

MAKING SENSE OF FAILURE: A MOTIVATED MODEL OF HINDSIGHT BIAS

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Can we learn from our mistakes? Does the large body of research demonstrating hindsight bias indicate that people are not likely to take responsibility for their errors and thus deprive themselves of the opportunity to learn to avoid such errors in the future? This examines two somewhat contradictory theories of hindsight bias, defensive processing and retroactive pessimism, and proposes a “motivated sense-making” model as a possible similar common pathway for the two processes. Specific attention is given to the implications of each process with regard to learning from one’s mistakes.

The most fruitful lesson is the conquest of one’s own error. Whoever refuses to admit error may be a great scholar but he is not a great learner. Whoever is ashamed of error will struggle against recognizing and admitting it, which means that he struggles against his greatest inward gain.

—Goethe, *Maxims and Reflections*

Can we learn from our own mistakes? Thirty years of research on hindsight bias (Fischhoff, 1975) would seem to suggest that the prospects are not good. A robust phenomenon demonstrated in a large number of domains (Guilbault, Bryant, Brockway, & Posavac, 2004), hindsight bias amounts to the belief that one could have more accurately predicted past events than is actually the case. Almost universally, the nearly 600 papers that have cited Fischhoff’s seminal work in this area have claimed that hindsight is an im-

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pediment to learning. If failure to be surprised by the past causes us to overestimate what we knew, so the logic goes, we have little reason to change our beliefs. However, very few researchers have directly examined this claim (cf. Hoch & Loewenstein, 1989). More important, hindsight researchers have primarily focused on the supposed failure to learn from *other* people's misfortunes rather than their own (e.g., Alicke, Davis, & Pezzo, 1994; Busby, 1999; Henrikson & Kaplan, 2003).

Recently, however, researchers have begun to shift their attention to self-relevant outcomes. This shift has spawned two somewhat contradictory schools of thought concerning hindsight bias following disappointments or failures. First, a "defensive processing" school (Louie, 1999; Mark & Mellor, 1991) suggests that in order to avoid culpability for a negative outcome, people perceive—or at least report—the event as unforeseeable. A second "retroactive pessimism" school (Tykocinski, 2001; Sanna & Chang, 2003) also posits an underlying desire to reduce one's sense of responsibility for failures, but instead proposes that we are able to convince ourselves of the negative outcome's inevitability. Although both approaches rely on the notion that we can avoid upsetting internal attributions for the outcome, they make opposite predictions – defensive processing proposes *less* hindsight, and retroactive pessimism proposes *greater* hindsight following a disappointing outcome.

Does this mean that engaging in one self-protective process is detrimental to learning how to improve future behavior and the other is not? Perhaps not. We suggest that it is not the resulting hindsight bias that has the greatest effect on learning, but rather the degree of consideration that one gives to internal causes for the event. Defensive and retroactive pessimism processes *both* seem to protect the self by stifling any search for personal causation (Roese, 2004). To the extent that this is true, neither process is likely to promote meaningful learning to prevent future mistakes. To show this, we will review both literatures and present a model demonstrating how each might arise from a single "motivated sense-making" process. This model extends the predictions of the (purely cognitive) sense-making model of hindsight bias (Pezzo, 2003) by noting how negative self-relevant outcomes can alter the search for causes.

COGNITIVE THEORIES

Cognitive theorists hold that the human memory system is not so much designed to accurately reconstruct the past as it is to make sense of it in order to better anticipate the future (Roese, 1997; Wilson, Gilbert, & Centerbar, 2003). Accordingly, hindsight bias results from a generally adaptive process of "knowledge updating" that improves causal inferences over time (Hawkins & Hastie, 1991; Hoffrage, Hertwig, & Gigerenzer, 2000; Roese & Olson, 1996). Such a sense-making process (which is spontaneously activated following surprising or negative outcomes) causes reasons in favor of the out-

come to be strengthened, and reasons for alternative outcomes to be weakened (Wasserman, Lempert, & Hastie, 1991). Although this can produce a biased perception of the likelihood of a single event, in the long run such a process should teach us how to better avoid future failures, either through changes in behavior or—for outcomes not under personal control—knowledge of base rates. As Roese (2004) has noted, the advantage of a better future may be worth the price of a little hindsight bias (see also Hoffrage & Hertwig, 1999).

Although early reviews of hindsight bias correctly described the phenomenon as robust across situations (e.g., Christensen–Szalanski & Willham, 1991) subsequent research has shown that it is not inevitable (Louie, Curren, & Harich, 2000; Mark & Mellor, 1991; Pezzo & Beckstead, in press). Pezzo (2003) developed a model in which the occurrence of hindsight bias is said to depend on the successful completion of a cognitive sense-making process that is triggered by initially unexpected outcomes. According to this model, hindsight bias will not occur when the outcome was so expected as to not warrant any sense-making behavior. In this case, people can justifiably claim that they really did “know it all along.” Hindsight bias may also not occur for extremely unexpected outcomes (e.g., Ofir & Mazursky, 1997), in which sense-making is unsuccessful. Here people could justifiably claim that they “did *not* know it all along.” Research by Sanna, Schwarz, & Small (2002) supports this contention that sense-making *failure* reduces hindsight judgments. They found that when it is subjectively difficult to generate reasons for an outcome (or even “feels” difficult because one is asked to furrow one’s brow!), hindsight bias is reduced.

Because effective sense-making reduces feelings of surprise (Pezzo, 2003; Wilson et al., 2003), most arguments that hindsight bias impairs learning center on the overconfidence that it produces (Arkes, Wortmann, Saville, & Harkness, 1981; Christensen–Szalanski & Willham, 1991; Fischhoff, 1975, 1982; Hawkins & Hastie, 1990). Louie (2005) suggests that hindsight bias can make people overly risky in their future decisions. However, a clear causal link between hindsight bias and overconfidence has not been directly established (Biais & Weber, 2005; Winman, Juslin, & Bjorkman, 1998). In fact, Hoch and Loewenstein (1988) claim that the same process that produces hindsight bias may actually reduce overconfidence in that it provides diagnostic information useful in assessing population base-rates and knowledge calibration. So long as outcome information does not produce extreme bias typical of “insight problems” (Hom & Ciaramitaro, 2001; Winman, 1999), it should help people to become better calibrated for future decisions despite producing some degree of hindsight bias.

How does the sense-making model deal with negative self-relevant outcomes? Because such outcomes are generally unexpected, they are more likely to invoke the sense-making process. If that process is successful, then the hindsight bias will increase regardless of the valence or personal relevance of the outcome. However, there is increasing evidence that embar-

rassing or personally disappointing outcomes affect the sense-making process through more than just a “cold” cognitive process. Rather than search for the most plausible (Pohl, 1998), or easily accessible (Sanna et al., 2002) reasons for an outcome without regard to their implications, people instead appear to selectively seek causes that minimize their culpability, or otherwise reduce the sting of disappointment. Whether driven by ego defense or impression management, self-serving motives appear to be able to hijack the sense-making process (Ditto & Lopez, 1992; Kunda, 1990; Roese, 2004).

EVIDENCE FOR DEFENSIVE PROCESSING

A growing number of studies have found reduced or no hindsight bias following negative self-relevant outcomes. In the following two sections, we summarize these studies, and include some lesser-reported findings that are somewhat equivocal with regard to defensive processing.

The seminal study in this area (Mark & Mellor, 1991) found that laid off manufacturing workers claimed that their layoffs were less foreseeable than did retained workers or community members. Because it was not possible to obtain predictions before the lay-offs, Mark and Mellor used a compelling regression-discontinuity analysis to estimate how the laid off workers *should* have responded based on an objective predictor of being laid off (e.g., job seniority). In a second study, Mark, Boburka, Eyssell, Cohen, and Mellor (2003) found that actors rated a failed stock purchase as less foreseeable than did either opponents (for whom the same outcome was beneficial) or observers who had no investment in the outcome. No such difference was obtained when outcomes were viewed as positive by actors. Because a no control condition was included it is difficult to determine if participants exhibiting bias experienced “knowledge updating” thought to underlie hindsight bias.

To address this concern, Louie (1999, 2005) has performed three similar studies¹ that include a control condition. Participants who were given negative feedback (e.g., decided against purchasing stock, but then its price increased) showed no hindsight bias, whereas those who were given positive feedback showed a significant bias. Additionally, participants who were given positive feedback had more outcome-consistent thoughts and more internal attributions for the outcome than did participants who received negative feedback who made more external attributions. In related research by Louie et al. (2000), MBA students participated as a team in a graded mar-

1. In fact, all three studies reported by Louie appear to use an identical scenario concerning a petroleum company (Hayes, 1992). Although they consistently replicate one another using somewhat different measures, care should be taken not to overstate the generalizability of these findings.

keting simulation. Participants showed hindsight bias for their own team's success, but not the success of another team. Similarly, participants displayed no hindsight bias for their own failure, but did display a bias for another team's failure. It should be noted that outcomes were not randomly assigned in this study, although participants earning both favorable and unfavorable outcomes appear to have had roughly equal a priori expectations for success. Interestingly, one of the Louie's first studies (1999, Study 2) included an additional condition explicitly warning participants not to overstate what they would have been able to predict, because doing so could lead to poor performance on a subsequent task. Here, hindsight bias was removed for participants receiving a positive outcome, and slightly reversed (although not significantly) for those receiving a negative outcome. This finding is consistent with research on demand characteristics (Sharpe & Adair, 1993) showing that people can follow instructions to produce (i.e., *simulate*) both a stronger than normal "knew-it-all-along" effect and a "never-knew-that" effect in which no hindsight bias is exhibited.

In addition to laboratory support of defensive processing, it is also instructive to consider recent studies that have used real-world outcomes. Renner (2003) asked local townspeople to predict their cholesterol level 40 minutes before being tested, and then to immediately recall their predictions upon receiving their results. Those receiving an unexpectedly low value (a positive outcome) did not exhibit hindsight bias, whereas those receiving unexpectedly high values did. Five weeks later, however, those with high cholesterol recalled a lower prediction than the already low one that they made in foresight! Renner suggests that the immediate hindsight bias for high-cholesterol patients might reflect an attempt to regain a sense of control and self-efficacy in the face of an uncontrollable threat, and the eventual emergence of a reverse hindsight bias occurred only after the feelings of threat dissipate and goals have shifted to that of avoiding blame. More recently, Pezzo and Beckstead (in press) asked college students to estimate and then recall two months later the likelihood that 30 different self-relevant events (e.g., partner "cheats" on you, have enjoyable vacation) would occur in the following two months. After controlling for initial expectations, they found that the hindsight bias was smaller for negative than for positive occurrences, again supportive of defensive processing.² Admittedly such real-world designs are susceptible to internal validity threats that most laboratory experiments avoid. Outcome valence, for example, may be confounded with other dimensions (Pezzo, 2003; Roese &

2. Pezzo and Beckstead (in press) were unable to query participants immediately after their outcomes, and thus had no way to determine if Renner's (2003) findings of an *initial* retroactive pessimism could be replicated. Also, regardless of valence, outcomes judged to be more controllable (i.e., less likely to be produced by chance) resulted in greater hindsight bias, consistent with an unmotivated cognitive perspective.

Olson,1996). However, real-world studies certainly provide an enhanced understanding of the generalizability of the phenomenon.

EQUIVOCAL EVIDENCE FOR DEFENSIVE PROCESSING

Not all research clearly supports the defensive processing hypothesis. In particular, research studying exam performance has generally not found evidence for reduction of hindsight following negative outcomes. Sanna and Schwarz (2004) found a significant hindsight bias of roughly equal magnitude for both participants who received good and poor grades on an exam. In fact, the bias appears to have been slightly larger for students receiving poor grades, contradicting defensive processing. Similarly, Conway (1990) found that students who performed better than expected recalled having predicted a higher score than they actually did, while those who performed worse than expected recalled having predicted a worse score than they actually did. Haslam and Jayasinghe (1995) also found that students receiving a lower grade than they initially expected exhibited hindsight bias. Students who performed better than expected, however, showed “reverse” hindsight bias, recalling even lower predicted scores. They speculated that students may attempt to increase their positive affect by magnifying the idea that they did better than expected. It should be noted again that these real-world studies have imperfect internal validity. Students who perform well or poorly on tests may differ on other dimensions that obscure our conclusions about the effects of outcome valence. To address this, Pezzo (2003, Experiment 2) randomly assigned outcome by giving participants bogus feedback following a “cognitive abilities” test while observers read along. As expected, observers showed hindsight bias of equal magnitude for negative and positive outcomes. Actors who were low in academic self-esteem (who expected to perform poorly) showed hindsight for positive feedback, but not for negative feedback. High-self-esteem actors (who expected to perform well) showed the opposite—greater hindsight for negative than for positive feedback. Although this finding could be interpreted as defensive processing for low-self-esteem actors only, a more parsimonious explanation is that hindsight follows from a successful sense-making process that is only engaged by unexpected outcomes. Expected outcomes that do not activate the sense-making process will not produce hindsight bias.

Now, consider a study by Hölzl, Kirchler, and Rodler (2002). They asked participants six months before and after the introduction of the Euro currency to estimate the probability of several economic developments (e.g., tax rate will increase). Supporters of the Euro showed greater hindsight for developments supporting their attitude and less hindsight bias for contradictory developments. Opponents exhibited the opposite results. *Prima facie*, this is consistent with defensive processing. However, it is important to note that because participants had no responsibility for economic developments,

the typical defensive processing concerns about reducing culpability do not apply. Because some of the events used by Pezzo and Beckstead (in press) were also uncontrollable (e.g., favorite sports team wins big game) the same argument applies. One should have little motivation to alter perceptions of culpability for an event that one could not have caused.³ Hölzl et al. suggested that their unhappy participants may have been “blaming chance” for undesirable outcome. Indeed, outcomes produced by chance events do not typically produce hindsight bias (Tan & Lipe, 1997; Wasserman et al., 1991). Of course, participants in both studies (Hölzl et al., 2003; Pezzo & Beckstead, in press) would still feel embarrassment at not having been able to *predict* such outcomes, and this may produce some threat to the self. In any case, it appears that defensive processing may not always be restricted to controllable outcomes (cf. Pezzo, 2003).

Finally, note that although the culpability argument is often posed as one of *ego* defense (see Mark et al., 2003 for an excellent discussion), another possibility is that hindsight bias is reduced via impression management. In this case, people may not actually “believe” the answers they give, but are simply responding so that they do not *appear* responsible. Put bluntly, people may lie. Although some appear not to favor one approach over the other to explain self-serving biases (e.g., Markman & Tetlock, 2000; Tetlock & Manstead, 1985), certainly most research on culpability involves the appearance of impropriety to *others* (Alicke, 1992) rather than oneself. No previous research has examined whether participants spontaneously succumb to impression management with regard to hindsight bias, but studies have shown that providing subjects with impression management goals can alter their hindsight judgments (Agrawal & Maheswaran, 2005, Study 1) and that participants can sometimes respond to a request to not show the bias (Louie, 1999) or to simulate a “never-knew-that” effect (Sharpe & Adair, 1993). Future research should examine this further, especially in light of findings that impression management concerns can affect related biases such as overconfident time predictions (Pezzo, Pezzo, & Stone, 2006) and an escalation of commitment to a failing venture (Arkes & Blumer, 1985).

EVIDENCE FOR RETROACTIVE PESSIMISM

Contrary to the predictions of defensive processing, Tykocinski and her colleagues propose a theory of “retroactive pessimism” (Tykocinski 2001; Tykocinski, Pick, & Kedmi, 2002; Tykocinski & Steinberg, 2005), in which hindsight bias is greater following very disappointing outcomes, presumably because “an inescapable failure might be easier to digest than a failure

3. We note that, in some circumstances involving sports fans with very strong identification with their teams, direct culpability for a failure may not be necessary to invoke defensive processing (Hirt, Zillman, Erickson, & Kennedy, 1992; Cialdini & Richardson, 1980).

that could have been easily avoided" (Tykocinski, 2001, p. 381). Thus, although the underlying motivation appears to be the reduction of responsibility as with defensive processing, the predictions are in the opposite direction. In her first article (Tykocinski, 2001), participants estimated the chances of success following a very disappointing outcome (i.e., missing a big sale) to be much lower than following a less-disappointing outcome (i.e., missing a smaller sale), although only for people with a high desire for control (Burger & Cooper, 1979). Another study (Tykocinski, 2001 Study 2) showed that people who were disappointed with the result of an election rated the outcome more likely than did those pleased with the election. In a second article (Tykocinski et al., 2002), fans of a losing soccer team showed greater hindsight than did fans of the winning team, with the magnitude of the bias proportional to the degree of disappointment. Two additional studies showed that participants who imagined missing a deadline to apply for a college stipend exhibited greater hindsight when the stipend was large than when it was small. This effect did not occur if the loss occurred to a friend.

One possible explanation for these effects is that disappointing events are also more unexpected (Bell, 1985; Roese & Olson, 1996) and thus produce greater sense-making (Schkade & Kilbourne, 1991). Additionally, although finding retroactive pessimism for outcomes that involved the self but not a friend suggests a motivational process, Falk (1989) showed that even emotionally neutral coincidences involving oneself are judged more surprising than identical coincidences involving others. Finally, note that participants in Tykocinski's research are never asked to ignore the outcome; thus comparing her research to those studies in which people were instructed to ignore the outcome may be misleading (see Blank & Nestler, 2006, for more on the issue of differing measures of hindsight).

More recently, Tykocinski and Steinberg (2005) found that participants considering the most disappointing outcomes listed fewer upward counterfactuals (i.e., ways in which the disappointing outcome could have turned out differently). The causal link between upward counterfactuals and likelihood judgments, however, was inconsistent across two studies. More important, retroactive pessimism occurred only when the disappointing outcome resulted from external rather than internal causes.

Sanna and Chang (2003) also found retroactive pessimism, but only in participants scoring high in optimism. In their first study, optimists showed a sizable hindsight bias after imagining failure, but not success, whereas pessimists showed an opposite, but not statistically significant, trend (see Pezzo, 2003, Study 2 for a similar finding). Optimism indicates a general disposition to expect good outcomes, and is associated with active coping following negative outcomes rather than avoidance or denial (Carver et al., 1993). Thus, optimists are likely more surprised by negative outcomes, and more apt to try to make sense of them, resulting in greater hindsight bias. In

a second study, participants were given bogus negative feedback on a creative intelligence test, and asked to generate two or 10 external or internal reasons for their poor performance. Optimists asked to generate two external reasons gave larger probability estimates for the outcome (and indicated better mood) than in all other conditions, except for controls who were not asked to generate reasons. Sanna and Chang (2003) surmise that optimists in the control condition were likely spontaneously generating satisfying external reasons, equivalent to the two external reasons condition.

Although desire for control and optimism can have independent effects, they are related; both predict active coping and to varying degrees the absence of avoidant coping (Aspinwall & Taylor, 1992; Carver et al., 1993; Gebhardt & Brosschot, 2002). Perhaps people in Tykocinski and Steinberg's (2005) study were prevented from thinking about upward counterfactuals because they were busy considering external reasons for the negative outcome (typically plentiful in the retroactive pessimism literature). As Sanna and Chang (2003) found, it would not take very many external reasons before participants started feeling better and believed that the actual outcome was more likely. Consistent with this account, Sanna and Chang found that probability judgments were related to mood, but only for optimists.

A MODEL OF "MOTIVATED" SENSE-MAKING

How do we reconcile the opposing predictions of these two approaches with a single motivational mechanism? Figure 1 presents an updated sense-making model that seeks to explain the contradiction. Unless one is pessimistic or has low self-esteem, negative self-relevant events tend to be unexpected and thus should produce active sense-making. Whether or not hindsight bias occurs depends on how successful that process is (Pezzo, 2003), which may depend on the sorts of reasons one has available and the ease with which those reasons can be utilized (Sanna et al., 2002). In particular, the *relative* availability of internal versus external reasons for the outcome may play a key role. Because people desire to diffuse responsibility away from themselves, they first seek external reasons for negative outcomes. Research (Caldwell & O'Reilly, 1982; Curren, Folkes, & Steckel, 1992; Markman & Tetlock, 2000) has shown that people spontaneously act to defend themselves by producing excuses when their decisions fail. When external reasons are readily available (as they are in all studies to date examining retroactive pessimism), sense-making will be successful, resulting in greater hindsight bias, and the successful avoidance of feeling culpable for the outcome. However, when external causes are not readily available, the unwillingness to consider possible internal causes may force the conclusion that the outcome was produced by unpredictable chance factors. Here, hindsight bias is reduced, and people should again feel better because they appear less

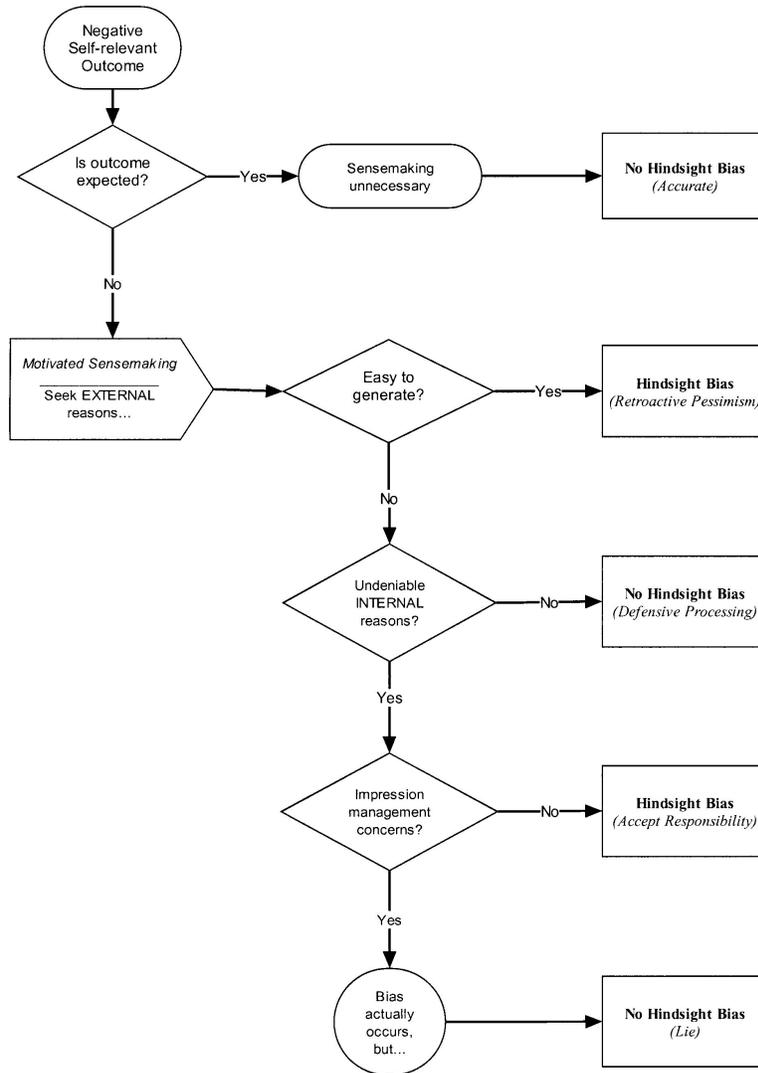


FIGURE 1. A Motivated Sense-making Model of Hindsight Bias. Unexpectedly negative and self-relevant outcomes typically trigger a search for external, but not internal causes. Hindsight bias results when the search is successful (retroactive pessimism). A failure to uncover external causes often results in little or no hindsight bias (defensive processing). In some instances, however, internal causes may be undeniable, leading to hindsight bias (accept responsibility), although strong impression management concerns may keep such a shift in belief from being publicly declared (lie).

responsible for the outcome (e.g., Mark & Mellor, 1991), or, in the case of an uncontrollable outcome, less incompetent for not having been able to predict that it would occur (Hölzl et al., 2002). Of course, sometimes internal reasons for failure are so obvious or unavoidable that defensive motives cannot ignore them. Similarly, one may have experienced a shift in moral perspective that reduces defensiveness. In either case, one will be able to make sense of the outcome by accepting responsibility for it, which will lead to increased perceived likelihood of that outcome. Whether or not hindsight bias is *publicly* reported following the actual experience may depend on the presence or absence of impression management concerns.⁴

It must be noted that although the present model offers a theoretically plausible resolution for the discrepancies in the hindsight literature, direct empirical tests of the model are limited. Models are most useful when they assist researchers in making predictions for future studies. We offer a few such predictions below. Support for the motivated sense-making model will depend on the extent to which these, and other predictions deriving from the model, are supported by future research.

1. The extent to which people exhibit defensive processing versus retroactive pessimism should be determined by the relative availability of external causes for the outcome.
2. People exhibiting reduced hindsight following negative self-relevant outcomes should take longer to respond than those who show hindsight, whether via retroactive pessimism or unmotivated sense-making. This is because the additional time required to search for unavailable external causes should take longer.
3. Whether or not hindsight bias is produced by retroactive pessimism or unmotivated sense-making can be determined by the extent to which a person cites internal causes (i.e., responsibility) for the outcome.
4. Negative emotions should decrease more following hindsight produced by retroactive pessimism (denying responsibility) than following hindsight bias produced by internal causes.

4. We agree with a reviewer that the acceptance of responsibility would not *necessarily* lead to increased hindsight bias. Theoretically, a person could admit failure, but not claim that the outcome was known to him or her. That is, one might claim that he or she *should* have known the outcome, but that he or she *did not* know it. Although Pezzo (2003) has previously discussed this possibility (p. 438), we know of no published studies that include both “should have known” and “did know” measures.

We should note that our model is not meant to represent a comprehensive list of all factors affecting the magnitude and direction of hindsight bias.⁵ For example, Muller and Stahlberg (this issue) report unpublished data suggestive of the idea that metacognitive factors, such as the “feeling” of surprise, may directly contribute to hindsight bias (see also Ofir & Mazursky, 1997). This research is intriguing, and future studies should examine further whether such metacognitive experiences typically occur independently of the sense-making process or as a result of that process (see Pezzo, 2003 for further discussion).

IMPLICATIONS FOR LEARNING

If we adopt the proposed model assuming a common sense-making process in both retroactive pessimism and defensive processing, what implications does each approach have for learning to improve future behavior? Let us begin with retroactive pessimism. In this case, increased foreseeability occurs because people have made sense of an outcome by attributing it to easily identifiable external causes. Because this immediately makes one feel better, there is no need to continue through the path of the model to consider any reasonable internal causes. Even if the primary cause of the outcome may in fact have been external, a truncated sense-making process will lose any available information about how to avoid similar failures in the future.

Although Tykocinski argued that because retroactive pessimism occurs primarily for uncontrollable (i.e., externally produced) outcomes, “there is less of a lesson to be learned” (Tykocinski & Steinberg, 2005, pp. 556–557), even uncontrollable events can provide some valuable lessons—if only to learn that uncontrollable events do sometimes occur. In fact, a whole literature on the planning fallacy examines just such a situation. The planning fallacy occurs when people repeatedly underestimate how long a task will take despite knowing that they have finished similar tasks late in the past. It is believed that this phenomenon occurs because people view each past failure as due to some uncontrollable event that will not be relevant for future predictions (Beuhler, Griffin, & Ross, 1994). Essentially, people are failing to learn that although any given impediment is unlikely to occur, the probability of some sort of unexpected distraction is quite high and should be used in generating predictions. The similarity between retroactive pessimism and the planning fallacy is especially notable in light of the fact that many of the scenarios used by Tykocinski and her colleagues involved participants being late for some appointment or event. Further research evaluating the

5. Our model does not specify the conditions under which reverse hindsight bias will occur. To date, reverse hindsight bias remains a controversial phenomenon (e.g., Arkes, 1988), and relatively few empirical studies exist upon which we could make predictions about its occurrence.

connection between hindsight bias and future planning may prove quite interesting.

Does learning occur with defensive processing? It seems not. In this case, people are unable to secure external reasons for an outcome and they are unwilling to consider internal reasons. As Arkes (2001) has noted, "the feedback you receive is valuable; do not belittle it" (p. 506). Defensive processing, however, may cause decision makers to do just that. Essentially, defensive processing appears to result only in an active search for excuses (external attributions) rather than an objective search for any causes, regardless of implications for the self. Unfortunately, because outcome information can have multiple effects (Hoch & Loewenstein, 1989), it is impossible to know from the current research if decision makers who show reduced or reverse hindsight bias have actually learned anything from the outcome. However, we predict that because people seem to be effectively discounting the possibility of internal causes for failure, dedicated research will show that they are not learning how to best avoid such mistakes in the future.

Finally, how do we deal with the possibility that impression management may underlie defensive processing results with regard to learning? If some of the reduction of hindsight from defensive processing stems from impression management tactics, then people may be learning, albeit covertly. Nonetheless, this presents its own set of problems in contexts such as communication between decision makers, group learning, etc. Further, what learning does take place may eventually be undermined by dissonance-produced attitude changes that typically result from lying to others. In other words, we may eventually come to believe our defensive claim that the past was unpredictable.

CONCLUSIONS

The model we have proposed is somewhat disturbing. Rather than seek the most reasonable cause for an unfortunate event, we appear to place a premium on external causes that absolve us of responsibility. It seems that only when internal causes are irrefutable do we own up to our role in negative outcomes. Defensive processing and retroactive pessimism may soften the blow of a negative outcome, but they seem to detract from the learning opportunities of a mistake.

Unfortunately, this phenomenon is not limited to the trivial tasks reviewed thus far. Although we would like to think that when the stakes are higher, as with medical decision making, doctors might seek an *accurate* account of the causes of the outcome, rather than one that merely makes them look good, this does not seem to be the case. Mizrahi (1984) found that the most common coping mechanisms of physicians following a medical error were denial of responsibility, discounting of importance, and emotional distancing. One study found that only 50% of medical residents informed their

attending physicians of their mistakes, and fewer than 25% told their patients or the patients' families (Wu, Folkman, McPhee, & Lo, 1991).

Such defensive strategies may be counterproductive because growing evidence suggests that lawsuits arise primarily out of patient dissatisfaction with physician arrogance and denial of wrongdoing (Wu, 1999). It has, thus, been suggested that a simple policy of disclosure and apology could substantially reduce the number of malpractice claims (www.sorryworks.net; but see Mazor, Simon, & Gurwitz, 2004). Although an apology acknowledges responsibility, it also acknowledges regret, which, "signals an intention to avoid similar violations in the future" (Kim, Ferrin, Cooper, & Dirks, 2004, p. 105).

Will apologizing reduce hindsight bias? Probably not. To the extent that apologies involve explanation, they will permit successful sense-making, and thus lead to increased outcome probabilities. However, if hindsight bias indicates that physicians are learning from, or at least that they make, mistakes, this may not matter (Flach, 2003). If our primary interest is to reduce the likelihood of future mistakes, hindsight bias might not be our foe as much as the defensive thought processes that sometimes—and sometimes do not—lead to it.

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