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The sad truth about depressive realism

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In one form of a contingency judgement task individuals must judge the relationship between an action and an outcome. There are reports that depressed individuals are more accurate than are nondepressed individuals in this task. In particular, nondepressed individuals are influenced by manipulations that affect the salience of the outcome, especially outcome probability. They overestimate a contingency if the probability of an outcome is high—the "outcome-density effect". In contrast, depressed individuals display little or no outcome-density effect. This apparent knack for depressives not to be misled by outcome density in their contingency judgements has been termed "depressive realism", and the absence of an outcome-density effect has led to the characterization of depressives as "sadder but wiser". We present a critical summary of the depressive realism literature and provide a novel interpretation of the phenomenon. We suggest that depressive realism may be understood from a psychophysical analysis of contingency judgements.

Alloy and Abramson (1979) reported an unexpected and intriguing result that attracted the attention of many researchers and is discussed in current textbooks (e.g., Myers & Spencer, 2004; Nolen-Hoeksema, 2001). Alloy and Abramson asked depressed and nondepressed college students to rate the degree of control that their responses had over the occurrence of an environmental event. They used the discrete-trial, active (operant) version of the contingency judgement task. In this task, each trial is clearly marked, and the participant has the option of responding (e.g., pressing a button) or not responding (e.g., not pressing a button). At the termination of the response period, an outcome occurs (e.g., the illumination of a light) or does not occur (in this example, the light does not illuminate). At the end of a block of trials, the participant is asked to rate their control over the outcome. The 2 × 2 matrix relating responding to outcomes is shown in Table 1. We represent an active response as R, an inactive response as ∼R, the occurrence of an outcome as O, and the nonoccurrence of an outcome as ∼O. The letters in the cells (a, b, c, d) represent the joint frequency of occurrence of the four response–outcome combinations. The measure of the contingency between the response and the outcome is ΔP—the difference between the conditional probability of an outcome given that a response has occurred and the conditional probability of an outcome given that a response has not occurred (Allan, 1980):

$$\Delta P = P(O|R) - P(O|\sim R) = \frac{a}{a+b} - \frac{c}{c+d}. \quad 1$$

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Table 1. *The 2 × 2 matrix for the response–outcome pairings in the discrete-trial, active contingency task*

	O	∼*O*
R	a	b
∼R	c	d

Note: The letters in the cells (a, b, c, d) represent the joint frequency of occurrence of the four response–outcome combinations in a block of trials.

It has been known for some time (see Allan, 1993) that, for a given ΔP value, participants typically report that their responses have greater control over the outcome as the probability of an outcome, P(O), increases:

$$P(O) = \frac{a + c}{a + b + c + d}. \qquad 2$$

This phenomenon of reported increased control between R and O as P(O) increases has been termed the "outcome-density effect" (see Allan, 1993) and has also been referred to as an "illusion of control" (see Alloy & Abramson, 1979). Alloy and Abramson concluded that such an effect is seen in nondepressed but not depressed individuals. That is, rather than displaying the illusion apparent in nondepressives, depressed college students did not inflate their judgements of control when P(O) increased. Such resistance by depressives to concluding that the contingency between a response and outcome is increased when just the outcome density is increased has been referred to as "depressive realism" (e.g., Alloy & Abramson, 1988). As an example, consider the situation where ΔP = 0, and P(O) is varied. Nondepressive ratings of the control of responding over the occurrence of the outcome increased with P(O), an illusion of control since the actual contingency did not change. In contrast, depressive ratings were not influenced by P(O), depressive realism. As the title of their article indicates, Alloy and Abramson (1979) concluded that depressed college students were "sadder but wiser" than nondepressed college students.

Other variables in addition to outcome density have been reported to result in an illusion of control in nondepressives and depressive realism in depressives. While this mood effect has been replicated by other investigators, nonreplications have also been reported. One purpose of the present paper is to provide a critical summary of mood effects in contingency studies in order to assess the reliability of the phenomenon and to delineate the conditions under which it occurs (for a brief earlier summary, see Dobson & Franche, 1989). Recently, there has been a renewed interest in the outcome-density effect, and two novel theoretical accounts have been proposed (Allan, Siegel, & Tangen, 2005; Msetfi, Murphy, & Simpson, 2007; Msetfi, Murphy, Simpson, & Kornbrot, 2005). A second purpose of this paper is discuss the applicability of these accounts to understanding depressive realism.

EMPIRICAL RESEARCH

Almost all the research concerned with depressive realism in contingency judgement tasks[1] has used college students who are divided into two mood groups, "depressed" and "nondepressed", on the basis of their scores on a number of depression inventories such as the Beck Depression Inventory (BDI: Beck, 1967) and the Multiple Affect Adjective Checklist (MAACL: Zuckerman & Lubin, 1965). Both male and female students participated in most experiments. While males and females did not always differ, when they did, differences due to mood were generally greater for females then for males.

[1] Many of the papers concerned with contingency judgements and depressive realism cite unpublished experiments. In our review, we only include published work.

Table 2. *A summary of the design of the four experiments reported by Alloy and Abramson (1979)*

Experiment	*ΔP*	*P(O)*	*O valence*
1	± .25	.675	
	± .50	.500	
	± .75	.375	
2	0	.25	
	0	.75	
3	0	.5	win
	0	.5	lose
4	± .5	.5	win
	± .5	.5	lose

Alloy and Abramson (1979)

The referent report by Alloy and Abramson (1979) describes a series of four experiments. The designs of these experiments are summarized in Table 2. On each of 40 trials, participants could either press a button (R) or not (∼R), and then a green light was illuminated (O) or not (∼O). At the end of the 40 trials, the participant rated, on a 100-point scale, the degree of control that their responses exerted over the illumination of the light, where 0 indicated no control, and 100 indicated complete control. One purpose of these experiments was to evaluate the predictions made by the learned helplessness theory of depression (Seligman, 1975). According to this theory, depressed people have generalized expectancies of independence between their responses and outcomes—the depressive is characterized as one who believes that he or she is ineffective and powerless to control outcomes in the world.

A deduction from learned helplessness theory is that depressed individuals should underestimate the degree of contingency between their responses and environmental outcomes (Abramson & Alloy, 1980; Alloy & Seligman, 1979), and Experiment 1 in Alloy and Abramson (1979) evaluated this prediction. The size of the contingency (ΔP = .25, .50, and .75) and the sign of the contingency (positive ΔP and negative ΔP) were varied. The pairs of conditional probabilities—that is, P(O|R) and P(O|∼R), see Equation 1—for the three positive ΔP values were .75 and .50, .75 and .25, and .75 and .00, and the pairs for the three negative ΔP values were .50 and .75, .25 and .75, and .00 and .75. There was no effect of sign[2] on ratings, and the ratings, collapsed over sign, are plotted as a function of ΔP in Figure 1a. Ratings of control increased with ΔP, and there was no difference between depressed and nondepressed participants. The absence of a difference between the ratings of the two mood groups is inconsistent with the predictions of learned helplessness theory—depressives should have underestimated the degree of contingency between response and outcome, but did not.

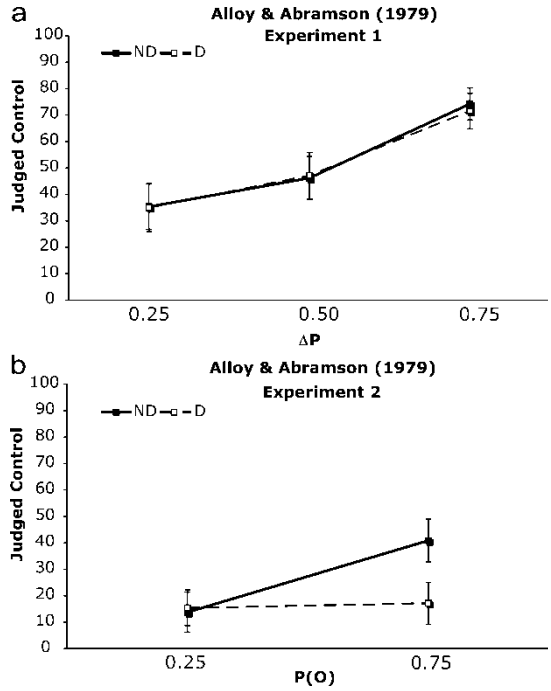

Figure 1. *The data are replotted from the Tables in Alloy and Abramson (1979). Figure 1a shows judged control in Experiment 1 as a function of ΔP for each mood group (ND = nondepressed, D = depressed). Figure 1b shows judged control in Experiment 2 as a function of P(O) for each mood group (ND = nondepressed, D = depressed).*

[2] It should be noted that although there were negative contingencies, the rating scale ranged from 0 to 100.

According to Alloy and Abramson (1979), learned helplessness theory also regards nondepressives as having a generalized expectation of control, which should interfere with the detection of noncontingencies.[3] "Just as depressives' generalized expectation of response–outcome independence interferes with their ability to perceive that outcomes are now dependent on responses, nondepressives' generalized expectation that outcomes are dependent on responses should interfere with their ability to perceive that outcomes are independent of responses" (p. 457). Thus, nondepressives should show an illusion of control, and depressives should not when events are noncontingent. In Experiment 2 in Alloy and Abramson (1979), the relationship between responding and the outcome was noncontingent (i.e., $\Delta P = 0$) and P(O) was varied (.25 and .75). The ratings are plotted as a function of P(O) in Figure 1b. It is clear that P(O) interacted with mood state. When the outcome was infrequent, P(O) = .25, ratings were close to zero for both mood groups. Nondepressive ratings increased when P(O) = .75, whereas depressive ratings were unaffected by P(O). Thus, nondepressives showed an illusion of control—judged control increased with P(O)—whereas depressives displayed depressive realism—judged control was unaffected by P(O). Alloy and Abramson argued that the results of their Experiment 2, while showing a difference between depressives and nondepressives, were inconsistent with learned helplessness theory, which predicts that the two mood groups should differ when P(O) = .25 as well as when P(O) = .75. That is, the theory predicts a mood effect, whereas the data revealed a Mood × Density interaction.

In their remaining two experiments, Alloy and Abramson (1979) evaluated the effects of outcome valence, rather than probability, on control ratings in depressive and nondepressive participants. That is, an outcome was made either desirable or undesirable (rather than frequent or infrequent). In Experiment 3, both ΔP and P(O) were constant, $\Delta P = 0$ and P(O) = .5, and the valence of light onset was manipulated. For the "win" condition, the participant gained \$0.25 on each trial on which the light turned on. For the "lose" condition, the participant began the block of trials with \$5.00 and lost \$0.25 on each trial on which the light did not turn on. There was no contingency between responding and payoff; that is, these payoffs occurred regardless of whether or not the participant responded. As with P(O), outcome valence influenced nondepressive ratings but not depressive ratings. In the lose condition, ratings were low for both mood groups. Nondepressive ratings increased in the win condition, whereas depressive ratings did not. Thus, depressive realism was demonstrated with an "outcome valence effect", as well as with an outcome-density effect.

Experiment 4 also varied the valence of the outcome. In contrast with Experiment 3 (in which $\Delta P = 0$), however, ΔP was set at either +.5 or −.5. When $\Delta P = +.5$, the conditional probabilities were .75 and .25. When $\Delta P = -.5$, the conditional probabilities were .25 and .75. For the win condition, the participant gained \$0.10 on each trial on which the light turned on. For the lose condition, the participant began the block of trials with \$4.00 and lost \$0.30 on each trial on which the light did not turn on. As in Experiment 3, outcome valence influenced nondepressive ratings but not depressive ratings. In the win condition, the two mood groups did not differ, and ratings were at about the middle of the scale (i.e., 50). Nondepressive ratings decreased in the lose condition, whereas depressive ratings did not.

In addition to asking their participants to rate the degree of control of responding on the outcome, in all their experiments Alloy and Abramson (1979) required their participants (a) to estimate the overall percentage of light onset—that is, P(O), (b) to estimate the

[3] Alloy and Abramson (1979) do note that not all researchers agree with their interpretation of learned helpless theory (see p. 457).

percentage of light onset when they pressed—that is, P(O|R), and (c) to estimate the percentage of light onset when they did not press—that is, P(O|∼R). In general, depressives and nondepressives were similarly accurate in their estimates of these probabilities, and the two mood groups did not differ significantly. It appears that both groups had the appropriate data with which to make an accurate judgement of control. Alloy and Abramson concluded that the locus of nondepressive errors "is in their *organization* of the incoming response–outcome data and not in the perception of the data themselves" (p. 474).

In summary, the Alloy and Abramson (1979) data indicate that depressed college students are quite accurate in judging how much control they exert over the outcome, whereas nondepressed college students succumb to illusions about their control over the outcome. Specifically, nondepressives overestimated the control that their responses had over the outcome when noncontingent outcomes were frequent (Experiment 2) or desired (Experiment 3) and underestimated the control when contingent outcomes were undesired (Experiment 4).

Replications: Successes and failures

Some investigators have reported depressive realism findings similar to that reported by Alloy and Abramson (1979), but others have reported an inability to obtain the phenomenon.

Replications

In their Experiment 1, Alloy and Abramson (1979) demonstrated that depressives and nondepressives did not differ in their ratings of control when $\Delta P \neq 0$ (i.e., when the relationship was contingent, $\pm .25$, $\pm .50$, and $\pm .75$). This result has been replicated a number of times. Lennox, Bedell, Abramson, Raps, and Foley (1990) conducted a similar experiment but with four patient groups: major depressive disorder, schizophrenia with depression, schizophrenia without depression, and nonpsychiatric medical/surgical. They included four of the ΔP conditions used by Alloy and Abramson ($\pm .25$ and $\pm .75$). As in Alloy and Abramson, ratings of control increased with ΔP, and there were no differences among the four groups (although, in contrast with Alloy & Abramson, Lennox et al. did find that the sign of the contingency mattered, with higher ratings for positive contingencies than for negative contingencies). Vázquez (1987) noted that ΔP and P(O) were confounded in Experiment 1 in Alloy and Abramson (1979) because as ΔP increased, P(O) decreased (see Table 2; this was also the case for Lennox et al., 1990). In Vázquez's Experiment 1, there were two values of ΔP (.25 and .75), generated by the conditional probability pairs of .50 and .25, and .75 and .00. Thus for both contingencies, $P(O) = .375$. The results were similar to those reported by Alloy and Abramson—ratings of control increased with ΔP, and there was no difference between depressed and nondepressed participants. Kapçi and Cramer (1999) also varied contingency ($\Delta P = .5$ and 1) and sign (positive and negative). The pairs of conditional probabilities for the two positive ΔP values were .75 and .25 and 1.00 and .00. The pairs for the two negative ΔP values were .25 and.75 and .00 and 1.00. Thus for all contingencies, $P(O) = .5$. Again, ratings increased with ΔP, and there was no difference between mood groups. As in Lennox et al., but in contrast to Alloy and Abramson, the ratings tended to be higher for positive contingencies than for negative contingencies.

In their Experiment 2 (see Table 2), Alloy and Abramson (1979) demonstrated that, with $\Delta P = 0$, when P(O) is high (.75), but not when it is low (.25), nondepressives rated their control higher than did depressives (see Figure 1b). That is, nondepressives, but not depressives, displayed an outcome-density effect. Vázquez (1987) and Presson and Benassi (2003) have provided independent replications of Alloy and Abramson's (1979) Experiment 2. Experiment 2 in Vázquez was similar to Experiment 2 in Alloy and Abramson (1979), and the significant interaction between mood and P(O) was obtained—nondepressive ratings increased with P(O), and depressive ratings did not change. Vázquez's participants were also college students but at a Spanish

university, thus extending the generality of the Alloy and Abramson results. In Presson and Benassi, $\Delta P = 0$ and $P(O) = .75$. Consistent with the findings of Alloy and Abramson and of Vázquez, depressive judgements of control were lower than nondepressive judgements.

Nonreplications

In contrast with the above reports, others have reported inabilities to replicate the difference in control judgements between the two mood states when $\Delta P = 0$. Bryson, Doan, and Pasquali (1984) reported that neither mood group showed an illusion of control—ratings were constant with increases in P(O)—whereas Kapçi and Cramer (1999) reported that both mood groups showed an illusion of control—ratings increased with increases in P(O). Dobson and Pusch (1995) used clinical populations rather than college students. There were three patient groups: clinically depressed (currently receiving treatment), previously depressed (no longer receiving treatment), and never depressed. In the Dobson and Pusch study, $\Delta P = 0$ and $P(O) = .75$. The three groups did not differ in their ratings. Although Dobson and Pusch did not vary P(O), they used the level of P(O) at which Alloy and Abramson (1979) found a difference between mood groups.

Summary

When the relationship between responding and the appearance of the outcome is noncontingent (i.e., $\Delta P = 0$), there have been both replications and nonreplications of the findings reported by Alloy and Abramson (1979). In some studies nondepressives show an illusion of control, and depressives do not, but in other studies the two mood groups do not differ. There appears to be consistency among all the studies that the two mood groups do not differ when the relationship is contingent (i.e., $\Delta P \neq 0$). Alloy and Abramson commented on this absence of a mood difference in their Experiment 1:

> Although manipulations of reinforcement frequency affected judgements of control adversely in the noncontingent case, such manipulations were not sufficient to produce errors in the contingent case. These results may imply that noncontingency is psychologically more difficult relationship to perceive or understand than contingency. (p. 474)[4]

As was noted earlier, ΔP and P(O) were confounded in their Experiment 1 and also in Lennox et al. (1990). In the other studies where $\Delta P \neq 0$, P(O) was constant. In Vázquez (1987), $P(O) = .375$ for both contingency values, and in Kapçi and Cramer (1999), $P(O) = .5$ for both contingency values. Given that Alloy and Abramson found an interaction between mood and P(O) when $\Delta P = 0$, it is surprising that investigators have not manipulated P(O) when $\Delta P \neq 0$ and moreover that they have evaluated only low values of P(O)—that is, $\leq .5$. On the basis of the available $\Delta P = 0$ data, one would not expect a difference between mood groups with low values of P(O).

In their Experiments 3 and 4, Alloy and Abramson (1979) reported that manipulations of outcome valence (in addition to outcome probability) can be used to demonstrate depressive realism. Subsequent research, inspired by these findings, have additionally evaluated the effects of outcome valence manipulations on mood effects in contingency judgements.

Mood effects and judgements of contingency[5]

Induced mood

The Alloy and Abramson (1979) experiments do not provide information about the causal direction of the correlation between depression and accuracy in judging contingencies. It could be that the depressive mood state causes people to assess contingencies accurately. If so, people should judge

[4] Alloy and Abramson (1979) used "reinforcement" interchangeably with "outcome".

[5] Alloy, Abramson, and collaborators published a series of papers in the 1980s. In our review we have included only papers directly concerned with mood effects on judgements of contingency. We have not included papers where the main focus was on learned helplessness theory (e.g., Abramson, Alloy, & Rosoff, 1981; Alloy & Abramson, 1982).

contingencies accurately when they are depressed but not when they are not depressed. Alternatively, those who judge accurately may be more prone to depression than those who misjudge. That is, those who are realistic about their impact on environmental events would be at high risk for depression. Alloy, Abramson, and Viscusi (1981) investigated whether the results reported by Alloy and Abramson would be seen when the mood states were transient. Depressed and elated mood states were induced in naturally nondepressed and depressed female students, respectively. Depressed mood was induced by having participants read self-referent depressing sentences such as: "I have had too many bad things happen in my life" and "I want to go to sleep and never wake up". Elated mood was induced by having participants read self-referent elative sentences such as "Things will be better and better today" and "God, I feel great". Other depressed and nondepressed participants were not induced or read neutral statements, such as "Utah is the Beehive State". The impact of mood induction was assessed on the win noncontingent task used in Experiment 3 in Alloy and Abramson (see Table 2). With no induction or with neutral induction, nondepressed participants gave higher ratings of control than did depressed participants, replicating the results of Alloy and Abramson. Depressives who were given elation induction gave higher ratings of control than did nondepressives who were given depression induction. Thus, depressives made temporarily elated showed illusions of control normally observed in nondepressives, whereas nondepressives made temporarily depressed showed depressive realism normally observed in depressives.

Self and others

Martin, Abramson, and Alloy (1984) compared the relationship between depression and susceptibility to the illusion of control for oneself and for others. Depressed and nondepressed college students rated how much control they themselves had or how much control a male or female confederate had in the win noncontingent task used in Experiment 3 in Alloy and Abramson (see Table 2). In the confederate condition, the participant watched a confederate perform the task, whereas in the self condition, the participant performed the task alone. In the confederate condition, sex of the participant was crossed with sex of the confederate. Self-ratings replicated Experiment 3 in Alloy and Abramson—nondepressives showed an illusion of control, depressives showed depressive realism, and there was no difference between males and females. Others-ratings, however, were a complex interaction of participant mood, participant sex, and confederate sex. Martin et al. concluded that "an adequate understanding of depressive and nondepressive cognition requires an interpersonal as well as an intrapsychic perspective" (pp. 134–135). Depressive realism and nondepressive illusions in judging control may be specific to the self.

Benassi and Mahler (1985) were interested in determining the influence of the presence of an observer on the mood effects reported by Alloy and Abramson (1979). They compared ratings under two conditions: Either the participant completed the task alone or an observer was present. They found that mood interacted with observer present or absent. For example in their Experiment 1, there was no contingency between responding and outcome ($\Delta P = 0$), and the outcome was frequent, $P(O) = .75$. In the participant-alone condition, Benassi and Mahler replicated the basic finding of depressive realism—nondepressive ratings were higher than depressive ratings. However, in the observer-present condition, it was the depressives who had the higher ratings. In Experiment 2, only the observer-present condition was used, and P(O) was varied (.25 and .75). Benassi and Mahler found an interaction between P(O) and mood. When outcome density was high—that is, $P(O) = .75$, depressive ratings were higher than nondepressive ratings, replicating the results of their Experiment 1. At the low outcome density, $P(O) = .25$, the two mood groups did not differ. In Experiments 1 and 2, the observer was present throughout the experiment. In Experiment 3, the observer was present during the 40 response–outcome trials, but not during the ratings. Again, depressive ratings were

higher than nondepressive ratings. Thus, the presence of an observer reverses the effects reported by Alloy and Abramson (1979)—depressed college students show an illusion of control relative to nondepressed college students.

Vázquez (1987) was also interested in self versus others in his Experiments 3 and 4. He used sentences (negative or positive) as outcomes and varied the referent in these sentences (self or other). Examples of the four sentence types are: "My problems are unsolvable" (negative self-referent), "My problems are, in general, not unsolvable" (positive self-referent), "Problems of human beings [aggressivity, selfishness, etc.] will never be solved" (negative other-referent), and "Problems of human beings [aggressivity, selfishness, etc.] will be solved at last" (positive other-referent). In Experiment 3 $\Delta P = .25$ (.50 and .25), and in Experiment 4 $\Delta P = 0$ (.75 and .75). Across the two experiments, control judgements were a complex interaction of ΔP, valence, and referent. Overall, nondepressives were more influenced by valence then were depressives. However, when $\Delta P = 0$, depressives showed higher judgements of control than do nondepressives when the outcomes were negative self-referent sentences. Also, outcome valence did not affect the judgements of either mood group when the sentences were other-referent.

Active versus passive

Almost all reported contingency studies concerned with depressive realism have used the discrete-trial, active task described earlier. In a book chapter, Alloy, Abramson, and Kossman (1985) briefly describe three studies that used the passive (Pavlovian) contingency task.[6] In the passive task, a cue is either presented or is not presented, and then the outcome either occurs or does not occur. At the end of a block of trials, the participant is asked to rate the strength of the relationship between the cue and the outcome (in contrast with the active task, in which judgements are about response–outcome relationships). In Experiment 1 in Alloy et al., the cue was a red light (presented or not presented), and the outcome was a green light (presented or not presented). At the end of a 40-trial sequence, the participant was asked "to judge the degree of contingency or predictability (on a 0 to 100 scale) that existed between red light onset and green light onset" (p. 236). There were two values of ΔP (.25 and .75). The pairs of conditional probabilities for the two ΔP values were .75 and .50, and .75 and 00. As in Experiment 1 of Alloy and Abramson (1979), ratings increased with ΔP and the two mood groups did not differ. Experiment 2 was modelled on Experiment 3 in Alloy and Abramson (see Table 2): $\Delta P = 0$, $P(O) = .5$, and the win–lose conditions were used to manipulate outcome valence. Alloy et al. concluded that "there were no differences between depressed and nondepressed subjects' judgements of predictability, and both groups judged relatively accurately that the red light provided little prediction of the green light" (p. 237). In Experiment 3, $\Delta P = 0$ and $P(O) = .75$. For half the participants, the task was active (as in Alloy & Abramson, 1979) and for half the participants the task was passive. Alloy et al. concluded that "whereas nondepressed subjects as a group were more likely than depressed subjects as a group to exhibit an illusion of personal control when the experimental outcome was noncontingent but frequent, nondepressives were no more likely than depressives to exhibit an illusion of prediction about this same outcome" (p. 240). Mood state does not appear to differentially affect predictive judgements.

In summary, in contrast with the findings of Alloy and Abramson (1979) with the active form of the contingency task, Alloy et al. (1985) reported no evidence of depressive realism with the passive form of the task. However, these Alloy et al. data were presented briefly in a chapter and have not subsequently been presented in a more comprehensive form in a journal article (L. B. Alloy, personal communication, April 18, 2005).

[6] The three studies reported in this chapter have not been published in a journal article. The description in the chapter is brief, and neither standard errors nor statistical analyses are reported.

Intertrial interval

Msetfi et al. (2005; Msetfi et al., 2007) evaluated the effect of the duration of the intertrial interval (ITI) on the illusion of control. Msetfi et al. (2005) noted that in the Alloy and Abramson (1979) experiments mean ITI duration was 14 s. On the basis of their review of contingency experiments that varied P(O) in active tasks, Msetfi et al. (2005) concluded that an illusion of control is usually seen when the ITI is long and is rarely seen when the ITI is short. Msetfi et al. (2005; Msetfi et al., 2007) reported the results of experiments in which ITI was varied (e.g., 3 s and 15 s). They concluded that when the ITI was short, P(O) did not affect ratings, and this was the case for both depressives and nondepressives—that is, neither mood group showed an illusion of control. At the long ITI, P(O) affected nondepressive ratings but not depressive ratings—that is, nondepressives displayed an illusion of control, and depressives displayed depressive realism. Thus, it appears that mood state interacts not only with P(O) but also with ITI. Nondepressives overestimate their control when the outcome is frequent, and the ITI is long, whereas these variables do not influence depressive judgements.

Summary

Depressive realism is a fragile phenomenon. Nonreplications have been reported. The necessary conditions are difficult to organize into a coherent whole. The complex interactions that have appeared (e.g., under some conditions nondepressives appear to be realistic, and depressives show an illusion of control) are disconcerting.

THEORETICAL ACCOUNTS OF DEPRESSIVE REALISM

The Alloy and Abramson (1979) findings attracted the attention of researchers because they were inconsistent with predictions of the prominent theories of depression that were popular at that time, such as learned helplessness (e.g., Seligman, 1975). To reiterate, according to learned helplessness theory, depressed people have generalized expectancies of independence between their responses and outcomes that should interfere with the detection of contingencies, and nondepressed people have generalized expectations of control that should interfere with the detection of noncontingencies. Alloy and Abramson concluded that their data were inconsistent with learned helplessness theory. It should be noted that their conclusion, though widely accepted by researchers interested in contingency judgements, did generate debate (Alloy & Abramson, 1981; Schwartz, 1981a, 1981b).

As an alternative to learned helplessness theory, Alloy and Abramson (1979) suggested that motivational factors may account for the difference between depressed and nondepressed students' judgements of control in their experiments. According to their motivational account, the mood effects reflect a difference in self-esteem between the two groups. Alloy and Abramson suggested that nondepressives have a higher level of self-esteem than do depressives and engage in behaviour to protect their self-esteem. In particular, nondepressives distort reality in an optimistic fashion. Nondepressives, because they are motivated to maintain or enhance their self-esteem, overestimate their degree of control over desirable outcomes and underestimate their degree of control over undesirable outcomes. Depressives, on the other hand, do not make such errors because they do not have a specific motivation to preserve self-esteem. In a later paper, Alloy and Abramson (1988) concluded:

> . . .one point appears clear: Depressed individuals may be suffering from the absence or breakdown of normal optimistic biases and distortions. Maladaptive symptoms of depression, such as low self-esteem, social skills deficits. . .may be consequences, in part, of the absence of healthy personal illusions. (p. 257)

In recent years there has been renewed interest in theorizing about differences in contingency judgements of depressed and nondepressed individuals. This interest stems from research on the outcome-density effect. Recently, two novel theoretical accounts have been proposed for the outcome-density effect (Allan et al., 2005; Msetfi et al., 2007; Msetfi et al., 2005), and these accounts

provide opportunities for a new look at depressive realism.

ITI hypothesis

We noted earlier that Msetfi et al. (2005; Msetfi et al., 2007) concluded that ITI duration influenced control judgements. Specifically, with a short ITI, P(O) did not affect ratings, and this was the case for both depressives and nondepressives—an outcome-density effect was not seen in either mood group. With a long ITI, P(O) affected nondepressive ratings but not depressive ratings—an outcome-density effect was seen in nondepressive ratings but not in depressive ratings (i.e., depressive realism was observed). To account for their results, Msetfi et al. (2005; Msetfi et al., 2007) suggested that the ITI could be conceptualized as equivalent to cell d of the 2 × 2 matrix depicted in Figure 1—that is, ∼R∼O. Thus, the ITI hypothesis predicts an interaction between ITI duration and P(O)—the outcome-density effect should increase with ITI duration.

Msetfi et al. (2005) explained how their ITI integration hypothesis is compatible with both computational models (e.g., Cheng, 1997) and associative models (e.g., Dickinson, Shanks, & Evenden, 1984) of contingency judgements. Computational models specify that judgements are determined by ΔP—and in some versions, ΔP normalized by P(O|∼R). Integration of ITI into cell d would effectively decrease P(O|∼R) and thereby increase ΔP. Since inflation of cell d would be an increasing function of ITI duration, effective ΔP would also increase with ITI. Moreover, the higher the value of P(O), the higher the spurious value of ΔP. Within the framework of an associative model, ITI is conceptualized as the context. Integration of ITI into cell d would weaken the context's association with the outcome, thereby allowing the response to gain more associative strength.

To account for the absence of an ITI effect in their depressed participants, Msetfi et al. (2005; Msetfi et al., 2007) suggested that depressed mood is accompanied by reduced contextual processing—specifically depressives do not integrate the ITI into cell d. They concluded that depressive realism effects occur because depressed people do not use all the available evidence to arrive at their judgements rather than because they are being realistic.

Msetfi et al. (2005) did acknowledge that their ITI account of the outcome-density effect is incomplete. There are many studies that show an outcome-density effect in the passive task when the ITI is short (e.g., Allan & Jenkins, 1983, Exp. 3; Allan et al., 2005; Vallée-Tourangeau, Murphy, Drew, & Baker, 1998). Msetfi et al. concluded that the ITI hypothesis is, so far, restricted to the active contingent task.

Response criterion hypothesis

One phenomenon that triggered interest in depressive realism in the contingency judgement literature was the finding that depressed individuals seemed immune to the outcome-density effect—their judgements of the contingency between responding and outcome were not unrealistically inflated as the outcome density increased. Elsewhere (Allan et al., 2005) we have argued that it is useful to consider an individual's judgement of the magnitude of a contingent relationship as consisting of two components. It is as if the participant asks himself or herself two questions on each trial: (a) "What do I perceive the likelihood of the outcome to be on this trial?", and (b) "Given that likelihood, how should I respond?" These two components of the decision process, of course, correspond to the two variables of classic signal detection theory: perception (d′) and response criterion (C), respectively (see Wickens, 2002). Variables that change decision-making behaviour (e.g., outcome density) may be due to their effect on either of these two variables.

As indicated earlier, depressive realism is a fragile phenomenon. There is ample evidence in the psychophysical literature that response criterion effects (in contrast with perceptual effects) are notoriously variable, across individuals and experiments (e.g., Allan, 1968, 2002). The fragility of depressive realism is consistent with its location

in the decision process (rather than in the perception process).

In contingency judgement tasks, participants typically rate the relationship between a response (or a cue) and the outcome. These ratings are made after some number of trials (often at the end of a block of trials). Allan et al. (2005) showed that this rating response does not always provide information about the participant's perception of the contingency. Allan et al. used the passive contingency task: On each trial, the cue was either presented or not presented, and then the outcome either occurred or did not occur. In their experiment, Allan et al. varied both ΔP and P(O). Their data showed a strong outcome-density effect in the ratings of the relationship between the cue and the outcome at the end of a block of trials, for both contingent and noncontingent matrices. In addition to ratings at the end of a block of trials, Allan et al. asked their participants to make a prediction response on each trial. Specifically, the cue was presented or was not presented, the participant predicted whether the outcome would or would not occur, and then the outcome either occurred or did not occur. They applied a psychophysical analysis to the trial prediction data that allowed them to examine sensitivity to the contingency independently of any biases in decision processes. They were able to show that as P(O) increased, the participant's criterion for predicting the outcome also changed. The participant became more biased towards predicting that the outcome would occur. This criterion shift was present both on cue-present and on cue-absent trials indicating that the participant's sensitivity to the contingency remained unchanged across different values of P(O). Allan et al. concluded that the ratings were a reflection of the response criterion and were not an accurate measure of the participant's sensitivity to the contingency.

On the basis of a response criterion interpretation of depressive realism, depressives and nondepressives differ not in their perception of contingency, but rather in their willingness to predict that the outcome will occur. There are data that show criterion differences between depressives and nondepressives in a variety of quite diverse tasks, such as short-term memory, gustatory sensitivity, flicker fusion, and judgement of line length (for summaries, see Miller & Lewis, 1977; Herskovic, Kietzman, & Sutton, 1986; Pizzagalli, Jahn, & O'Shea, 2005; Potts, Bennett, Kennedy, & Vaccarino, 1997, respectively). In essence, depressives seem to be "nay-sayers". A number of studies using a psychophysical framework (e.g., Herskovic et al., 1986; Miller & Lewis, 1977; Pizzagalli et al., 2005; Potts et al., 1997) have shown that depressives do not differ from normal controls with regard to sensitivity on these tasks. Rather depressives adopt a more conservative criterion for saying "yes" than do normal controls.

Such criterion differences between mood groups might lead one to expect mood differences in the probability of responding, P(R), in the active contingency task. Matute (1996), for example, varied P(R) through instructions. The task was to determine whether an aversive outcome could be terminated by pressing a button. The actual relationship between button pressing and the outcome was noncontingent. One group of participants (analytic) was instructed "to behave scientifically in order to find out how much control over the outcome was possible"; another group of participants (naturalistic) was instructed "to obtain the outcome" (p. 289). At the end of a block of trials, participants in both groups were asked to rate the degree of control they thought they had over termination of the aversive outcome on a scale that ranged from −100 to +100. Matute found a correlation between control ratings and P(R). For the analytic group, P(R) was close to .5, and ratings were around zero. For the naturalistic group, P(R) was close to 1.0, and ratings were around 60. Matute discussed the implication of her results for studies that have found mood effects in contingency judgements. She suggested that nondepressives would be more likely to respond than depressives, and that the illusion of control sometimes observed in nondepressive ratings might reflect this response bias in responding (see also Skinner, 1985). Available data do not permit a

strong test of Matute's hypothesis since most of studies concerned with depressive realism and contingency judgements have not reported P(R). However, the few studies that did report P(R) (e.g., Benassi & Mahler, 1985; Dobson & Pusch, 1995; Msefti et al., 2007) do not provide support for Matute's (1996) prediction in that there was not a difference in P(R) between the mood groups.

While Matute (1996) expected mood differences in the relationship between P(R) and ratings, the response criterion hypothesis expects mood differences in the relationship between prediction responses (whether explicitly required by the experimenter or implicitly made by the participant) and ratings. Unfortunately, since prediction responses have not been explicitly required in the active task, the response criterion analysis cannot be applied retrospectively to existing data. The active task could readily be modified to incorporate trial prediction responses. On each trial, after the participant did or did not respond, he or she would then predict whether the outcome would or would not occur. According to the response criterion hypothesis, the participant would be biased towards predicting that the outcome would occur as P(O) increased. If depressive realism is a criterion effect, then the bias should be greater for nondepressives than for depressives.

It is unclear in the writings of Alloy, Abramson, and their colleagues whether they placed the locus of the difference in the judgements of depressives and nondepressives in the perception of the contingency, or in the response criterion. On the one hand, they talk about an "illusion of control", and illusions are usually considered to be perceptual. On the other hand, they talk about "biases" and suggest that both depressed and nondepressed are susceptible to biases, but in opposite directions, "with nondepressives distorting environmental information optimistically and depressives distorting it pessimistically" (Alloy & Abramson, 1988, p. 255). Response biases refer to the criterion applied in deciding whether or not to answer "yes" or "no", given the perceptual information that currently is available. We suggest that understanding depressive realism requires some precision in distinguishing these two processes. When depressed people do not succumb to the outcome density effect it is not because they are particularly "realistic", but rather because they are particularly reluctant to say "yes". The nature of the outcome density manipulation in the contingency judgement task is such that this bias of depressives is experienced, by the experimenter, as an illusion of accuracy.

Summary

For the ITI hypothesis, mood differences are attributed to differential processing of the ITI—"...a context processing difference between depressed and nondepressed people removes any objective notion of 'realism' that was originally employed to explain the depressive realism effect" (Msefti et al., 2007). For the response criterion hypothesis, mood differences are attributed to differential propensities for predicting outcomes. Thus, the two accounts are conceptually similar—depressives and nondepressives do not differ in their ability to detect the degree of control that their responding has over outcomes.

CONCLUSIONS

Since it was first described in 1979, the phenomenon of depressive realism has been subjected to extensive empirical and theoretical scrutiny. There are reports of both successes and failures to replicate Alloy and Abramson's (1979) report. The literature does not readily fall into a coherent picture.

We have concluded that, in general, the outcome-density effect is better understood as a change in C than a change in d′. That is, increasing the outcome density does not affect the participant's perception of the relationship between behaviour (or cue) and outcome. Rather, for any particular contingency, increasing the probability of an outcome increases the tendency for the participant to say "yes, the outcome will occur" (and to respond in ways appropriate to the imminent arrival of the outcome).

It might be said that, when the outcome density is increased, the typical participant displays irrational optimism. When outcome density increases, they increase their bias towards predicting an outcome. Depressed individuals are not optimistic individuals. Compared to nondepressed individuals, depressives are "nay-sayers". They must be very confident that something will occur before they accede to responding in a manner that indicates that the event will, indeed, occur. It is clear that the poorer performance of depressed individuals than nondepressed individuals on tasks involving short-term memory, gustatory sensitivity, flicker fusion, and line length discrimination is located in their decision process, not their perception process. Similarly, we suggest that the differences in depressive and nondepressive responding to outcome density is a manifestation of the depressed individual's relative (compared to the nondepressed individual) pessimism. It is not much of a leap to suggest that manipulations of outcome valence, like outcome density, differentially affect the decision processes of nondepressed and depressed individuals. Since depressive realism resides in decision processes, rather than perception processes, we would expect the phenomenon to be fragile and subject to participants' perceived evaluation of the various consequences of making a correct and incorrect judgement of whether or not an outcome will occur. Minor procedural differences may substantially affect such judgements.

In summary, compared to nondepressed individuals, depressives are "nay-sayers". Depressives may be sadder but they are not wiser; rather, so-called "depressive realism" results from the bias of depressives to say "no".

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