

Judgment of Contingency: Cognitive Biases in Depressed and Nondepressed Subjects

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In this research I investigated whether the use of relevant affective outcomes influences depressed and nondepressed subjects' judgment of contingency. Similar to previous studies (Alloy & Abramson, 1979, Experiments 1 and 2), Experiments 1 and 2 confirmed that when the outcome is affectively neutral (i.e., the onset of a light) depressed subjects make accurate judgments of contingency, whereas nondepressed subjects show (in noncontingent situations) a significant *illusion of control*. In Experiments 3 and 4 (a contingency situation and a noncontingency situation, respectively) different types of sentences (negative self-referent, negative other-referent, positive self-referent, positive other-referent) were used as outcomes. Although depressed subjects were more reluctant to show biased judgments than were the nondepressed subjects, in noncontingency situations depressed subjects made overestimated judgments of contingency when the outcomes were negative self-referent sentences. Results are discussed with regard to current cognitive theories of depression, particularly the learned helplessness model.

The study of depressed and nondepressed persons' judgments of the contingency between their behavior and resulting environmental outcomes is one of the most interesting issues to emerge from experimental psychopathology in the last several years. Although this variable is considered somewhat implicitly in the main cognitive models of depression (e.g., Beck, 1976; Rehm, 1977), it is the learned helplessness model that has manifestly introduced such a variable into its theoretical framework (Abramson, Seligman, & Teasdale, 1978; Overmier & Seligman, 1967; Seligman, 1975). Understanding variations in people's judgments of contingency is crucial because these judgments are one of the first cognitive steps made in a causal analysis of the environment (Seligman 1975).

Alloy and Abramson (1979) used a direct method to evaluate the judgment of contingency. In their procedure, which was similar to that of Jenkins and Ward (1965), the subjects are given 40 trials on each of which they can decide to respond (by pressing a button) or not to respond (by not pressing the button), and as a consequence of this choice, a stimulus (e.g., a light) may or may not appear. Thus, at the end of the 40 trials, the subjects have available two conditional probabilities— $p(S/R)$ and $p(S/R^*)$ ¹—that in combination determine the actual de-

gree of contingency between their responses and the stimulus onset (Seligman, 1975). An objective contingency situation is one in which $p(S/R) \neq p(S/R^*)$. Thus, for instance, a situation in which the outcome appears 50% of the time that the subject presses the button and 30% of time that the subject does not press it is one for which the actual degree of contingency is 20% (i.e., the difference between the two probabilities or percentages). On the other hand, a noncontingency situation would be, for instance, one in which the outcome appears 30% of the time that the subject presses the button and 30% of the time that he or she does not.

To date, the results of studies using this procedure have been quite surprising. Depressed subjects accurately judge the degree of contingency both in objectively contingent and noncontingent situations, whereas nondepressed subjects show a consistent tendency to make biased judgments depending on the frequency of stimulus onset or the valence of the stimulus, or both (Alloy & Abramson, 1979, 1982). Other studies have also demonstrated circumstances under which depressed persons' cognitions are quite accurate. Golin and her coworkers found that depressed students (Golin, Terrell, & Johnson, 1977) and depressed patients (Golin, Terrell, Weitz, & Drost, 1979) accurately judged the expectations of success in a dice game, whereas nondepressed subjects manifested unrealistic expectations of success. Similarly Lewinsohn, Mischel, Chaplin, and Barton (1980) found that nondepressed subjects overevaluated their actual skills for interpersonal communication; depressed subjects, however, evaluated their lack of skills quite accurately.

This accuracy by depressed subjects is paradoxical in light of those traditional theories that describe the distortions and cognitive deficits of depressed subjects (Beck, 1967, 1976; Beck,

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¹ The equation $p(S/R)$ is the probability that the stimulus appears when the subject makes a response and $p(S/R^*)$ is the probability that this same stimulus appears when the subject makes no response.

Rush, Shaw, & Emery, 1979; Coyne & Gotlib, 1983; Shaw & Dobson, 1981). Furthermore, this apparent depressive "realism" or "wisdom" (Alloy & Abramson, 1979) is contrary to one of the basic assumptions of the learned helplessness theory. In effect, that theory states that helpless subjects underestimate the degree of actual contingency existing between their responses and outcomes. According to the theory, this is due to previously developed expectations of uncontrollability interfering with a correct analysis of the actual relation (Maier & Jackson, 1979; Overmier & Seligman, 1967; Polaino & Vázquez, 1981; Seligman, 1975). However, Alloy and Abramson (1979) found that when an actual degree of contingency exists between the subject's responses and the appearance of either a neutral stimulus (i.e., a light) or a hedonic stimulus (i.e., winning or losing a small amount of money), depressed subjects do not underestimate the relation; rather, they judge it with a high degree of accuracy. Thus, as Alloy and Abramson (1980) and Alloy (1982) have pointed out, some of the basic hypotheses of the learned helplessness model have not yet been adequately demonstrated.

In view of these findings, learned helplessness theorists have proposed that expectations of uncontrollability may cause only motivational and emotional deficits, not necessarily cognitive ones (Alloy, 1982; Alloy & Abramson, 1982; Alloy & Seligman, 1979). Thus, they have rejected, perhaps prematurely, one of the most distinctive components of that theory of depression.

The observed distortions in nondepressed subjects' judgments of contingency have been interpreted in terms of the *illusion of control* phenomenon (Langer, 1975, 1977; Lefcourt, 1973), a common tendency to believe that one's responses exert greater control over an outcome than is actually the case. It has been hypothesized that both the accuracy of depressed subjects and the distortion of nondepressed subjects in the judgment of contingency can be explained as a function of different levels of self-esteem in the two groups. Because nondepressed people have a higher level of self-esteem than do depressed people (Beck, 1976), nondepressed persons' biases could serve to protect their self-esteem by distorting the environment and creating a self-enhancing feeling of control. However, depressed people would not be motivated to protect their self-esteem because it is at such a low level (Alloy & Abramson, 1979, 1982; Alloy & Seligman, 1979; Frankel & Snyder, 1978).

Alloy and Abramson's findings, however, could be somewhat dependent on their experimental procedure. Indeed, the types of affective stimuli used in their experiments might be inappropriate because those stimuli are rather unspecific. For instance, recent research on memory in depressed people has demonstrated the importance of introducing verbal stimuli *specific* to the depressive syndrome in order to bring out depressive cognitive schemata (Derry & Kuiper, 1981; Vázquez & Alloy, 1986). Along the same lines, studies by Harrell, Chambless, and Calhoun (1981), Finkel, Glass, and Merluzzi (1982), Peterson, Luborsky, and Seligman (1983), and Karoly and Ruchman (1983) emphasize the importance of paying attention to the content of depressed subjects' cognitions to uncover any existing idiosyncratic methods of information processing in such people. Thus, introducing affective verbal stimuli (e.g., depressivelike or nondepressivelike sentences) as outcomes, rather than as the gain or loss of money, might serve to demonstrate estimative distor-

tions in depressed subjects' judgments of contingency because those verbal stimuli supposedly are more likely to activate depressive schemata (e.g., Weissman & Beck, 1978).

Beck has proposed that depressed people are characterized by a negative cognitive set that consists of a negative view of the self, world, and future. However, the nature of that hypothesized negative schema might be more heterogeneous than Beck believed it to be (Beck, 1976). For instance, a negative view of the self does not necessarily imply a negative view of others or of the world (Diener & Dweck, 1978; Garber & Hollon, 1980; Golin, Jarret, Stewart, & Drayton, 1980; Lobitz & Post, 1979; Vázquez & Alloy, 1986). In fact, some authors have proposed a new type of depression in which individuals have a negative view of self but not of others; that distinction would subsume such classifications as personal versus universal helplessness (Abramson et al., 1978) or depressions attributable to low expectancies of self-efficacy versus low expectancies of results (Bandura, 1977). Therefore, in the present study, not only was the hedonic valence of the outcome to be presented (depressed/nondepressed sentences) taken into account but also its *reference* (self-referent, in which the grammatical subject of the sentence is oneself, versus other-referent, in which the sentence's subject is the world or others).

The present study consisted of four experiments. Analyzed in Experiments 1 and 2 were the judgments of contingency of depressed and nondepressed subjects under conditions of objective contingency or noncontingency situations with a neutral stimulus (i.e., a light) as the outcome. Both were close replications of the earlier studies of Alloy and Abramson (1979, Experiments 1 and 2) and constituted an internal comparative criterion for the other two experiments in which verbal stimuli were introduced as *outcomes* in both an objective contingency situation (Experiment 3) and an objective noncontingency situation (Experiment 4).

Experiment 1

This experiment examined subjects' judgment of contingency in an objective contingency situation where the outcomes were hedonically neutral.² Alloy and Abramson (1979, Experiment 1) selected three types of problems (75%-50%, 75%-25%, and 75%-0%) that differed not only in their degree of actual contingency (25%, 50%, and 75%, respectively) but also in their expected mean percentage of appearance of the red light in the experimental task as a whole (62.5%, 50%, and 37.50%, respectively). To avoid confounding the effects of these two factors (degree of contingency and percentage of reinforcement), the contingency problems in the present study were designed so that the percentage of stimulus appearance was the same in each, although the degree of objective contingency differed. Two problems were chosen: one of 50%-25% (25% of actual degree of contingency) and one of 75%-0% (75% of actual degree of contingency).

According to the learned helplessness model (see Seligman,

² An explanation of Experiments 1 and 2 is not exhaustive because they were essentially replications of the previously cited experiments of Alloy and Abramson (1979).

Table 1
Means and Standard Deviations of BDI and Judgment of Contingency Scores for All Experimental Groups in Experiment 1

Problem type	BDI				Judgment of contingency			
	Nondepressed		Depressed		Nondepressed		Depressed	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
75%–0%	2.50	3.00	15.50	4.12	77.50	9.57	78.75	7.50
50%–25%	5.50	0.58	13.00	3.74	25.00	14.72	38.75	15.48

Note. BDI = Beck Depression Inventory.

1975), depressed individuals underestimate the actual degree of contingency both in absolute and in relative terms (i.e., in comparison with nondepressed students). In line with the findings of Alloy and Abramson (1979, Experiment 1), however, the predictions of this experiment were that both depressed and nondepressed students would accurately estimate the degree of objective contingency in the two problems.

Method

Subjects. The subjects were 16 female undergraduate volunteers from the Universidad Complutense of Madrid, Spain. Subjects were assigned to a depressed or nondepressed group on the basis of their scores on the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The cutoff score was 9 or above for the depressed group and 8 or below for the nondepressed group. The sample consisted of 8 depressed ($M = 14.25$) and 8 nondepressed students ($M = 4.00$). The BDI means and standard deviations for all experimental groups are shown in Table 1. In order to collect additional information, subjects also completed the Hopelessness Scale (HS; Beck, Weissman, Lester, & Trexler, 1974), the Self-Esteem Scale (SS; Rosenberg, 1967/1973), and the Mastery Scale (MS; Lewinsohn, 1971), however, these scores were not used as further criteria for selecting groups.³ The four scales were administered just before the experimental task was presented, as Hammen (1980) and Sacco (1981) have recommended. Participating subjects in each group were randomly assigned to the two experimental conditions, with the restriction that each condition contain equal numbers of depressed and nondepressed subjects. I served as the only experimenter in all the experiments. No subject participated in more than one experiment of the present study.

Experimental design. The experiment used a 2 (problem type: low contingency or high contingency) \times 2 (mood: depressed or nondepressed) factorial design. In the low-contingency problem, the red light came on 50% of the time when the button was pressed and 25% of the time when it was not pressed. In the high-contingency problem, the red light came on 75% of the time when the button was pressed and never when the button was not pressed. All in all, there were four experimental groups (depressed–low contingency, depressed–high contingency, nondepressed–low contingency, and nondepressed–high contingency).

Dependent measures. Once the experimental task was finished, subjects were asked to complete a number of scales on a postexperimental questionnaire that provided the main dependent measures. As in other experiments in this area (see Abramson, Alloy, & Rosoff, 1981; Alloy & Abramson, 1979, 1982), these were three scales on which subjects estimated, from 0% to 100%, the degree of contingency between their responses and the appearance of the red light (judgment of contingency), the percentage of trials in which the red light came on when they responded (judgment of reinforcement if pressed), and the percentage of trials in which the red light came on when they did not respond (judgment of reinforcement if not pressed).

Subjects also estimated, on a scale that ranged from 0 to 40, the total number of times that the red light came on (judgment of reinforcement).

Apparatus and materials. The experiment was conducted in a room in which a wooden screen kept the subject from observing the experimenter. Stimuli were presented on a panel (60 cm \times 40 cm) placed 80 cm in front of the subject. Mounted in the center of the panel was a translucent paper screen (36 cm \times 24 cm) for use in Experiments 3 and 4. Positioned at the top of the panel (3 cm from the border) were a green and a red light 5 cm from each other. The subject's response box had a spring-loaded button mounted in the center.

The degree of contingency between the subject's responses (press or not press) and the outcome (appearance of the red light) was scheduled by a probability randomizer (Campden, CA-247). Control of stimulus presentation and outcomes was realized by standard relay system, so that the results appeared only after the subject's 3-s response interval had passed. The subject's responses and whether or not they were followed by presentation of the light were recorded by the experimenter.

Procedure. When the subject arrived at the experimental room, she was asked to complete the four self-report scales (BDI, HS, SS, and MS). After her BDI was scored, she was randomly assigned to one of the two experimental conditions and then was taken to the part of the room where the experiment would be conducted. In all of the experimental conditions, the procedure was the same. Each problem consisted of 40 trials signaled by a green light that lasted 3 s. In this short period, the subject could press or not press the button, following which a red light either went on or remained unlit. There was an intertrial interval of 6 s. The experimenter read the instructions aloud while the subject read them silently. The instructions, which were almost identical to those of Alloy and Abramson (1979), explained in detail the procedure and the concept of judgment of contingency.

Results⁴

A Problem \times Mood analysis of variance (ANOVA) of the judgment of contingency scores revealed a significant main effect for

³ The BDI was selected because it is short and well validated (Bumberry, Oliver, & McClure, 1978; Carroll, Fielding, & Blashky, 1973). Furthermore, it has been validated in clinical and nonclinical populations in Spain (Conde, Esteban, & Useros, 1976). In a recent unpublished study (Polaino, Vázquez, & Ochoa, 1983), we found that the BDI scores of a sample population ($N = 345$) of Universidad Complutense students had a distribution similar to that obtained in American university students (Bumberry et al., 1978; Hammen, 1980; Oliver & Burkham, 1979).

⁴ All ANOVAs performed were parametric. In no case, as Cochran's test showed (Howell, 1982; Winer, 1971), was the assumption of homogeneity violated. The established level of significance was 5% for all tests.

type of problem, $F(1, 12) = 56.55, p < .001$. Subjects in the high-contingency situation (75–0) believed they had more control than did those in the low-contingency problem (50–25). Furthermore, these judgments were accurate in absolute terms, because the differences between judged and actual degree of contingency were not significant for any experimental group, as revealed in t tests. Table 1 shows the means and standard deviations in the judgment of contingency for all experimental groups. No other significant effect was found for this variable.

As in the Alloy and Abramson (1979) study, both depressed and nondepressed subjects accurately estimated the two conditional probabilities as well as the total number of stimuli that were presented. For each dependent variable used, three ANCOVAs were performed (Dixon, 1981) using as criteria the subject's scores on the HS, SS, and MS. However, because these analyses did not modify the ANOVA results of this set of studies, they are not further discussed here.

Discussion

The results of this experiment closely parallel those found in Alloy and Abramson's study (1979, Experiment 1) and thus clearly do not support the traditional finding that people do not have a precise concept of *correlation* (Jenkins & Ward, 1965; Smedslund, 1963) or *probability* (Lichtenstein, Fischhoff, & Phillips, 1982; Teigen, 1983). Possible explanations for this discrepancy may include both methodological shortcomings in the earlier studies (see Alloy & Abramson, 1979) and differences in the type of instructions given to subjects (see Arkes & Harkness, 1983; Beyth-Marom, 1982).

Alloy and Abramson (1979) found in their first experiment that in the 75–50 problem (one of low contingency and high density of reinforcement) all subjects had a nonsignificant, although consistent, overestimative tendency in their judgments of contingency. The authors argued that a high number of stimulus appearances could facilitate the observed tendency. The results of the present experiment support this interpretation. In fact, in the 50–25 problem (low contingency but not high density of reinforcement) both groups were extremely accurate.

The results of Experiment 1 are contrary to the learned helplessness assumption that depressed people underestimate the actual degree of contingency between their responses and the results (Overmier & Seligman, 1967; Seligman, 1975). This experiment has shown that in objective contingency situations with a neutral result, both depressed and nondepressed subjects make accurate estimations of the actual degree of contingency. Although the subjects of this experiment were women, Alloy and Abramson (1979, Experiment 1) found that subject's sex did not affect either judgment of contingency or judgments of probabilities.

Experiment 2

In Experiment 2, subjects' judgments of contingency in an objective noncontingency situation using a neutral stimulus were examined. It was also a close replication of Alloy and Abramson's (1979) Experiment 2. Two types of noncontingency problems were selected (25–25 and 75–75) that differed

only in the number of stimuli appearing in each one during the 40 trials.

On the basis of the results of Alloy and Abramson's (1979) experiment, it was predicted that depressed subjects would accurately judge the degree of contingency in all the experimental conditions, whereas nondepressed subjects would make accurate estimations when the stimulus was infrequent (low density of reinforcement: 25–25 problem) but would overestimate their judgments when the stimulus appeared frequently (high density of reinforcement: 75–75 problem).

Method

Subjects. Sixteen female undergraduates from the Universidad Complutense served as volunteers. They were assigned to a depressed or nondepressed group on the basis of their BDI scores (cutoff score was 9). The sample consisted of 8 depressed students ($M = 12.00$) and 8 nondepressed students ($M = 4.00$). The BDI means and standard deviations for all experimental groups are presented in Table 2. Subjects in each group were randomly assigned to one of the two experimental conditions, with the restriction that each condition contain equal numbers of depressed and nondepressed subjects.

Experimental design. The experiment used a 2 (problem type: low density or high density of light onset) \times 2 (mood: depressed or nondepressed subjects) factorial design. Both the low-density problem (25–25) and the high-density problem (75–75) were objectively noncontingent. There were four experimental groups (depressed–low density, depressed–high density, nondepressed–low density, and nondepressed–high density).

Dependent measures. These were the same as in Experiment 1.

Apparatus, materials, and procedure. These were also the same as in Experiment 1.

Results

A Problem \times Mood ANOVA for subjects' scores on the judgment of contingency yielded a significant main effect for mood, $F(1, 12) = 10.65, p < .01$, and a significant Problem \times Mood interaction, $F(1, 12) = 5.53, p < .04$. A Tukey (a) test (t) showed that nondepressed subjects' judgments of contingency in the 75–75 problem were higher than in the 25–25 problem and higher than depressed subjects' judgments in the 25–25 problem ($t = 32.12, p < .05$). Table 2 presents the mean judged contingency scores for all experimental groups.

In summary, as in Alloy and Abramson's (1979) second experiment, it was found that depressed subjects' judgments of contingency were accurate both in a problem of low density of outcomes (25–25) and in a problem of high density of outcome (75–75), whereas nondepressed subjects were accurate only in the low-density condition, showing a significantly overestimated judgment of contingency when the density of stimulus that appeared was high.

Subjects' estimations of $p(S/R)$ and $p(S/R^*)$ were accurate in all experimental groups. The differences between actual and judged percentages were not significant for any experimental group. Therefore, subjects estimated accurately the necessary elements for making a precise judgment of contingency.

Discussion

The results of Experiment 2 were almost identical to those found in Alloy & Abramson's (1979) second experiment. It

Table 2

Means and Standard Deviations of BDI and Judgment of Contingency Scores for All Experimental Groups in Experiment 2

Problem type	BDI				Judgment of contingency			
	Nondepressed		Depressed		Nondepressed		Depressed	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
25%–25%	2.50	1.29	11.25	3.86	27.50	18.48	20.00	14.58
75%–75%	5.50	2.08	12.75	3.86	58.75	13.15	12.50	18.93

Note. BDI = Beck Depression Inventory.

could be argued that depressed subjects' accuracy in evaluating a noncontingency situation is simply due to a hypothetical distorted tendency to judge that there is no relation between their responses and the outcomes in any situation. However, when the results of Experiments 1 and 2 are considered together, they seem to support the depressive realism hypothesis not only because depressed subjects were more accurate than were nondepressed, but also, and more important methodologically (see Coyne & Gotlib, 1983), because depressed subjects were accurate in *objective* terms. Furthermore, it is important to note that the present study was carried out in a cultural environment different from that of Alloy and Abramson's studies, which emphasizes the consistency of this pattern of results.

From a comparative perspective, it is surprising that nondepressed subjects are the people who distort their judgment of contingency. This distortion results in a self-enhancing overestimation (cf. Abramson & Alloy, 1980; Alloy & Abramson, 1979) that could be interpreted as an illusion of control phenomenon (Langer, 1975).

Although people usually overestimate the actual degree of contingency between their responses and the outcomes that occur, that bias is observed particularly often in noncontingent, random situations (e.g., Langer, 1975, 1977; Lefcourt, 1973). Thus, one could affirm that, in general, subjects are more vulnerable to showing cognitive biases in noncontingency situations than in contingency situations.

Alloy and Abramson (1979, Experiment 2) found that depressed male students overestimated the judgment of contingency less than did depressed female students. However, the female students' results in their experiment were almost identical to those found in Experiment 2 of this study, which used all female subjects. Therefore, the results of the two experiments are parallel.

The predictions from the learned helplessness model (i.e., in a noncontingency situation, depressed subjects will accurately estimate the judgment of contingency, and nondepressed subjects will overestimate it) were confirmed for all experimental groups, with the lone exception of the results of the nondepressed subjects in the 25–25 problem. Alloy and Abramson (1979) proposed that perhaps nondepressed subjects perceive that the more often outcomes appear, even if not contingent on their responses, the better the situation is; therefore, the subject's judgment of contingency seems to be influenced both by his or her mood and by the hedonic value of the situation.

Experiments 3 and 4 analyzed, in detail, how the hedonic value of the outcome affects subjects' judgment of contingency,

both in contingency situations (Experiment 3) and in noncontingency situations (Experiment 4).

Experiment 3

It has been shown that depressed subjects exhibit accurate judgments of contingency when the outcome is either positive (winning \$5 by the end of the problem) or negative (losing \$5 by the end of the problem), both in contingency problems (Alloy & Abramson, 1979, Experiment 4) and in noncontingency problems (Alloy & Abramson, 1979, Experiment 3, 1982). However, the accuracy of nondepressed subjects' judgments of contingency is affected by the valence of the outcome. They judge accurately or even underestimate contingency when the result is negative, and they overestimate contingency when the outcome is positive.

Yet, it is possible that winning or losing a small amount of money has somewhat superficial emotional effects in depressed subjects if those subjects do in fact show a motivational system that is *anhedonic* (Beck, 1976; Costello, 1972, 1978). Alloy and Abramson (1979) found that both their win and lose problems were effective in modifying subjects' mood (as measured by the Multiple Affect Adjective Check List). However, it is likely that, as Beck has suggested, depressed subjects' negative schemata are activated only with regard to very specific negative topics (Beck, 1976; Riskind & Rholes, 1984). For instance, research on memory has shown that depressed subjects do show an enhanced recall of depressive words (e.g., Derry & Kuiper, 1981) but not of negative words in general (e.g., Davis, 1979). Thus, it seems that the specificity of the outcomes may play an important role in the activation of cognitive schemata in depressed subjects. It is likely, then, that to lose some money is not sufficient to activate negative cognitions in depressed subjects (see Weissman & Beck, 1978). To introduce greater *specificity* in the stimuli used as outcomes, Experiments 3 and 4 used outcomes more relevant to mood, as Karoly and Ruehlman (1983) have recommended, than did those used in Alloy and Abramson's hedonic experiments. Taking into consideration the importance of linguistic components in depression (Abramson et al., 1978; Beck, 1967, 1976; Ellis, 1962; Finkel et al., 1982; Miller & Seligman, 1982; Missel & Sommer, 1983), verbal stimuli (depressive or nondepressive sentences) were introduced as outcomes instead of the previous red light used in Experiments 1 and 2 (and instead of winning or losing money as in the previously cited experiments of Alloy and her coworkers). Furthermore, because a number of studies have stated that a negative

Table 3
Means and Standard Deviations of BDI and Judgment of Contingency Scores for All Experimental Groups in Experiment 3

Problem type	BDI				Judgment of contingency			
	Nondepressed		Depressed		Nondepressed		Depressed	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Self-referent								
Positive	3.75	2.50	14.00	6.68	51.25	18.88	22.50	16.58
Negative	7.00	0.81	16.75	6.24	18.25	13.12	35.00	19.58
Other referent								
Positive	2.75	1.26	14.25	3.50	48.75	33.26	38.75	27.20
Negative	5.25	1.50	13.25	3.30	19.25	13.12	38.75	27.80

Note. BDI = Beck Depression Inventory.

self-concept is not necessarily associated with a negative concept of others or the world (Abramson et al., 1978; Bandura, 1977; Diener & Dweck, 1978; Finkel et al., 1982; Garber & Hollon, 1980; Golin et al., 1977, 1979; Karoly & Ruehlman, 1983; Lewinsohn et al., 1980; Lobitz & Post, 1979) an additional factor was introduced: the *reference* of the sentences (self-referent or other-referent).

With these assumptions in mind, it was hypothesized that stimulus specificity would affect the judgments of contingency of all subjects, not only those of the nondepressed subjects as found in the previous experiments (Alloy & Abramson, 1979, 1982; Alloy, Abramson, & Viscusi, 1981). The predictions made for Experiments 3 and 4 were that depressed subjects would overestimate the actual degree of contingency existing between their responses and the stimuli that appeared in the task when those stimuli were negative (see Beck, 1976; Beck et al., 1979; Shaw & Dobson, 1981, for a review of clinical and experimental data supporting this prediction), and it was predicted that they would underestimate the degree of consistency when the stimuli were positive. The predictions for the nondepressed subjects were just the opposite: Presented with negative outcomes, nondepressed subjects should accurately estimate, or even underestimate (see Alloy & Abramson, 1979, Experiment 4), the actual degree of contingency, whereas they should overestimate it when given positive outcomes. Assuming that the self-reference is the most prominent semantic encoding of the cognitive system (Ferguson, Rule, & Carlson, 1983; Kihlstrom & Cantor, 1984; Zajonc, 1980), it was hypothesized that both the accuracy and the distortion effects found in the judgment of contingency would be more extreme in self-referent conditions than in other-referent conditions.

Method

Subjects. The subjects were 32 female undergraduate volunteers from the Universidad Complutense. They were assigned to a depressed or nondepressed group as a function of their BDI scores (cutoff score = 9). The sample consisted of 16 depressed ($M = 14.56$) and 16 nondepressed ($M = 4.68$) students. Table 3 lists the BDI means and standard deviations for all experimental groups. Participating subjects in each group were randomly assigned to the four experimental conditions, with each condition containing equal numbers of depressed and nondepressed subjects.

Experimental design. The experiment used a 2 (mood: depressed or nondepressed subjects) \times 2 (reference of the sentence: self-referent or other-referent) \times 2 (valence of the sentence: positive or negative) factorial design. The problem was one of objective contingency. A 50–25 problem was selected because it had previously been shown that depressed and nondepressed subjects accurately judged that degree of contingency in a hedonically neutral condition (see Experiment 1). Eight experimental groups resulted from the combination of the three factors.

Dependent measures. These were the same as in Experiments 1 and 2, except that subjects were also asked to score, on a 10-point scale, their degree of agreement with the set of sentences they were given.

Apparatus and materials. In addition to the randomizer of probabilities and the relay system used in Experiments 1 and 2 for controlling the appearance of the stimuli, this experiment also used a slide projector and an electronic tachistoscopic shutter (Lafayette, LA-43016) in order to control the subjects' length of exposure to the slides. The slides were projected on the screen cut into the panel used in the two previous experiments. At the top of the panel, a green light marked the length of each trial. The postexperimental questionnaire was almost identical to that used in Experiments 1 and 2, differing only in that questions concerned the slides presented instead of the red light.

Stimuli. Four groups with 35 sentences each were used. The first group consisted of negative/self-referent sentences, which were selected in the following manner. Sentences were extracted from published material (Beck, 1976; Automatic Thoughts Questionnaire of Hollon & Kendall, 1980; Subjective Probability Questionnaire of Munoz & Lewinsohn, 1976) and from clinical case histories. Three judges⁵ independently evaluated whether each negative self-referent sentence was or was not characteristic of depressed subjects. Only those sentences that received the agreement of all the judges were included. Accordingly, a group of 35 sentences was chosen (e.g., "My problems are unsolvable") to serve as a matrix for constructing the remaining three sets: positive/self-referent (e.g., "My problems are not, in general, unsolvable"), negative/other-referent (e.g., "Problems of human beings [aggressivity, selfishness, etc.] will never be solved"), and positive/other-referent (e.g., "Problems of human beings [aggressivity, selfishness, etc.] will be solved at last").⁶

Procedure. The problem consisted of 40 trials, on each of which the subjects had 2.5 s to decide to press the button. When a slide came on, it was exposed for 7.5 s. The instructions asked the subject to read each slide as it came on and to decide whether she agreed with it. The inter-

⁵ The three judges were all professors of psychopathology at Universidad Complutense.

⁶ The list of 140 sentences is available from the author on request.

trial interval was 5 s, so that the total length of the problem was about 10 min.

Results

A Mood \times Reference \times Valence ANOVA for subject's number of responses yielded a significant Mood \times Valence interaction, $F(1, 24) = 4.40, p < .05$. A Tukey (*a*) test revealed that the only significant difference was that depressed subjects in the positive-sentences conditions pressed the button more frequently ($M = 27.25$ times) than did nondepressed subjects in the negative-sentences conditions ($M = 21.12$ times). There was no difference between depressed subjects in positive conditions ($M = 23.12$) and depressed subjects in negative conditions ($M = 23.62$).

A Mood \times Reference \times Valence ANOVA for subjects' scores on the judgment of contingency revealed only a significant Mood \times Valence interaction, $F(1, 24) = 5.66, p < .02$. A Tukey (*a*) test showed that nondepressed subjects' judgments of contingency in the positive condition ($M = 55.00$) were higher than in the negative condition ($M = 18.75, t = 30.54, p < .05$). As Figure 1 shows, the type of reference (self vs. other) did not affect the pattern of results.

Correlation between judged and actual number of slides appeared was $.69 (p < .01)$ for depressed subjects and $.58 (p < .05)$ for nondepressed subjects.

Subjects also rated their degree of agreement with the set of slides as a whole. A Mood \times Reference \times Valence ANOVA of those scores yielded a significant main effect for valence, $F(1, 24) = 14.45, p < .001$, and a significant Mood \times Valence interaction, $F(1, 24) = 13.07, p < .001$. A Tukey (*a*) test showed that nondepressed subjects' agreement with positive sentences ($M = 8.00$) was significantly greater than that for any of the other conditions: nondepressed subjects with negative sentences ($M =$

3.00), depressed subjects with negative sentences ($M = 5.13$), and depressed subjects with positive sentences ($M = 5.13$). Product-moment correlations between subjects' degree of agreement with the sentences and their judgments of contingency were $.55 (p < .01)$ for nondepressed subjects and $.01 (ns)$ for depressed subjects, which indicates that nondepressed subjects' degree of agreement with the sentences could have interfered with their judgments of contingency.

Discussion

The pattern of results partially confirmed the set of predictions for this experiment. As hypothesized, nondepressed subjects evaluated accurately the actual degree of contingency in the negative condition and overestimated it in the positive condition. On the other hand, depressed subjects judged the degree of contingency accurately in the positive conditions but, contrary to predictions, did not overestimate the actual degree of contingency when negative sentences were presented. As in Alloy and Abramson (1979, Experiment 4), depressed subjects made accurate judgments of contingency regardless of the type of hedonic value, whereas nondepressed subjects were affected by the stimulus valence.

Nondepressed subjects pressed the button significantly more often in the positive than in the negative conditions. It is possible that this instrumental effect contributed to their overestimated judgments of contingency in the positive condition because, as Langer (1977) pointed out, active involvement in a task favors the onset of the illusion of control phenomenon.

Alloy and Abramson (1979, Experiment 4) found that nondepressed subjects had a tendency to underestimate the actual degree of contingency in the losing condition. The contingency problem they used (75–25) differed from the one used in the present experiment (50–25). Obviously a 50–25 problem is less

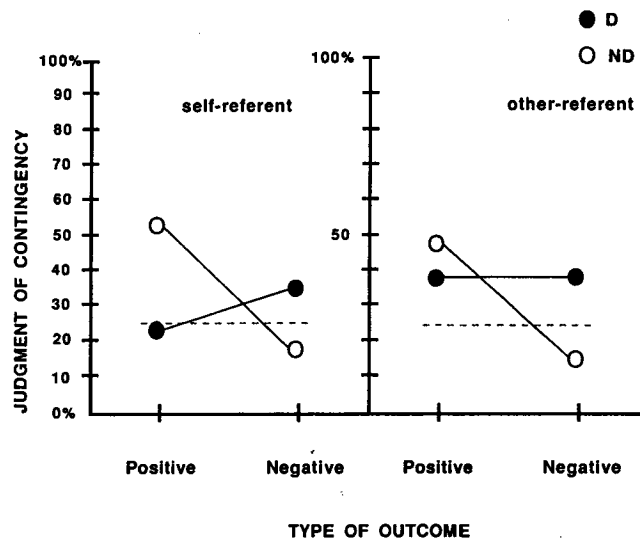


Figure 1. Judgment of contingency of depressed (D) and nondepressed (ND) students in a contingency problem in which affective sentences appeared as results. (The figure shows the Mood \times Reference \times Valence interaction. It also represents the prearranged value of the actual degree of contingency [see dotted lines].)

sensitive in detecting underestimative judgments of contingency (the error range is from only 0 to 25), but it is more sensitive in detecting overestimations (the error range is from 25 to 100). That difference could explain the fact that in the present experiment, nondepressed subjects did not show underestimative judgments of contingency in the negative conditions. Finally, the sample used in this experiment was composed only of women; however, Alloy and Abramson (1979, Experiment 4) found that the subject's sex was not an influential variable on the judgment of contingency in the hedonic objective contingency situation they designed.

Similar to other studies (e.g., Finkel et al., 1982; Karoly & Ruehlman, 1983), subjects' scores of their degree of agreement with the sentences that appeared revealed that whereas nondepressed subjects made *extreme* appraisals (i.e., a great rejection of negative sentences and a great acceptance of positive sentences), depressed subjects made more *balanced* appraisals. It has been proposed that perhaps depressed students have a rather inconsistent self-schema in which positive and negative components are mixed, whereas nondepressed students' self-schema seems to be consistently positive (Derry & Kuiper, 1981; Kuiper, Olinger, & MacDonald, in press).

Experiment 4

Experiment 4 was almost identical to Experiment 3, with the only exception being that it was an objective noncontingency problem. In noncontingency situations, either with a neutral result (see Experiment 2 and, also, Alloy & Abramson, 1979, Experiment 2) or with an hedonic result (Alloy & Abramson, 1979, Experiment 3, 1982), depressed subjects make accurate judgments of contingency but nondepressed subjects show an overestimative tendency under certain outcome conditions (i.e., when the outcome is positive or has a high density of appearance).

For this experiment, a condition of high density of stimuli appearance (75-75) was selected because, as the results from Experiment 2 showed, this seems to favor the emergence of estimative biases on the judgment of contingency. Predictions were the same as in Experiment 3. Taking into account previous results (see Experiments 1 and 2), it was expected that a noncontingency problem, rather than one of contingency, would be more likely to elicit errors in the estimation of the actual degree of contingency.

Method

Subjects. Thirty-two female undergraduates from the Universidad Complutense participated as volunteers. As a function of their BDI scores (cutoff score = 9), they were assigned to a depressed or nondepressed group. The sample consisted of 16 depressed ($M = 12.81$) and 16 nondepressed students ($M = 4.00$). The BDI means and standard deviations for all experimental groups are presented in Table 4. Participating subjects in each group were randomly assigned to the four experimental conditions, with the restriction that each condition contain equal numbers of depressed and nondepressed subjects.

Experimental design. The experiment was a 2 (mood: depressed or nondepressed) \times 2 (reference: self-referent or other-referent) \times 2 (valence: positive or negative) factorial design. The problem was of objective noncontingency and high density of stimuli appearances (75%-

75%). There were eight experimental groups resulting from the combination of the three factors.

Dependent measures. These were identical to those used in Experiment 3.

Apparatus, materials, and procedures. These were also the same as those used in Experiment 3.

Results

A Mood \times Reference \times Valence ANOVA for subjects' number of responses did not yield any significant effects. On the subjects' judgment of contingency, a Mood \times Reference \times Valence ANOVA revealed a significant Mood \times Valence interaction, $F(1, 24) = 4.62, p < .04$, and a significant Mood \times Reference \times Valence interaction, $F(1, 24) = 6.36, p < .02$. To interpret this second order interaction, two additional ANOVAs were performed considering a 2 \times 2 interaction under each one of the two levels of the third factor (Howell, 1982). These analyses yielded a significant Mood \times Valence interaction for self-referent sentences, $F(1, 24) = 10.91, p < .03$, but a nonsignificant Mood \times Valence interaction for other-referent sentences, $F(1, 24) = .07$. Figure 2 shows a disordinal Mood \times Valence interaction on self-referent sentences and no interactive effect on other-referent sentences. Means and standard deviations of judgment of contingency scores are shown in Table 4.

A Tukey (*a*) test revealed that for the self-referent sentences, both depressed subjects' judgment in the negative condition ($M = 40.00$) and nondepressed subjects' judgment in the positive condition ($M = 32.50$) were higher than depressed subjects' judgment in the positive condition ($M = 2.50$). Furthermore, depressed subjects' judgment in the negative condition was higher than nondepressed subjects' judgment in the negative condition ($M = 13.75, t = 23.48, p < .05$). Mood \times Reference \times Valence ANOVA for subjects' estimations of $p(S/R)$ and $p(S/R^*)$ did not yield any significant effect.

A Mood \times Reference \times Valence ANOVA for subjects' scores on degree of agreement with the sentences yielded a significant main effect for valence, $F(1, 24) = 15.03, p < .001$, and a significant Mood \times Valence interaction, $F(1, 24) = 4.12, p < .05$. Nondepressed subjects' agreement for negative sentences ($M = 2.50$) was significantly less than the degree of agreement of any other group: nondepressed for positive sentences ($M = 6.50$), depressed for positive sentences ($M = 5.50$), and depressed for negative sentences ($M = 4.25; t = 1.43, p < .05$). Correlation of subjects' judgment of contingency with their degree of agreement was $-.28$ (*ns*) for depressed subjects and $.55$ ($p < .05$) for nondepressed. The difference between these two correlations was also significant ($z = 2.36, p < .05$).

Discussion

The pattern of results found in Experiment 4 confirmed almost completely the main predictions noted earlier. When the noncontingent results were *negative self-referent* sentences, depressed subjects overestimated the actual degree of contingency between their responses and the results, whereas nondepressed subjects judged it accurately. However, when the results were *positive self-referent* sentences, the judgment of contingency of depressed subjects was extremely accurate, whereas nonde-

Table 4

Means and Standard Deviations of BDI and Judgment of Contingency Scores for All Experimental Groups in Experiment 4

Problem type	BDI				Judgment of contingency			
	Nondepressed		Depressed		Nondepressed		Depressed	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Self-referent								
Positive	3.50	1.91	12.50	5.07	32.50	21.02	2.50	5.00
Negative	4.00	2.94	10.75	2.22	13.75	9.46	40.00	16.83
Other referent								
Positive	4.25	2.22	11.50	3.79	20.00	21.60	17.50	22.54
Negative	4.25	2.63	16.50	5.20	15.75	14.10	8.75	17.50

Note. BDI = Beck Depression Inventory.

pressed subjects showed a tendency, which approached significance, to overestimate.

What is most important about this finding is that in some situations, depressed subjects also distort (by overestimating) their judgment of contingency. This result contradicts both the assumption of the learned helplessness theory concerning accurate judgments of contingency of depressed people in objective noncontingency situations and the results found by Alloy and Abramson (1979, 1982) and Alloy et al. (1981) that suggested a hypothetical cross-situational accuracy in the judgments of contingency made by depressed people. Therefore, the depressive realism hypothesis has boundary conditions, at least in the case of judgment of contingency.

It must be emphasized that *similar* accuracy/distortion tendencies were manifested, although in the opposite direction, in depressed and in nondepressed subjects. Perhaps, as Volpicelli, Altenor, & Seligman (1983) and Mineka and Hendersen (1985) have pointed out, the effects of control experiences are *bidirec-*

tional; that is, cognitive distortions can be brought out in depressed and in nondepressed subjects. In this way, neither group is absolutely safe from distortions in the judgment of contingency (Vázquez, 1984).

Depressed subjects' error appeared in the self-referent condition but not in the other-referent condition. This finding stresses even more the idea that the cognitive set of either depressed or nondepressed subjects may not be as homogeneous as previously thought (e.g., Beck, 1976; Beck et al., 1979). In fact, the reference type, such as the self versus other distinction tested in Experiments 3 and 4, may have an important role in the configuration of the depressive cognitive schemata (see Tabachnik, Crocker, & Alloy, 1983, Greenberg, Vázquez, & Alloy, in press, or the excellent work of Kihlstrom & Cantor, 1984).

The results of Experiment 4 suggest that subjects' tendency to overestimate judgments of contingency, which was significant for depressed subjects, could have a direct connection with the type of *attributions* usually found in depressed subjects (for a

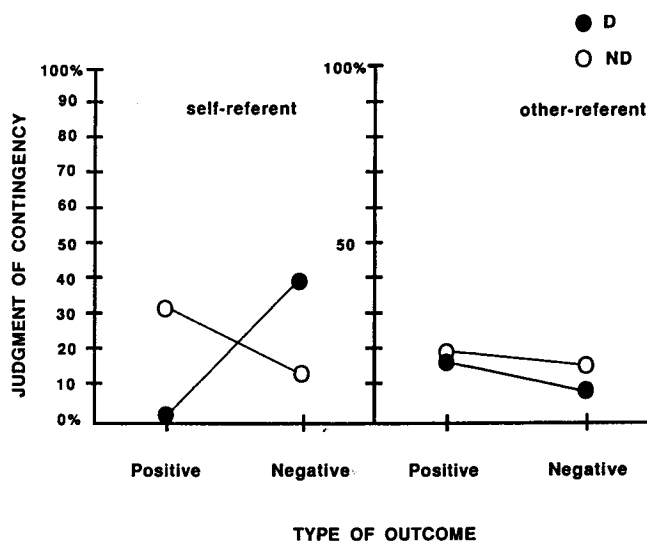


Figure 2. Judgment of contingency for depressed (D) and nondepressed (ND) students in a noncontingency problem in which affective sentences appeared as results. (The figure shows the Mood \times Reference \times Valence interaction. The actual degree of contingency was zero in all cases.)

review, see Peterson & Seligman, 1984) and in nondepressed subjects or in the general population (Bradley, 1978; Diener & Dweck, 1978; Ross & Sicoly, 1979; Zuroff, 1981). It could be argued that depressive or nondepressive distorted causal attributions are based, at least in part, on analyses of contingency also distorted in the same direction. For instance, depressed subjects' excessive self-blame (e.g., Abramson et al., 1978; Beck, 1976) could have its origin in an overestimative bias in the perception of contingency between their acts and certain negative results.

On the degree of agreement with the sentences, the subjects' scores were similar to those reported for Experiment 3. Once again, nondepressed subjects rated the sentences more extremely than did depressed subjects. Furthermore, the reference of the sentences did not affect the subjects' evaluation. Therefore, it seems that the evaluated degree of agreement is not the only variable that might predict the judgment of contingency made by the subjects. Such variables as the frequency of these thoughts, for instance, may also be associated with the judgments of contingency that subjects make.

General Discussion

The results of the present study have demonstrated that there is a definite interaction between the type of stimuli appearing as the outcome and the mood of the subjects, which indicates that the two factors jointly determine the judgment of contingency that subjects make. Although that effect has already been observed in nondepressed subjects, depressed subjects seem to be reluctant to succumb to any type of distortion in their judgments of contingency (Alloy & Abramson, 1979, 1982; Alloy et al., 1981), with the exception of those cases in which they have to judge either the actual degree of control that another subject has (Martin, Abramson, & Alloy, 1984) or their own degree of control in the presence of an observer (Benassi & Mahler, 1985). In these situations, they, too, show an illusion of control. The data from comparisons between judged and actual degree of contingency in Experiments 3 and 4 showed that under contingency situations, nondepressed subjects did overestimate the actual relation between their responses and positive outcomes. Under noncontingency situations, depressed subjects did overestimate the relation between their responses and self-referent negative outcomes; furthermore, under noncontingent positive self-referent outcomes, nondepressed subjects made greater judgments of contingency than depressed subjects did. Therefore, distortions associated with self-referent outcomes were more likely to appear under noncontingent conditions than under contingent conditions. In fact, as we have already discussed, noncontingent situations favor, in general, the onset of the illusion of control phenomena. In the rest of the experimental conditions, subjects' judgments of contingency were not significantly distorted.

Thus, it has been shown that depressed subjects' realism has precise boundaries. Such boundaries seem to be located in the most important point of reference that subjects have for categorizing events: the self (Fong & Markus, 1982; Kihlstrom & Cantor, 1984; Rogers, 1981). In fact, Lewinsohn, Larson, and Munoz (1982) have found, through factoring a number of self-scales, that the items that most differentiated depressed from

nondepressed subjects were those that alluded to the self-evaluation of personal abilities.

In line with the observations of several authors (e.g., Derry & Kuiper, 1981; Greenberg et al., in press; Kihlstrom & Nasby, 1980; Riskind & Rholes, 1984), the introduction of specific verbal stimuli as experimental material in the present study has proved to be crucial in revealing particular cognitions in depressed subjects. Nevertheless, it is interesting to realize that the *threshold of biasing* in the judgments of contingency is quite consistently lower in nondepressed than in depressed subjects. That is, it is easier to elicit biases in nondepressed than in depressed subjects. One could argue that there seems to be a sort of "positive cognitive set" in nondepressed people that is even more consistent than the negative one observed in the *subclinically* depressed subjects.

The results of Experiment 4 are also revealing because the kind of distortion observed in the depressed subjects' judgment of contingency matches the direction of the most common depressive distortions observed in other cognitive variables (Beck, 1976; Coyne & Gotlib, 1983; Miller, 1975; Shaw & Dobson, 1981). Despite Abramson and Alloy's (1980) argument that it would be likely that the problem of depressed people is not so much having *depressogenic* cognitive biases but, rather, not having the same type of biases that nondepressed people show, the results of Experiment 4 suggest the idea that depressed people could actually have a *genuine* cognitive bias, instead of, or in combination with, an absence of the positive cognitive bias exhibited by nondepressed people.

The errors in the judgment of contingency that the subjects made were mainly deductive ones. In the words of Kahneman and Tversky (1982), such errors would be of *application* rather than of *understanding*, because subjects evaluated accurately the two necessary elements (i.e., the two conditional probabilities) in order to make an accurate judgment of contingency. However, they seemed to use a previous general concept (Alloy, 1982; Crocker, 1981; Kayne & Alloy, in press) that interfered with making their judgments of contingency. That previous concept perhaps relies on the different history of reinforcements that depressed and nondepressed subjects have (Alloy & Abramson, 1979; Langer, 1977; Lewinsohn, 1974). It could explain the nondepressed subjects' tendency to believe that their responses are more associated with positive than with negative outcomes, and it could explain the opposite tendency in the depressed subjects as well. In any case, the use of certain heuristics is not universal (Kahneman & Tversky, 1982; Simon & Hayes, 1976). Indeed, as the present study has found, such factors as the type of stimuli of the situation are likely to modify the use of the heuristics (Ebbesen & Konecni, 1980).

An important issue to be considered is the adaptive value of such distortions. It is problematic to try to teach thinking strategies (see Fischhoff, 1982; Nisbett & Ross, 1980) because the objective adjustment criteria are not known (Einhorn, 1980). In fact, if subjects are actually "building" their own social environments (Avia, 1978; Bowers, 1973; Byrne, 1971; Gergen, 1984), then the use of heuristics such as *representativeness* could be appropriate in most cases. In natural settings, it may sometimes be difficult to know if the negative cognitions of depressed people are real distortions or accurate views of an actually deleterious environment in which they are involved

(Abramson & Alloy, 1981; Brown, 1979; Coyne, 1982; Coyne & Gotlib, 1983).

Although the goal of the cognitive therapies for depression is to take apart the "primitive thinking" (cf. Beck et al., 1979) of the depressed subject, perhaps one could take into account that the therapeutic goal may not be to achieve "rational" thinking but a distorting positive bias (as nondepressed subjects show). As Langer (1977), Hogarth (1981), and Kayne and Alloy (in press) have pointed out, in many cases suboptimal rules work well although they are not scientifically accurate. That could be the case of such cognitive variables as the judgments of contingency. Furthermore, the finding of a negative bias in the depressed subjects' judgment of contingency (see, for instance, Experiment 4 and Martin et al., 1984) provides a rationale for the use of cognitive therapeutic strategies that could reverse such depressive distorted judgments (e.g., Abramson et al., 1978; Beck et al., 1979; Seligman, 1978).

The finding of a distorted judgment of contingency in depressed subjects lends some support to the learned helplessness theory of depression. Indeed, contrary to what authors of that model have recently argued (Abramson & Alloy, 1980; Alloy, 1982; Alloy & Abramson, 1979, 1982; Alloy & Seligman, 1979), the earlier proposal of the theory about a genuine cognitive deficit of depressed subjects' judgments of contingency (Abramson et al., 1978; Maier & Jackson, 1979; Seligman, 1975) may still be valid. That is, depressed subjects show, under some circumstances, genuine *distorted* judgments of contingency. However, contrary to what was proposed in the learned helplessness theory, that distortion is not necessarily an underestimative judgment (e.g., Experiment 4; Benassi & Mahler, 1985; Martin et al., 1984).

Although the set of results relating to the judgment of contingency is highly consistent, further studies should analyze them in more naturalistic settings (Silver, Wortman, & Klos, 1982) and use samples of clinically depressed subjects in order to generalize the results (Coyne & Gotlib, 1983; Doerfler, 1981). Finally, the mutual relations among the judgment of contingency and other variables related to depression should be studied (Abramson et al., 1978; Vázquez & Polaino, 1982). Along this line, Alloy et al. (1981) have found that the induction of a specific mood (elated or depressed), using the Velten procedure (1968), modifies the judgment of contingency. In this same way, it would be interesting to analyze the robustness of the observed biases and accuracies. Studying the most suitable methods for *debiassing* the distorted judgments (Fischhoff, 1982; Kahneman & Tversky, 1982) might shed some light on antidepressive therapeutic strategies.

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