

Hindsight Bias: A Primer for Motivational Researchers

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Abstract

Thirty-five years since the publication of Fischhoff's (1975) seminal article, we continue to be fascinated by the hindsight bias. Like a well-developed character in a novel, the bias has something for everyone. Its basic tenet – that things seem less surprising in hindsight than they should – is instantly recognizable as a common human flaw. It is robust, often difficult to reduce, and appeals to researchers with a wide range of interests including history, business, law, medicine, and of course, psychology. This interest stems from the belief that failure to be surprised by an event prevents us from learning from it, and will likely cause us to judge others unfairly for not having been able to foresee it. But just how bad is it? Although guided by a cold cognitive mechanism that 'creeps up' on us, hindsight bias is complex, seemingly strengthened, and yet also reduced by self-serving motives. In this article, I introduce the reader to the basic designs used to study the bias, key cognitive and motivational mechanisms, the major controversies, and some unstudied questions that I hope will guide future research.

In 1975, Fischhoff first demonstrated the hindsight bias, the tendency to overestimate how much we believed we *would have* or *did* know about something had we been asked before the truth were revealed to us. His study was simple enough. People in a foresight condition were given a scenario (e.g. an unfamiliar 19th century war, or a clinical case study) with a list of possible outcomes, and asked to rate the likelihood of each outcome. People in a hindsight condition were told the 'correct' outcome, but asked to ignore it when they made their estimates – that is, to respond hypothetically, as if they didn't know the outcome. They couldn't, and gave higher likelihood estimates for whatever outcome they believed occurred.

Trying a different approach, Fischhoff and Beyth (1975) asked students to predict the likelihood of different possible events that might occur during President Nixon's upcoming trip to China and the USSR. Two weeks to 6 months later, they asked the students to recall their predictions and to indicate which events actually occurred. Student remembered giving higher probabilities to events that they believed had occurred, and lower probabilities to events that they didn't think had occurred. In both studies the responses seemed to imply that they 'knew all along' – or rather believed that they knew – what would happen.

Fischhoff (1975) quickly became a citation classic, and has been cited over 700 times according to ISI Web of Knowledge. Fischhoff only published a few additional studies on the bias himself (Fischhoff, 1977; Fischhoff, Gonzalez, Lerner, & Small, 2005; Slovic & Fischhoff, 1977) but each year an increasing number of articles appear addressing the topic (See Figure 1). An excellent review of the first 15 years of research can be found in Hawkins and Hastie (1990), and two special issues of new theoretical and empirical work were published in the past 10 years (*Memory*, 2003; and *Social Cognition*, 2007).

Although hindsight bias research asks participants to look backwards, it can be considered part of a larger family of biases related to forecasting that include *overconfidence*

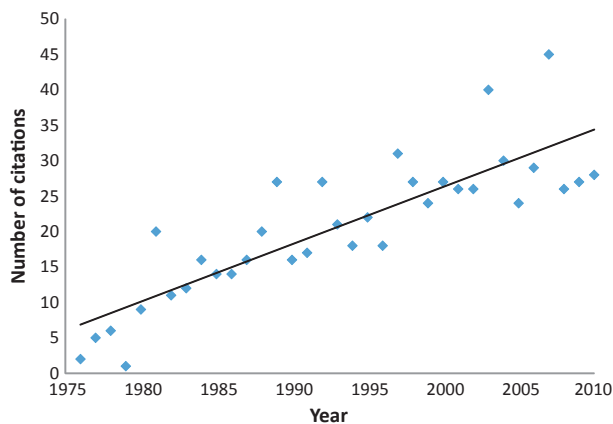


Figure 1 Number of publications citing Fischhoff (1975) to 2010. Web of Knowledge search conducted December 19, 2010. The astute reader may notice a similarity to Christensen-Szalanski and Beach (1984, figure 1) who demonstrated a 'citation bias' in which the average number of citations per article per year increases over time for articles about poor reasoning, whereas those concerning accurate reasoning do not. Human flaws make for interesting reading!

(Lichtenstein, Fischhoff, & Phillips, 1982); the *planning fallacy* (Buehler, Griffin, & Ross, 1994), *affective forecasting* (Wilson & Gilbert, 2008), and *foresight bias* (Koriat & Bjork, 2005). All involve an undue focus on confirmatory factors (e.g. factors leading to the known outcome, to why my answer is correct, etc.) and neglect for alternatives (e.g. the opposite outcome, being wrong, etc.).

In the sections that follow, I outline the major things we've learned from this research with an eye toward the researcher interested in motivational factors. Along the way, I'll offer some observations and a few criticisms too.

Hindsight Bias is a Difference...Usually

Hindsight bias is almost always defined as the difference between two judgments, one made in hindsight, and one foresight. In a hypothetical-outcome design (e.g. Fischhoff, 1975), the difference is between two different groups of people; while in a memory design (e.g. Fischhoff & Beyth, 1975) the judgments are made by the same person at two different times. The judgments are usually outcome probabilities, but a number of other judgments have been used (e.g. Fischhoff, 1977). Some researchers use a single metacognitive measure, taken only in hindsight, to capture participants' awareness of their foresight state. For example, Mark and his colleagues (Mark, Boburka, Eyssell, Cohen, & Mellor, 2003; Mark & Mellor, 1991) asked people to indicate how *foreseeable* the outcome was. Other measures have included outcome *obviousness* (Wong, 1995), outcome *certainty* (Müller & Stahlberg, 2007), and the *feeling of surprise* – or rather the lack of this feeling (Choi & Choi, 2010). Such metacognitive measures lend themselves nicely to research examining motivational aspects of hindsight bias.

Hindsight Bias is Robust

No matter how you measure it, the bias is *robust*, occurring in a variety of settings, including physician diagnoses (Arkes, Wortmann, Saville, & Harkness, 1981), sporting

event predictions (Roese & Maniar, 1997), legal judgments (Arkes & Schipani, 1994), economic predictions (Hölzl, Kirchler, & Rodler, 2002), and auditing judgments (Reimers & Butler, 1992) to name a few. It has been shown in children and in older adults (Bayen, Pohl, Erdfelder, & Auer, 2007), and recently has been demonstrated in additional sensory domains, including gustatory (Pohl, Schwarz, Szczesny, & Stahlberg, 2003) and visual (Cavillo & Gomes, 2011; Harley, Carlsen, & Loftus, 2004). Indeed, a potential criticism of the field is that it is more enamored of cataloging the bias than it is with examining its theoretical underpinnings. I sometimes find myself agreeing with this criticism, but ultimately the breadth of studies should help us to better understand the underlying mechanism(s).

Hindsight Bias is (Mostly) Cognitive

There is general consensus that the bias is produced by cognitive rather than motivational factors (Ash, 2009; Blank & Nestler, 2007; Roese, 2004). Rather than an attempt merely to look smart after the fact, hindsight bias results from belief updating in which we ‘rewrite the story’ to make sense of the outcome (Hawkins & Hastie, 1990; Pezzo, 2003). Factors that would have led to a different outcome are minimized, while factors that can be linked to the outcome are emphasized. This process, which Fischhoff (1975) coined *creeping determinism* (to indicate that the bias seems to creep on us without our awareness), causes the outcome to seem more predictable, and less surprising (Slovic & Fischhoff, 1977). This ‘curse of knowledge’ also makes it difficult for us to take the perspective of others who don’t know the outcome because it seems relatively obvious to us (Birch & Bernstein, 2007). It’s not all bad, though. The same sensemaking process that produces hindsight bias has been shown to benefit us by reducing the sting of negative emotional events (Wilson, Gilbert, & Centerbar, 2003) and may help us to learn from the outcome, even if we don’t realize it (Pezzo & Pezzo, 2007).

Fischhoff characterized creeping determinism as effortless and essentially unavoidable. Although it does move quickly and generally without our awareness, hindsight bias isn’t inevitable (e.g. Hasher, Attig, & Alba, 1981; Louie, 1999; Ofir & Mazursky, 1997), and requires cognitive resources to ‘creep’. For example, Nestler, Blank, and von Collani (2008) found that people under high cognitive load (e.g. asked to simultaneously rehearse an 8-digit number) did not show the bias (see also Werth & Strack, 2003). Although other cognitive factors besides belief updating (e.g., memory impairment and biased reconstruction) can affect hindsight bias (e.g., Bernstein, Erdfelder, Meltzoff, Peria, & Loftus, 2011), studies examining these factors tend to use techniques that are less relevant to motivational mechanisms (e.g., trivial questions), and thus will not be discussed here.

Hindsight Bias Requires Successful Sensemaking

The current trend in hindsight research seems to be examining those situations in which the bias does *not* occur. For example, I proposed a model (Pezzo, 2003) in which hindsight bias only occurs if the sensemaking process is activated and successful. We observe little hindsight bias for expected outcomes, because there is no need to make sense of them. They will seem obvious not because of any biased processing, but because they actually are obvious! Further, we do not observe hindsight bias for unexpected outcomes that are difficult to make sense of. If there are no clear causal antecedents (e.g. A war is

won because a freak tornado kills most of the enemy troops) then we don't show the bias (Wasserman, Lempert, & Hastie, 1991).

How do we know when an outcome makes sense? One possibility is that the ease with which we generate reasons for the outcome cues us. Sanna, Schwarz, and Small (2002) asked participants to generate either 10 or 2 reasons for an outcome. The 10-reasons group had some trouble with this, and only listed about eight, but surely listing eight reasons should produce more hindsight bias than only two, right? In fact, the 10-reasons group actually showed a reverse bias! Apparently, when it's difficult to generate a lot of reasons, we conclude that we really didn't know it would happen (see also Sanna, Schwarz, and Stocker, 2002). Harley et al. (2004) used a different technique to show that ease of thoughts (which they called 'processing fluency') affects hindsight bias. They asked subjects to indicate when they recognized each of a series of celebrity's photographs that became less blurry over time. Later they were asked to recall how blurry the picture was when they first recognized the target's identity. Participants believed they had identified the celebrities sooner (when the pictures were more blurry) than they really did. Presumably this is because it was easier to make sense of the blurry picture once they knew the identity.

Even facial muscle movements can provide clues as to how easy something is to make sense of. Sanna, Schwarz, and Small (2002) asked participants to furrow their brow or not while considering factors leading the actual outcome or an alternative outcome. Participants who furrowed their brow showed less bias!

Future research might examine whether people who receive negative and self-relevant outcomes show less hindsight bias because their troubled facial expressions provide a cue that the outcome doesn't make sense, or because the emotion itself simply inhibits cognitive processing necessary to make sense of it. Indeed, any extremely emotional outcome – whether negative or positive – might produce less hindsight bias, at least initially (Wilson & Gilbert, 2008). I know of no research that has examined this directly (but see Renner, 2003).

Hindsight Bias Isn't Particularly Large

Two meta-analyses have been performed to examine the size of the hindsight bias. Christensen-Szalanski and Willham (1991) analyzed 122 published and unpublished studies and found a relatively small effect size ($r = .24$). Guilbault, Bryant, Brockway, and Prosavac (2004) analyzed 252 studies and found a larger effect size ($r = .36-.42$). This is still considered 'small' to 'medium' (Cohen, 1988). Nevertheless, Christensen-Szalanski and Willham noted that even a small effect could account for a change in a person's decision in up to 27% of cases.

Relatively few studies have used self-relevant outcomes so we don't know much about their contribution. Guilbault et al. (2004) included personal relevance and outcome valence in their meta-analysis, but analyzed these factors separately. Unfortunately, a negative outcome may produce opposite effects depending on whether it is self-relevant or not. Pezzo and Beckstead (2008) asked participants to predict the likelihood of 30 self-relevant outcomes that might occur during Christmas break. Three months later they indicated which events actually happened, and recalled their predictions. The bias was significantly smaller for negative events than for positive. Notably, the effect size for outcome unexpectedness (a cognitive factor) was almost four times larger than for outcome valence in this study.

Hindsight ≠ ‘I knew it all along’

The expression ‘*I knew it all along*’ is often used to characterize the metacognitive state in a hindsight subjects. This is unfortunate, because it suggests to the casual reader a much larger effect than is typically found. Fessel, Epstude, and Roeser (2009) refer somewhat pejoratively to the expression as a ‘catchy phrase’ (p. 58) and ‘attention grabbing jargon’ (p. 62). I agree. Hindsight bias usually only produces a small shift in the direction of the outcome. For example, if someone predicts a likelihood of 20% for an outcome, discovers that this outcome actually occurred, and later recalls his prediction to have been 30%, the person has shown a hindsight bias, but certainly shouldn’t claim that he knew all along that the outcome would occur. Similarly, if I predict an event to have an 80% chance of occurrence, it happens, and then I recall the prediction to be 87% – I am showing a bias – but I can also reasonably claim that I *did* know it all along (Pezzo, 2003). The same can be said for reverse hindsight bias, which is often described as ‘I would *never* have known that’ (Ofir & Mazursky, 1997). Although reverse biases do occur, they aren’t particularly large either. When they do occur, it’s usually because an extremely unexpected event occurred, and so the reaction ‘I *never*’ is actually appropriate even though the shift in probabilities is usually quite small.

Hindsight Bias is Studied in Many Disciplines

An impressive breadth of disciplines has examined the hindsight bias and related phenomenon. Using the admittedly imperfect marker of merely citing Fischhoff (1975), Figure 2 shows that psychology journals only account for 51% of articles published, while business, medical and law journals contribute 39%. Unfortunately, there isn’t very much cross-discipline referencing. The neglect may be caused by the relatively unfamiliar outlets in which such articles appear, e.g. *Managerial Auditing Journal*, *Journal of Political Economy*, *Medical Decision Making*, etc. and also by obscure titles such as ‘a posteriori revision of a priori decision criteria’ (Alicke, Davis, & Pezzo, 1994) or ‘Postdecision consolidation in a trend prediction task’ (Lundberg & Svenson, 2000), that don’t exactly scream hindsight bias. For example, a number of excellent studies in accounting and finance (e.g. Emby,

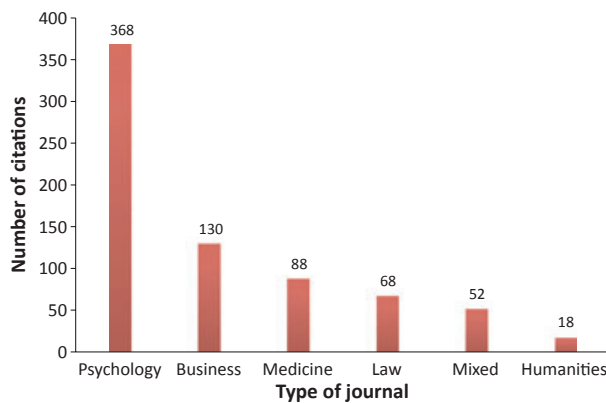


Figure 2 Number of publications citing Fischhoff (1975) as a function of discipline. This figure breaks down all citations from Figure 1 into journal disciplines. Examples of ‘mixed’ journals are *Journal of Applied Psychology* and *Organizational Behavior and Human Decision Processes*. The relative proportion depicted here has maintained over the past 35 years.

Gelardi, & Lowe, 2002; Jennings, Lowe, & Reckers, 1998; Lowe & Reckers, 1994) rarely get cited in mainstream psychology journals (Pezzo & Pezzo, 2006). To be sure, reading these articles takes a bit more work to decipher the unfamiliar terminology, but the questions being asked are essentially the same.

Outcome Bias

Traditional hindsight bias researchers assume that increased probability estimates translate into harsher evaluations of others. *If I knew it all along, then you should have too!* But hindsight researchers rarely examine this directly. Consider for example, the outcome bias (Baron & Hershey, 1988), which is very similar to hindsight bias research both in design and proposed mechanisms. The key difference merely being that in outcome bias research a decision is described, people are given either a negative or positive outcome (or in some cases, no outcome) and then asked to judge the *quality* of the decision, or traits about the decision maker, rather than the likelihood of the outcome. Baron and Hershey sought to avoid confounding hindsight bias in his studies, and so he provided outcome probabilities to his subjects. Relatively few studies have examined the relationship between outcome likelihood estimates and judgments of negligence or decision quality (e.g. Labine & Labine, 1996; Mitchell & Kalb, 1981; Ratner & Herbst, 2005). Interestingly, these studies either found no evidence that probability estimates were driving the evaluations or failed to report whether a relationship existed (but see Carli, 1999).

Regardless, a number of good outcome bias studies exist that could be useful, but are largely ignored by more traditional hindsight researchers (e.g. Buchheit, Pasewark, & Strawser, 2009; Lipshitz, 1989; Mackie & Ahn, 1998; Mackie, Ahn, Asuncion, & Allison, 2001). In addition to factors such as expertise and outcome controllability (Tan & Lipe, 1997), this research provides an interesting look at issues such as defensiveness, incentives, and accuracy motives (Agrawal & Maheswaran, 2005), concerns about other stakeholders (Anderson, Jennings, Lowe, & Reckers, 1997), and the overall seriousness of the evaluation (Clarkson, Emby, & Watt, 2002) – all important motivational factors.

Negative Self-Relevant Events

Consider the following: A TSA agent screens a suitcase at an airport. She notices something a bit strange, but it does not rise to the level of a threat, and she allows the bag to pass. Given her workload, she quickly forgets about it. If the bag turns out to have contained a bomb, will the agent react with hindsight, claiming that she knew it all along? Is it possible to avoid hindsight bias merely because the outcome makes us look bad?

Mark and Mellor (1991) believe so. They found that laid off factory workers thought their layoff was less foreseeable than did either employees who were also laid off but later reinstated, or community members. In a second study, using a simulated stock trading game, Mark et al. (2003) found that students rated their own negative outcomes less foreseeable than did other students competing with them, or neutral observers. In both studies, they argued that denying that the outcome was foreseeable allows the actor to escape culpability for the negative outcome. If you couldn't have known an outcome would occur, then you can't be held responsible for it.

Louie (1999, 2005) also found that students who were given negative feedback about a simulated stock decision showed no bias compared to those who were not given any feedback. Those receiving the negative outcome also made more external attributions (read: excuses) for their performance. In a third study, (Louie, Curren, & Harich, 2000)

MBA students competing in a graded marketing simulation made predictions about a target firm's market share performance, and then a week later, recall those predictions. Consistent with a defensive processing account, students showed hindsight bias for their own team's success, but not the success of another team, and no bias for their own failure, but a significant bias for another team's failure.

In my own research, results have been mixed. My dissertation (Pezzo, 1996) used simulated, but involving and emotional decisions (e.g. whether or not to hire a man who was openly gay, whether or not to advise a teenage girl to have an abortion). In the hiring decision, nobody showed the hindsight bias; not even people whose decisions were supported by the outcome. In the abortion decision, everybody showed hindsight bias, even those whose decisions were contradicted by the outcome. Trying a different approach (Pezzo, 2003, Experiment 2), I found that students with low academic self-esteem showed hindsight bias when they received positive, but not negative, performance feedback on a cognitive abilities test. High self-esteem students, however, showed more hindsight bias for negative than for positive feedback. The most parsimonious conclusion was that motivational factors didn't matter, and that expected outcomes don't produce any bias regardless of valence. Finally, as described earlier, in one of the few studies of self-relevant, real-world outcomes, Pezzo and Beckstead (2008) found a significant, but relatively small reduction in hindsight bias (using recalled likelihood predictions) for negative events.

Retroactive Pessimism

Although denying the foreseeability of a negative self-relevant outcome might reduce one's sense of culpability, Tykocinski (2001) suggests that believing a negative outcome was 'inevitable' may sometimes be more *comforting*: "An inescapable failure might be easier to digest than a failure that could have been easily avoided" (p. 381). In one study, Tykocinski found that after an election, everyone rated the likelihood of success for the winning candidate higher. No surprise there. But, those people who were disappointed with the results of an election actually changed their assessment more. A second study showed that fans of a losing soccer team exhibited more hindsight bias than did fans of the winning team (Tykocinski, Pick, & Kedmi, 2002, Experiment 1). Further, the bias was strongest for losing fans who were most disappointed with the outcome. In two additional studies, participants who imagined missing an opportunity to apply for a college stipend showed more hindsight bias when the stipend was large than when it was small (Tykocinski et al., 2002, Experiments 2 and 3). It is important to note that in none of Tykocinski's research, does she provide instructions to ignore the outcome. Thus, comparing her research to those studies in which people were given such instructions may be misleading (but see Fischhoff et al., 2005). In any case, her observation that 'inevitable' events are less upsetting is certainly consistent with Wilson and Gilbert's (2008) notion that making sense of an outcome (which will increase its perceived probability) reduces its perceived sting (See also Burrus & Roese, 2006, and Sweeny & Shepperd, 2007 for related research on 'fate' and 'bracing' respectively).

Hindsight Components Approach

At first blush, retroactive pessimism might seem mutually exclusive with denying the foreseeability of an outcome. But, as Blank, Nestler, von Collani, and Fischer (2008)

cleverly observe “in some regions of the world earthquakes are rather inevitable [...] but, unfortunately, unforeseeable” (p. 1412). That is, inevitability and foreseeability are independent concepts. Blank and his colleagues (Blank & Nestler, 2006; Blank & Peters, 2010; Nestler, Blank, & Egloff, 2010) suggest hindsight bias can be measured via one of three different and independent ‘components’: inevitability, foreseeability, and memory distortions. For example, Blank and Peters (2010) replicated the typical self-blame avoidance findings (Louie, 1999; Mark & Mellor, 1991) using a foreseeability measure, but replicated the retroactive pessimism findings of Tykocinski (2001; Tykocinski et al., 2002) when they used an inevitability measure. The concept of hindsight components is appealing, but the method in which Blank and his colleagues measure them is sometimes confusing – at least to me. For example, many of their studies measure outcome foreseeability in the foresight condition. This is quite different than the approach used by previous researchers (e.g., Labine & Labine, 1996; Mark & Mellor, 1991; Mark et al., 2003). As with judgments of blame, responsibility, and negligence, it seems more natural (albeit ironic) to ask about the foreseeability of an outcome after it has actually occurred (e.g. Menec & Weiner, 2006). In their defense, Blank and his colleagues sometimes include disclaimers such as “This sounds awkward in English, but works in the original German” (Nestler et al., 2010, p. 1405).

I’ll learn from my mistake, but it wasn’t my fault either!

Consistent with the components approach, some studies, using outcome bias measures, have shown that if you ask the right questions, you can find both evidence of defensive processing and acceptance of one’s mistakes.

Jones, Yurak, and Frisch (1997) asked participants to choose between two scholarship applicants and then provided information indicating that their choice was good or bad, or provided no outcome. Seemingly contrary to the defensive processing hypothesis, participants rated the quality of their decision-making process lower (see Pezzo, 1996, Study 1, for similar results). However, participants also indicated that the decision was more difficult and that they were less confident in the decision that they made at the time.

Ratner and Herbst (2005) found that the regret felt after receiving a negative outcome can cause a person to switch to a less optimal choice for future decisions even when reminded that the choice is less optimal. Said one of their subjects “This wouldn’t make sense to do statistically, but I would probably allow my emotions toward B [to] affect my decision in leaning toward Broker A” (p. 32). Interestingly, participants high in the need for cognition were significantly less affected by regret, and stayed with their initial (more optimal) choice.

Bradfield and Wells (2005) showed a video clip of a couple interacting. Participants were told that, shortly after the video was made, one of the two people committed suicide (or had an affair). The task was simply to decide which person that was. Participants were then given confirming or disconfirming feedback. Those randomly assigned to receive disconfirming feedback reported that they were less certain of their choice, had less basis for their decision, found the decision more difficult, and took longer to decide. However, they also rated the quality of their decision and their ability to read non-verbal cues to be lower than did those who received confirming feedback.

Finally, Lundberg and Svenson (2000) reported that advanced graduate students who were randomly told that their financial trend predictions were incorrect, recalled having given lower diagnostic ratings to the cues they were provided, essentially claiming that

they had less basis for their decision. By the same token, all participants revised their evaluations of indicators to be more consistent with the outcome.

These studies indicate that we can make sense of a threatening outcome, but when given the opportunity, deny responsibility for it (Pezzo & Pezzo, 2007). As Markman and Tetlock (2000) note, excuses that remind people of the lack of diagnostic information during decision making can help to debias observers so that they are less likely to judge us more harshly due to their own hindsight bias.

Motivation Sense-Making Model

To attempt to synthesize the many motivational aspects affecting the hindsight bias, Pezzo and Pezzo (2007) offered a model of *motivated sensemaking*. Their key assumption was that unexpected negative and self-relevant outcomes only trigger a search for causes that do not implicate the self. If external causes are found, hindsight bias results (retroactive pessimism), and if they aren't, then hindsight bias is reduced or removed (defensive processing). Acceptance of responsibility (an internal cause) can also lead to hindsight bias. Finally, it's always possible that a person simply denies the foreseeability of an outcome (read: lies) due to impression management concerns, while inwardly believing that the outcome was predictable.

Does Hindsight Bias = I *should* have known?

Hindsight researchers almost always request that their subjects provide numerical responses. Rarely do they ask participants to give verbal responses that they are likely to generate spontaneously. Indeed, when faced with disappointing or upsetting outcomes individuals prefer verbal to numerical predictions. One reason for this is that verbal assessments (e.g. the outcome was 'somewhat possible') are more vague and easier to reinterpret later, and also perceived as more justifiable than numerical assessments (Piercy, 2009). One particular verbal response that has been almost completely overlooked in the hindsight bias literature is 'I *should* have known'. With the exception of a scale measuring trauma-related guilt (Kubany & Manke, 1995), I know of no research that has studied this response, or even acknowledged it as unique. We should though, because in some data that a colleague and I collected (Schlett & Pezzo, 2008, Unpublished manuscript) it was the most common response people gave when asked to 'recall a past decision that turned out badly'. In this study, participants were asked to describe what happened, when it happened, and then 'choose one statement that best represents how you currently feel'. The statements and number of people who chose each one is listed in Table 1. As you can see, almost twice as many people chose 'I should have known' as any other statement. Is this an instance of the hindsight bias? Yes and no. Additional data showed that the people who said they should have known were also more likely to admit responsibility for their decision (which hopefully means that they've learned from their mistake, Pezzo & Pezzo, 2007). But as Table 1 also shows, they were somewhat surprised by what happened, and logically, to claim that one *should* have known implies that, at the time, they *didn't* know. Clearly verbal responses are more challenging to study. However, I predict that they will become more popular in the field, as they are measuring what a lot of researchers have really been interested in all along. The interested reader should also examine the literature on counterfactual thinking and regret in decision making (e.g., Connolly & Zeelenberg, 2002; Kruger, Wirtz, & Miller, 2005).

Table 1 Mean Reported Surprise as a Function of Statement Chosen to Describe Feelings about 'A Decision That Turned Out Badly'

Measure	<i>N</i>	<i>M</i>	<i>SD</i>
I should have known this would happen	40	4.13 ^a	1.94
I did not know this would happen	22	4.77 ^a	2.45
I could not have known this would happen	13	5.99 ^b	1.44
I did know this would happen	10	2.9 ^c	2.13

Note: Means with different superscripts are significantly different, $p < .05$.

Individual and Cultural Differences

Relatively few studies have examined individual differences in hindsight bias and even fewer have explicitly examined those that relate to motivational processes (see Musch & Wagner, 2007 for a review). Musch (2003) reported no significant effect of either public or private self-control, or of desirability of control. Tykocinski (2001) found that retro-active pessimism only occurred for those scoring high on desire for control. A few studies (Campbell & Tesser, 1983; Musch, 2003) reported that hindsight bias was greater for those scoring higher on a self-presentation scale, but other studies examining self-presentation concerns have found no effect (e.g. Leary, 1981). Using an outcome bias approach, Agrawal and Maheswaran (2005) reported that the high self-monitors, i.e., more likely to engage in impression management, were more affected by outcome information (product test results) than were low self-monitors when asked to evaluate that product.

Some researchers have begun to examine cultural differences in the hindsight bias, with interesting results. Choi and Nisbett (2000) reported that Korean participants responded with more hindsight bias (and less surprise) than did American participants to a range of outcomes. Because East Asians tend to have more 'complex models of behavior' (p. 891) they are more accepting of apparent contradictions when they occur and are thus better able to explain them. Westerners tend to think more analytically and thus find it (relatively) more difficult to explain outcomes that contradict their expectations. However, two additional studies (Heine & Lehman, 1996; Pohl, Bender, & Lachmann, 2002) found little or no evidence for Asian/Western differences in hindsight bias.

Hindsight Bias and Learning

Finally, consider this. Virtually every published paper on the hindsight bias claims – or at least implies – that hindsight bias impairs learning. The logic is that if the past doesn't surprise us, we will repeat our mistakes (Fischhoff, 1975). Perhaps, but unless an outcome is caused purely by chance (e.g., Wasserman et al., 1991) it seems reasonable to believe there is something to be learned from its occurrence (see also Hershey & Baron, 1992). To the extent that most outcomes are related to their antecedents in meaningful ways, wouldn't the same sensemaking that produces hindsight bias also help us to become better prepared for the future (Hoffrage, Hertwig, & Gigerenzer, 2000)? Pezzo and Pezzo (2007) thought so, and reviewed the empirical literature on learning and hindsight bias. It didn't take long, as very few studies have actually examined the relationship. Hoch and Loewenstein (1989) was one of the rare exceptions, and they argued that the presence of hindsight bias is a sign that learning *is* taking place. Support also comes from

developmental researchers who tend to find stronger hindsight effects for children (e.g., Bernstein, Atance, Meltzoff, & Loftus, 2007; Bernstein et al., 2011). Children are very good at learning, but this may come at the cost of greater hindsight bias (however, see Pohl, Bayen, & Martin, 2010). At present, the relationship between learning and hindsight remains an empirical question, the answer to which will likely depend on the way in which hindsight bias is measured.

Conclusion

In this paper, I attempted to summarize many (though certainly not all) of the key findings from large literature on hindsight bias. My primary focus was motivational mechanisms that have been hypothesized to reduce the bias. Although hindsight bias is studied across a variety of academic domains (e.g., psychology, business, medicine, and law) it does suffer a bit from insularity. Ironically, the field is so large that it is relatively easy to cite only papers directly examining hindsight bias, neglecting the many related fields that could inform our research. For this reason, I introduced a number of studies from areas not traditionally considered to fall under the hindsight bias umbrella. I hope that this will inspire researchers to pursue creative ways to study this important phenomenon.

Short Biography

Mark Pezzo is a social judgment researcher who examines how we make sense of unexpected events in our lives. He has authored or co-authored papers in the *Psychological Science*, *Organizational Behavior & Human Decision Processes*, *Journal of Experimental Social Psychology*, *Social Cognition*, *Applied Cognitive Psychology*, *Memory*, *Personality and Individual Differences*, *Basic and Applied Social Psychology*, *Medical Decision Making*, *Encyclopedia of Human Behavior*, and the *Encyclopedia of Social Psychology*. His current research examines the relationship between the hindsight bias, planning fallacy, and sensemaking. He has also published research on the transmission of rumors and gossip, and on human curiosity. He is Associate Professor of Psychology at the University of South Florida St. Petersburg, and also holds the position of Associate Dean in the College of Arts & Sciences there. Before coming to USFSP he held a visiting position at Wake Forest University. He holds a B.S. in Special Studies (Psychoacoustics) from S.U.N.Y. Fredonia, and an M.S. and Ph.D. in Experimental Social Psychology from Ohio University, Athens.

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