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HINDSIGHT BIAS: ON BEING WISE AFTER THE EVENT

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Since Baruch Fischhoff's (1975) groundbreaking paper opened up a whole new research field, more than 150 journal articles and book chapters, two meta–analyses (Christensen–Szalanski & Willham, 1991; Guilbault, Bryant, Brockway & Posavac, 2004), and one special issue (*Memory*, 2003, edited by Ulrich Hoffrage & Rüdiger Pohl) have addressed hindsight phenomena. The current editorial aims to provide a rough roadmap to the hindsight bias research landscape. It highlights some important landmarks and developments of the last 30 years and puts the 13 articles of the present special issue into a historical and systematic perspective.

This special issue of *Social Cognition* on the hindsight bias is organized around four main questions that might reasonably be addressed at any interesting psychological phenomenon: What is it? Why is it important? Does it apply to everybody? How can it be explained? In our introduction, we focus on each of these questions in turn. We try to sketch the major lines of relevant hindsight research in order to provide some historical and systematic background for the contributions to this special issue and to provide readers who are unfamiliar with the topic with some preliminary orientation. The

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special issue presents short, opinionated overview articles addressing one or several of the main questions stated above, and might be taken to collectively reflect the current state of research on hindsight bias. However, as no single article, not even a collection of 13, can accommodate all developments, we occasionally mention interesting additional work or point to issues that might be more thoroughly investigated in future hindsight research.

WHAT IS THE HINDSIGHT BIAS?

The term *hindsight bias* describes the observation that people are often wise only after the event (Pennington, 1981). In the broadest sense, it refers to a biased representation of events or facts once they are viewed in hindsight, with knowledge about the outcome. Beyond this very general notion, different researchers have characterized hindsight bias in more specific ways (see Blank, von Collani, Fischer, & Nestler, 2006 for an overview). Probably the most influential characterization was the one reflected in Fischhoff's (1975) classic demonstration of hindsight bias for event outcomes (see Fischhoff, this issue for a fascinating description of the personal and historical background of this early research). Using historical, political, and clinical diagnosis case scenarios, he established initially (Exp. 1) that people judge event outcomes as more probable from a hindsight perspective if they are presented as the factual outcomes, as compared to judging the same outcomes as possibilities in foresight without actual outcome knowledge. Two further experiments showed that exaggerated hindsight probabilities persisted (a) when the participants were instructed to ignore the factual outcome and make their judgments as they would have done in foresight (Exp. 2) and (b) when they were asked to put themselves in the shoes of others who did not possess outcome knowledge (Exp. 3). Taken together, Fischhoff (1975) characterized these findings as demonstrating *creeping determinism*—that is, a tendency to view event outcomes in hindsight as more inevitable or foreseeable than they appeared in foresight (see Blank et al., 2006 for a finer distinction between inevitability and foreseeability). At the same time, people's apparent unawareness of these judgmental changes provided a justification for the term hindsight *bias* (see Kelman, Fallas, & Folger, 1998, and Pohl, 2004a, for a more detailed analysis of the bias issue).

Another core manifestation of hindsight bias was first demonstrated by Fischhoff and Beyth (1975) when they compared people's foresight predictions of possible outcomes of President Nixon's 1972 visit to China and the Soviet Union to their recollections of these predictions in hindsight. People exhibited *memory distortions*—that is, they thought they had made predictions that were closer to the actual outcomes than they in fact had been. A further study by Fischhoff (1977) showed similar memory distortions for newly acquired factual knowledge. After having learned, for example, that the story of Aladdin originated in Persia (as opposed to China), participants

remembered having been more confident about this correct answer than they had been when asked to choose between the two alternatives. Later studies established that the effect also occurs for memories of numerical estimates. For example, after having learned that the Eiffel Tower is 300 meters high, participants remembered their original estimates as being closer to this solution than they in fact had been (e.g., Hell, Gigerenzer, Gauggel, Mall, & Müller, 1988).

These two manifestations of hindsight bias, distorted event probabilities and distorted memory for judgments of factual knowledge, have dominated the hindsight literature ever since. This is also reflected in the articles of this special issue, which mostly focus on one or the other of these "Big Two." Moreover, they are naturally related to different explanatory approaches to hindsight phenomena (see below) and also to different ways of assessing hindsight bias. The latter is specified in much more detail in the central methodological contribution by Pohl (2007–this issue), who discusses the pros and cons of different methods of eliciting, defining, and measuring hindsight bias.

In recent years, additional variants of hindsight bias have been discovered that go beyond the Big Two featured above. One of these has been found with visual material (Bernstein, Atance, Loftus, & Meltzoff, 2004; Harley, Carlsen, & Loftus, 2004) and manifests itself in biased retrospective estimates of the point in time at which an initially blurred image of an object or person became clearly visible and its content could be recognized. In a nutshell, participants thought, once they knew what the object or who the person was, that they had been able to see it much earlier than they, or others, in fact did (the procedure is described in more detail by Birch and Bernstein, 2007 this issue). Hom and Ciaramitaro (2001) observed a similar misrepresentation of the point in time at which a solution became obvious for anagram and insight problems (see also Bryant & Guilbault, 2002 for reflections on the temporal dynamics of hindsight bias). Further, Pieters, Baumgartner, and Bagozzi (2006) found an interesting extension of hindsight memory distortions to action intentions. It might be an interesting task for the future to see how these new variants of hindsight bias can be related to its classic manifestations.

WHY IS HINDSIGHT BIAS IMPORTANT?

Hindsight bias is important (1) because it is ubiquitous, (2) because it is hard to avoid, and (3) because it has potentially detrimental consequences in applied settings. (1) Hindsight bias has been demonstrated in a variety of quite different domains, ranging from almanac questions to historical and political settings, medical diagnoses, and economic, judicial, and everyday decision making (see Harley, 2007, this issue, and Louie, Rajan, & Sibley, 2007, this issue). (2) From early on, attempts at reducing the bias using warnings have met with only limited success (e.g., Pohl & Hell, 1996; Wood, 1978), or

have been restricted to relatively artificial trivia questions settings (Hasher, Attig, & Alba, 1981). Later debiasing attempts using counterfactual reasoning instructions and other methods have sometimes been more successful (see Harley's, 2007, this issue, detailed review of debiasing techniques in judicial settings), but typically one has to go to great lengths to get a sizable reduction of the bias. (3) Hindsight bias has been considered potentially dangerous in two respects: (a) It affects our perceptions of other people's responsibility for the outcomes of their decisions because the bias makes these consequences appear more foreseeable than they probably were. This may have serious implications when it comes to negative outcomes that are put to trial in court. Consequently, some of the earliest investigations of hindsight bias have concentrated on legal settings (Arkes, Wortmann, Saville, & Harkness, 1981; Casper, Benedict, & Perry, 1989; see Harley's paper). Hindsight bias is also an important phenomenon in other decision-making settings including the financial sector, in which it seems to be moderated by the favorability of the outcome and self–serving strategies (Hölzl & Kirchler, 2005; Louie, 1999; Louie et al., 2007, this issue). (b) A more general practical consequence of the hindsight bias that has been discussed in the literature is that it may limit our ability to learn from experience. If we think that we knew it all along, we may not find anything wrong with our foregoing analyses and decisions. Why should we change our ways of thinking then, even in contexts where it would be appropriate and adaptive to do so? On the other hand, some scholars (e.g., Hawkins & Hastie, 1990; Hoffrage, Hertwig & Gigerenzer, 2000) have argued that adaptation does occur and that hindsight bias should actually be seen as a natural byproduct of adaptive learning. While the relation between learning from experience and hindsight bias is certainly important and interesting, there is surprisingly little research directly pertaining to it. Consequently, this might constitute a promising field for future research.

DOES HINDSIGHT BIAS APPLY TO EVERYBODY?

There are two ways to pose this question: (1) Are there individual differences in hindsight bias? and (2) Is the hindsight bias equally prevalent across the life span? Both questions are underresearched, compared to the dominant tradition of investigating hindsight bias in light of the general laws of information processing and storage (see below). (1) Campbell and Tesser (1983) were the first to argue and demonstrate that hindsight bias may be influenced by individual traits, needs, and motives, and that these factors should be taken into account as an important supplement to cognitive accounts of the phenomenon. Their and subsequent work on individual differences—including, for instance, intelligence, suggestibility, a need for predictability, self–presentational concerns, and expertise—is discussed and evaluated by Musch and Wagner (2007, this issue), along with methodological problems complicating the investigation of individual differences

in hindsight bias. The latter include the problem of statistical power and the sometimes low reliability of hindsight indices (cf. Pohl, 1999). (2) Bayen, Pohl, Erdfelder, and Auer (2007, this issue) review the few existing studies of hindsight bias in children and older adults, focusing on age–related differences in memory processing (e.g., inhibition deficits) and also featuring the use of multinomial modeling to investigate differences in cognitive processing. Another developmental line of inquiry is presented in Birch and Bernstein's (2007, this issue) aforementioned contribution, which links hindsight bias to other cognitive biases in children that have been discussed in the context of the *theory of mind* literature.

HOW CAN HINDSIGHT BIAS BE EXPLAINED?

At present, there is no single theory that can explain all manifestations of and influences on hindsight bias that have been studied to date in the lab or in the field. A likely reason for this is that multiple processes are involved in producing the effect (Erdfelder & Buchner, 1998; Hawkins & Hastie, 1990; Pohl, Eisenhauer, & Hardt, 2003; Stahlberg & Maass, 1998). Hence, different studies may have investigated different aspects, or even variants, of hindsight bias, complicating comparisons and precluding generalizations (Blank, Fischer, & Erdfelder, 2003; Blank & Nestler, 2006).

It is, at least, possible to classify explanations of hindsight bias along two dimensions; (1) Cognitive versus social–motivational: Originating from the heuristics and biases tradition (see Fischhoff, 2007, this issue), hindsight bias first came to be seen as a cognitive illusion (Pohl, 2004b). Subsequent theorizing in this tradition has considerably refined our understanding of the underlying cognitive processes (see below). Social–motivational explanations were introduced only later and as supplementary accounts of hindsight bias, not questioning the importance or even primacy of the cognitive approach. While earlier studies highlighted self–presentational and controllability concerns (e.g., Campbell & Tesser, 1983), there has been, in recent years, a proliferation of research and theorizing on self–defensive processing in self–relevant hindsight settings (e.g., Louie, 1999; Mark, Boburka, Eyssell, Cohen, & Mellor, 2003; Tykocinski, 2001). This latter research is reviewed in Pezzo and Pezzo's (2007, this issue) contribution and linked to cognitive processes in an integrative model of sense–making. (We would like to remark here that, because of the importance of both cognitive and social–motivational processes in explaining hindsight bias, there is no better place to publish this special issue than *Social Cognition*.)

(2) Basic/automatic/memory processes versus complex/controlled/judgment processes: Roughly following the "Big Two" phenomenological distinction made earlier, we may also distinguish between hindsight bias explanations that focus on memory processes involved in distorted recollections of pre–outcome judgments and explanations targeted at distorted judgments of event outcome probabilities. The former invoke basic and more

automatic memory processes, whereas the latter feature a whole array of more elaborate causal attribution, sense–making, and metacognitive processes. Because several contributions to the special issue feature one or the other type of process, we will introduce them in more detail.

On the memory distortion side, two kinds of interrelated basic cognitive processes seem to be involved, (1) *memory impairment* for and (2) *biased reconstruction* of pre–outcome judgments. (1) The first notion is embodied in Fischhoff's (1975) *immediate assimilation* hypothesis and is also implemented in two computational models of hindsight bias, SARA (Selective Activation and Reconstructive Anchoring; Pohl et al., 2003) and RAFT (Reconstruction After Feedback with Take the best; Hoffrage et al., 2000; see Blank and Nestler, 2007, this issue, for details; these authors also explore the relationship of these two memory–oriented process models to the other main class of hindsight models, causal event models; see below). (2) Reconstructive processes have been thoroughly discussed by Hawkins and Hastie (1990; see also Schwarz & Stahlberg, 2003). In this special issue, Erdfelder, Brandt, and Bröder (2007, this issue) introduce a multinomial model (Erdfelder & Buchner, 1998) that covers both memory impairment and biased reconstruction processes and apply it in four experiments to further elucidate different forms of memory impairment (called *recollection biases* in their article), exploring links to the classic literature on retroactive inhibition.

Different types of explanations, involving additional processes, have been proposed to explain distorted hindsight probability judgments for event outcomes. Emerging from a broad notion of biased reconstruction (Hawkins & Hastie, 1990), this line of reasoning has evolved into a type of causal event model that focuses on sense–making and causal reasoning processes (e.g., Pezzo, 2003) and which is flexible enough to include social–motivational (see Pezzo & Pezzo, 2007, this issue) as well as metacognitive processes. The first example of metacognitive influence that came to the attention of researchers was the impact of *surprise* on hindsight bias (Mazursky & Ofir, 1990), which turned out to be quite complex. The contribution of Müller and Stahlberg (2007, this issue) reviews heterogeneous effects of surprise on the magnitude of hindsight bias and combines them into an integrative theoretical model. They successfully test their model in three experiments, using a new methodology to separate different effects of surprise empirically. Another type of metacognitive influence is related to the experienced fluency or ease/difficulty in generating or processing hindsight–related cognitions. Interestingly, such effects (e.g., due to the experienced difficulty of thinking about possible reasons for a given outcome) can be quite independent from the effects of the content itself (e.g., the quality of the generated reasons). Sanna and Schwarz (2007, this issue) review and theoretically integrate this most recent body of research. Metacognitive processes are also partly discussed in Pezzo and Pezzo (2007, this issue), Birch and Bernstein (2007, this issue), and in Mazzoni and Vannucci's (2007, this issue) contribution.

The main focus of Mazzoni and Vannucci's paper, however, is to system-

atically compare research paradigms and theorizing in the hindsight domain to two other areas that focus on the malleability of memories and beliefs, namely, the eyewitness misinformation effect and implanted autobiographical beliefs, concluding that the three paradigms have much more in common than has previously been acknowledged (e.g., a common emphasis on reconstruction processes). We believe that such a theoretical dialogue can be very fruitful, between paradigms and also within the hindsight domain itself. Indeed, a core idea in planning this special issue was to systematically cover as many important perspectives on hindsight bias as possible in order to facilitate the perception of theoretical links but also links between cognitive, social–psychological, individual difference, developmental, and applied perspectives. Taken together, the present special issue provides a thorough and scholarly review of the current state of research into an intriguing phenomenon, which may serve as an introductory text for readers not yet familiar with the topic, but also as a reference to the latest research on all aspects of hindsight bias.

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