control according to the complexity of the action strategies they reported. We constructed five categories of complexity ranging from intuitive approaches to complex strategies. A chi-square analysis revealed no difference in the type of strategies used in all three groups, $\chi^2(8, N = 61) = 2.81$, $p = .95$. We also analyzed these statements in order to determine whether subjects observed the regularities in light onset generated by the algorithm. As it turned out, none of the subjects indicated recognition of the programmed sequence of light onset.

Discussion

Consistent with our predictions, subjects who were asked to deliberate an unresolved personal problem showed significantly less illusion of control over target light onset than subjects who were told to plan the implementation of a personal goal. Thus, the predecisional exercise apparently induced a deliberative mind-set, whereas the postdecisional exercise produced an implemental mind-set. Most important, the observed differences in accuracy of control judgments cannot be explained either by differences in subjects' desire for control or by differences in their action strategies with respect to turning on the target light. Rather, the deliberative mind-set seems to have prevented subjects from focusing exclusively on goal achievement (i.e., target light onset), thus putting them in a position to view action–outcome contingencies in a more accurate manner. The implemental mind-set, however, appears to have encouraged a focus on goal achievement alone, thus generating illusionary optimism.

Whenever problems of great personal importance were deliberated during the predecisional mental exercise, subjects' control judgments were particularly accurate. That is, the more subjects worked themselves into a deliberative mind-set during predecisional mentation, the more the characteristics of this mind-set unfolded. The same was found for the implemental mind-set: The more determined subjects felt to implement the personal goal tackled during the postdecisional mental exercise, the more illusionary were their judgments of control. Both findings strongly suggest that distinct mind-sets evolve when people either try to make a decision or get ready to implement a chosen goal. Such mind-sets seem to affect cognitive functioning to the extent that individuals dwell on expected value and action–outcome expectancy or implementation-related pursuits, respectively.

It is important to note that these mind-sets also generalize across situations. Subjects had acquired the respective mind-sets by tackling personal problems, yet the properties characteristic of a mind-set also came to the fore on a simple (button-pressing) task that did not appear to have much immediate personal relevance. In addition, subjects began working on the contingency apparatus quite some time after they had terminated the mentation of their personal problem. Nevertheless, the mind-sets that originated during the mental exercise still affected subjects' inferences on the contingency task, thus suggesting that the deliberative and implemental mind-sets show some stability over time.

It seems likely that the degree to which mind-sets generalize across situations and the stability of these mind-sets over time depend heavily on how pronounced mind-sets are at the outset. As we just pointed out, we assume that high involvement in the predecisional task of choosing an action goal or the postdecisional task of implementing the chosen goal should yield more effective mind-sets than low involvement. However, mind-sets are probably susceptible to disruption by external experiences, much the way a certain mood may fade in the face of mood-incongruent experiences.

Finally, we observed that control subjects showed somewhat less illusion of control than implemental mind-set subjects but significantly more than deliberative mind-set subjects. The illusionary nature of control subjects' contingency judgments is consistent with the findings of Alloy and Abramson (1979, Study 2) for nondepressed subjects working on the same contingency problem (the 75–75 condition). Our theoretical framework suggests that control subjects might have been inclined to overestimate their degree of influence over intended outcomes by approaching the contingency task with an implemental mind-set. That is, the very nature of the contingency task probably encouraged subjects to obligate themselves to the goal of achieving maximum light onset (even though they were not explicitly requested to do so). Control subjects should therefore have been inclined to pursue target light onset, thus increasing the likelihood of an illusion of control.

This interpretation of the control group's contingency judgments is in line with the findings of recent studies that have investigated the conditions under which nondepressed individuals do not show an illusion of control. Whenever conditions were such that it was made difficult for subjects to obligate themselves to the goal of achieving target light onset, subjects did not show evidence of an illusion of control. For example, Martin, Abramson, and Alloy (1984) found that when nondepressed subjects assessed the control another person exerted over frequent but noncontingent outcomes, they were likely to judge correctly that the other person did not exert much control. Because subjects were requested to focus on the performance of others, a personal concern with goal achievement should have been absent. In another study (Vázquez, 1987, Study 4), either positive or negative self-referent sentences were used as the outcomes in a contingency judgment task (the 75–75 problem). It was found that nondepressed subjects showed an illusion of control for positive but not for negative self-referent sentences. Presenting nondepressed subjects with negative valence outcomes apparently discouraged them from obligating themselves to the achievement of these outcomes.

General Discussion

Our two experiments show that people who are faced with making a decision develop a different mind-set than people who are requested to implement a chosen goal. When assessing action–outcome expectancies in a situation in which actions and frequent outcomes are noncontingently related, the deliberative mind-set generally leads to rather accurate control inferences, whereas an implemental mind-set promotes an illusion of control. This is true regardless of whether such mind-sets are created by giving the appropriate instructions on how to work on the contingency problem (Experiment 1) or by using mental exercises that had to be completed prior to working on this problem (Experiment 2).

These studies did not address the issue of how accurately people in a deliberative or implemental mind-set judge the degree of personal control in situations in which the degree of controllability over outcomes is varied while keeping the absolute amount of target light onset constant (e.g., the 75–0 problem as compared with the 50–25 problem). Our theory predicts that deliberative mind-set subjects' control estimates should be rather accurate, independent of the objective amount of controllability over outcome appearance. Implemental mind-set subjects, however, should be inclined to overestimate personal control over outcomes, particularly when the degree of objective control decreases. This implies that the deliberative mind-set effect should not be misconstrued as an inclination to chronically underestimate personal control; similarly, the implemental mind-set effect should not be interpreted as a universal readiness to overestimate personal control. With respect to uncontrollable outcomes, Experiment 1 has demonstrated that implemental mind-set subjects do not chronically overestimate control: When uncontrollable outcomes were infrequent (the 25–25 problem) as opposed to frequent (the 75–75 problem), subjects' control estimates became more modest.

The concept of illusion of control was introduced by Langer in 1975. In a number of experiments, she found that although people do not have control over outcomes in games of luck or chance, they often believe that they can influence such outcomes. Langer discovered that factors that made a luck task (i.e., a task with random outcomes) appear to be a skill task induced erroneous inferences in the sense that subjects claimed to have influenced the appearance of objectively uncontrollable outcomes. In particular, incorporating competitive aspects into the luck task or getting subjects involved in behaviors that appeared to achieve the desired outcome sufficed to create an illusion of control effect.

Viewed in the context of our theoretical framework, the presence of skill-related aspects apparently compelled subjects to obligate themselves to the goal of achieving the desired outcomes, even though their appearance was solely determined by chance. That is, subjects might have construed working on the chance task as an opportunity to strive for attainable and desirable outcomes, therefore developing a sense of obligation and determination to reach those outcomes.

Alloy and Abramson (1979, 1982, 1988) conducted extensive research on the illusion of control phenomenon, with particular emphasis on the investigation of *depressive realism.* Those researchers discovered that whereas nondepressed subjects showed evidence of an illusion of control when noncontingent outcomes were frequent, depressed subjects were able to make rather accurate judgments of control. The explanations provided for this phenomenon focus on such aspects as a breakdown in the mechanisms for maintaining one's self-esteem and approval from others, the prevalence of self-schemata with strong and consistent negative content, and the operation of self-directed attention (see Alloy & Abramson, 1988).

The mind-set conceptualization provides a new framework from which to view depressive realism. Contrary to nondepressed individuals, it is conceivable that depressed individuals find it particularly difficult to set themselves the goal at hand (e.g., to maximize target light onset) because of pervasive negative beliefs about themselves (Beck, 1967, 1976). Such beliefs should generate doubts concerning the attainability of the given goal that, in turn, should hinder the development of a firm obligation toward goal achievement. Thus, when depressed individuals are asked to work on a contingency judgment task, they may simply fail to commit themselves to the goal of achieving the target outcome and, as a consequence, remain insusceptible to feelings of illusionary optimism. Vazquez's (1987, Experiment 4) finding that depressed individuals show an illusion of control when uncontrollable outcomes entail negative self-descriptions supports this line of thought. Apparently, when target outcomes are negative self-descriptions, depressed individuals readily commit themselves to the goal of achieving such outcomes, thus undermining depressive realism and creating the kind of illusionary optimism characteristic of nondepressed individuals.

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Received December 17, 1987
Revision received July 21, 1988
Accepted August 2, 1988 ■