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Ex Post \neq Ex Ante

Determining Liability in Hindsight*

Kim A. Kamin[†] and Jeffrey J. Rachlinski[‡]

Participants in three conditions (foresight, hindsight, and a modified hindsight condition designed to ameliorate the hindsight effect) assessed whether a municipality should take, or have taken, precautions to protect a riparian property owner from flood damage. In the foresight condition, participants reviewed evidence in the context of an administrative hearing. Hindsight participants reviewed parallel materials in the context of a trial. Three quarters of the participants in foresight concluded that a flood was too unlikely to justify further precautions—a decision that a majority of the participants in hindsight found to be negligent. Participants in hindsight also gave higher estimates for the probability of the disaster occurring. The debiasing procedure failed to produce any significant differences from the regular hindsight condition. The results suggest that absent an effective debiasing technique, risk assessments made in foresight will be judged harshly in hindsight.

Life involves risk and danger. The potential for accidental harm looms in every environment and situation. When careless conduct causes an accident, injuring people or damaging property, the American tort system obliges a party who has negligently caused damage to pay for it. The tort system recognizes that not every accident is the product of negligence. To obtain compensation, a plaintiff suing for negligence must prove four things: (1) The defendant owed a duty of care to the plaintiff; (2) the duty was breached; (3) the breach caused (4) damage to the plaintiff (American Law Institute [ALI], 1965, p. 4). Negligence law requires that

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judgment of the second element, whether the defendant's conduct breached a duty of care, be based on the defendant's knowledge *before* the plaintiff's injury (ALI, 1965, p. 68). Yet, the legal system necessarily judges a defendant's conduct *after* the harm has occurred. Research on human judgment suggests that people cannot ignore a known outcome when assessing an event's likelihood—a phenomenon known as “the hindsight bias” (Fischhoff, 1975). In this article, we address the possibility that the hindsight bias may make precautions that seem reasonable in foresight look inadequate in hindsight.

In most negligence suits, defendants are liable only for consequences arising from their failure to exercise “reasonable care” in avoiding injury to the plaintiff. Legal scholars have described reasonable care in terms of a cost–benefit analysis (ALI, 1965, pp. 54–57). As articulated by Judge Learned Hand, “if the probability [of an injury] be called P; the injury, L; and the burden [of precautions] B; liability depends upon whether B is less than L multiplied by P” (*United States v. Carroll Towing Co.*, 1947, p. 173). In effect, if an accident's cost multiplied by the probability of its occurrence outweighs the cost of untaken precautions, a defendant may be found liable for breaching the duty of reasonable care (Grady, 1989). Judge Hand's formula has attracted widespread support and is “the negligence standard most often cited in legal discussions of the problem” (Brown, 1973, p. 194). In fact, it remains the fundamental description of reasonable care in tort law treatises (Keeton, 1984, p. 173), and is embodied in jury instructions (Devitt, Blackmar, & Wolf, 1987, P. 138). It has even been applied to the causation element of negligence (Grady, 1983; Landes & Posner, 1983).

In the application of the Hand formula to a defendant's conduct, a judge or jury must assess the costs and benefits of precautions based upon what the defendant should have known when making the judgment, regardless of what has been learned after the fact (ALI, 1965, p. 68). This requires making a post hoc evaluation of “what particular precautions the defendant could have taken, but did not” (Grady, 1989, p. 140). To correctly apply Hand's formula and determine liability, legal decision makers must make *ex post* (after the fact) judgments of the *ex ante* (before the fact) probabilities. In effect, a proper adjudication of reasonable care requires a judge or jury to disregard the obvious fact that the precautions failed to prevent an accident (Devitt et al., 1987, p. 138).

The Hindsight Bias

Ignoring a known outcome while recreating a decision is a difficult cognitive task. In making such judgments, people overestimate both the probability of the known outcome and the ability of decision makers to foresee the outcome (Fischhoff, 1975). When trying to reconstruct what a foresightful state of mind would have perceived, people remain anchored in the hindsightful perspective. This leaves the reported outcome looking much more likely than it would look to the reasonable person without the benefit of hindsight (Fischhoff, 1982a, p. 343).

Research on the hindsight bias has demonstrated the effect in a diverse range of subject populations across varied laboratory and applied settings. Detmer, Fryback, and Gassner (1978) reported a hindsight bias in surgeons appraising sur-

gical cases. Arkes, Wortmann, Saville, and Harkness (1981) found it among physicians assessing a medical diagnosis. Pennington, Rutter, McKenna, and Morely (1980) found it in women reacting to the results of a pregnancy test. The bias has also been found in voters' election predictions (Leary, 1982), in nurses' employee evaluations (Mitchell & Kalb, 1982), and may contribute to the phenomenon of blaming a rape victim for her misfortune (Carli & Leonard, 1989). These studies suggest the robustness of the bias across a variety of subjects, situations, and tasks.

The Hindsight Bias and Legal Decision Making

The hindsight bias' potential relevance to law has not escaped the notice of legal and psychological scholars. In discussing a demonstration of the hindsight bias in medical diagnosis, Arkes (1989) claimed that the bias could affect liability judgments in misdiagnosis cases. Since a failure to diagnose a disorder will look much more culpable after discovering the true nature of an illness, doctors may be subject to liability even for reasonable diagnostic procedures that turn out badly. Wexler and Schopp (1989) expressed similar concerns about doctors sued for "negligently" releasing psychiatric patients who later commit violent acts.

Researchers have conducted several empirical demonstrations of the hindsight bias in legal settings. In a study by Bodenhausen (1990), undergraduates read case summaries containing the results of jury deliberations. The study revealed that the jury's conclusion heavily influenced subject evaluations of the defendant's culpability. Casper, Benedict, and Perry (1989) had students and adults called for jury service assess opening and closing arguments in a hypothetical suit against police officers who allegedly had conducted illegal searches. Although the legality of a search does not depend on its outcome, both types of participants were more sympathetic to the plaintiff when the search uncovered nothing than when it uncovered damning evidence against him. Kagehiro, Taylor, Laufer, and Harland (1991) extended Casper's findings, concentrating on the hindsight bias' influence on judicial review of third-party consent to warrantless searches. In their study, undergraduates read vignettes describing a warrantless police search and then responded to a questionnaire. Results indicated that search outcome heavily influenced judgments of the search's legality.

Because decision making in a legal context differs from nonlegal demonstrations of hindsight, in both complexity and the influence that previously held attitudes have on its outcome (e.g., Thompson, Cowan, Ellsworth, & Harrington, 1984), one might suppose it to be immune from the bias' influence. These studies suggest otherwise. As these studies show, neither the attitudinal variables nor the complexity of legal decisions appears to mitigate the bias' effect.

Tort law itself lacks a generic empirical demonstration of the hindsight bias. Although Wexler and Schopp (1989) provide a fairly detailed discussion of the effects the bias might have on psychiatric malpractice cases, they collected no data. Furthermore, Wexler and Schopp (1989) limit their discussion to psychiatric malpractice. In recognition of the generality of the effect, however, they include a comment by professor Robert Rabin that "negligent release cases appear simply

to be a variant on the general structure of accident law'' (Wexler & Schopp, 1989, p. 489). As this comment indicates, the hindsight bias problem probably extends beyond psychiatric malpractice. Indeed, Saks (1986) has suggested that foreseeability issues in tort law could occupy a lifetime of research.

Debiasing Techniques

Demonstration of pervasive bias in a significant area of law begs the question of a remedy. Unfortunately, the hindsight bias has proven resistant to most debiasing techniques (Fischhoff, 1982b). Attempts to undo the hindsight effect with strategies that rely on motivation, such as suggesting to people that they try harder (Davies, 1987; Fischhoff, 1977), increasing personal relevance of the task (Connolly & Bukszar, 1990), and rewarding people for unbiased responses (Hell, Gigerenzer, Gauggel, Mall, & Muller, 1988), have proven ineffective. Furthermore, alerting people to the bias' influence does not mitigate the effect (Fischhoff, 1977; Kurtz & Garfield, 1978; Wood, 1978). Some researchers have obtained limited debiasing by significantly restructuring the decision-making task (Fischhoff, Slovic, & Lichtenstein, 1978), or by having participants consider alternative outcomes (Arkes, Faust, Guilmette, & Hart, 1988; Einhorn & Hogarth, 1986). Although these cognitive strategies have reduced the influence of the bias, no known technique completely eliminates the effect.

Wexler and Schopp (1989) considered debiasing strategies suitable for the courtroom. They suggested bifurcating trials to avoid prejudice from knowing outcomes while judging negligence. Bifurcation of trials, in fact, may decrease the liability juries attribute to defendants (Horowitz & Bordens, 1990; Zeisel & Callahan, 1967). However, as Wexler and Schopp admit, bifurcation is an imperfect solution. It is unlikely that the jury determining negligence could be kept completely ignorant of the fact that an accident has occurred. Furthermore, although bifurcation of liability and damage issues is common, bifurcation to avoid outcome knowledge is unprecedented. Wexler and Schopp's proposal may be the only method for completely eradicating the bias, but it presents enormous practical difficulties.

A less intrusive courtroom technique would be to incorporate the successful cognitive debiasing techniques into jury instructions. As Wexler and Schopp (1989) explain, these instructions must do more than merely admonish jurors to disregard outcome information. Rather, they should employ successful debiasing techniques, such as imagining alternative outcomes. If written in plain language, reviewed before revealing the evidence, and then repeated at the end of the trial, these instructions might impact the decision-making process. Alternatively, expert testimony could serve the same function, much as it does in cases involving eyewitness identification (Loftus, 1993). In addition, the defense attorney could make efforts to restructure the case to avoid the bias, or induce other decision making heuristics favorable to a defendant such as counterfactual reasoning—the mental “undoing” of an adverse event (e.g., Miller & McFarland, 1986; Wells, Taylor, & Turtle, 1986).

The Present Experiment

The present experiment tested the influence of the hindsight bias in a negligence suit and the effectiveness of jury instructions as a debiasing method. The study compared participants' evaluations in an administrative hearing (choosing precautions for a potential accident) to those in a mock trial (in which an accident had already occurred). A second hindsight-trial condition was identical to the first except for the addition of debiasing instructions designed to reduce probability estimates and findings of liability.

The stimuli in the present experiment depicted a situation similar to that of a famous tort case, *Petition of Kinsman Transit Co.* (1964). In the foresight condition, participants learned that a city had constructed a drawbridge and needed to determine whether the risk of a flood warranted maintaining a bridge operator during the winter when the bridge was not in use. Hiring the operator would serve as a precaution. The operator would monitor weather conditions and raise the bridge if the river threatened to flood. The foresight condition asked participants without outcome knowledge to decide whether a flood was sufficiently probable for the city to appropriate funds for the operator.

The hindsight manipulations contained the same background facts. The story continued, however, stating that the city had decided not to hire the operator. During the first winter of the bridge's existence, debris lodged under it. This resulted in a flood that could have been prevented had an operator been hired. The flood damaged a neighboring bakery, whose owner then sued the city. Participants in the hindsight condition were instructed to hold the city liable if the flood was sufficiently probable that the city should have hired the operator to prevent it. The second hindsight condition added a debiasing manipulation in which the judge instructed participants to recognize the influential effects of hindsight and to consider alternative outcomes as had the city in foresight. All three conditions required participants to base their decisions on a critical percentage derived from the application of Judge Hand's reasonable care formulation.

The stimuli consisted of an audio-tape with an accompanying slide-show. Each subject heard one of the three versions of the stimuli (foresight, hindsight, or debiasing). Dependent variables were the participants' ratings of probability and their ultimate decision to hire the operator or hold the city responsible for failing to hire an operator. Other measures (whether the city should pay damages, how well the two opposing sides had done, how realistic the simulations were, and how difficult it was to decide the accident's probability) served as manipulation checks.

The primary hypothesis was that participants in the foresight condition would be less inclined to take the precaution than participants in the hindsight condition would think they should have been. We expected these decisions to correspond with higher probability estimates generated by participants in the hindsight conditions. We also expected that hindsight participants would tend to think the city should pay for flood damages more than foresight participants would. For the manipulation checks, we predicted that hindsight would influence the case alone

and would not affect evaluations of the attorneys or the simulation itself. Finally, participants in the debiasing condition should give lower probability estimates and be less likely to hold the city liable than those in the hindsight condition. Since other studies show that this debiasing strategy tends to reduce the bias, but not eliminate it, we expected a similar effect in this study.

METHOD

Participants

Seventy-six undergraduates at Stanford University, 37 women and 39 men, received either \$5 in cash or course credit in an introductory psychology class for their voluntary participation in the study.

Experimental Materials

Separate transcripts for each of the three conditions (foresight, hindsight, and debiasing) were read onto audio-tape by actors. The tapes each lasted approximately 30 minutes. The foresight tape depicted an administrative hearing of "The Duluth Urban Planning Committee," while the two hindsight tapes presented the same information in the form of a civil trial, *Continental Bakeries, Inc., v. City of Duluth*. Each role in the foresight condition had an analogous part in the trial conditions, and the same actors performed in all three versions. In the administrative hearing, one member of the committee board advocated taking the precaution and played a role analogous to the plaintiff's attorney in the trial versions. Similarly, another administrator opposed the precaution, thereby assuming the defense attorney's position. The secretary of the committee mirrored the bailiff in the trial. A neutral chairman mirrored the judge. Six witnesses appeared in the same order in both the administrative hearing and the trial versions of the story. Where appropriate, multiple conditions contained recordings of identical materials. In all conditions, two exhibits discussed in the audio-tape were made available to the participants during the presentation.

The presentational format was standardized as a slide-show with the accompanying audio-tape. The slides presented different models posing as each of the characters. The background for the witnesses was a stark paneled wall; two witnesses were standing in front of a wooden door, while all the others were sitting in what looked like a wooden witness stand. Each condition used the same slides in the same order. The only exception was that the slides for the judge and the bailiff differed from those for the corresponding chairman and the secretary of the planning committee. These differences were necessary to show the judge in robes and the bailiff in uniform. Transcripts and all other materials are available from the authors on request.

Opening Instructions

The opening instructions in each of the conditions contained only those differences necessary to create the setting for the manipulations. The foresight tape

began with the committee chairman describing the administrative setting. The hindsight tapes opened with the judge describing the trial setting. Below are the actual instructions (with the hindsight text indicated in italics):

First, *[both parties have agreed to]* let me give you an abbreviated version of the *[situation/facts which are not in dispute]*. *[Last May/During May 1988]*, the City of Duluth completed construction of a drawbridge across the mouth of the Miniwapa river. The Miniwapa river sees a considerable amount of commercial traffic during the summer and early fall from many upstream businesses. During the months of December through April, the river is usually frozen. Hence, there is no commerce on the waterway in the winter. During the active months, the city maintains a bridge operator 24 hours a day, seven days a week, so that the bridge can be lowered or raised at any time. The city *[presently is deciding whether or not to employ a bridge operator during the winter months/decided not to employ a bridge operator during the winter months. It is this decision that is in contention here today]*.

The foresight tape then explained:

The City Disaster Preparedness Commission has alerted us to the fact that some possibility of winter and spring flooding exists as a result of the new bridge. A flood could be caused by a premature thaw or else by ice and debris getting caught under the bridge so as to create a dam. A flood would be a terrible event, potentially causing severe damage to property along the bank of the river. Employing a bridge operator during the winter and spring would alleviate this threat, but is fairly costly. The decision as to whether or not the city should hire an operator is the decision that is in question here today. I am torn between the two options. But two other members of our committee, Ms. Sugal and Mr. Markwell, have chosen sides and we will hear from a series of visitors to help you make your decision. My ambivalence arises from the uncertainty associated with the probability of a flood occurring. I would like you to review the available testimony to determine how likely it is that a flood will occur during the winter months.

The hindsight tapes explained instead:

During the middle of March 1989, the weather turned unexpectedly warm, and the normally frozen Miniwapa river began to thaw. When it thawed, the river approached flood stages and turned into a violent torrent, filled with ice floes. On the night of March 17, 1989, the river crested at eighteen feet high, only two feet below the bottom of the new bridge. While this occurred, a barge broke loose upstream. This barge lodged under the bridge, and along with numerous large chunks of ice, created a temporary dam, blocking the flow of water under the bridge. This backlog resulted in the river flooding upstream before the bridge could be raised. Had the bridge been raised, it would have freed the barge and the ice and prevented the river from flooding. The flood only affected Continental Bakeries' property and a public park owned by the city.

Finally, the debiasing tape included these additional instructions:

Deciding this case will eventually require you to make a determination about the probability that a flood like the described one will occur in any given year. Making such an assessment may be difficult since the accident has already occurred. When listening to the evidence, you should consider how the events which led up to the accident could have turned out differently.

Testimony

Following the opening instructions, the six witnesses were questioned by the committee members/attorneys. The opposing characters first made opening statements and then called the witnesses.

The first witness, a meteorologist discussing yearly water levels, testified that in the past 60 years the river had crested to dangerous levels on 14 occasions in five different years. He also introduced a memorandum describing each of these instances. On none of these occasions did the river rise to the level of the new drawbridge. The next witness, a civil engineer for the City Disaster Preparedness Commission, discussed the possibility that a flood could occur if ice, debris, or loose boats lodge under the bridge, forming a dam. This witness introduced a memorandum written by the City Disaster Preparedness Commission. The memorandum described several hazards posed by the new bridge, including automobile accidents, boat collisions, and flooding. It explained that enough ice or debris caught under the bridge could create a backlog and cause a flood. It also recommended that the city consider employing a bridge operator throughout the winter to monitor the bridge. The third witness was the accounting officer of the Planning Committee. She stated that the flood precaution (i.e., hiring an operator for the winter) would cost the city \$100,000 annually, while the cost of the potential damages from a flood was approximately \$1,000,000 per occurrence—ten times the cost of prevention on an annual basis.

Next, the chairman of the City Disaster Preparedness Commission testified on behalf of the opponent/defendant. He attacked the credibility of the “overzealous” civil engineer who had testified for the proponent/plaintiff. The second witness for the opponent/defendant was the current dock inspector. He stated that in his ten years of experience no boats had broken loose on the river during the winter. The final witness, a retired dock inspector, rebutted this testimony. He claimed that in his 40 years of service boats had broken loose four or five times, although under cross examination he could not specifically recall the occasions when this occurred.

Closing Arguments

Following the testimony, the opposing sides each made closing arguments to highlight the facts supporting their respective points. The proponent/plaintiff claimed that the flood was a likely event that should be/have been prevented. The opponent/defendant claimed that the flood was too unlikely to warrant the costs of prevention. In the debiasing condition, the defense attorney also asked the participants to imagine the possibility that the flood had not occurred, and to consider the waste of hiring a bridge operator “who would sit in a booth every hour of every day in the winter to watch for floods.”

Closing Instructions

The tapes’ closing instructions were as follows (the hindsight text is in italics):

The law also gives you a clear definition as to which precautions are reasonable, and which are not. In deciding whether the employment of a bridge operator throughout the winter [is/was] a reasonable precaution, you must consider the economics of the decision. If the precaution [will prevent/*would have prevented*] more harm than its cost, then the city is responsible for not taking the precaution. If, however, the precaution costs more than the harm it would have prevented, then the city is not responsible. When

making this determination, you must take into account the probability [of an accident occurring/*that the accident was going to occur. This evaluation must be one of the probability that the flood would have occurred given the information available at the time the decision not to hire was made, not as of now*].

The law makes the task fairly simple here. [We know that the damage from a flood would cost/*The parties have stipulated to the amount of damages at*] \$1,000,000 [*and the defense has stipulated that this is the amount of damage they predicted*]. [The annual cost of eliminating the risk of the flood by employing the operator is/*Also, both parties have stipulated to the cost of precautions*]: \$100,000. The only number missing from our calculation is the probability [of a flood/*that the flood was going to occur*]. It is your job to supply that number. Therefore, if you find that the probability of a preventable flood each year exceeds 10% then you must [agree with Ms. Sugal that the city should hire an operator/*side with the plaintiff*]. If you find that the probability of a flood is less than 10%, then [you must side with Mr. Markwell that an accident is too unlikely to be worth the cost of hiring an operator/*the city is not responsible for the flood since the precaution was not reasonable under the circumstances*]. The [committee/*court*] has provided a special verdict form which includes these instructions. You are to fill out this form when deciding the case. [The committee thanks you for your participation as an auxiliary member/*Thank you for your attention.*]

In the debiasing tape the judge added a final admonishment:

Making a fair determination of probability may be difficult. As we all know, hindsight vision is always 20/20. Therefore it is extremely important that before you determine the probability of the outcome that did occur, you fully explore all other possible alternative outcomes which could have occurred. Please take a moment to think of all the ways in which the event in question may have happened differently or not at all.

The Questionnaire

After watching the simulated meeting or trial, participants received a three-page questionnaire. The questionnaire was entitled “Final Determination Form” in the foresight condition, and “Final Verdict Form” in the hindsight conditions. The first page asked participants to provide estimates for “the probability of a preventable flood in any year.” It then asked them to give their opinion as to whether the city “should hire an operator” or “was responsible for the flood damage.” On the next page, the questionnaire asked participants to provide a written explanation for their decisions.

The final page asked participants to agree or disagree with five short statements using 7-point Likert scales. These statements were: “(1) The [proponent/*plaintiff's attorney*] did a good job arguing her position; (2) The [opponent/*defense attorney*] did a good job arguing his position; (3) The City of Duluth should be made to pay for damages [if a flood were to occur because of the absent bridge operator]; (4) The [meeting/*trial*] simulation was realistic; and (5) It was difficult to decide the correct probability.”

Procedure

Participants were run alone or in pairs. They entered the room and were greeted by a female experimenter who instructed them to serve as committee members or jurors in a decision-making task. They were told to pay careful

attention to the slide and audio presentation that would describe the decision-making task. At appropriate times during the presentation, participants were given written copies of the exhibits being discussed. At these times the experimenter said: "You will now receive a copy of Exhibit [A/B] to look over briefly and then refer to as it is discussed." Participants were instructed not to take notes.

Upon completion of the slide and audio presentation, the experimenter turned on the lights and gave participants the "Final Determination/Verdict Form" and written copies of the closing statements and instructions. Participants run in pairs were instructed to work individually and to avoid discussing their answers. All participants were allotted ten minutes in which to complete the questionnaire. The participants were then debriefed about the background and hypothesis behind the experiment. At this time they were informed about all three conditions, told of the experimental predictions, and given the opportunity to discuss the experiment.

RESULTS

Preliminary analyses revealed no significant effects involving sex of subject and whether or not they were paid. Therefore, the results are reported collapsed across these variables.

Of the participants in the foresight condition, only 24% (6 out of 25) chose to hire the operator, whereas 56.9% (29 out of 51) of those in the two combined hindsight conditions believed that the defendant should have hired the operator: a statistically significant difference, $\chi^2(1, n = 76) = 7.3, p < .01$. A similar analysis comparing the hindsight cell to the debiasing cell showed no significant differences; 57.7% in the hindsight condition (15 out of 26) found the defendant liable versus 56.0% in the debiasing condition (14 out of 25) found the defendant liable, $\chi^2(1, n = 51) = .01, p > .5$.

Two problems with the distributions of the probability estimates led us to use a nonparametric analysis on this variable. First, the distributions were positively skewed. Second, a smaller number of the estimates were extremely popular among the participants (e.g., 14 participants chose 5% and 11 chose 15%). This made a transformation somewhat meaningless and generally muted the level of variance in the data. Consequently, the data were analyzed using the Mann-Whitney Rank Test. Comparing the foresight condition with the two hindsight conditions revealed that participants in hindsight made significantly higher estimates of the probability that the accident would occur in any given year, $U = 436, p < .025$. Participants in the debiasing condition did not differ from the ordinary hindsight condition, $U = 301, p > .5$.

Further analyzing only participants who chose to hire the operator (or to hold the city liable) indicated that the hindsight participants' likelihood estimates were only slightly, and not significantly, higher than the foresight ones, $U = 86, p > .5$. The mean probabilities were 15.85 for the foresight participants and 17.78 for the hindsight participants. Similarly, among participants who chose not to hire the

operator (or to exonerate the city) probability estimates did not differ significantly (foresight = 7.03, hindsight = 6.53, $U = 183.5$, $p > .1$). This suggests that participants could have first decided whether the flood was more likely than 10%, and then chosen a particular probability anchored on the 10% cutoff.

The remaining data from the 7-point Likert scales (measuring the simulation's realism, the difficulty in deciding the probability, the effectiveness of the opposing advocate characters, and whether or not the city should pay damages) were analyzed using a 2×3 ANOVA, with main effects of choice (hire/hold liable vs. don't hire/don't hold liable) and condition (foresight, hindsight, and debiasing). Participants who chose to hire/hold liable agreed with the statement that the city should pay for accident damages significantly more than participants who chose not to hire or hold the city liable, $F(1,70) = 15.7$, $p < .001$. This rating did not differ by condition, $F(2,70) = 2.0$, $p > .1$. Nor did the interaction between choice and condition affect the rating, $F(2,70) = 0.2$, $p > .5$. Analysis of the participants' ratings of the simulation's realism and of the task difficulty revealed no significant main effects or interactions, F 's < 2.8 , p 's $> .05$.

Participants' ratings of the effectiveness of the proponent/plaintiff's attorney did not differ by condition, choice or their interaction, F 's < 2.3 , p 's $> .1$. The ratings of opponent/defense attorney did not differ by choice, $F(1,70) = .05$, $p > .5$, but the effect of condition was significant, $F(2,70) = 4.4$, $p < .01$. (Means are 4.12, 3.00, 3.60, for foresight, hindsight, and debiasing, respectively, with higher numbers indicating a worse rating.) Post hoc analysis using the Tukey–Honestly Significant Differences test revealed that this effect was driven primarily by the low rating given by the hindsight participants in contrast to the foresight participants. No other contrasts were significant. The interaction between choice and condition did not significantly affect ratings of the defense attorney's effectiveness, $F(2,70) = .67$, $p > .5$.

DISCUSSION

These results demonstrate that the hindsight bias influences judgments of liability. In this study, outcome knowledge deeply affected participants' interpretations of a complex story. A majority of participants randomly assigned to the hindsight condition judged the choice made by over three quarters of the foresight participants to be negligent. As the study shows, a good faith effort to determine a reasonable level of precautions in foresight may receive harsh judgment when viewed in hindsight.

The data did not support the secondary hypothesis; the judicial debiasing instructions failed to reduce the hindsight bias. There are several possible explanations for the ineffectiveness of the debiasing instructions. The instructions may simply have been missed or ignored in the context of the full trial. Research on jury instructions shows that they often do not produce their desired effects (Diamond, 1993; Sue, Smith, & Caldwell, 1973), or that they may even have a counterproductive influence (Thompson, Fong, & Rosenhan, 1981).

Alternatively, participants may not have actively followed the instructions to “consider how the events that led up to the accident could have turned out differently.” Unlike this experiment, the successful debiasing studies all required their participants to actually state reasons why other outcomes may have occurred (Arkes et al., 1988) or to list supporting facts for various potential outcomes (Davies, 1987). Confined by the context of a court hearing, the present study indicates that merely encouraging participants to “imagine alternative outcomes” may not be adequate for reducing the bias. Although this study tested a technique easily suitable for the courtroom, its failure suggests that ‘more intrusive procedures might be necessary to counteract the bias’ influence.

The data support the hypothesis that the hindsight bias would affect judgments of the events and not the characters involved. Participants’ evaluations of the opposing characters’ abilities and of the simulation in general did not differ between conditions, except that hindsight participants rated the opponent/defense attorney’s performance significantly higher than did the foresight participants. This finding is difficult to explain, and the effect is in the opposite direction from what the hindsight bias might predict. Hindsight participants felt that the defense attorney did a better job, despite expressing more disagreement with his position. The meaning of this effect is unclear.

There may be other limitations within the study, as well. Participants in the trial conditions were not given instructions on the plaintiff’s burden of proof. This was to ensure that the two conditions were parallel, but it did result in a deviation from normal trial procedures. Since hindsight’s influence was so large (57% versus 24%), the effect should have occurred anyway, but this variance from normal procedures may have exacerbated the effect size.

Additionally, the study tested individual judgments rather than those of a jury. The sample is unrepresentative of a typical jury pool, and no group deliberation occurred. However, researchers (e.g., Casper et al., 1989) have found college student samples to display the hindsight bias in patterns similar to adults called for jury service. Furthermore, at present the effects of group deliberation on the hindsight bias are unknown. In reality, juries decide few civil suits. Bench trials have become increasingly popular (Hans & Vidmar, 1986), and more importantly, the vast majority of cases settle before trial (Lempert & Saunders, 1986). Hence, the outcome of civil suits is determined primarily by attorneys and clients reviewing the merits of their case, or by arbitrators and mediators. This means that liability judgments are often decided by individuals rather than by groups. One might argue that data from undergraduates do not apply to the decision making of attorneys or arbitrators, but the robust nature of the hindsight bias across differing populations suggests otherwise.

The differences in the instructions and testimony or even the basic differences in format (meeting vs. trial) could also be said to account for the results. Yet differences in the instructions and testimony probably cannot account for the effect because there were so few. The instructions necessarily differed, as described in the methods section, but required the participants to make the same assessment. The substance of each witness’ testimony did not vary, and the text itself was practically identical.

The basic format may have had some effect. While an administrative hearing demands an honest assessment of accident likelihood, trials tend to focus more on the assignment of blame. The possibility exists that these may be fundamentally different chores. In this study, however, participants in each condition were instructed to base their decisions on their probability judgments. Furthermore, not only were hindsight participants more likely to judge the city liable, but they also estimated higher annual flood likelihood. This suggests that the hindsight bias, rather than a difference in tasks, drove the effect. Finally, even if the basic format made a difference, then the implications for law would be the same. Potential defendants who take what appear to be reasonable precautions in foresight might find their choices indefensible once being sued.

One aspect of analysis indicates that something other than the hindsight bias may have driven the effect. After accounting for the decision to hire/hold liable, hindsight participants' probability estimates are only slightly, and not significantly, higher than those of the foresight participants. Thus, arguably the data cannot distinguish participants who decided liability first and then determined probability, from participants who decided the probability was greater or less than 10% first, and then anchored their judgment on this point. Since anchoring is a well-known phenomenon (Tversky & Kahneman, 1982), finding it in a study with a salient probability should be expected. We suggest that although anchoring distorted the distribution of the probability estimates, there is no reason to believe it affected the way in which the hindsight bias drove the decision to find the defendant liable.

In referring to the problem as a hindsight bias, however, we do not mean to suggest that supposedly reasonable minds in foresight do not err in assessing probabilities. It is possible that people underestimate the likelihood of that which has not yet occurred. Instead of "what did happen had to happen" (Fischhoff, 1975), "what has not happened will not happen." This would be a foresight bias. In either case, the tort system promises to only hold defendants liable for the level of precautions that appeared reasonable to them before an accident occurred. Thus under any interpretation, the bias ensures that some reasonable defendants will feel ambushed by adverse liability judgments after an accident has occurred.

Implications

Finding the hindsight bias in a generic case such as this one indicates the bias' potential influence in any negligence case. Since all tort litigation necessarily involves such *ex post* judgments, any untaken precaution may later give rise to liability, even if that precaution could not reasonably have been justified *ex ante*. The data may be interpreted as describing a pervasive flaw in the deterrence model of torts. Under the deterrence theory, requiring negligent defendants to compensate plaintiffs forces them to internalize the full social costs of their activities (Posner, 1992, pp. 163–167). The theory holds that potential injurers forced to bear the full costs of their activities will make socially correct choices about the costs and benefits of precaution, spending neither too much nor too little on safety. The deterrence theory has always assumed that errors in such estimates

are random (Grady, 1983). To the extent that attorneys, judges, and juries reach estimates of *ex ante* probabilities that deviate systematically from the actual *ex ante* estimates, potential injurers will respond by spending more on safety precautions than cost-benefit analysis would justify.

Beyond the tort system, the hindsight bias may affect other areas of law, since foreseeability limitations pervade legal thinking. A computer search of the California Code reveals that the words "foresight," "foreseeable," "unforeseeable," and their variations appear in 193 different statutes. These range from statutes governing such diverse areas as attorney's fees (California Business and Professions Code, Sec. 6146), endangered species (California Fish and Game Code, Sec. 2067), pesticides (California Food and Agricultural Code, Sec. 12978), and earthquake education (California Public Resources Code, Sec. 2806). The United States Code contains 179 such references and the laws of other states also include significant use of the terms (Illinois, 68 statutes; New York, 89; Texas, 80). Furthermore, the application of the Hand formula is enormously popular. The difficulty of fairly determining foreseeability in hindsight seems to have escaped the notice of the legislators and judges.

CONCLUSIONS

Given the present research, this article cannot offer a solution to the hindsight problem. As we have demonstrated, mere judicial instructions are apparently unable to activate the cognitive processes necessary to reduce the bias. Perhaps more effective instructions could nevertheless be drafted. Other solutions for bias reduction could include elaborate special verdict forms or Wexler and Schopp's (1989) suggestion on bifurcating trials. A special verdict form would contain a detailed set of instructions to the jury as to how they should decide the case. It could direct them to consider alternative outcomes and could even require them to write out such alternatives. Since Wiggins and Breckler (1990) have shown that special verdict forms improve comprehension of jury instructions in civil trials, perhaps such forms could improve the cognitive processes of jurors as well.

Legal scholars have suspected for some time that the current standard of deciding negligence in hindsight may be inadequate (Green, 1977). The bias is likely to be influencing other legal judgments as well. The ubiquity of foreseeability judgments in law suggests the need for developing effective debiasing techniques.

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