Climate Related Disasters and Hindsight Bias

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Abstract

Hindsight bias is one of the biases that might influence decisions made in difficult situations, commonly known as the knew-it-all-along effect. The purpose of our study is to replicate both the studies of Walmsley et al. (2019) and Yama et al. (2021). A two-group study design was used with a convenience sample of 205 participants. Qualtrics, a web-based survey, was used to randomize participants into either a results group or a control group. We provide evidence of hindsight bias, including how it affects everyday people. We conducted an experiment with two dependent variables, each including three different hypotheses. We hypothesized that if a picture of a muddy riverbed and a photo of hailstorm clouds are shown to two groups of individuals while informing only one half of the group (Group A) of the flash flood and hailstorm actually occurring, then Group A will report that a flash flood and hailstorm will be more likely to occur whereas Group B will rate the likelihood of a flash flood and hailstorm to not be as probable. Two surprising themes emerged within the data collected. First, the results group responded with lower levels than expected in two of the six t-tests conducted – the ratings of the likelihood of a flash flood and the likelihood of a hailstorm. This resulted in a lack of statistical significance in both. Second, the results group rated the remaining four t-tests with statistically significant scores, showing that participants rated these probabilities as expected but did not rate the two main objectives as predicted. It demonstrated that even when posed with weather-related questions, people are frequently led by hindsight bias.

Keywords: hindsight bias, decision making, natural disasters

Hindsight Bias in Natural Occurring Disasters

One of the biases that might influence decisions made in difficult situations is the hindsight bias phenomenon, commonly known as the knew-it-all-along effect. Hindsight bias has been around for nearly 50 years, dating back to 1975 when Fischhoff first reported it (Klein, 2017). It has been studied by a multitude of people concerning many different areas of study and topics, ranging from children to occupations to natural disasters. Hindsight bias is the propensity to believe that an event was predictable after it has already happened. Therefore, even when an unexpected occurrence occurs, individuals frequently think they could have predicted it. The internal track record we have of our prior judgments is distorted by the hindsight bias, which gets in the way. This may result in excessively optimistic projections of the future that support riskier choices with negative consequences (Kahneman, 1993). More generally, the bias keeps us from drawing conclusions from our past experiences. Thus, decision-making can be negatively impacted by hindsight bias. For example, a study done by Yama et al. showed that hindsight bias can be seen even in legal cases. When a couple of kindergarten teachers took their class to a riverside, a sudden flash flood occurred leaving two children injured and one child dead. The teachers were accused of negligence due to the death and injury of the children. Could the teachers have predicted the flash flood due to the muddiness of the river? “When people believe that an accident could have been predictable after knowing that the accident occurred, this can cause a detrimental effect of hindsight bias on legal decision making” (Yama et al., 2021). Being able to manipulate the amount of information provided to jurors might be useful in understanding how biased thinking might get in the way of logical decisions.

Even though hindsight bias has been seen throughout human history, psychologists. looking into decision-making mistakes first identified and investigated the phenomena in the

1970s. One of the judgment traps that has received the greatest attention is hindsight bias, which has been discussed in more than 800 academic studies. Hindsight bias is widespread and is present in both young and old individuals. Bernstein et al. provided the findings of the first investigation into how hindsight bias changes over the course of a lifetime (2011). They showed that preschoolers have greater hindsight bias which is caused by them remembering the right response instead of the wrong one and that older adults showed greater hindsight bias because they forgot their initial response and remembered one that was somewhat similar to the right response but not exactly the same. Bukszar and Connolly (1988) tested the theory that the strategy of a manager's decisions with their businesses requires a lot of skill and precision, and thus when decisions that are made prior to outcome are evaluated, they often are unfairly assessed due to using present information and thus are influenced by hindsight bias. The high-outcome group rated the business to have higher success and return of investment and the low-outcome group rated the business to have a lower success and return of investment thus showing both groups showed hindsight bias from the knowledge of first-year results.

Additionally, Hertwig et al. note that in Christensen-Szalanski and Willham's (1991) meta-analysis, the amount of experience people have with the job at hand affects how much hindsight bias is produced (2003). Hertwig et al. use it in order to put the newly suggested RAFT model (*Reconstruction After Feedback with Take the best*) to yet another test. This model is a series of cognitive processes that shed light on hindsight bias. Their results supported the "expertise effect," and they found that people's hindsight bias is reduced the more thorough their foresight information is. Libby et al. conducted a sequence of trials to observe the effects that memory perspective has on the perception of personal change (2005). The results showed that compared to the six individuals who underwent their recollection from the first-person

viewpoint, those who were prompted to assume a third-person viewpoint reported more personal change over a period of time. In a different trial, it was shown that individuals who were prompted to reflect on their high-school social awkwardness from a third-person viewpoint not only experienced more personal transformation but also went on to behave more socially adept.

Furthermore, Louie showed hindsight bias is present when individuals assess their own judgments and have no limitations given for taking credit for their positive results (1999). The hypothesis that was tested, and accepted, was that if individuals are given favorable or unfavorable outcomes for their initial decisions, then they will exhibit hindsight distortions by either taking credit for their favorable decisions or evading taking blame for unfavorable decisions. Seeing it from a different perspective, Nancy (2022) demonstrated that people tend to answer differently to questions depending on how it is presented to them. This would affect the way, for example, a judge would decide what to think. They mentioned this as the framing effect, which shows how people's decisions can be skewed depending on the way we ask the questions in our experiment. The results of this study showed that jurors fall prey to hindsight bias just as much as other people do and is seen often in medical wrongdoing lawsuits. Along with this, it showed that the harsher the outcomes are, the higher the hindsight bias is. Essentially, all professions are prey to cognitive biases, especially when individual differences play a role.

Finally, Walmsley et al. tested the theory of the importance of reflection on past decisions, their outcomes, and learning from the mistakes that were made (2019). This reflection and learning could help pilots avoid making future errors as long as the perception of the prior mistakes is accurate. They tested whether the role of availability, hindsight, and outcome bias had an effect on the pilot's viewpoint of past flights. Presumably, these cognitive biases would affect the pilot's discernment for future flight judgment calls. It was observed that hindsight bias

was shown when the pilots were given certain types of information. For example, pilots who were told that the flight either ended up crashing or landed safely exhibited the effects of hindsight bias.

Along with this, Yama et al. tested cognitive biases that often play a role in legal decision-making, particularly when the prosecution is judging the defendant's decisions in a situation that would otherwise be considered unexpected and impossible to predict (2021). The hypothesis tested in this study was if the prosecution is aware of the negative outcome of an accident and they fail to ignore this information when making judgments on the defendant's pre-outcome decisions, then hindsight bias is used as an unfair conviction in a situation where the defendant was incapable of predicting the outcome. There was a total of 114 participants in the first experiment and a total of 64 participants in the second experiment. In the first experiment, participants were randomly assigned to two groups – outcome or control. The second experiment randomly assigned its participants into four conditions – control-causality, control-neutral, outcome-causality, and outcome-neutral. The first and second experiments used the same photos and the same leaflet given to participants. The photographs were projected onto a screen where participants were told to answer questions based on their judgments of the muddiness of the river on a 9-point scale. In the outcome group, they were provided a narrative similar to that of the court case. They were told that due to the flash flood occurrence, a child had died. Knowing this, they were told to hypothetically judge the muddiness of the water as if they were unaware of the death.

The purpose of our study was to replicate both the studies of Walmsley et al. (2019) and Yama et al. (2021) and thus we hypothesized that if a picture of a muddy river bed and a photo of hail storm clouds are shown to two groups of individuals while informing only one half of the

group (Group A) of the flash flood and hail storm actually occurring, then Group A will report that a flash flood and hail storm will be more likely to occur whereas Group B will rate the likelihood of a flash flood and hail storm to not be as probable.

Methods

Participants

We had 200 participants in this study; 36 male, 163 female, and 1 prefer not to say. The racial/ethnic backgrounds were as follows: American Indian/Alaska Native (2%), East Asian (.5%), South Asian (.5%), Native Hawaiian or other Pacific Islander (.5%), Black or African American (2.5%), White (92%), Multiracial (1.5%), and Other or Unknown (1.5%). The study was conducted at a small university located in northeastern Tennessee (Milligan University). They were randomly assigned 2 conditions: 95 people in the control group and 105 people in the outcome group. The mean age was 37.32 years (SD = 15.24) with a minimum of 18 years old and maximum of 73 years old. We made sure to ask the participants about their experience or knowledge of signs of flooding and with storm clouds.

Materials

We used a Qualtrics survey to preform our study. In the survey, we used two natural disaster pictures, one of a pre-hailstorm and the other of a muddy riverbed (See appendix A). The participants were asked to rate how likely a hailstorm was and how likely a flashflood would occur, both rated on the given 5-point Likert-type scale.

Measures

We used a 5-point Likert-type scale to ask them about the muddiness of the water and the likeliness of a hailstorm; 1 being not muddy and 5 being very muddy or 1 being not likely at all and 5 being very likely (See appendix B). Our dependent variable was whether or not people

responded with hindsight bias when presented with either full or partial information on a flash flooding scenario and a hailstorm scenario. Our independent variable was the amount of information we provided to Group A (full) versus Group B (partial). Group A received the entire narrative, being that in picture A the flash flood is about to occur and in picture B a hailstorm is about to occur. Group B only received the partial narrative, being that the information about a flash flood and a hailstorm will not be present in their description.

Procedures

First, we filled out an Exemption IRB form and sent it in for approval. We got it back within a week and a half and then started the study. The participants were given a Qualtrics survey in which they answered a series of questions regarding informed consent, demographics, natural environmental occurrences, and knowledge about hindsight bias. In the questions regarding natural environmental occurrences, the participants were shown a picture of a muddy riverbed and a pre-hailstorm and were asked to make two perceptual judgments and one probability judgment for each photo. The participants in the outcome condition were instructed that the flash flood (picture 1) had occurred, and a hailstorm (picture 2) had occurred. They were then instructed to make a hypothetical judgment assuming they were unaware of the result. The participants in the control group were given no outcome information on the flood or the hailstorm and were only asked a series of questions.

Results

A series of six independent samples t-tests were used to test our hypotheses. We hypothesized that if a picture of a muddy riverbed is shown to two groups of individuals while informing only one half of the group (Group A) that a flash flood had occurred, then Group A will report that the water appears muddier and that a flash flood will be more likely to occur,

whereas Group B would rate the water as less muddy and the likelihood of a flash flood to not be as probable. Group A would also be less likely to move to the area rather than Group B. Likewise, if a picture of a storm cloud prior to a hailstorm is shown to two groups of individuals while informing only one half of the group (Group A) that a hailstorm had occurred, then Group A will report that a hailstorm will be more likely to occur and they will be less inclined to visit the area or fly through the storm clouds if they were a pilot, whereas Group B would rate the likelihood of a hailstorm to not be as probable and they will be more inclined to visit the area or fly through the storm clouds if they were a pilot.

Table 1 contains t-tests for the rating of the muddiness of the water, the likeliness of a flashflood, and the likeliness of moving to the area. It shows that the scores for the rating of the muddiness of the water and the likeliness of moving to the area were statistically significant.

Table 1

Results from the 3 t-tests ran on the muddy riverbed

DV Question	Results		*No Results*		*t*(40)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Muddiness	3.762	.8029	3.526	.7834	-2.096	.019	0.298
Flashflood	3.162	1.279	3.053	1.206	-.620	.268	0.088
Moving	1.781	1.2936	2.642	1.246	4.785	<.001	0.678

Note. No results N=95; Results N=105

Table 2 contains t-tests for the likeliness of a hailstorm, the likeliness of visiting the area, and the likeliness of flying through the clouds if they were a pilot. It shows that the scores for the likeliness of visiting an area and flying through the clouds if they were a pilot were statistically significant.

Table 2

Results from the 3 t-tests ran on the pre-hailstorm clouds

DV Question	Results		*No Results*		*t*(40)	*p*	Cohen's *d*
	M	*SD*	*M*	*SD*			
Hailstorm	3.991	.8933	3.863	.8826	-1.012	.156	0.147
Visiting	1.924	1.299	2.747	1.255	4.551	<.001	0.639
Flying	1.200	1.362	1.768	1.275	3.038	.001	0.430

Note. No results N=95; Results N=105

Discussion

The purpose of this study was to test six hypotheses regarding whether or not a person uses hindsight bias when presented with two environmental-related situations. To test these, participants were randomly assigned into two groups; one group (Group A) was given a description of the two pictures, along with the results and ramifications of the flash flood and hailstorm. The second group (Group B) was not given any description or results of the flash flood or hailstorm. Both groups were asked the same question regarding the photos. The first three hypotheses were based on the picture of a muddy riverbed. For the first and third hypotheses, it was expected that Group A would rate the muddies of the water at a higher degree and the likelihood of moving as less probable than Group B. The difference between the two means was statistically significant, thus, these hypotheses were strongly supported by the data. The second hypothesis was that Group A would rate the likeliness of a flash flood as higher than Group B. The difference between the two means was not statistically significant and thus, the data offered limited support for the second hypothesis.

The final three hypotheses were based on the picture of the hailstorm clouds from before the storm. The fourth hypothesis was that Group A would rate the likeliness of a hailstorm as

higher than Group B. The difference between the two means was not statistically significant, thus, the data offered limited support for the fourth hypothesis. For the fifth and sixth hypotheses, it was expected that Group A would rate the likeliness of visiting the area as lower and the likeliness of flying through the storm clouds if they were a pilot as less likely than Group B. The difference between the two means was statistically significant and thus, these hypotheses were strongly supported by the data. Though, our sixth hypothesis correlates with the study Walmsley (2019) conducted based on the role that hindsight bias played in the pilots' decision-making, especially when the outcome knowledge given was severe in nature. The failure of the data to support hypotheses two and four for hindsight bias is surprising in light of the strong support for the hypothesis in the earlier experiment by Yama, Akita, and Kawasaki (2021), in which the prosecution is judging the defendant's decisions.

A possible explanation for this inconsistency might be due to the exaggerated representation in the photos and the life experiences and knowledge of the participants on these natural occurrences. The severity of the photographs selected may have affected the interpretations of the participants. For the survey, pictures of the muddy riverbed and the pre-hailstorm clouds were severe in nature. Thus, the bias tested was based solely on the picture provided rather than the description. This may have caused an unwanted change of focus. Along with this, the volunteer sample for this survey consisted of disproportionately older aged individuals. The mean age was 37, with many 50-, 60-, and 70-year old's within the group of participants. The natural life experiences may have skewed the participant's views on both how severe and how likely a flash flood is, and hailstorms are. From the pool of participants, there were a significant number of individuals that stated they had some experience or a decent amount of experience or knowledge on signs of both natural occurrences.

This study raises two suggestions. Because survey results showed that more than half of the participants had some to decent experience or knowledge, researchers should consider aiming towards an audience that has little to no experience in flash floods or hailstorms. Researchers should also consider using a less drastic depiction of a muddy riverbed and a pre-hailstorm cloud for future study replication. By doing so, the bias being tested will be more focused on the information from the description given rather than the picture itself. In addition, for researchers seeking to replicate the study, we recommend telling the participants in the results group to disregard the information provided, just as Bukszar and Connolly (1988) did when they told the participants in the results group to ignore the first year of return when making their assessments.

References

Bernstein, D. M., Erdfelder, E., Meltzoff, A. N., Peria, W., & Loftus, G. R. (2011). Hindsight bias from 3 to 95 years of age. *Journal of Experimental Psychology. Learning, Memory & Cognition, 37(2), 378–391*. Retrieved September 25, 2022, from https://doi-org.milligan.idm.oclc.org/10.1037/a0021971

Bukszar, E., & Connolly, T. (1988). Hindsight bias and strategic choice: Some problems in learning from experience. *Academy of Management Journal, 31(3), 628–641*. Retrieved September 25, 2022, from https://doi-org.milligan.idm.oclc.org/10.2307/256462

Hertwig, R., Fanselow, C., & Hoffrage, U. (2003). Hindsight bias: How knowledge and heuristics affect our reconstruction of the past. *Memory, 11(4/5), 357*. Retrieved September 25, 2022, from https://doi.org/10.1080/09658210244000595

Kahneman, D., & Lovallo, D. (1993). Timid choices and bold forecasts: A cognitive perspective on risk taking. Management science, 39(1), 17-31.

Klein, O. (2017). *Hindsight 40 years on: An interview with Baruch Fischhoff*. Carnegie Mellon University. https://www.cmu.edu/epp/people/faculty/research/Memory%20Studies%20interview.pdf

Libby, L. K., Eibach, R. P., & Gilovich, T. (2005). Here's looking at me: The effect of memory perspective on assessments of personal change. *Journal of Personality and Social Psychology, 88(1), 50–62*. Retrieved September 26, 2022, from https://doi.org/10.1037/0022-3514.88.1.50

Louie, T. A. (1999, February). Decision makers' hindsight bias after receiving favorable and unfavorable feedback. *Journal of Applied Psychology*, *84*(1), 29–41. Retrieved September 24, 2022, from https://doi.org/10.1037/0021-9010.84.1.29

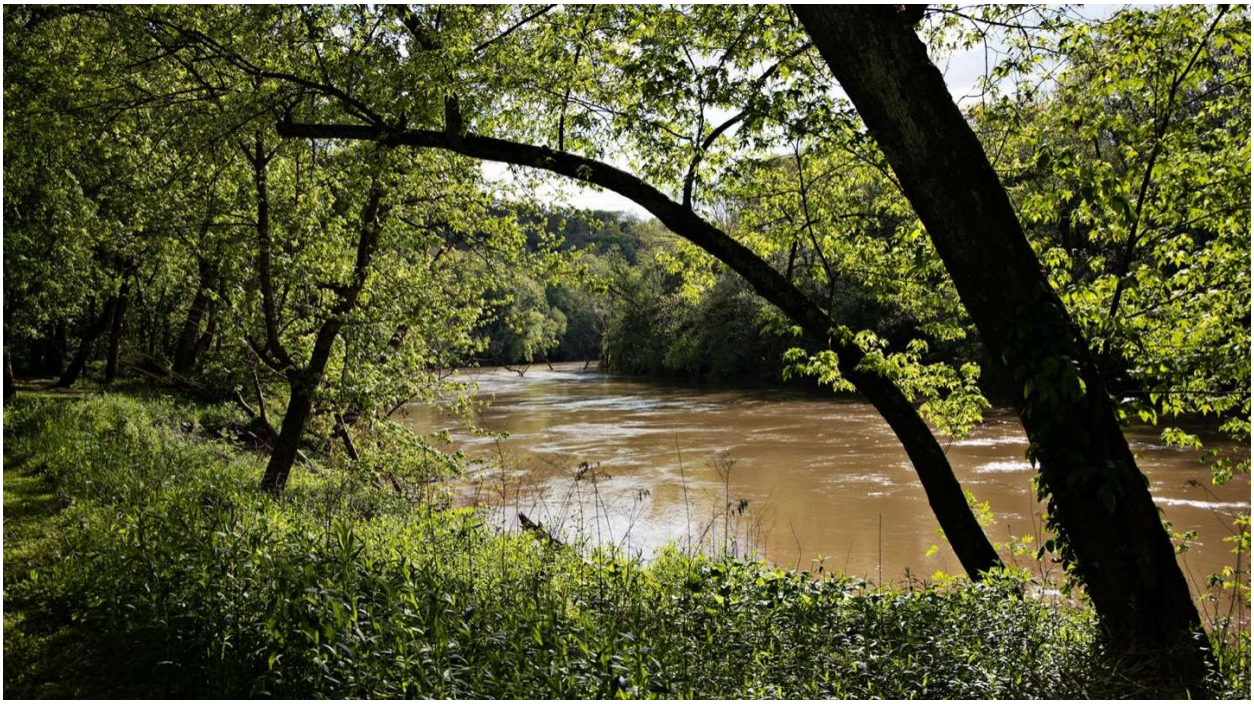
Nancy, F. (2022, January 4). The impact of cognitive biases on professionals' decision-making: A review of four occupational areas. *National Center for Biotechnology Information*. Retrieved September 14, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8763848/

Walmsley, S., & Gilbey, A. (2019). Understanding the past: Investigating the role of availability, outcome, and hindsight bias and close calls in visual pilots' weather-related decision making. *Applied Cognitive Psychology, 33(6), 1124–1136*. Retrieved September 25, 2022, from https://doi-org.milligan.idm.oclc.org/10.1002/acp.3557

Yama, H., Akita, M., & Kawasaki, T. (2021, January 28). Hindsight bias in judgments of the predictability of flash floods: An experimental study for testimony at a court trial and legal decision making. *Applied Cognitive Psychology Volume 35, Issue 3 P. 711-719*. Retrieved September 13, 2022, from https://doi.org/10.1002/acp.3797

Appendix A

Picture of the muddy riverbed:



Picture of the pre-hailstorm clouds:

Appendix B

Questions for the muddy riverbed:

1. Based on the picture, rate the muddiness of the water
2. Based on the picture, how likely do you think a flashflood will occur
3. Based on the picture, what is the likeliness of you moving to this area

Questions for the pre-hailstorm clouds:

4. Based off the picture above, what is the likelihood of there being a storm?
5. How likely would you be to visit this area right now?
6. If you were a pilot, how likely would you be to fly through the clouds shown above?