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The Role of Surprise in the Attribution Process

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We report five studies which compared two theories linking surprise to causal attribution. According to the *attributional model*, surprise is frequently caused by luck attributions, whereas according to the *expectancy-disconfirmation model*, surprise is caused by expectancy disconfirmation and stimulates causal thinking. Studies 1 to 3 focused on the question of whether surprise is caused by luck attributions or by unexpectedness. In Studies 1 and 2, subjects had to recall success or failure experiences characterised by a particular attribution (Study 1) or by low versus high surprisingness (Study 2), whereas in Study 3, unexpectedness and luck versus skill attributions were independently manipulated within a realistic setting. The main dependent variables were unexpectedness (Studies 1 and 2), degree of surprise (Studies 1 and 3), and causal attributions (Study 2). The results strongly suggest that surprise is caused by expectancy disconfirmation, whereas luck attributions are neither sufficient nor necessary for surprise. Studies 4 and 5 addressed the question of whether surprise stimulates attributional thinking, again using a remembered-incidents technique. The findings of the previous studies were replicated, and it was confirmed that surprising outcomes elicit more attributional search than unsurprising ones. Additional results from Study 5 suggest that causal thinking is also stimulated by outcomes that are both negative and important.

INTRODUCTION

Contemporary emotion theorists broadly agree that emotions, far from being merely disruptive or disorganising states (e.g. Watson, 1919; cf. also Leeper, 1948), serve important adaptive functions (e.g. Frijda, 1986; Izard, 1977; Plutchik, 1980; Scherer, 1984; Weiner, 1986). In this article, we are concerned with the functional role of *surprise*, and more specifically, with its role in the attribution process. Two models linking surprise to

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causal attribution are compared. The starting point of our inquiry was a model proposed by Weiner (e.g. 1985a, 1986), which constitutes the most elaborate existing analysis of surprise from an attributional perspective. This model is compared with an alternative, and in our view more adequate, theory of the role of surprise in causal thinking, which is a slight elaboration of an earlier formulation by Meyer (1988; Meyer, Niepel, & Schützwohl, 1994). Because the immediate causes of surprise proposed in the two models are, respectively, luck attributions versus expectancy disconfirmations, they are henceforth labelled the *attributional* versus the *expectancy-disconfirmation* model. In the rest of the Introduction, we first summarise the two models and then give an overview of our empirical studies.

The Attributional vs. the Expectancy-Disconfirmation Model of Surprise and Causal Thinking

The attributional and the expectancy-disconfirmation model are schematically diagrammed in Fig. 1. As can be seen, the two models agree in that both specify a causal sequence between the variables (degree of) *expectancy disconfirmation*, or unexpectedness of an event,[1] *surprise*, *attributional search*, and *attributions to chance or luck*. However, they differ in their assumptions about how these mental events are causally related, and specifically with respect to the place of surprise in the causal sequence.

Attributional Model. According to the attributional model (cf. Weiner, 1985a; 1986; Weiner, Russell, & Lerman, 1978, 1979), surprise, like a number of other emotions (e.g. guilt, pity, or pride), is caused by attributions. Specifically, surprise is caused (at least often, see below) by the attribution of an event to chance or luck. From Weiner's published writings on the topic, it is not entirely clear whether he regards luck attributions as necessary or sufficient causes of surprise (or both). However, Weiner (personal communication) has clarified that he regards luck attributions as sufficient but unnecessary cognitive causes of surprise. That

[1] Some authors draw a sharp distinction between those unexpected events which disconfirm a previously held, relatively specific event-related expectation, and those for which the individual ostensibly had no prior expectations at all (e.g. Charlesworth, 1969; Ortony, Clore, & Collins, 1988). Although we do not deny that there are differences between these two classes of unexpected events, we believe that the members of the second class can also be conceptualised as instances of expectancy disconfirmation: They disconfirm the *implicit*, schema-based belief that the unexpected event was unlikely to occur in the given situation. However, nothing essential in the present paper depends on this assumption.

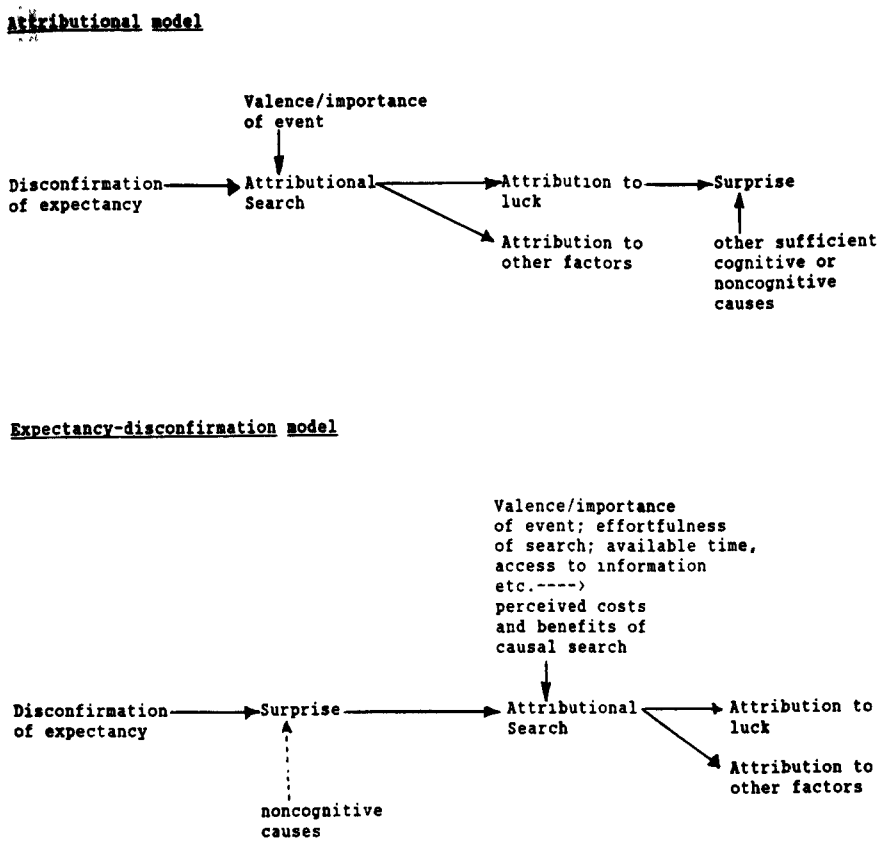

FIG. 1. The attributional and the expectancy-disconfirmation model of surprise and attribution.

is, at least in the normally functioning, awake organism, the occurrence of a luck attribution is (a) sufficient to cause surprise (and the intensity of experienced surprise is presumably a monotonically increasing function of the degree of luck attribution); but (b) there are other cognitive, and possibly also other noncognitive, pathways to surprise. However, it seems that Weiner regards luck attributions as fairly typical causes of surprise in adults; in particular, they are presumably responsible for many of the surprise feelings experienced in response to achievement outcomes (see Weiner et al., 1978, 1979).

Surprise is also related to expectancy disconfirmation (event unexpectedness) and to causal search, but only indirectly (cf. Fig. 1). That is, the unexpectedness of events is assumed to be one important stimulant of spontaneous causal thinking (cf. Weiner, 1985b; see also Pyszczynski & Greenberg, 1981, 1987; and the introduction to Study 4). The *nature* of

these spontaneous attributional activities has been examined in detail by Pyszczynski and Greenberg (1987); their main adaptive *function*, it may be plausibly assumed, is to permit individuals to extend, correct, or revise their action-guiding schemas and expectations and thereby to regain control over their environment (Meyer, 1988; Meyer et al., 1994; see also Berlyne, 1960; Heider, 1958). As the causal analysis may terminate in an attribution to chance or luck, event unexpectedness is an indirect cause of surprise. Luck attributions (and ensuing surprise) should in fact be relatively frequent outcomes of the attributional process instigated by unexpected events, because unexpectedness is assumed by Weiner (1980) to be an important factor fostering luck attributions, at least in achievement contexts. This assumption is supported by the results of several studies (e.g. Feather, 1969; Feather & Simon, 1971; Meyer, Niepel, & Engler, 1987).

Apart from unexpectedness, attributional search is also influenced by other factors, in particular by the valence and importance of events (cf. Fig. 1). Specifically, it is assumed that causal search is generally more intensive for negative or important events than for positive or unimportant ones (Weiner, 1985b, 1986).

The empirical evidence for the attributional model will be reviewed later (cf. the introductions to Studies 1 and 4). For the time being, we would like to point out two *theoretical* problems with this model. (1) Attributions to luck are assumed to constitute only one important cognitive pathway to surprise. However, the other sufficient cognitive causes of surprise have not been spelled out; and it is difficult to see what they could consist of. In particular, expectancy disconfirmation is not a plausible candidate, because this variable has already a different function in the attributional model (i.e. it is an instigator of causal search and an indirect cause of luck attributions). (2) In the attributional model, surprise is a consequence of luck attributions, but it has apparently no further consequences and hence remains an epiphenomenon. This stands in marked contrast to Weiner's (1986) assumptions concerning a variety of other emotions, such as anger and pity, which are regarded as important motivators of action (see also Weiner, 1994). We think that, for these theoretical problems alone, an alternative model is preferable. Such a model is now described.

Expectancy-Disconfirmation Model. The expectancy-disconfirmation model of surprise and attribution proposed here is an elaboration of an earlier formulation by Meyer (1988; Meyer et al., 1994; see also Meyer & Niepel, 1994; Meyer, Niepel, Rudolph, & Schützwohl, 1991). In line with a traditional and widespread view (e.g. Charlesworth, 1969; Izard, 1977; Ortony et al., 1988; Scherer, 1984), it is assumed that the crucial cognitive

antecedent of surprise is expectancy disconfirmation, i.e. the cognition that an event violates a previously established expectancy or cognitive schema (cf. Fig. 1). This detection of schema violation is assumed to be both a sufficient and necessary cognitive cause of surprise.[2] That is, in the normally functioning, awake organism, the pathway to surprise is *always* via expectancy disconfirmation or schema violation, with the intensity of surprise being a monotonically increasing function of the degree of unexpectedness of the event. Beyond that, no further cognitive analyses of the event are required. In particular—in contrast to the attributional model—surprise requires neither an active analysis of the causes of the event, nor its attribution to a particular type of cause (e.g. to luck). In addition, *there are no other*, or at least no other *cognitive* pathways to surprise in the normally functioning organism.[3] In particular, luck attributions do not cause surprise.

Spontaneous, active causal search is assumed to be a frequent *consequence* of surprise in this model (cf. Fig. 1). Indeed, it is assumed that the very function of surprise is to prepare and to motivate the individual to explore the unexpected events that elicited the surprise; or more generally speaking, to enable and motivate spontaneous epistemic activities. Causal thinking (attributional search) can be regarded as a special kind of these epistemic activities (Pyszczynski & Greenberg, 1987; Weiner, 1985b; Wong & Weiner, 1981). Surprise, it is assumed, (a) *enables* spontaneous epistemic (in particular attributional) activities by interrupting ongoing processes and by refocusing the individual's attention on the unexpected events and (b) simultaneously also provides an initial *motivational impetus* for instigating these activities (for more detail, see Meyer et al., 1994).

Surprise is however not the only determinant of causal search (cf. Fig. 1). Although surprise may often be sufficient for initiating causal search and, we suggest, is generally sufficient for creating a corresponding action

[2] Some authors have gone so far as to *identify* surprise with (the awareness of) unexpectedness (e.g. Ortony et al., 1988, p. 127). In contrast, we assume here—in line with many other authors—that the awareness of a schema discrepancy is, in and of itself, a "cold" cognition, whereas the feeling of surprise is a mental state different from, but caused by, unexpectedness. According to Izard (1977), for example, the feeling of surprise is essentially the awareness of feedback from peripheral facial expressions. More plausible is the suggestion that surprise feelings are generated by a central neural mechanism (e.g. Oatley & Johnson-Laird, 1987).

[3] The possibility of noncognitive causes of surprise, such as feedback from facial activity (cf. Izard, 1977; Laird & Bresler, 1992), or noncognitively mediated effects of personality dispositions, is left open.

tendency or desire ("epistemic curiosity"; cf. Berlyne, 1960),[4] it is assumed —similar to the attributional model—that how long and intensively this search is pursued also depends on a number of other factors. However, rather than restricting these additional factors to the importance and valence of events (Weiner, 1985b), we assume, more generally, that causal search also depends on its *perceived costs and benefits.* These, in turn, are influenced by the valence and importance of the events, but factors such as the perceived effortfulness of causal search and the available resources of the individual (e.g. time, access to information) are also assumed to play an important role (see also, Pyszczynski and Greenberg, 1987).

Finally, it is assumed (see Fig. 1) that the active analysis of the causes of unexpected events terminates relatively often (at least more often than for expected events) in an attribution to chance or luck. As already mentioned, this assumption is supported by a number of previous studies (e.g. Feather, 1969; Feather & Simon, 1971; Meyer et al., 1987). We think that the most plausible explanation of these findings is the following one: (a) The causal determinants of expected events are typically known (or believed to be known) beforehand, whereas the causes of unexpected events are, at least initially, unknown; (b) although a determinate cause of these latter events is found in many cases, in many other cases their causes cannot be determined with certainty or cannot be determined at all; and (c) the ordinary language labels "chance" or "luck" are typically used to designate event causes that are either unknown or are regarded as being too complex to be precisely determined (see also Roseman, 1979).

Summary Comparison of the Two Models. As is evident from a comparison of the two diagrams in Fig. 1, the main difference between the attributional and the expectancy-disconfirmation models concerns the place of surprise in the cognitive-affective sequence involving expectancy disconfirmation, surprise, causal search, and attributions to chance or luck.

[4] A reviewer of this paper has suggested that epistemic curiosity, i e the desire to know (specifically about the causes of events), might conceivably be *identified* with surprise If so, the expectancy-disconfirmation model proposed here would become largely equivalent to (parts of) Pyszczynski and Greenberg's (1987) biased hypothesis-testing model of causal attribution However, in our view surprise cannot be identified with epistemic curiosity. There are at least three reasons for thinking so First, epistemic curiosity can also be elicited by unsurprising events For example, if one has no specific hypothesis concerning the outcome of an experiment, any actual outcome will be equally unsurprising, nevertheless, because it is unexplained, it may well arouse epistemic curiosity Secondly, in our view only surprise, but not epistemic curiosity, can plausibly fulfil the function of enabling causal search by interrupting ongoing processes Thirdly, the experience of surprise is typically a very short-lived phenomenon (cf. Meyer et al , 1991), whereas the desire to know about the causes of surprising events usually continues to exist much longer (i e until it has been satisfied).

According to the attributional model, the sequence of these mental events is: *Expectancy disconfirmation (unexpectedness) → Attributional analysis → Luck attributions → Surprise* (cf. Fig. 1). Other causal sequences involving surprise are also permitted, but, as mentioned before, sequences involving a direct causal link between expectancy disconfirmation and surprise are very implausible in this model. Furthermore, event unexpectedness, attributional analysis, and luck attributions are not related in a strict fashion: At least the extent of attributional search is also influenced by the valence and importance of the event; and the attributional analysis of unexpected events need not terminate in a luck attribution. In contrast, luck attributions *always* cause surprise in the normally functioning organism. This means, in particular, that luck attributions should cause surprise even when the event is entirely expected (cf. Study 3). Finally, surprise serves no obvious function in the attributional model.

In contrast, according to the expectancy-disconfirmation model, the sequence of the described mental events is: *Expectancy disconfirmation (unexpectedness) → Surprise → Epistemic (specifically, attributional) analysis → Luck attributions* (cf. Fig. 1). Expectancy disconfirmation is a sufficient and necessary cognitive cause for surprise in this model, whereas the remaining links are only more or less strong. In particular, although surprise creates a motivation for causal search, whether this search is indeed initiated and the extent to which it is pursued, is also influenced by its perceived costs and benefits, which depend among other factors on the valence and importance of the events (as also assumed by the attributional model). Also in agreement with the attributional model, the attributional analysis of unexpected events results comparatively often in an attribution to chance. Finally, surprise is assigned an explicit functional role in the expectancy-disconfirmation model, namely the function of enabling and instigating spontaneous causal search.

Overview of the Empirical Studies

To compare the two described models, five empirical studies were conducted. Our general hypothesis was that the expectancy-disconfirmation model is more adequate. Studies 1–3 focused on the antecedents of surprise and were intended to support our hypothesis that surprise is an immediate reaction to unexpectedness (expectancy-disconfirmation model) rather than a reaction to luck attributions (attributional model). Study 1 was an extended replication of a previous experiment by Weiner et al. (1979, study 1) aimed at demonstrating that the findings apparently supporting the attributional model reported by these authors, as well as similar findings reported by Weiner et al. (1978), were probably due to an inadvertent confounding of luck attributions and outcome unexpectedness.

Study 2 used a somewhat different design to support the same conclusion. The aim of Study 3 was to replicate the previous findings within a realistic setting and to demonstrate unambiguously that luck attributions are neither sufficient nor necessary cognitive causes of surprise.

Studies 4 and 5, in addition to providing a further replication of the previous findings, addressed the hypothesis that surprise, rather than being a consequence of luck attributions (attributional model), promotes causal thinking (expectancy-disconfirmation model).

STUDY 1

Weiner et al. (1978, 1979, study 1) conducted two studies which, at first sight, seem to support their hypothesis that surprise is an attribution-dependent emotion (i.e. is often, particularly in achievement contexts, caused by luck attributions). In these studies, subjects were asked either to imagine hypothetical achievement outcomes concerning another person (Weiner et al., 1978) or to recall personal experiences of achievement outcomes (Weiner et al., 1979). Each situation description specified an outcome (success vs. failure) and a causal factor (ability, luck, etc.) that was responsible for the outcome. The subjects then had to indicate how the person concerned (Weiner et al., 1978) or they themselves (Weiner et al., 1979) felt in the situation. Although successes and failures attributed to luck were found to be associated with several emotions, they were most clearly associated with surprise. Indeed, the link between surprise and luck attributions was considered by Weiner et al. (1978, p. 75) to be "perhaps the clearest finding in our data". Weiner et al.'s findings were subsequently confirmed by Meyer and Plöger (1980) and Meyer et al. (1987), who examined subjects' causal attributions and affective reactions in response to imagined outcomes at a ring-toss game.

Weiner et al. (1978, 1979) concluded from their findings that luck attributions are not only *associated* with surprise in the investigated achievement situations, but that they *caused* the surprise feelings. However, the remembered incidents and hypothetical scenario techniques used by Weiner et al. do not allow one to unambiguously draw this conclusion. The chance-attributed achievement outcomes remembered or imagined by the subjects may have frequently been unexpected ones, whereas those attributed to effort, ability, and task difficulty may have been more frequently expected ones. If so, the luck-surprise association found in these studies could have been due to an uncontrolled third variable, namely, the unexpectedness of the outcomes.

In the present study, the proposed alternative explanation of the findings by Weiner et al. was tested using the same remembered-incidents technique as Weiner et al. (1979, study 1); however, in contrast to the latter study, event unexpectedness was also measured. The basic idea guiding the study was that, if our alternative interpretation is valid, then statistically controlling for unexpectedness should eliminate the association between luck ascriptions and surprise.

Method

The experimental procedure of Study 1 paralleled that used by Weiner et al. (1979, study 1), expect that a number of additional dependent variables, most importantly the perceived unexpectedness of the outcomes, were also assessed, and that rating scales rather than a free response format were used. Subjects were asked to recall achievement outcomes that they had experienced in the past differing with regard to the valence of the outcome (*success* vs. *failure*) and its attribution (*ability*, *task difficulty*, *effort*, *or luck*). Each subject was asked to recall one success and one failure experience for which type of attribution was held constant (e.g. success because of high ability and failure because of low ability). Hence, the design of the experiment was a 2 (outcome valence) × 4 (type of attribution) split-plot ANOVA, with valence of outcome as the within-subjects factor and type of attribution as the between-subjects factor.

Subjects. Sixty male and female students from different departments of the University of Bielefeld participated in the experiment on a voluntary basis.

Materials and Procedure. Subjects were individually approached in the university library and asked whether they would be willing to complete a short questionnaire. If they agreed to participate, they received a booklet which first presented a brief description of the aims of the research, described as an analysis of the feelings and thoughts following success and failure. Subsequently, it was explained how to work through the material. Subjects first had to recall a particular type of achievement outcome. For example, in the success/high effort condition, subjects were asked to recall the following situation: "You did well on a written class test that was important to you. In your view, your success was due to the high effort you invested in preparing for the test." The subjects were then asked to give a brief description of the recalled situation and to indicate how well they could remember it on a 7-point scale ranging from *very poorly* (1) to *very well* (7). This rating was included to make sure that the achievement outcomes of different types were remembered approximately equally well. Subsequently, the subjects indicated which outcome they had expected immediately before they learned about their grades on a 15-point scale ranging from *sure failure* (−7) to *sure success* (+7) (this served as an

indirect measure of the unexpectedness of the actual outcome) and the intensity of surprise about the actual outcome on a 7-point scale ranging from *not at all surprised* (1) to *very strongly surprised* (7). Finally, they also judged the personal importance of the outcome on a 7-point scale ranging from *not at all important* (1) to *very important* (7).

Results and Discussion

Following Weiner et al. (1979, study 1), the results were analysed separately for the success and failure conditions.

Remembrance and importance. Remembrance and importance ratings did not differ significantly as a function of attributions in either the failure or the success condition, all Fs < 2.8. The means of the remembrance ratings were $M = 4.6$ for the failure and $M = 5.0$ for the success condition; those of the importance ratings were $M = 4.0$ for the failure and $M = 4.6$ for the success condition.

Surprise. The mean surprise ratings are shown in Table 1. Replicating the findings by Weiner et al. (1979), the means differed significantly as a function of attributions in both the success condition, $F(3, 56) = P < 0.02$; and the failure condition, $F(3, 56) = 5.0$, $P < 0.01$. The percentage of explained variance (EV) due to the attribution factor, calculated as $omega^2 \times 100$, was 14.5% in the success and 19.5% in the failure condition. *Post hoc* comparisons using the Student–Newman–Keuls test revealed that surprise was significantly ($P < 0.05$) higher in both outcome conditions when the outcome was attributed to luck than when it was attributed to ability or task difficulty. In the failure condition, surprise was in addition significantly ($P < 0.05$) more intense if the outcome was attributed to luck rather than to effort.

Unexpectedness of outcome. The ratings of initial outcome expectancy were transformed into an index of unexpectedness by first linearly transforming the original scale values (ranging from -7 = sure failure to $+7$ = sure success) into range (0, 14) to enhance interpretability, and then

TABLE 1
Mean Ratings of Surprise and Unexpectedness as a Function of Outcome Valence (Success, Failure) and Attribution

	Success				*Failure*			
	Ability	*Effort*	*Task Difficulty*	*Luck*	*Ability*	*Effort*	*Task Difficulty*	*Luck*
Surprise	2.4	3.1	2.1	4.4	1.9	1.7	2.5	4.0
Unexpectedness	3.5	4.4	3.1	6.0	3.7	4.1	5.5	7.9

Note: High values indicate high surprise and high unexpectedness.

reversing the transformed scale for the failure condition. As a consequence, higher scale values express higher unexpectedness of the respective outcome in both the failure and the success condition.

Type of attribution had a significant effect on unexpectedness (see Table 1) in the failure condition, $F(3, 56) = 4.6$, $P < 0.01$, $EV = 18.1\%$; and a marginally significant effect in the success condition $F(3, 56) = 2.6$, $P = 0.06$, $EV = 10.4\%$. *Post hoc* comparisons using the Student–Newman–Keuls test ($P < 0.05$) showed that the outcome was regarded as significantly more unexpected in both outcome conditions given a luck attribution than an attribution to ability or effort (cf. Table 1).

The link between luck attributions and surprise after controlling for unexpectedness. We hypothesised that the link between surprise and luck attributions obtained in the present study, as well as in the previous one by Weiner et al. (1979) was due to an uncontrolled third variable, namely, perceived unexpectedness. To test this assumption, the surprise ratings were subjected to a one-way analysis of covariance, using attribution as a four-level factor and unexpectedness as a covariate. In line with our predictions, we found (a) that the covariate unexpectedness was strongly associated with surprise in both the success condition, $F(1, 55) = 45.1$, $P < 0.001$, $EV = 42.1\%$, and the failure condition, $F(1, 55) = 72.4$, $P < 0.001$, $EV = 54.2\%$, whereas (b) type of attribution in both the success and failure condition no longer had a significant effect on surprise once unexpectedness was statistically controlled for, $F(3, 55) < 1.3$, $EV < 2.5\%$.

Conclusion

In sum, the results replicated the Weiner et al. findings of a significant association between luck attributions and surprise ratings. However, they showed further (a) that both surprise and luck attribution are also significantly associated with unexpectedness and (b) that the association between surprise and luck attributions disappears when unexpectedness is statistically controlled for. These latter findings are in accord with our predictions and corroborate our doubts concerning Weiner's (1985a, 1986; Weiner et al., 1978, 1979) assumption that luck attributions were the immediate antecedents of surprise feelings in the achievement contexts studied. Because this conclusion is essentially based on correlational analyses (i.e. analyses of covariance), the present study does not conclusively refute the attributional model, although the finding that the association between surprise and unexpectedness was substantially stronger (in terms of explained variance) than the surprise-attribution link favours the expectancy-disconfirmation model. What the data clearly do show, however, is that the repeatedly found association between luck attributions

and surprise can be explained at least equally well by the common association of these variables to event unexpectedness. Hence, the studies by Weiner et al. (1978, 1979) provide no clear-cut support for the attributional model; their findings can be accounted for, at least equally well, by the expectancy-disconfirmation model.

STUDY 2

Study 2 was a replication of Study 1 using a different methodology (cf. Weiner et al., 1979, experiment 2). In Study 1, the subjects had to recall achievement outcomes characterised by valence and type of attribution and to rate (among other things) the surprise experienced in these situations. In contrast, the participants of Study 2 were asked to recall achievement situations characterised by outcome valence (success vs. failure) and intensity of surprise (no surprise vs. high surprise) and to indicate the extent to which ability, task difficulty, effort, and luck had been responsible for the outcome. Also in contrast to Study 1, each subject recalled only a single situation. Hence, the design of Study 2 was a 2 (success/failure) × 2 (low/high surprise) between-subjects factorial. We again predicted that surprise and luck attributions would be associated, but that this association would disappear if unexpectedness is statistically controlled for.

Method

Subjects. Forty-four male and female students from different departments of the University of Bielefeld participated in the experiment on a voluntary basis.

Materials and Procedure. The materials and the procedure were similar to those used in Study 1. Each subject was asked to recall one of the following four situations: "You did [well/badly] on a written examination that was important for you. The announcement of your grade [elicited a very strong/did not elicit any] feeling of surprise." The subjects were again asked first to describe briefly the recalled situations and to indicate how well they could remember them. Subsequently, they rated their antecedent outcome expectancy on a 7-point scale ranging from *sure failure* (1) to *sure success* (7)—this again served as an indirect index of the unexpectedness of the actual outcome—and judged to what extent ability, task difficulty, effort, and luck had been responsible for the outcome on a 7-point scale ranging from *very unimportant cause* (1) to *very important cause* (7). Finally, the subjects again indicated the subjective importance of the outcome (cf. Study 1).

Results and Discussion

Remembrance and importance. Again, all achievement outcomes were remembered reasonably well ($M = 4.6$), although highly surprising outcomes were remembered somewhat better ($M = 5.2$) than unsurprising ones ($M = 4.0$), $F(1, 39) = 5.6$, $P < 0.05$. This latter finding is in line with previous results indicating that unexpected events—presumably because they are more thoroughly processed—tend to be remembered better than expected ones (see Meyer et al., 1991; Pyszczynski & Greenberg, 1987). In addition, success was rated as somewhat more important ($M = 5.9$) than failure ($M = 4.4$), $F(1, 39) = 10.5$, $P < 0.01$. No other main effects or interactions were significant, $Fs < 3.3$.

Attributions. Table 2 shows the means of the attribution ratings as a function of outcome valence and intensity of surprise. Compared with unsurprising outcomes, highly surprising ones were attributed significantly more strongly to luck, $F(1, 38) = 6.3$, $P < 0.02$, $EV = 11.6\%$; less to task difficulty, $F(1, 38) = 4.5$, $P < 0.05$, $EV = 7.9\%$; and less to effort, $F(1, 38) = 5.5$, $P < 0.05$, $EV = 8.6\%$. The association between surprisingness of outcome and ability attributions failed to reach significance, $F(1, 38) = 2.0$, n.s. There were no significant main or interaction effects involving valence of outcome.

Unexpectedness. The initial outcome expectancy ratings were again transformed into an index of unexpectedness such that higher values indicate higher unexpectedness in both the success and the failure condition. The mean values on this index for surprising and unsurprising successes and failures are also shown in Table 2. Highly surprising outcomes were rated as significantly more unexpected than unsurprising ones, $F(1, 40) = 35.2$, $P < 0.001$, $EV = 43.3\%$. No main or interaction effect involving valence of outcome was obtained.

The relation between luck attributions and surprise after controlling for

TABLE 2
Mean Ratings of Unexpectedness and Attributions to Ability, Effort, Task Difficulty, and Luck as a Function of Outcome Valence (Success, Failure) and Surprise Intensity

	Success		*Failure*	
	No Surprise	*High Surprise*	*No Surprise*	*High Surprise*
Ability	5.0	3.8	4.6	3.3
Effort	5.4	4.6	2.9	2.5
Task Difficulty	4.0	3.6	4.1	1.8
Luck	2.4	3.9	2.0	3.7
Unexpectedness	2.6	5.1	2.3	4.5

Note: High values indicate high unexpectedness and high importance of causes.

unexpectedness. To test whether the association between luck attributions and surprise might have been due to unexpectedness, the luck attributions were subjected to a two-way analysis of covariance, using surprisingness and valence of the outcome as the two 2-level factors and rated unexpectedness of the outcome as the covariate. As expected, the covariate was significantly related to luck attributions, $F(1, 37) = 5.9$, $P < 0.02$, $EV = 10.7\%$, whereas surprisingness of outcome was no longer significantly related to luck attributions when unexpectedness was statistically controlled for, $F(1, 37) = 1.5$, $EV = 1.5\%$.

Conclusion

The results of Study 2 replicated the findings of Study 1 in that the link between luck ascriptions and surprise disappears if unexpectedness is controlled for. Thus, Study 2 corroborates the conclusion drawn from the Study 1 findings that the association between luck attributions and the surprise feelings obtained in the achievement contexts investigated by Weiner et al. (1978, 1979) provides no clear-cut support for the attributional model, but can be explained, at least equally well, by the expectancy-disconfirmation model.

STUDY 3

Although the results of Studies 1 and 2 were in accord with our hypothesis that surprise is an immediate consequence of the cognised unexpectedness of events, rather than of luck attributions, the methodology of these studies did not provide for a very strong test of this hypothesis. First, the remembered-incidents technique used in these studies is potentially prone to memory errors and other distorting influences. Second, event unexpectedness and attributions were not independently manipulated in these studies, and our conclusions about the direction of causality were essentially based on correlational analyses (i.e. analysis of covariance).

These concerns were addressed in Study 3. In this experiment, the causal attributions of an outcome and its unexpectedness were independently manipulated within a realistic setting, using a 2 (luck vs. skill attribution) $\times$ 2 (high vs. low success probability) completely randomised factorial design. Subjects were asked to solve a task that was plausibly portrayed as being either skill-dependent or chance-dependent (attribution manipulation), and for which the probability of finding (skill tasks) or of guessing (chance tasks) the correct solution was described as either low or high (this served as the manipulation of outcome unexpectedness). After giving their answers, all subjects received success feedback. The main dependent variable was the degree of experienced surprise. We predicted

that surprise would be influenced by the experimental manipulation of unexpectedness, but not by the experimental manipulation of attributions.

Method

Subjects. The subjects were 40 male and female students from different departments of the University of Bielefeld who participated on a voluntary basis.

Materials and Procedure. After arriving at the laboratory, the subjects were informed that they would be working on several tasks. Most of the tasks would be subtests of the Raven Intelligence Test and hence would be mainly dependent on ability, although half of them would be very easy and the other half rather difficult to solve. In addition to these skill tasks, they would also be asked to work on a few additional tasks which, although superficially similar to the Raven tests, would be entirely chance-dependent (i.e. dependent on guessing). These additional tasks were ostensibly included to permit the experimenter to adjust the results obtained for the skill task for the probability of guessing the correct solution. The subjects were informed that, to maximise the similarity of the chance tasks to the two types of skill tasks, the former would also differ in "difficulty", in this case operationalised as a low versus high probability of guessing the correct solution (see later). The subjects were further told that they would have to work on 10 sequentially presented tasks and that they would be asked to complete a short questionnaire after one or several tasks. Whether a task was a skill or chance task, and whether it was easy or difficult, would be determined by the experimenter who would randomly select a task from a prepared pile containing both skill and chance tasks.

Subsequently, half of the subjects received a skill-dependent and the other half a chance-dependent task. The skill-dependent tasks were original subtests from the Raven test, whereas the chance-dependent tasks were constructed from the Raven tests by covering the eight multiple response options with adhesive labels; as a result, the subjects could only guess which response option (location) contained the correct solution. This skill versus chance manipulation was crossed with the manipulation of perceived success probability (low vs. high). For the skill tasks, this manipulation consisted of the information that on average, seven versus only one out of eight subjects solved the task; whereas for the chance tasks, it consisted of the information that seven versus only one of the eight covered response options were correct.

The subjects were given one minute to find or guess the correct solution. Subsequently, the experimenter pretended to check the result and informed all subjects that they had been successful. The subjects were then asked to

complete a questionnaire containing rating scales for experienced surprise (ranging from 1 = *not at all surprised* to 7 = *very strongly surprised by the result*); unexpectedness of the result (ranging from 1 = *entirely unexpected* to 7 = *completely expected*); and the importance of ability and luck as determinants of the solution (1 = *unimportant* to 7 = *very important*).

Results and Discussion

Manipulation checks. The experimental manipulations were successful: (a) success on chance-dependent tasks was attributed significantly more strongly to luck (M = 6.3) and less to ability (M = 2.1) than success on skill-dependent tasks (Ms = 3.4 and 4.5, respectively); $F(1, 36) = 31.0$, $P < 0.001$; and $F(1, 36) = 20.7$, $P < 0.001$, respectively; and (b) success on difficult tasks (i.e. unexpected success) was rated as more unexpected (M = 5.7) than success on easy tasks (M = 2.9; $F(1, 36) = 41.7$, $P < 0.001$). Replicating previous findings (e.g. Feather, 1969; Feather & Simon, 1971; Meyer et al., 1987), unexpected success was also attributed significantly more strongly to luck, M = 5.3, than expected success, M = 4.0; $F(1, 36) = 7.8$, $P < 0.01$. In addition, there was a significant, although weak, 2-way interaction between task difficulty and skill versus luck on rated unexpectedness; $F(1, 36) = 8.6$, $P < 0.01$, which reflected the fact that the difference in judged outcome unexpectedness between difficult and easy tasks was somewhat more pronounced for ability-dependent tasks (M = 6.4 vs. 2.3) than for luck-dependent tasks (M = 5.0 vs. 3.6).

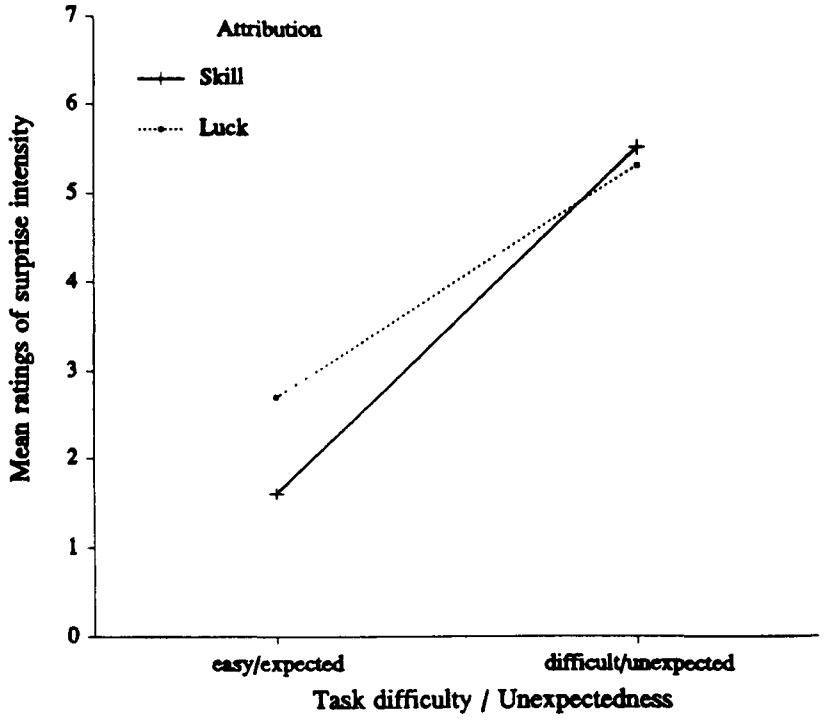

FIG. 2. Mean ratings of surprise intensity as a function of Attribution (skill vs. luck) and Task difficulty (unexpectedness).

Intensity of surprise. The findings for surprise are shown in Fig. 2. These findings were entirely in line with our predictions. Surprise was more intense following success on difficult tasks (high unexpectedness of outcome), M = 5.4, than on easy tasks (low unexpectedness of outcome), M = 2.1; $F(1, 36) = 59.4$, $P < 0.001$, EV = 59.1%. In contrast, there was no significant effect of the attribution manipulation (skill vs. luck), $F(1, 36) < 1$, and no interaction effect between outcome unexpectedness and attribution, $F(1, 36) = 2.1$.

Conclusion

Study 3 further supports the results obtained in Studies 1 and 2 which suggested that the direct cognitive antecedent of surprise is unexpectedness rather than luck attributions. The study goes beyond the previous ones, however, in two significant ways. First, it supported this hypothesis in a realistic setting, ruling out the possibility that the findings obtained in the previous studies were artefacts due to memory biases or other distorting influences connected to the remembered-incidents technique. Secondly, the independent manipulation of the expectedness and the causal attribution of the outcome rather unambiguously permits the conclusion that unexpectedness rather than luck attributions determine experienced surprise. In conflict with the attributional model, chance attributions are *not sufficient* for surprise, for chance attributions did not lead to surprise if the outcome was expected (cf. the luck-expected outcome condition). In addition, chance attributions are also *not necessary* for surprise, for provided that the outcome was unexpected, it led to surprise even if it was attributed to ability (cf. the skill-unexpected outcome condition).

In sum, we conclude that, taken together, the results of Studies 1–3 provide strong support for the hypothesis that the cognitive antecedent of surprise is event unexpectedness rather than luck attributions, and that the latter are neither sufficient nor necessary causes of surprise. Rather, as mentioned in the Introduction, we propose that surprise promotes causal thinking, of which luck attributions are comparatively frequent consequences. In the remaining two experiments reported in this article (Studies 4 and 5), these latter assumptions were addressed.

STUDY 4

The attributional model assumes that the unexpectedness (and importance/valence) of events promote causal search which, if it terminates in a luck attribution, results in surprise. In contrast, the expectancy-disconfirmation model assumes that surprise is caused by unexpectedness and promotes spontaneous causal search processes which terminate comparatively frequently in luck attributions (cf. Study 1).

The attributional model's assumption that unexpectedness (and importance/valence) promotes causal search receives support from several sources. Berlyne (1960, 1965) has demonstrated that novel or unexpected events instigate exploratory activities, of which causal thinking (attributional search) can be considered to be a specific type (cf. Weiner, 1985b; Wong & Weiner, 1981). More to the point, Isaacs (1930, p. 295) found that children ask "why"—questions particularly in situations characterised by "a sudden clash, gap or disparity between our past experience and any present event. Some fact is met which is contrary to expectation, or unexpected". Issacs' (1930) finding has been confirmed by several more recent researchers who found that spontaneous attributional activity is more pronounced following unexpected than expected outcomes (e.g. Lau & Russell, 1980; Pyszczynski & Greenberg, 1981; Wong & Weiner, 1981).

However, although these findings indicate that unexpectedness promotes spontaneous causal thinking, they do not show that this effect of unexpectedness was direct, rather than mediated by the feeling of surprise. They are equally consistent with our assumption that unexpectedness causes surprise, which in turn stimulates causal thinking (which in turn frequently leads to chance attributions).

To demonstrate empirically that it is indeed the affective state of surprise, rather than just the "cold cognition" of event unexpectedness *per se* which promotes causal search is, however, no easy task. An unambiguous demonstration would require one to influence the degree of experienced surprise independently of manipulating the unexpectedness of outcomes. At least with the present methodology, this seems to be next to impossible if unexpectedness is indeed (as we assume) a necessary and sufficient cognitive cause of surprise. The purpose of Study 4 was therefore more modest, namely, to provide some initial, *correlational* support for the plausibility of our alternative explanation, by showing that the previously obtained association between causal search and *outcome unexpectedness* can be replicated for *surprisingness*.

The design and procedure of Study 4 were the same as those used in Study 2, except that additional dependent variables, intended to measure the duration and intensity of attributional search, were now also included. Again using a 2 (success/failure) × 2 (high/low surprise) design, subjects were asked to recall an achievement outome characterised by a particular valence and surprise intensity, and to indicate the extent of their attributional search (duration and intensity) for the causes of the achievement outcome. We predicted a greater amount of attributional search for surprising than for unsurprising outcomes. In addition, we expected that the intensity and duration of causal search would also be more pronounced after failure than after success, as found in several previous studies (e.g. Försterling & Groeneveld, 1983; Lau, 1984; Wong & Weiner, 1981). In sum, we predicted that surprising or negative outcomes would lead to longer and more intense attributional search than unsurprising or positive ones. In addition to testing this main hypothesis, Study 4 also enabled us to replicate the findings from Study 2 concerning the links between luck attributions, surprise, and unexpectedness.

Method

Subjects. Fifty-two male and female students from the University of Bielefeld participated on a voluntary basis. Most of them were students of law or business management.

Materials and Procedure. The experimental procedure and the materials were the same as those of Study 2, except that, following the expectancy ratings, the subjects were also asked to indicate the duration and intensity of their attributional search by answering the following two questions: "How long did you need to determine the cause?" (duration), and "How intensively did you search for the cause?" (intensity). Duration of attributional search was rated on a 7-point scale ranging from *I knew the causes for my success/failure immediately* (1) to *I needed a very long time to determine the causes for my success/failure* (7); intensity of search was rated on scale ranging from *I made only a cursory attempt to find the causes for my success/failure* (1) to *I reflected extensively on the causes of my success/failure* (7).

Results and Discussion

Remembrance and importance. The achievement events were again remembered reasonably well ($M = 4.6$) and judged as fairly important ($M = 5.0$). In contrast to Study 2, surprise intensity and outcome valence had no significant effect on either remembrance or importance ($Fs < 1.8$).

Links between surprise, unexpectedness, and luck attributions. Concerning first the replication aspect of this experiment, we found that the results concerning the link between unexpectedness, surprise, and luck attributions were consistent with those of Study 2 (see Table 3). Surprising outcomes were attributed more strongly to luck ($M = 3.0$) than unsurprising ones ($M = 2.0$), $F(1, 48) = 3.94$, $P < 0.05$, $EV = 5.2\%$, and were

TABLE 3
Mean Ratings of Attributional Search, Attribution to Luck and Unexpectedness as a Function of Outcome Valence (Success, Failure) and Surprise Intensity

	Success		*Failure*	
	No Surprise	*High Surprise*	*No Surprise*	*High Surprise*
Attributional Search	1.9	3.7	2.1	4.2
Luck	2.3	3.5	1.7	2.5
Unexpectedness	2.0	5.0	2.1	4.8

Note: High values indicate intensive attributional search, high importance of luck as a cause, and high unexpectedness. Attributional Search = Mean of intensity and duration judgements.

rated as more unexpected ($M = 4.9$) than unsurprising ones ($M = 2.1$), $F(1, 48) = 81.7$, $P < 0.001$, $EV = 61.5\%$. Furthermore, the covariate unexpectedness was again significantly related to luck ascriptions, $F(1, 47) = 4.4$, $P < 0.05$, $EV = 6.1\%$, and the effect of surprise intensity on luck ascriptions disappeared when unexpectedness was statistically controlled for, $F(1, 47) < 1$, $EV < 1\%$.

Attributional search. Analyses of variance were conducted separately for the two indices of causal search (intensity and duration), as well as for an overall index consisting of the mean of the two ratings. Because these analyses yielded completely parallel findings, only the results for the combined index will be reported. As predicted, subjects reported significantly more attributional search ($M = 3.9$) after a highly surprising outcome than after an unsurprising one ($M = 2.0$), $F(1, 46) = 40.6$, $P < 0.001$, $EV = 44.9\%$. However, in conflict with our predictions, there was no main or interaction effect involving outcome valence, all Fs < 1.4.

Conclusion

The results of Study 4 again substantiated the conclusion drawn from Studies 1–3 that surprise is not caused by luck ascriptions, but by unexpectedness. In addition, they are consistent with the hypothesis that surprise, rather than being a consequence of attributions, promotes causal thinking. That is, the results of Study 4 verify a necessary precondition for the truth of this hypothesis, namely a significant association between surprisingness and causal search.

We would like to re-emphasise, however, that the results reported above do not permit us to conclude with certainty that it was indeed the feeling of surprise, rather than just the "cold cognition" of event unexpectedness *per se*, which promoted causal search. Nor did additional, correlational analyses provide reasons for preferring one of these models over the other: Surprisingness and (rated) unexpectedness were both associated

equally strongly with causal search, and statistically controlling either of the two predictor variables reduced the association of the other to causal search to nonsignificance. Given the strong association between unexpectedness and surprise posited by our model, this finding certainly does not discredit this model, but neither is it selectively favoured by the data.

There remains, however, a good *theoretical* reason for preferring the proposed cognitive-affective model (unexpectedness–surprise–causal search) over the alternative hypothesis that unexpectedness directly influences causal search: The latter hypothesis assumes implicitly that the feeling of surprise is a mere epiphenomenon, i.e. a causally inert consequence of unexpectedness. As already mentioned in the Introduction, this position is problematic, particularly because the proposed epiphenomenalism is strangely "selective"—i.e. although surprise is regarded as an epiphenomenon, other mental states, in particular the cognition of unexpectedness (and, in Weiner's model, other affects as well), are accorded causal potency. The present, cognitive-affective model avoids this problem.

One finding of Study 4 did not conform to our predictions: Namely, there was no evidence that the amount and intensity of causal search was also determined by outcome valence, or more specifically, that failure led to more attributional search than did success. Several possible explanations of this finding come to mind, but because it conflicts with the results of several previous studies (cf. earlier), we decided, before pursuing these explanations further, to check whether the results could be replicated. In addition, we also included, as a further factor that presumably influences attributional search (cf. the Introduction), the importance of the outcome. This variable has not been systematically varied in prior studies (cf. Weiner, 1985b).

STUDY 5

This study paralleled Study 4, except that importance of outcome was included as an additional independent variable. Hence, the subjects were asked to recall one of eight possible situations (2 levels of outcome × 2 levels of surprise × 2 levels of importance), and to complete the same rating scales as used in Study 3. Our hypothesis was that surprising, as well as negative and/or important outcomes would lead to more attributional search than others.

Method

Subjects. The subjects were 96 male and female students. Sixty-five were psychology freshmen who participated in partial fulfilment of their course requirements, whereas the rest were voluntary participants from other disciplines.

Materials and Procedure. On arrival in the laboratory, subjects were given a booklet containing the experimental material, which was the same as that for Study 4, with the exceptions mentioned before. Hence, the subjects were asked to recall a surprising or unsurprising success or failure on a test that was highly important or unimportant for them.

Results and Discussion

Remembrance and importance. The achievement outcomes were again reasonably well remembered ($M = 4.6$). Important achievement outcomes were remembered slightly better ($M = 5.0$) than unimportant ones ($M = 4.1$), $F(1, 88) = 5.8$, $P < 0.05$; and successes were remembered slightly better ($M = 5.0$) than failures ($M = 4.1$), $F(1, 88) = 6.8$, $P < 0.05$. The manipulation of importance was successful, inasmuch as important outcomes were rated as more important ($M = 5.4$) than unimportant ones ($M = 3.4$), $F(1, 88) = 33.6$, $P < 0.001$. In addition, successes were rated as more important ($M = 4.9$) than failures ($M = 3.9$), $F(1, 88) = 5.5$, $P < 0.05$.

Unexpectedness of outcomes and attributional search. Table 4 shows the degree of unexpectedness and amount of attributional search as a function of surprise intensity and outcome importance for the success and failure situations. Concerning the unexpectedness ratings, the ANOVA once more yielded a highly significant main effect of surprisingness of outcome, $F(1, 88) = 72.3$, $P < 0.001$, $EV = 40.8\%$, as well as a significant outcome × importance interaction, $F(1, 88) = 8.0$, $P < 0.01$, $EV = 3.6\%$. As can be seen from Table 4, surprising outcomes were rated as more unexpected than unsurprising ones. Furthermore, highly important successes were rated as less unexpected ($M = 3.2$) than unimportant successes ($M = 4.1$), $F(1, 44) = 4.2$, $P < 0.05$; whereas highly important failures were rated as more unexpected ($M = 3.8$) than unimportant failures ($M = 3.1$), $F(1, 44) = 3.8$, $P < 0.06$.

Concerning attributional search, the ANOVA for the combined index (mean of duration and intensity; highly similar results were again obtained for the two indices when considered separately) produced a significant main effect for surprisingness, $F(1, 85) = 27.1$, $P < 0.001$, $EV = 20.3\%$, as well as a significant importance × valence interaction, $F(1, 85) = 12.2$, $P < 0.001$, $EV = 8.8\%$. As can be seen from Table 4, independent of outcome valence and importance, highly surprised subjects searched longer and/or more intensely for the causes of their outcomes than did unsurprised ones. Follow-up analyses of the importance × valence interaction revealed that important failures elicited more attributional search than both unimportant failures, $F(1, 41) = 10.6$, $P < 0.01$, and important successes, $F(1, 44) = 8.0$, $P < 0.01$. These results suggest that the

TABLE 4
Mean Ratings of Attributional Search and Unexpectedness as a Function of Outcome Valence (Success, Failure), Surprise Intensity, and Importance of Outcome

	Success				*Failure*			
	No Surprise		*High Surprise*		*No Surprise*		*High Surprise*	
	Important	*Unimportant*	*Important*	*Unimportant*	*Important*	*Unimportant*	*Important*	*Unimportant*
Unexpectedness	2.0	2.9	**4.5**	5.1	2.4	2.1	5.3	4.0
Attributional Search	2.1	**2.5**	**3.4**	3.8	3.2	1.7	4.6	3.3

Note: High values indicate intensive attributional search and high unexpectedness.

combination of high importance plus negative valence increases attributional search. However, there are some interpretative ambiguities concerning this conclusion, because important failures were also rated as more unexpected. Therefore, the reason why they stimulated causal search may have been exclusively their greater unexpectedness and ensuing surprisingness, rather than their importance. To test this possibility, we calculated a three-way analysis of covariance with importance, surprisingness, and valence of the outcome as the three independent variables, and unexpectedness as the covariate. This analysis resulted in a highly significant effect for the unexpectedness (the covariate), $F(1, 86) = 72.1$, $P < 0.001$, $EV = 41.6\%$, as well as a significant importance × valence interaction, $F(1, 86) = 4.3$, $P < 0.05$, $EV = 1.9\%$. This latter amount of explained variance is substantially less than that explained by the corresponding interaction term in the original analysis of variance (8.8%). Hence, it seems that the enhancement of causal search by important failures was for the greater part due to the greater unexpectedness of these outcomes. Nevertheless, it does not seem to be exclusively due to this factor.

Conclusion

In sum, the results of Study 5 concerning the impact of unexpected, surprising outcomes on the intensity and duration of attributional search completely paralleled the findings of Study 4. Causal analysis was more thorough (longer lasting and more intense) for highly surprising outcomes than for unsurprising ones. Thus, surprise seems to stimulate causal analyses. In addition, the data from Study 5 also provided weak evidence that apart from surprise, outcome importance promotes attributional search, at least in the case of failure. However, they also suggest that at least part of the effect of outcome valence on attributional search found in prior studies might in fact have been due to the greater unexpectedness (and ensuing surprisingness) of negative outcomes. Further reflection on these findings has led us to believe that this part of the expectancy-disconfirmation model is at present too crudely formulated. However, a refinement of this part of the model must be left to another occasion.

GENERAL DISCUSSION

In five studies, the adequacy of two proposed models linking surprise to causal attribution was tested. Taken together, the results indicate against the attributional model and in favour of the expectancy-disconfirmation model. *First*, the results of all five studies consistently showed that the

association between luck attributions and surprise found in the previous studies by Weiner et al. (1978, 1979) does not necessarily reflect a causal effect of luck attributions on surprise; rather, this association was most likely due to the degree of expectancy disconfirmation, or the degree of unexpectedness of the events. The strongest support for this conclusion comes from Study 3, which rather unambiguously showed that luck attributions are neither sufficient nor necessary for surprise. *Secondly*, the results of Studies 4 and 5 provided evidence consistent with the assumption that surprise, rather than being a consequence of luck attributions, promotes attributional search. Although the evidence for this later hypothesis is at present exclusively correlational and the data give no strong reason to prefer this hypothesis to the alternative one that causal search is directly influenced by unexpectedness, we have argued that the proposed cognitive-affective model is preferable because it avoids the "selective epiphenomenalism" of the unexpectedness-causal search model.

In sum, the data support our hypothesis that surprise is not the consequence of luck attributions, as maintained in the attributional model, but an affective reaction to unexpectedness that precedes the attributional process or more precisely, stimulates causal thinking. We therefore propose that the pertinent parts of Weiner's (e.g. 1986) general theory of emotion and motivation should be modified to conform to the expectancy-disconfirmation model. As far as we can see, such a modification would not require any further significant changes in that theory; and it would have the additional benefit that surprise is explicitly assigned an important functional role, which would be in better agreement with Weiner's assumptions concerning the functional significance of other emotions, such as anger and pity (cf. Weiner, 1986, 1994).

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