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The Effect of Induced Fear on Culturally Transmitted Credulity Assessments

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The Effect of Induced Fear on Culturally Transmitted Credulity Assessments

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by

Theodore James Samore

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ABSTRACT OF THE THESIS

The Effect of Induced Fear on Culturally

Transmitted Credulity Assessments

by

Theodore James Samore

Master of Art in Anthropology

University of California, Los Angeles, 2017

Professor Daniel Fessler, Chair

When threatening events occur, especially in the context of human violence, rumors spread precipitously. During such events as mass shootings and terrorist attacks, conflicting reports rapidly emerge and spread. People may be especially likely to believe these rumors because there is a general asymmetry in the costs of incorrectly maintaining vigilance in the case of a false positive, versus the costs of ignoring a potential threat in the course of a false negative. Likewise, even in the absence of a threatening situation, people appear to be simply more credulous of information concerning hazards than of information concerning benefits because of a fundamental disparity in costs between failing to act on a potential benefit versus disregarding, and incurring the costs of, a potential hazard. Here, using the framework of negatively biased credulity proposed by Fessler, Pisor, and Navarrete (2014), I investigated whether threatening situations impact an individual's willingness to believe culturally-transmitted information about

other hazards in the world. I hypothesized that participants primed to experience fear, but not anger, in the context of an imminent threat would be more credulous toward the existence of other hazards. Although findings were mixed across four studies, ultimately the results did not support the primary prediction, though it is difficult to resolve whether the null result was the product of an inaccurate hypothesis or methodological limitations in the experimental elicitation of fear. However, two out of three studies replicated the effect of negatively biased credulity as originally reported by Fessler and colleagues.

The thesis of Theodore James Samore is approved.

Gregory A Bryant

Harold Clark Barrett

Colin Holbrook

Daniel Fessler, Committee Chair

University of California, Los Angeles

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ACKNOWLEDGMENTS

This project would not have been possible without the support of many people. This research was done in full collaboration with Daniel Fessler and Colin Holbrook. Many thanks to my committee as a whole—including H. Clark Barrett and Greg Bryant—for reading numerous revisions of this thesis and helping every step of the way. During the period when this research was conducted, I benefited from the support of the U.S. Air Force Office of Scientific Research under Award #FA9550-10-1-0511, D.M.T. Fessler, P.I. Also thanks to Ann Walters for providing tremendous support as the Anthropology department's graduate advisor. Thank you to the faculty and students in the Anthropology department and at the UCLA Center for Behavior, Evolution, and Culture for providing invaluable feedback in our classes, workshops, and seminars. And finally, thank you to my partner for their unfailing support and love.

CHAPTER 1

INTRODUCTION

In May 2016, an embittered former Ph.D. student returned to the campus of the University of California, Los Angeles and shot dead his thesis advisor before killing himself. Although the scope of the shooting was limited, the event provoked a large response from the Los Angeles Police Department. Hundreds of officers converged on the scene, and the entire campus was locked down. Before the extent of the incident became known, rumors spread rapidly. There were reports of multiple gunmen, dozens of victims, and a "wave of assailants" (Parvini, Mather & Branson-Potts, 2016). Heavily armed SWAT officers lined students up with their hands up, and patted them down for firearms. Students cried and called loved ones, convinced that a mass shooting was underway. Although the details of the murder-suicide became clear after a few hours, false rumors had already engendered pandemonium on campus. Why were students and faculty so susceptible to believing these reports?

During dangerous, threatening situations such as the incident that occurred at UCLA, rumors spread with alarming rapidity. Individuals caught in threatening situations appear especially open to believing reports about additional threats, which quickly leads to the proliferation of false information. Further, with the advent and wide adoption of information technology, news services and social media platforms such as Twitter spread that false information even more rapidly, to even more people.

Imminent threats have profound impacts on cognition and behavior. These effects are mediated by distinct emotions such as fear, anger, sadness, and disgust. Although these emotions can all be elicited by threatening situations, they serve different purposes. From an evolutionary perspective, different kinds of threats present contrasting ultimate-level adaptive

challenges, and emotions such as fear and anger are contextually relevant proximate mechanisms that address those varying adaptive demands (Holbrook, forthcoming; Tooby & Cosmides, 2008). For instance, anger might motivate retaliation against the source of danger, and serve to deter future threat (Fessler, 2010; Skitka et al., 2006). Likewise, a growing literature has shown that while disgust and fear are both threat-related, they engage substantially different, domain-specific behaviors and psychobiological responses (Holbrook, 2016; Krusemark & Li, 2011). For instance, pathogen threats—but not violent threats—initiate oral immunological changes (Stevenson et al., 2011), and increase the value placed on cues of physical health (White et al., 2013), consistent with a functional profile geared toward pathogen-deterrence.

Although imminent threat is a diverse category with domain-specific emotions calibrated to solve specific adaptive problems, the clinical and psychological literature is frequently imprecise on the distinctions between distinct categories, and collapses all threat responses into fear or anxiety (Sylvers et al., 2011). However, in keeping with the enterprise of delineating domain-specific responses to different types of imminent threats, I seek to advance a functional account of fear, and examine how it differs from other threat-related emotions. In addition to motivating escape and safety seeking (Fessler et al., 2004; Öhman & Mineka, 2001), fear promotes information-gathering in the face of imminent threats (Gray, 1987). For instance, electrical stimulation of the amygdala upregulates attention and vigilance (Davis & Whalen, 2001), and fear facial expressions maximize sensory intake by increasing nasal volume, inhalation velocity, and eye-movement speed (Susskind et al., 2008). Further, in the face of potential threats like predation, fear activates specialized perceptual systems that both lower the signal detection threshold for identifying threats, and collect information about the presence and nature of the threat (Tooby & Cosmides, 2008). Finally, fear focuses attention and vigilance

toward the elicitor of the threat (Larsen, 2004). Imminent violence is frequently chaotic, and, as the UCLA shooting shows, accurate information is not always easily available. Fear motivates intense information-gathering on the nature of the threat to inform strategies for finding safety (Marks, 1987; Nesse, 1990; Tooby & Cosmides, 2008).

When gathering information—threat related or otherwise— organisms face a dilemma. How much confidence should they assign to any given piece of data? An organism could adopt the strategy of accepting everything as true, and thereby excel at avoiding true threats. However, the organism would then fall trap to many false positives, which are also costly: it may flee in fear of a predator when no predator is present, or search for a patch of food that does not exist. Of course, on the opposite end of the spectrum, the skeptical organism that refuses to believe anything will insist it needs more evidence even as the predator swallows it whole. So, given a novel piece of information, the relative costs and benefits of believing or disbelieving the information must be considered.

When weighing information about threats, there is an asymmetry between the costs of disbelieving a true danger versus believing a threat is imminent when in fact none exists. Although there are metabolic and opportunity costs associated with engaging vigilance in the absence of a real threat, they are almost always lower than those incurred by the threat itself (Stein & Nesse, 2011). Therefore, an inability or unwillingness to attend to cues of threat—especially when a threat is already underway—could have serious fitness consequences (Marks & Nesse, 1994). Selection should favor excessive responses to threat because of the asymmetry between the relatively low cost of maintaining vigilance in the case of false alarms, versus the potentially much higher costs of disregarding a true threat (Nesse, 2005; 2006). This lends a functional logic to the willingness to believe even wild claims during periods of threat and

duress. In the case of the UCLA shooting, it would have been far costlier to disbelieve rumors about multiple assailants if those rumors had proven true, than it was to believe them and have that information turn out to be false.

The overregulation of threat sensitivity compared to the actual rate of threat is just one manifestation of the broader asymmetry between costs and benefits, and many organisms, including humans, exhibit a general negativity bias (Cacioppo & Bernston, 1999; Garcia et al., 1974; Rozin & Royzman, 2001). For instance, in humans, negative information is more salient, memorable, and likely to elicit negative emotions (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Ito et al., 1998; Rozin & Royzman, 2001). Considering its widespread phylogenetic distribution, negativity bias likely serves an important adaptive purpose. Because threats are often imminent, highly costly, and preclude acting on opportunities, organisms are oriented to attend to and respond more quickly to perceived threats versus other kinds of information (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Rozin & Royzman, 2001). Failing to act on a potential benefit generally has lower fitness costs than failing to act on a potential threat, because of the asymmetry in costs between ignoring fitness-reducing events versus ignoring fitness-enhancing events. Further, environmental differences, individual differences, and contextual differences should all titrate the optimal level of negativity bias. Imminently dangerous contexts, for instance, may adjust what level is optimal. The smoke detector principle (Nesse, 2006) demonstrates why organisms should be disproportionally willing to believe in and act on potential threats, even though it comes at the expense of generating more false positives. Likewise, general negativity bias illustrates why threat information more broadly should elicit a stronger response from the organism versus other kinds of information.

While negativity bias applies when organisms are assessing the validity of any kind of information, human reliance on cumulative culture and cultural transmission raises special considerations. We should expect humans to have specific adaptations tailored to our acquisition of cultural information (Fessler, 2006), including psychological mechanisms related to assessing the value and reliability of culturally transmitted information. Because causal efficacy is frequently opaque for cultural information (Henrich, 2011; Zwirner & Thornton, 2015), individuals need to be credulous of socially transmitted information to take advantage of important cultural knowledge, the utility of which may not be apparent to the learner (Fessler, Pisor, & Navarrete, 2014; Fessler, Pisor, & Holbrook, 2017). However, being excessively credulous is detrimental. In addition to the costs of believing and acting on false information, overly-credulous individuals risk exploitation (Kurzban, 2007). Consequently, individuals need to calibrate their credulity to the relative costs and benefits of belief versus non-belief. Negativity bias shows that not all types of information are created equal, and information about hazards should be considered differently than information about benefits. Therefore, individuals ought to calibrate the trade-off between the benefits and costs of credulity according to the type of information being presented. When culturally transmitted information concerns hazards, mistaken credulity is costlier than mistaken incredulity, because of the asymmetry between the costs of unnecessary vigilance versus the much larger costs of injury or death after disregarding a threat (Fessler, Pisor, & Navarrete, 2014; Fessler, Pisor, & Holbrook, 2017). When culturally transmitted information concerns benefits, there is no obvious systematic asymmetry in costs between erroneous credulity and erroneous incredulity. This theory predicts that people should more readily believe culturally transmitted information as true when that information relates to hazards rather than benefits. Indeed, research shows that when statements are framed as

culturally transmitted, individuals are more credulous of them when they concern hazards than whey they concern benefits (Fessler, Pisor, & Navarrete, 2014; Fessler, Pisor, & Holbrook, 2017; see also Hilbig, 2009, 2012a, 2012b).

Because fear fosters information-gathering in the face of imminent threats, it may affect other information processes such as negatively biased credulity. Fear may shift the optimal level of credulity when assessing information because of the conditions imposed by the threatening situation. For instance, because hazards frequently co-occur (Fessler, Pisor, & Holbrook, 2017), the presence of one threat may be predictive of the presence of further threats. In light of the greater likelihood of future harm, individuals may facultatively upregulate their credulity for hazard information during periods of threat.

Experimental results confirm that trait-based differences in threat susceptibility influence hazard credulity judgements. Conservatives—who display greater threat and negativity bias (Hibbing et al., 2014; Lilienfeld & Latzman, 2014)—show more pronounced negatively biased credulity (Fessler, Pisor, & Holbrook, 2017). Further, state differences in threat bias also influence information processing. In the wake of 9/11, people primed to experience fear—but not anger—in conjunction with the threat of terrorist attacks rated future terrorist attacks as probable (Lerner & Keltner, 2001; Lerner et al., 2003). Considering that credulity and other information-assessing processes can be shaped by both individual differences and state fear during imminent threats, I investigated whether fear triggered by the imminent threat of violence would have specific effects on credulity judgements. Further, I contrasted fear with another threat-related emotion—anger—to evaluate the domain-specific effects of threat-related emotions on information gathering processes such as credulity.

During periods of imminent violence, threat-related information is often relayed via cultural transmission processes, as was the case during the UCLA shooting. Therefore, individuals are likely activating credulity heuristics to assess the believability of information in those situations. Because the risk of harm is imminent, and culturally transmitted information might contain fitness-relevant information as to the nature of current and future threats, the optimal level of credulity should shift in favor of a higher susceptibility to believe hazard-related information. I expect this effect to be quite broad, with increased hazard credulity across a wide variety of threat domains unrelated to the source of the current, imminent threat. First, threats frequently occur together, so hazard credulity for diffuse domains of threat may be upregulated. Second, fear may be upregulating credulity for hazards unrelated to the domain of the threat as a byproduct. While the intended function of the mechanism could be to increase hazard credulity only for information related to the imminent threat, constraints on optimality might render the effect broader, so that hazard credulity is increased across all domains.

In sum, I predicted that people confronted with imminent, violent threats who experience fear—but not anger—will be more credulous of hazard information. Further, the effects of fear on credulity should not be limited to hazard domains linked to the source of the threat, but that fear will would instead increase hazard credulity across a wide variety of domains. Finally, I expected to replicate the general effect of negatively biased credulity.

CHAPTER 2

METHODS AND RESULTS

2.1 STUDY 1

2.1.1 Methods

Participants. In May 2017, 603 U.S. participants were recruited via Amazon's Mechanical Turk (participants were required to have completed at minimum 500 previous tasks on Mechanical Turk at a 95% approval rating). Participants were paid $1.50. Data were prescreened for age, minimal completeness, repeat participation, correct responses to catch questions, and technical issues. The final sample consisted of 510 adults (49% female; 81% White) ranging in age from 19 to 74 years (mean age = 37.68, *SD* = 11.66).

Materials and procedure. Participants were randomly assigned to one of three conditions: a control condition, a conflict-anger condition, and a conflict-fear condition. In the control condition, participants watched a 30-second video of people bicycling and jogging in New York City's Central Park. In the two experimental conditions, participants watched a 30-second video of the Boston Marathon terrorist bombing, and were primed either with fear or anger using methods adopted from Lerner and colleagues (2003). For the sake of simplicity, I will refer to the attempted elicitations of violent, imminent threats in conjunction with fear and anger as, respectively, "conflict-fear" and "conflict-anger" elicitations. In the conflict-anger condition, participants were asked to focus on their anger while watching the video, and subsequently describe which aspects of the video made them angry. Participants in the conflict-fear condition were given the same framing, but fear was substituted for anger (for the full text, see the Supplemental Materials). Participants then rated how strongly they felt fear, anger, sadness, and boredom while watching the video, using a scale from 1 to 5 (1 = *Not at all*, 5 = *Extremely*).

Next, I created a 40-statement credulity assessment measure modeled after the credulity scale used by Fessler and colleagues (2017). Although all of the statements were designed to appear plausible, they were actually false in order to control for variation amongst participants in prior knowledge about certain facts being true. However, in order to honestly inform participants that some of the statements were true, one factual statement was included in the scale and later excluded from analysis. The 40 statements fell into 20 categories, and, for each category, one statement was framed as a benefit, and the other statement was framed as a hazard, e.g., "Due to tidal conditions, albacore tuna from the Atlantic Coast is [*lower/ higher*] in toxic mercury than albacore caught in most other regions" (for the complete instrument, see the Supplemental Materials). The credulity statements were presented to participants as excerpts from the media. Participants judged truthfulness on a scale from 1 to 7 (1 = *I'm absolutely certain this statement is FALSE,* 7 = *I'm absolutely certain this statement is TRUE*).

While Fessler and colleagues' 2017 approach paired credulity statements in comparable domains (e.g. "Eating carrots results in significantly improved vision" versus "Kale contains thallium, a toxic heavy metal, that the plant absorbs from the soil"), I sought to improve on this method by more closely matching the benefit and hazard statements for each category. Toward that end, instead of pairing items based on thematic domains, the benefit/hazard pairs in this scale contained identical core claims, varying only with regard to whether the claim was framed as a benefit or as a hazard. This approach more tightly controlled for variation in inherent plausibility between the items. Because the core claims are the same within pairs, any difference in believability between the two versions can be more confidently attributed to the benefit/hazard framing. Unlike some previous credulity work (Fessler, Pisor, & Holbrook, 2017), participants did not rate the magnitude of the benefit or harm of the credulity statements, to save time and

because the tight balancing of benefit and hazard statements lends reason to believe magnitude should not significantly vary between versions. In addition, Fessler and colleagues (2017) have previously found no effect of magnitude ratings on credulity effects.

Because the hazard and benefit versions of each statement contradicted each other, participants only saw either the benefit or hazard statement for any given category. Therefore, individual participants only rated 20 credulity statements. Participants were randomly assigned to rate either the benefit or hazard version of each category, but participants always rated a total of 10 benefit statements and 10 hazard statements. Credulity statements were presented in semi-random order.

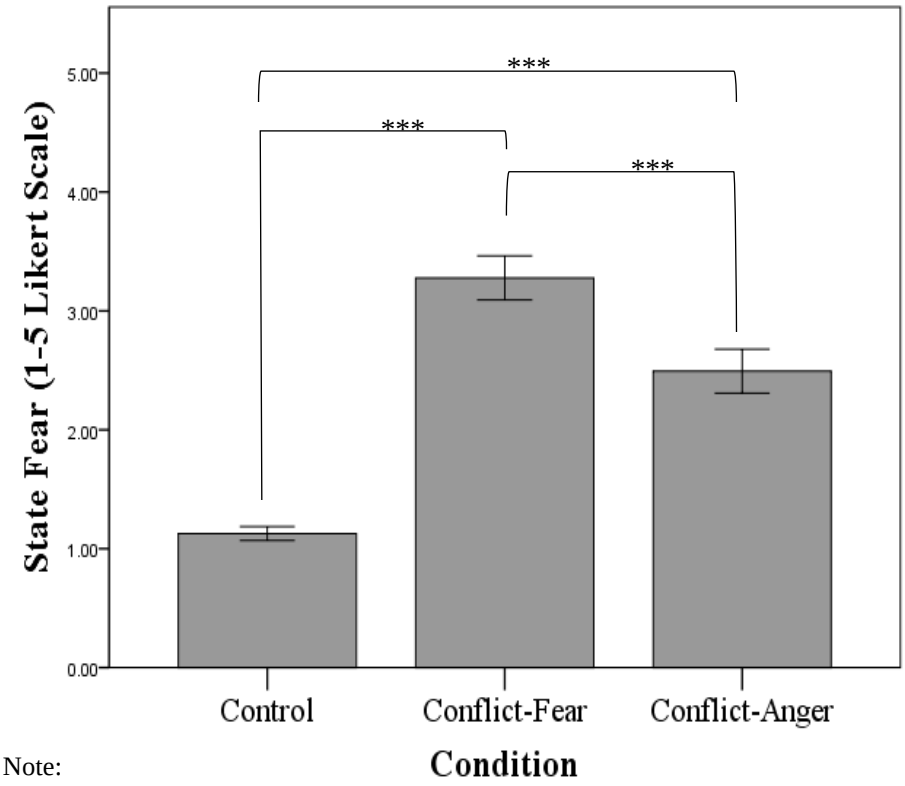
Finally, participants completed a series of check questions designed to assess participant attention, English comprehension, and whether any technical difficulties or distractions occurred during the study. Participants then completed demographic information, including sex, age, and ethnicity. See the Supplemental Material for the complete survey.

2.1.2 Results

Effect of condition on state affect. A series of ANOVAs were used to determine whether the conflict-fear and conflict-anger conditions predicted greater state fear and state anger, respectively, relative to the other conditions. There was a statistically significant difference between conditions for state fear, $F(2,507) = 215.85$, $p < .001$, $\eta^2_p = .460$. Planned contrasts revealed that state fear was significantly lower in the control condition compared to both the conflict-fear and conflict-anger conditions (see Figure 1). Further, state fear was also

significantly higher in the conflict-fear prime compared to the conflict-anger prime (see Figure 1).

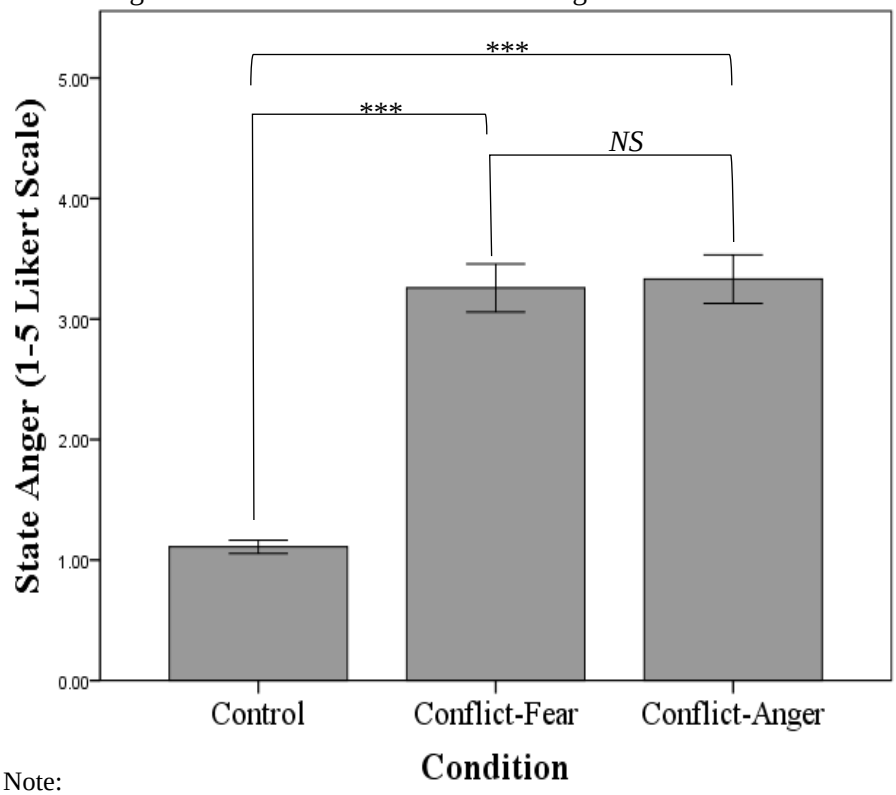
Figure 1. Effect of condition on state fear



Note:
Error Bars: 95% CI
*** = $p < .001$

There was also a statistically significant difference between conditions for state anger, $F(2,507) = 250.67$, $p < .001$, $\eta^2_p = .497$. However, while planned contrasts revealed that state anger was significantly lower in the control condition compared to the conflict-fear and conflict-anger conditions (see Figure 2), there was no significant difference in state anger between the conflict-fear and conflict-anger conditions.

Figure 2. Effect of condition on state anger



Note:
Error Bars: 95% CI
*** = $p < .001$
NS = $p > .05$

Effect of condition on hazard credulity: An ANOVA was used to test the hypothesis that hazard credulity would be higher in the conflict-fear condition versus the conflict-anger and control conditions. Predictions were partially confirmed. There was a statistically significant main effect of condition on mean hazard credulity ratings between the three conditions, $F(2,507) = 4.00$, $p < .05$, $\eta^2_p = .016$. However, while planned contrasts revealed that hazard credulity was significantly higher in the conflict-fear condition ($M = 3.71$, $SD = .62$) versus the control condition ($M = 3.52$, $SD = .61$, $t(507) = 2.82$, $p < .05$, $d = .31$), there was no significant difference between the conflict-fear condition and the conflict-anger condition ($M = 3.60$, $SD = .63$, $t(507) = 1.53$, $p = .13$, $d = .18$). Hazard credulity in the conflict-anger condition was not

significantly higher than hazard credulity in the control condition ($t(507)$ = 1.20, p = .23, d = .13).

Effect of state affect on hazard credulity: I next assessed whether state fear or state anger were associated with hazard credulity using a multiple linear regression to assess the unique contribution of each emotion. A significant relationship was observed between state fear and hazard credulity, but not between state anger and hazard credulity (see Table 1).

Table 1

Effects of State Fear and Anger on Hazard Credulity Assessments

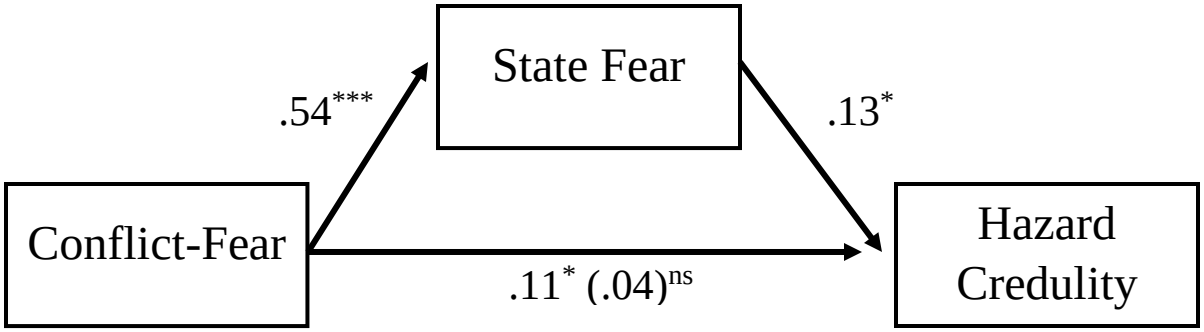
	b	*SE*	*β*	*p*
State Fear	.08	.03	.17	.005
State Anger	-.01	.03	-.02	.744

Note: N = 507.

State fear mediates the effect of conflict-fear prime on hazard credulity: A mediation test was conducted to assess whether elevated state fear mediated the effect of the conflict-fear prime on hazard credulity. The bias-corrected bootstrapping procedure (5,000 samples) found in the PROCESS macro for SPSS (Hayes, 2017) was utilized. Condition was entered as the independent variable, state fear as the mediating variable, and hazard credulity as the dependent variable. State fear fully mediated the effects of the conflict-fear prime on hazard credulity ratings (see Figure 3). The direct effect of the conflict-fear prime on hazard credulity judgments (b = .09, SE = .04, β = .11, p = .01) was no longer significant in the model (b = .06, SE = .07, β = .04, p = .42), whereas the indirect effect of state fear on hazard credulity judgments remained

significant (b = .06, SE = .02, β = .13, p = .01), and the confidence intervals did not overlap with zero (95% CI = [.01, .11].

Figure 3. Standardized regression coefficients for the relationship between the conflict-fear condition and hazard credulity ratings as mediated by feelings of fear.



Note:
***= $p < .001$
* = $p < .05$
ns = $p > .05$

Item-by-item robusticity check: Finally, to test the robusticity of the previous results, a MANOVA was conducted to probe potential effects of condition on the individual hazard credulity measure items. A significant effect of condition was found on only one individual hazard credulity item ($F(2,253) = 3.63$, $p < .05$, $\eta^2_p = .028$). No significant effects of condition were observed on any other hazard credulity items (Fs .14-3.00, ps .052-.868, η^2_ps .001-.023).

I next assessed potential associations between state fear and each individual hazard credulity item, using partial correlations controlling for co-varying state anger, as state anger and state fear were highly correlated (r = .66, $p < .001$). Three hazard credulity items were found to be significantly correlated with state fear (rs .13-.17, ps .006-.046), whereas the other 17 hazard credulity items were not associated with state fear (rs -.05-.11, ps .071-.901). After correcting for multiple contrasts using Bonferroni corrections, the three individual hazard credulity items

previously found to be significantly correlated with state fear were no longer significant (*p*s .06-.46).

Replication of negatively biased credulity: I also sought to replicate the general negatively biased credulity reported by Fessler and colleagues in 2014 and 2017. Because the conflict primes may have altered the main effect of hazard versus benefit credulity, only participants in the control condition were analyzed for this replication. A paired-samples T-test was used. However, the results failed to replicate negatively biased credulity. On a scale from 1-to-7, participants were significantly more likely to believe statements about benefits (M = 3.84, SD = .61) relative to statements about hazards (M = 3.52, SD = .64), $t(164) = 6.18$, $p < .001$, $d = .51$).

One potential issue with these results is the reliability of the credulity assessment. Further analysis of individual items showed that a number of hazard statements were at or near floor or in terms of participant believability ratings (see Table S1 in Supplemental Material for item-by-item mean credulity ratings). Further, mean credulity ratings for both benefit and hazard statements were substantially lower in Study 1 compared to the average ratings reported by Fessler and colleagues (2014; 2017). The preponderance of floor-effects—and the low plausibility of credulity statements in Study 1 in general—calls into question both the confirmation of the primary hypothesis, and the failure to replicate negatively biased credulity.

2.1.3 Discussion

While Study 1 largely produced results in the hypothesized direction, the results were fragile enough to warrant replication and a refining of the methods. First, although the conflict-fear condition elicited more fear than the conflict-anger condition, both conflict primes elicited the same amount of anger. This suggests that even with the focused-emotion design of the conflict primes, participants did not cleanly dissociate evoked fear and anger. Further, the lack

of differentiation in state anger between the conflict primes compromises the ability to parse the relative contributions of state fear and state anger on hazard credulity. Because emotions can be involuntary and difficult to control, it is possible that merely asking participants to consciously focus on either anger or fear was insufficient to suitably differentiate affective responses to the two conflict conditions. Second, although participants in the conflict-fear—but not conflict-anger—condition had significantly higher hazard credulity than participants in the control condition, there was no significant difference in hazard credulity between the two conflict primes. This can likely be attributed to the aforementioned affective uniformity between the conflict-fear and conflict-anger primes. However, state fear, but not state anger, was associated with hazard credulity across conditions, and state fear fully mediated the relationship between the conflict-fear prime and hazard credulity. Even if the conflict primes did a poor job of eliciting independent emotions, the unique contribution of state fear versus state anger to hazard credulity ratings lends confidence to the confirmatory results. Because of constraints on methods for evoking emotions in online research, and because state fear fully mediated the relationship with hazard credulity despite similarities between the conflict-fear and conflict-anger conditions, the same eliciting video and text were utilized in the next study.

Finally, in pursuing items whose framing was identical between hazard and benefit versions, I had inadvertently created credulity statements lacking in inherent plausibility (e.g. "Selecting credit cards that have a low APR worsens your credit score"). Resultantly, many of these implausible items had significant floor effects. The widespread lack of plausibility likely had a strong impact on general negatively biased credulity, potentially explaining why I failed to replicate previous findings. Therefore, I conducted a second study using an updated credulity assessment intended to produce normally distributed statement ratings.

2.2 Study 2

2.2.1 Methods

Participants: In July 2017, 801 U.S. participants were recruited via Amazon's Mechanical Turk (500 completed HITs, 95% approval). Participants were paid $1.50. Data were prescreened for age, minimal completeness, participants' first language being English, participants not completing the study on a cellphone, participants not being familiar with the research question, repeat participation, correct responses to catch questions, and technical issues. The final sample consisted of 638 adults (52% female; 79% White) ranging in age from 19 to 76 years (mean age = 38.09, *SD* = 12.25).

Materials and procedure. Participants were randomly assigned to one of the three conditions described in Study 1. Next, participants completed a new, 20-item credulity assessment designed to address the problems from Study 1. The assessment was a modified version of the credulity scale created by Fessler and colleagues (2014), and its format differed substantially from the scale used in Study 1. First, the information presented in the statements was phrased using statistics instead of adjectives (e.g. "On average, four years after opening, 44% of small businesses are turning a profit and still in business"). Second, items in Study 1 began with the same base statement in both the benefit and hazard versions: what varied was whether said statement resulted in a harm or a benefit. In Study 2, the benefit and hazard versions expressed the exact same overarching statistic. In one version, the explanatory prose frames that statistic as a benefit, and in the other version, frames it as a hazard:

> *Hazard:* "On average, four years after opening, 44% of small businesses are turning a profit and still in business."

Benefit: "On average, four years after opening, 66% of small businesses have failed to turn a profit and have gone out of business."

Whereas Study 1 presented two diametrically opposed facts for each category, Study 2 presented the same fact framed either positively or negatively.

The 20 items were grouped into 10 categories, and participants were randomly assigned to rate either the benefit or hazard version for each category. Participants rated 5 benefit statements, and 5 hazard statements. Finally, participants answered attention checks and demographic information before concluding the study. For the complete survey, see the Supplemental Material.

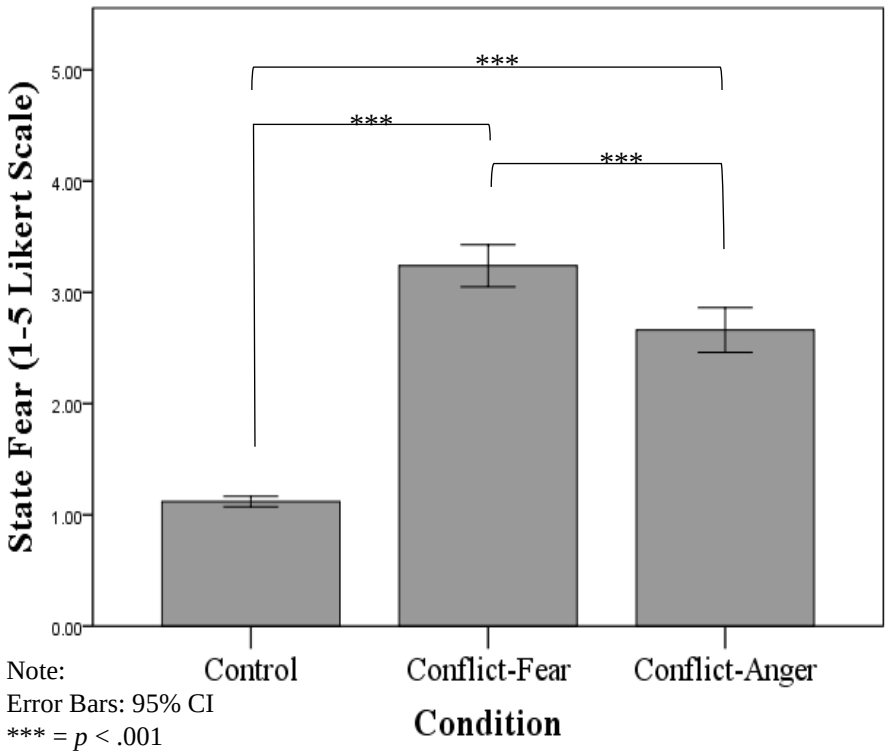
2.2.2 Results

Effect of condition on state affect. A series of ANOVAs were used to determine whether the conflict-fear and conflict-anger conditions predicted greater state fear and state anger, respectively, relative to the other conditions. There was a statistically significant difference between conditions for state fear, $F(2,434) = 190.74$, $p < .001$, $\eta^2_p = .468$. Planned contrasts revealed that state fear was significantly lower in the control condition compared to both the conflict-fear and conflict-anger conditions (see Figure 4). Further, state fear was also significantly higher in the conflict-fear prime compared to the conflict-anger prime (see Figure 4).

There was also a statistically significant difference between conditions for state anger ($F(2,434) = 244.33$, $p < .001$, $\eta^2_p = .530$). However, while planned contrasts revealed that state anger was significantly lower in the control condition compared to the conflict-fear and conflict-

anger conditions (see Figure 5), there was no significant difference in state anger between the conflict-fear and conflict-anger conditions.

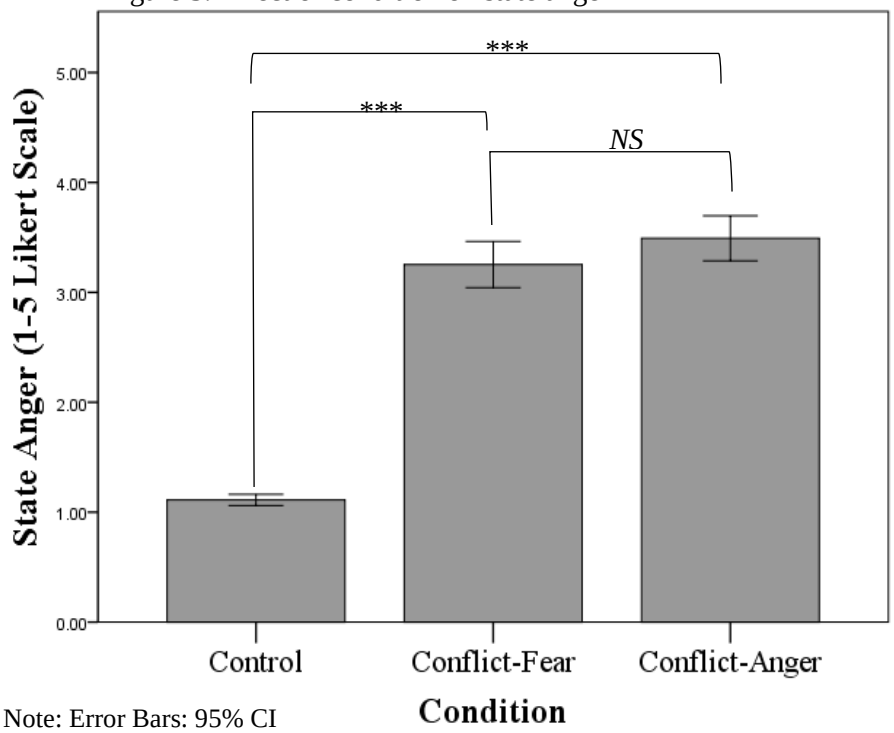
Figure 4. Effect of condition on state fear



Note:
Error Bars: 95% CI
*** = $p < .001$

Effect of condition on hazard credulity: An ANOVA was used to test the hypothesis that hazard credulity would be higher in the conflict-fear condition versus the conflict-anger and control conditions. Predictions were not confirmed. There was no statistically significant main effect of condition on mean hazard credulity ratings between the three conditions ($F(2,434) = .37$, $p > .500$, $\eta^2_p = .002$), and planned contrasts revealed no significant differences between any of the conditions (*p*s .665-.917).

Figure 5. Effect of condition on state anger



Note: Error Bars: 95% CI
*** = $p < .001$
NS = $p > .05$

Effect of state affect on hazard credulity: I next assessed whether state fear or state anger were associated with hazard credulity using a multiple linear regression to assess the unique contributions of each. I observed no significant relationships between state fear or state anger and hazard credulity (*p*s .36-.84, *b*s .007-.036, *SE*s .035-.039, *β*s .14-.061).

Replication of negatively biased credulity: Negatively biased credulity was evident: using a paired-samples T-test, participants were more likely to believe statements about hazards (M = 4.86, $SD.$ = .84) relative to statements about benefits (M = 4.42, SD = .81), a significant difference ($t(152) = 5.57$, $p < .001$, $d = .53$). Because the conflict primes may impact hazard versus benefit credulity ratings, only participants in the control condition were analyzed. Average credulity ratings were also more consistent with findings previously reported by Fessler

and colleagues (2014; 2017). Additionally, there were no substantial floor effects (*M*s 3.42-5.30, *SD*s 1.28-1.85).

2.2.3 Discussion

In Study 2, the predicted association between fear and hazard credulity was not documented. On the one hand, it is possible that the confirmatory results from Study 1 were a fluke. However, it is also possible that systematic differences between the credulity assessments in Studies 1 and 2 contributed to the non-replication. In particular, the differing complexity of the items stands out as a discrepancy between the two scales. In Study 1, hazard and benefit information was described using vague adjectives such as "more" and "worse". Additionally, statements from Study 1 involved short exposition and little explanation. However, in Study 2, claims were presented using statistical percentages and generally longer explanatory prose.

Previous research demonstrates that the effects of emotions elicited by priming are reduced when participants solve math problems and other cognitively demanding tasks (Berggren et al., 2013; DeFraine, 2016; Lerner et al., 2003). It is conceivable that numbers and complex prose block the intuitive effect of the conflict-fear prime on credulity assessments, hence the lack of replication in Study 2. Therefore, a third study was conducted that systematically investigated the differences between complex statistical statements and simple, non-statistical statements. In Study 3, a conflict-anger prime was not utilized. First, Studies 1 and 2 showed no association between hazard credulity and the conflict-anger prime, and the primary hypothesis concerns the relationship between hazard credulity and the conflict-fear prime. Second, reducing the number of conditions increased the power of the study.

Conflict-fear was predicted to be associated with simple hazard credulity, but not complex hazard credulity. Additionally, despite failing to replicate the previous findings, Study

2 did improve on its predecessor by avoiding the implausibility and floor effects that beset Study 1. Consequently, the credulity assessment in Study 3 preserved the general structure of that employed in Study 2.

2.3 Study 3

2.3.1 Methods

Participants: During September of 2017, 801 U.S. participants were recruited via Amazon's Mechanical Turk (500 completed HITs, 95% approval). Participants were paid $0.80. Data were prescreened for age, minimal completeness, participants' first language being English, not completing the study on a cellphone, not being familiar with the research question, taking at least one minute to complete the study, repeat participation, correct responses to catch questions, and technical issues. The final sample consisted of 561 adults (50% female; 73% White) ranging in age from 18 to 75 years (mean age = 37.89, *SD* = 11.61).

Materials and procedure. Participants were randomly assigned to either the control condition or the conflict-fear prime. In order to test whether the cognitive complexity of some items was suppressing the intuitive effect of the fear prime on hazard credulity, a new, 40-item credulity scale was created that systematically compared the effects of complexity on credulity judgments. The credulity scale was comprised of 10 categories, and each category contained four statements; a simple benefit statement, a complex benefit statement, a simple hazard statement, and a complex hazard statement. Complex items mirrored the format of credulity statements from Study 2: the benefit and hazard statements for each category contain the exact same statistic, only one is framed positively, and the other negatively:

Hazard: "Civil litigation is a time consuming and expensive process. When civil litigation cases go to trial, 60% of plaintiffs lose their cases and have to pay attorney's fees."

Benefit: "Civil litigation is a time consuming and expensive process. However, when civil litigation cases go to trial, 40% of plaintiffs ultimately win their cases and are awarded settlements that include their attorney's fees."

Compared to the simple credulity statements (see below), additional detailed explanatory prose was added to increase complexity. Benefit and hazard versions of simple statements also expressed congruent information. However, hazards and benefits were described with vague adjectives instead of statistics, and statements contained minimally descriptive text (e.g., "When civil litigation cases to go trial, many plaintiffs win [most plaintiffs lose]"). These qualities diminished the cognitive complexity of simple items. See Supplemental Materials for full comparison between complex and simple statements.

Participants were randomly assigned to rate only a single hazard/benefit simple/complex pairing for any given category, consequently each participant rated a total of 10 statements; 5 benefit items, and 5 hazard items. It is possible that the hypothesized emotion-blocking effect of complex items could bleed over to simple items if rated side-by-side. Therefore, simple and complex items were rated together, and the order of presentation was randomly counterbalanced across participants. Finally, participants answered study check questions and demographics. For the complete survey, see the Supplemental Materials.

2.3.2 Results

Effect of condition on state affect. A series of ANOVAs were used to determine whether the conflict-fear condition predicted greater state fear relative to the control condition. Participants

in the conflict-fear condition experienced significantly more state fear than participants in the control condition ($F(1,584) = 837.76$, $p < .001$, $\eta^2_p = .589$). Further, anger was also significantly higher in the conflict-fear condition relative to the control condition ($F(1,584) = 1157.77$, $p < .001$, $\eta^2_p = .665$).

Effect of condition on hazard credulity: A series of ANOVAs were used to test the hypothesis that simple hazard credulity—but not complex hazard credulity—would be higher in the conflict-fear condition versus the control condition. Predictions were confirmed. There was a statistically significant main effect of condition on mean simple hazard credulity ratings, $F(1,286) = 7.49$, $p < .05$, $\eta^2_p = .026$, but no effect of condition on mean complex hazard credulity ratings, $F(1,293) = .02$, $p > .05$, $\eta^2_p < .001$.

Effect of state affect on hazard credulity: I next assessed whether state fear was associated with simple and complex hazard credulity using a series of linear regressions to assess their unique contributions. A significant relationship was observed between state fear and simple hazard credulity, but not between state fear and complex hazard credulity (see Table 2).

Table 2

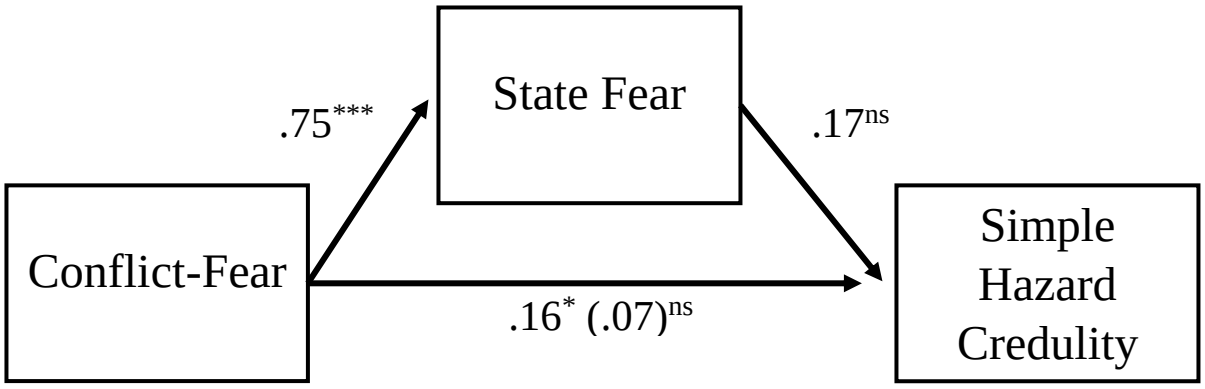
Effects of State Fear on Simple and Complex Hazard Credulity Assessments

	b	*SE*	*β*	*p*
Simple Hazard Credulity				
State Fear	.09	.03	.17	.003
Complex Hazard Credulity				
State Fear	-.01	.03	-.03	.643

Note: Simple hazard credulity: $N = 286$. Complex hazard credulity: $N = 293$.

State fear's mediation of the effect of conflict-fear prime on simple hazard credulity: A mediation test was conducted to assess whether elevated state fear mediated the effect of the conflict-fear prime on simple hazard credulity. The bias-corrected bootstrapping procedure (5,000 samples) found in the PROCESS macro for SPSS (Hayes, 2017) was utilized. Condition was entered as the independent variable, state fear as the mediating variable, and simple hazard credulity as the dependent variable. State fear did not mediate the effect of the conflict-fear prime on simple hazard credulity ratings (see Figure 6). The direct effect of the conflict-fear prime on simple hazard credulity judgments (b = .14, SE = .10, β = .16, p = .007) was no longer significant in the model (b = .10, SE = .13, β = .07, p = .458), but the indirect effect of state fear on hazard credulity judgments was also not significant (b = .06, SE = .05, β = .17, p = .168), and the confidence intervals overlapped with zero (95% CI = [-.03, .16].

Figure 6. Standardized regression coefficients for the relationship between the conflict-fear condition and simple hazard credulity ratings as mediated by feelings of fear.



Note:
***= p < .001
* = p < .05
ns = p > .05

Item-by-item robusticity check: Finally, to test the robusticity of the previous results, a MANOVA was conducted to probe potential effects of condition on the individual simple hazard

credulity measure items. A significant effect of condition was found on two individual simple hazard credulity items (*F*s 6.29-10.45, *p*s .002-.013, η^2_ps .043-.069). No significant effects of condition were observed on any other simple hazard credulity items (*F*s .009-2.00, *p*s .159-.924, η^2_ps .000-.014).

I next assessed potential associations between state fear and each individual simple hazard credulity item, using partial correlations controlling for co-varying state anger, as state anger and state fear were highly correlated ($r = .78$, $p < .001$). Only one simple hazard credulity item was found to be significantly correlated with state fear ($r = .25$, $p = .003$), whereas the other 9 simple hazard credulity items were not associated with state fear (*r*s -.01-.10, *p*s .23-.95). After correcting for multiple contrasts using Bonferroni corrections, the single simple hazard credulity item previously found to be significantly correlated with state fear was still significant ($p = .03$).

Replication of negatively biased credulity: General negatively biased credulity was robustly replicated in the control condition. Using a paired-samples T-test, participants were more likely to believe simple statements about hazards ($M = 4.48$, $SD = .74$) relative to simple statements about benefits ($M = 3.67$, $SD = .79$), a significant difference ($t(185) = 10.517$, $p < .001$, $d = 1.06$). Likewise, participants were also more likely to believe complex statements about hazards ($M = 4.78$, $SD = .75$) relative to statements about benefits ($M = 4.37$, $SD = .82$), a significant difference ($t(193) = 6.092$, $p < .001$, $d = .52$)

2.3.3 Discussion

In Study 3, the predicted association between conflict-fear and simple hazard credulity was documented. Further, complex hazard credulity was not associated with conflict-fear, likely because cognitively complex reasoning hinders the effect of the emotion prime on credulity judgments. However, several results indicate that the positive correlation between fear and

simple hazard credulity should be considered tenuous. First, although the direct effect of the conflict-fear prime on simple hazard credulity was non-significant, the indirect effect of state fear—while trending in the predicted direction—was not significantly correlated with simple hazard credulity either. Second, item-by-item analyses showed that the relationship between fear and simple hazard credulity was driven by only a few items. Finally, due to an error, I also failed to pre-register the predictions for this study. Therefore, I conducted a final, preregistered replication of Study 3's findings.

2.4 Study 4

2.4.1 Methods

Participants: In October 2017, 801 U.S. participants were recruited via Amazon's Mechanical Turk (500 completed HITs, 95% approval). Participants were paid $0.80. Data were prescreened for age, minimal completeness, participants' first language being English, participants not completing study on a cellphone, participants not being familiar with the research question, a study-completion time of at least one minute, repeat participation, correct responses to catch questions, and technical issues. The final sample consisted of 519 adults (54% female; 72% White) ranging in age from 18 to 80 years (mean age = 38.29, *SD* = 12.18).

Materials and procedure. I preregistered my predictions before collecting data for Study 4. Participants were randomly assigned to either the control condition or fear condition. Next, participants were presented with the hazard credulity items from Study 3, but not the benefit credulity items. Because hazard credulity was the domain of interest, and emotions such as fear decay quickly (Verduyn & Lavrijsen, 2015), eliminating the benefit items generated as short a credulity scale as possible. Participants were randomly assigned to view either the simple or

complex statement for any given category. The presentation order of complex and simple statements was randomly counterbalanced. Finally, participants completed both the study check and demographic questions used in the previous studies. For the complete survey, see the Supplemental Material.

2.4.2 Results

Effect of condition on state affect. A series of ANOVAs were used to determine whether the conflict-fear condition predicted greater state fear relative to the control condition. State fear was significantly higher in the conflict-fear condition relative to the control condition, $F(1,585) = 680.94$, $p < .001$, $\eta^2_p = .619$. Further, anger was also significantly higher in the conflict-fear condition relative to the control condition, $F(1,585) = 1248.61$, $p < .001$, $\eta^2_p = .681$.

Effect of condition on hazard credulity: A series of ANOVAs were used to test the hypothesis that simple hazard credulity—but not complex hazard credulity—would be higher in the conflict-fear condition versus the control condition. Predictions were not confirmed. There was no statistically significant main effect of condition on either mean simple or complex hazard credulity ratings (*F*s .77-.87, *p*s .353-.380, η^2_p*s* = .001).

Effect of state affect on hazard credulity: I next assessed whether state fear was associated with simple and complex hazard credulity using a series of linear regressions to assess their unique contributions. No significant relationship was observed between state fear and either simple or complex hazard credulity (*b*s .01-.03, *SE*s .02-.03, βs .02-.06, *p*s .159-.71).

2.4.3 Discussion

Although Study 3 had produced results in the predicted direction, item-by-item analyses suggested that the effect was likely small, and state fear failed to mediate the relationship

between conflict-fear and simple hazard credulity. Further, because of the mixed outcomes across Studies 1-3, it was especially important to replicate those results. Therefore, Study 4 was intended as a pre-registered, confirmatory replication of my previous findings. By failing to replicate the tenuous results from Study 3, the results of Study 4 make it clear that the conflict-fear prime does not reliably predict simple hazard credulity. It is possible that the removal of the benefit credulity items may have affected the results: if the predicted effects found in study 3 were reliant on participants' making contrasted judgements about both hazard and benefit statements, the failure to replicate here may have been a result of those contrasts being absent. Nevertheless, this caveat only reinforces the fragility of the positive associations found in studies 1 and 3, but whether this is due to methodological shortcomings including the weak and broad nature of the conflict-fear prime, or a real absence of any relationship between the variables of interest, remains uncertain.

CHAPTER 3

GENERAL DISCUSSION

Because multiple threats frequently co-occur—and the costs of disbelieving potential threats are high—I predicted that exposure to a threatening, fear-inducing prime would correlate with hazard credulity. Although results varied across the four studies, ultimately the predicted pattern was not consistently found. An additional prediction was also made based on results from Studies 1 and 2: because cognitively complex reasoning dampens the effects of primed emotions, I hypothesized that complex credulity statements would dampen the effect of the conflict-fear prime on hazard credulity assessments. Despite initial evidence supporting this hypothesis, these findings subsequently failed to replicate (see Table 3 for summary of findings across studies 1-4). Although results did not support the primary prediction, the principle pattern of negatively biased credulity as described by Fessler, Pisor, and Navarrette (2014) was replicated in Studies 2 and 3. Negatively biased credulity was not documented in Study 1, but a number of highly implausible items call the validity of that scale into question. Because benefit credulity was not collected, it was not possible to test negatively biased credulity in Study 4.

The results suggest that these effects may be highly sensitive to the individual items used to assess credulity. Even when I found predicted associations between hazard credulity and conflict-fear in Studies 1 and 3, the effects tended to be driven by only a handful of items. Although those results were robust to the exclusion of any one item, removing several items quickly degraded the effect found in Study 3. Because I was interested in whether conflict-fear upregulated hazard credulity across a wide variety of domains unrelated to the prime, the credulity assessments were deliberately designed to be as broad as possible. It is likely that unaccounted for random features of the items—which varied significantly given the large

domain diversity—had unexpected effects on the relationship between hazard credulity and conflict-fear. This could account for why I observed significant variation in results across studies, and why those positive results that I did find were driven by a minority of items. Further, considering the large number of unique credulity statements used over the four studies, I might expect some of the statements to be significantly associated with conflict-fear solely by chance, and not because of any real relationship.

Table 3

Summary of Findings

Predictions	*# of Studies Supported*
1. Conflict-fear prime elicits greater fear than conflict-anger prime	2 of 2
2. Hazard credulity higher in conflict-fear condition	2 of 4
3. State fear correlated with higher hazard credulity	2 of 4
4. State fear mediates relationship between conflict-fear and hazard credulity	1 of 4
5. Negatively biased credulity replicated	2 of 3

Note: Not every prediction was tested in every study, hence the total number of relevant studies varies by prediction.

The strength of the conflict-fear and conflict-anger primes is another limitation of my methods. Priming emotions is generally difficult in any experimental circumstance, and special considerations must be made (Harmon-Jones et al., 2007). Some emotions, like mirth, should be easier to genuinely elicit in participants. However, emotions such as fear are highly context dependent, and sensitive to cues of actual danger—studies can present genuinely humorous

content, but it is difficult, if not impossible, to make participants feel genuinely afraid (Gross & Levenson, 1995). Of course, primes do not have to be real in order to provoke a genuine emotional response. Rather, it can be assumed that the strength of the emotional response declines as the prime becomes a weaker facsimile of the intended real-world emotion-eliciting situation. Further, the experimental design employed to differentially elicit fear and anger relied on participants' conscious efforts to experience the target emotion. Such a design may do a poor job of penetrating the affective system. Relatedly, and consistent with the idea that imminent threats elicit a variety of functional emotional responses, there was little differentiation in affective responses between the conflict-anger and conflict-fear primes. In particular, the elicitation of state anger was as strong in the conflict-fear condition as it was in the conflict-anger condition, and in some studies, anger was in fact elicited more strongly than fear was within the conflict-fear prime. Taken in sum, it is difficult to make firm claims about the effects of state fear on hazard credulity assessments in either direction when we cannot be sure that the affective prime was properly parceling out the different threat-related emotions and eliciting the intended emotion.

In addition to the aforementioned limitations in eliciting fear, these studies have other features that might weaken the effect of the prime. Participants in all four studies completed the survey online, via Mechanical Turk, which may have weakened the impact of the primes because many participants likely experienced the eliciting prime in less-than-ideal circumstances. For instance, they may have watched the video in a small window, or they may have been multi-tasking, or they may have been in a public area full of distractions. Although I prescreened data with check questions asking whether participants were distracted, whether they listened to the video with sound, and whether they watched the video on a screen larger than a smartphone, the

commotion of real life likely inhibited immersion in the priming videos. The strongest affordance of using Mechanical Turk for this kind of research is the easy access to sufficiently large sample sizes. The shortcoming is that an ideal environment for the elicitation of elusive emotions and such contexts as conflict-fear cannot be ensured. As a result, I cannot eliminate the possibility that my failure to confirm the primary hypothesis was a result of poor emotion elicitation, and not a reflection of a true absence of a relationship between hazard credulity and conflict-fear.

Additionally, while I selected the Boston Marathon Bombing video to be maximally threatening and fear-inducing, it is not necessarily visceral for the average participant. Videos do provoke emotions in experimental settings (Rottenberg et al., 2007; Uhrig et al., 2016), and they offer affordances compared to other methods of eliciting affect: for instance, they lack deception and have higher ecological validity in auditory and visual domains (Gross & Levenson, 1995). However, videos cannot capture the full eliciting conditions of conflict-fear. Going forward, I plan to deploy methods that bolster emotion elicitation, both with any further work on conflict-fear and hazard credulity, and with future emotions research in general. Toward that end, virtual reality stimuli intended to elicit fear are being developed. Virtual reality is substantially more immersive than normal film. Users feel like they are they are in the middle of the video, can look around the video in 360 degrees, and have no visual distractions in their peripheral vision that cue a frame of reference outside the virtual world. Replicating my results using a stronger emotion elicitation would help adjudicate whether the null results were due to inferior methods, or an erroneous hypothesis.

If I obtained nulls because the hypothesis is truly false, and not an artifact of sensitivity to specific measures or a weak emotion elicitation, it would suggest that although conflict-fear

primes can impact information processing (Lerner & Keltner, 2001), the effect is specific to targets that match the eliciting threat. Assuming that the null is a true one, priming participants with a similar conflict-fear elicitation had no impact on credulity judgments whose domains are tangential to the source of the threat. This would imply that the effects of fear on information processing, especially as it relates to judgements about the accuracy of culturally transmitted information, are narrowly focused on hazards that match the domain of the eliciting threat. As a result, I suspect that, when using a prime such as that employed here, a credulity scale comprised of terrorism-related hazards would strongly correlate with conflict-fear, but that the diverse array of hazards presented in the credulity assessments here are too broad to be susceptible to the effects of the prime.

CHAPTER 4

CONCLUSION

Despite some results in the predicted direction, I was not able to reliably document a relationship between hazard credulity and conflict-fear. However, it is questionable whether the conflict-fear prime—a close-up video of the Boston Marathon bombing blasts—effectively elicited the target emotion. Therefore, future research with stronger emotion elicitations is needed to adjudicate whether the null results were a product of an erroneous hypothesis, or the product of ineffectual methods. Finally, although I did not confirm the primary hypothesis, two out of three studies replicated the overall effect of negatively biased credulity. This gives us confidence that credulity effects are a real phenomenon, and the development of more sophisticated methods should lead to future research on the ramifications of negatively biased credulity.

SUPPLEMENTAL MATERIALS

STUDY 1

Tables and Figures

Table S1

Item-by-item mean credulity ratings

	M	*SD*
Albacore-benefit	4.11	1.29
Albacore-hazard	4.43	1.21
Keyless entry-benefit	3.89	1.76
Keyless entry-hazard	4.00	1.78
Steel appliances-benefit	3.80	1.72
Steel appliances-hazard	3.81	1.70
Protein dense meals-benefit	3.58	1.59
Protein dense meals-hazard	3.63	1.74
Cat owners-benefit	4.55	1.69
Cat owners-hazard	2.54	1.42
Batteries-benefit	4.44	1.29
Batteries-hazard	3.17	1.31
Socks-benefit	3.15	1.59
Socks-hazard	4.09	1.58
Capsaicin-benefit	5.05	1.24
Capsaicin-hazard	3.61	1.58
Stockwood-benefit	3.74	1.17
Stockwood-hazard	3.37	1.41
Cleaning agents-benefit	3.56	1.39
Cleaning agents-hazard	4.41	1.37
Indoor exercise-benefit	3.41	1.44
Indoor exercise-hazard	3.19	1.64
Daycare-benefit	3.89	1.61
Daycare-hazard	3.38	1.61
Gastric bypass-benefit	3.65	1.46
Gastric bypass-hazard	3.91	1.27
Long distance running-benefit	4.13	1.69
Long distance running-hazard	4.35	1.54
Allergies-benefit	3.39	1.33
Allergies-hazard	3.07	1.43
Surgeons-benefit	3.43	1.43
Surgeons-hazard	3.00	1.40
Microwaves-benefit	3.41	1.36
Microwaves-hazard	3.43	1.38
Bicyclists-benefit	5.17	1.43
Bicyclists-hazard	4.04	1.93
Civets-benefit	3.94	1.30
Civets-hazard	4.54	1.24
APR-benefit	3.32	1.61
APR-hazard	2.15	1.23

Note: refer to full study design to match keywords to credulity items

Survey Materials

Emotion elicitation text:

Control condition:

This is a recording taken from a bicyclist in a park. This brief video provides a sense of what it is like to ride a bicycle.

Watch the flow of people, and try to notice details such as the scenery. Can you guess in what country and year this video was taken?

Please watch carefully and make sure you have the sound on.

Later, you will be asked questions about what you see.

Conflict-fear condition:

The Boston Marathon attack evoked a lot of emotion in Americans. We are particularly interested in what makes you most AFRAID about the attack. Please watch the video below of the attack. As you watch, allow yourself to feel any FEAR that may arise.

Please watch carefully and make sure you have the sound on.

(If you do not want to see the terrorist attack, it is OK not to watch the video)

……..

Please describe in detail the one thing that makes you most AFRAID about the attack. Write as detailed a description of that thing as possible. If you can, write your description so that someone reading it might even get AFRAID from learning about the situation.

- What aspect of the terrorist attack makes you the most AFRAID?
- Why does it make you so AFRAID?

Conflict-anger condition:

The Boston Marathon attack evoked a lot of emotion in Americans. We are particularly interested in what makes you most ANGRY about the attack. Please watch the video below of the attack. As you watch, allow yourself to feel any ANGER that may arise.

Please watch carefully and make sure you have the sound on.

(If you do not want to see the terrorist attack, it is OK not to watch the video)

……..

Please describe in detail the one thing that makes you most ANGRY about the attack. Write as detailed a description of that thing as possible. If you can, write your description so that someone reading it might even get ANGRY from learning about the situation.

• What aspect of the terrorist attack makes you the most ANGRY?
• Why does it make you so ANGRY?

State affect scale:

	Not at all	A little	Moderately	Quite a bit	Extremely
Scared	○	○	○	○	○
Bored	○	○	○	○	○
Angry	○	○	○	○	○
Sad	○	○	○	○	○

Credulity Scale:

20 categories of credulity statements. For each category, one hazard version and one benefit version.

1. Civets
   Hazard: Civets are kept as pets in some parts of Indonesia, but they tend to be quite feisty. Pet civets have a higher rate of scratching or biting than many breeds of dog or cat.
   Benefit: Civets are kept as pets in some parts of Indonesia, and they tend to be quite friendly. Pet civets have a lower rate of scratching or biting than many breeds of dog or cat.

2. Gastric Bypass
   Hazard: Gastric bypass surgery increases the risk of colon cancer.
   Benefit: Gastric bypass surgery improves colon health.

3. Albacore

Hazard: Due to tidal conditions, albacore tuna from the Atlantic Coast is higher in toxic mercury than albacore caught in most other regions.
Benefit: Due to tidal conditions, albacore tuna from the Atlantic Coast is lower in toxic mercury than albacore caught in most other regions.

4. Cat owners
   Hazard: On average, people who own cats have shorter lifespans than people who don't.
   Benefit: On average, people who own cats have longer lifespans than people who don't.

5. Long-distance running
   Hazard: Long-distance running causes osteoarthritis of the joints.
   Benefit: Long-distance running builds up joint strength.

6. Protein-dense meals
   Hazard: Eating small, protein-dense meals just before sleep interferes with weight loss.
   Benefit: Eating small, protein-dense meals just before sleep improves weight loss.

7. APR
   Hazard: Selecting credit cards that have a low APR worsens your credit score.
   Benefit: Selecting credit cards that have a low APR improves your credit score.

8. Stockwood
   Hazard: Stockwood, California is one of the most dangerous cities in the U.S.
   Benefit: Stockwood, California is one of the safest cities in the U.S.

9. Batteries
   Hazard: Storing batteries in low-static environments decreases their performance.
   Benefit: Storing batteries in low-static environments improves their performance.

10. Indoor exercise
    Hazard: On average, exercising indoors leads to less effective workouts.
    Benefit: On average, exercising indoors leads to more effective workouts.

11. Microwaves
    Hazard: Compared to microwave ovens operating at 10.25 GHz, those operating at 10.30 GHz are more likely to disrupt cell phones in the house.
    Benefit: Compared to microwave ovens operating at 10.25 GHz, those operating at 10.30 GHz are less likely to disrupt cell phones in the house.

12. Surgeons
    Hazard: Surgery performed by doctors under the age of 40 produces worse outcomes than any other age group of doctors.

Benefit: Surgery performed by doctors under the age of 40 produces better outcomes than any other age group of doctors.

13. Daycare

Hazard: Infants who spend most of their time in daycare learn to walk later than infants who spend most of their time at home.
Benefit: Infants who spend most of their time in daycare learn to walk sooner than infants who spend most of their time at home.

14. Bicyclists

Hazard: Even in heavy city traffic, bicyclists traveling several miles typically take longer to arrive at their destination than motorists traveling the same distance by car.
Benefit: In heavy city traffic, bicyclists traveling several miles typically arrive at their destination more quickly than motorists traveling the same distance by car.

15. Capsaicin

Hazard: Capsaicin, the compound that makes chili peppers spicy, harms helpful bacteria in the gut's microbiome.
Benefit: Capsaicin, the compound that makes chili peppers spicy, actually benefits helpful bacteria in the gut's microbiome.

16. Socks

Hazard: People who do not wear socks with their shoes are at a higher risk for developing ingrown toenails.
Benefit: People who do not wear socks with their shoes are at a lower risk for developing ingrown toenails.

17. Cleaning agents

Hazard: Some products marketed as cleaning agents for auto interiors contain chemicals that make the nylon in seatbelts wear out faster.
Benefit: Some products marketed as cleaning agents for auto interiors contain chemicals that make the nylon in seatbelts last longer.

18. Steel appliances

Hazard: Over time, frequently washing stainless steel appliances tends to increase rust and corrosion
Benefit: Over time, frequently washing stainless steel appliances helps to prevent rust and corrosion.

19. Allergies

Hazard: Women who have had multiple pregnancies are more likely to bear children who later suffer from food allergies.
Benefit: Women who have had multiple pregnancies are less likely to bear children who later develop food allergies.

20. Keyless entry

Hazard: Remote keyless entry systems have made it easier for thieves to steal cars.

Benefit: Remote keyless entry systems have made it more difficult for thieves to steal cars.

Study Checks:

1. Which of the following did you see in the video (Choose all that apply):
    a. Kittens
    b. Trucks
    c. Flags
    d. Fish
    e. Bicyclists
    f. Ocean
    g. Runners
    h. Explosions
2. How many letters are in the English alphabet?

3. Did you watch all of the video?
   (Please answer truthfully! If for any reason you did not watch all of the video, this will not affect your payment but letting us know will greatly improve the study.)
    a. Yes
    b. No
4. Were you able to listen to the video with sound?
    a. Yes
    b. No
5. During the study, did technical problems or occurrences in your environment (e.g., loud noises, phone calls) cause significant distraction?
    a. Yes
    b. Somewhat
    c. No
6. Have you participated in this study, or one very similar to it, before?
    a. Yes
    b. No
    c. I'm not sure
7. Before participating in this study, had you previously heard about research on belief in claims about potential harms or benefits?
    a. Yes
    b. No
    c. I'm not sure
8. Were you, or someone close to you, living in Boston or the surrounding area during the time of the 2013 Boston Marathon bombings?
    a. Yes

    b. No
9. When you look up on a clear day, what color is the sky?
    a. Cereal bowl
    b. Turkey
    c. Blue
    d. Train station
    e. Orange juice
    f. Laptop
    g. Cardboard box
10. What sort of computer are you using to participate?
    a. Desktop
    b. Laptop / Notebook
    c. Tablet
    d. Smartphone

Demographics:

1. Please enter your age in years
2. Your ethnicity?
    a. Black / African American
    b. Asian / Asian American
    c. Hispanic / Latino
    d. Middle Eastern
    e. White / European
    f. Native American
    g. Pacific Islander
    h. More than one
    i. Other
3. Your gender?
    a. Female
    b. Male
    c. Other / prefer not to say
4. What is your approximate income in US Dollars?
5. Your highest level of education completed?
    a. Elementary / Middle School
    b. High School or equivalent
    c. Some college, no degree
    d. Two-year degree / certificate
    e. Bachelor's degree
    f. Some graduate / professional school
    g. Ph.D. / M.D. / J.D.

STUDY 2

Survey Materials

Emotion elicitation text:

Same as study 1

State affect scale:

Same as study 1

Credulity Scale: 10 categories of credulity statements. For each category, one hazard version and one benefit version.

1. Small businesses
   Hazard: On average, four years after opening, 66% of small business have failed to turn a profit and have gone out of business.
   Benefit: On average, four years after opening, 44% of small businesses are turning a profit and still in business.

2. Civil litigation
   Hazard: When civil litigation cases go to trial, 60% of plaintiffs lose their cases and have to pay attorney's fees.
   When civil litigation cases go to trial, 40% of plaintiffs win their cases and are awarded settlements that include their attorney's fees.

3. German shepherds
   Hazard: German shepherds are a popular choice of dog breed. However, they have a reputation for being aggressive, and a recent study in the U.S. notes that this breed is responsible for 11% of dog attacks.
   Benefit: German shepherds are a popular choice of dog breed. Although they have a reputation for being aggressive, a recent study in the U.S. notes that other dog breeds are responsible for 89% of dog attacks.

4. LASIK
   Hazard: When it is successful, LASIK eye surgery can produce 20/20 vision. However, LASIK surgery leads to lasting complications—including double vision—in 5% of patients who undergo the procedure.
   Benefit: When it is successful, LASIK eye surgery can produce 20/20 vision. LASIK surgery leads to no lasting complications—such as double vision—in 95% of patients who undergo the procedure.

5. Short-term investing
   Hazard: Short-term momentum investors, who buy when high-performance stocks are on sale and sell when the market price of their stock increases, overestimate the strength of their strategy: critics argue that, due to changes in the market, the momentum strategy results in losses on 20% of stock purchases.

Benefit: Short-term momentum investors, who buy when high-performance stocks are on sale and sell when the market price of their stock increases, praise the strength of their strategy: proponents claim that the momentum strategy allows investors to profit on 80% of stock purchases.

6. Gardasil
   Hazard: Gardasil has been shown to protect women from types of human papilloma virus that cause the majority of cervical cancers. However, 7% of women who receive Gardasil experience side effects.
   Benefit: Gardasil has been shown to protect women from types of human papilloma virus that cause the majority of cervical cancers. 93% of women who receive Gardasil experience no side effects.

7. Allergies
   Hazard: 1% of people are allergic to peanuts and must not eat them despite their high fiber content.
   Benefit: 99% of people are not allergic to peanuts and can benefit from their high fiber content.

8. Chemotherapy
   Hazard: Chemotherapy, which can kill or slow the growth of tumor cells in many cancer patients, sometimes damages healthy cells also, causing side-effects such as infertility. Indeed, 30% of young people and 60% of people over 40 who undergo chemotherapy are subsequently infertile.
   Benefit: Chemotherapy, which can kill or slow the growth of tumor cells in many cancer patients, sometimes damages healthy cells also, causing side-effects such as infertility. However, 70% of young people and 40% of people over 40 who undergo chemotherapy do not suffer infertility.

9. Ground beef
   Hazard: Many people find rare ground beef patties delicious. However, 13% of ground beef patties contain bacteria that could cause illness if eaten rare.
   Benefit: Many people find rare ground beef patties delicious. Indeed, 87% of ground beef patties lack bacteria that could cause illness if eaten rare.

10. Logging
    Hazard: Although logging pays well, many people consider it a dangerous job. 5% of loggers experience serious or life-threatening injuries.
    Benefit: Although logging pays well, some people consider it a dangerous job. However, 95% of loggers do not experience serious or life-threatening injuries.

Study Checks:

Same as study 1

Demographics:

Same as study 1

STUDY 3

Survey Materials

Emotion elicitation text:

Same as study 1

State affect scale:

Same as study 1

Credulity Scale: 10 categories of credulity statements. For each category, a simple-hazard, simple-benefit, complex-hazard, and complex-benefit item.

1. LASIK
    Simple Versions:
        Hazard: Although LASIK eye surgery can sometimes produce 20/20 vision, it leads to lasting complications in a substantial number of patients who undergo the procedure.
        Benefit: LASIK eye surgery, which can produce 20/20 vision, does not lead to any lasting complications in the vast majority of patients who undergo the procedure.
    Complex Versions:
        Hazard: When it is successful, LASIK eye surgery can produce 20/20 vision. However, LASIK surgery leads to lasting complications—including double vision—in 5% of patients who undergo the procedure.
        Benefit: When it is successful, LASIK eye surgery can produce 20/20 vision. LASIK surgery leads to no lasting complications—such as double vision—in 95% of patients who undergo the procedure.

2. Chemotherapy
    Simple Versions:
        Hazard: A significant number of people become infertile as a side-effect of chemotherapy.
        Benefit: Almost all people do not become infertile as a side-effect of chemotherapy to treat cancer.
    Complex Versions:
        Hazard: Chemotherapy, which can kill or slow the growth of tumor cells in many cancer patients, sometimes damages healthy cells also, causing side-effects such

as infertility. Indeed, 30% of young people and 60% of people over 40 who undergo chemotherapy are subsequently infertile.

Benefit: Chemotherapy, which can kill or slow the growth of tumor cells in many cancer patients, sometimes damages healthy cells also, causing side-effects such as infertility. However, 70% of young people and 40% of people over 40 who undergo chemotherapy do not suffer infertility.

3. Litigation

Simple Versions:

Hazard: When civil litigation cases go to trial, most plaintiffs lose.

Benefit: When civil litigation cases go to trial, many plaintiffs win.

Complex Versions:

Hazard: Civil litigation is a time consuming and expensive process. When civil litigation cases go to trial, 60% of plaintiffs lose their cases and have to pay attorney's fees.

Benefit: Civil litigation is a time consuming and expensive process. However, when civil litigation cases go to trial, 40% of plaintiffs ultimately win their cases and are awarded settlements that include their attorney's fees.

4. Fishermen

Simple Versions:

Hazard: Commercial fishermen experience more serious injuries than workers in many other outdoor professions.

Benefit: Commercial fishing pays well, and fishermen experience fewer serious injuries than workers in many other outdoor professions.

Complex Versions:

Hazard: Although commercial fishing pays well, many people consider it a dangerous job. Indeed, 5% of commercial fishermen experience serious injuries, a rate higher than in many other outdoor professions.

Benefit: Although commercial fishing pays well, many people consider it a dangerous job. However, 95% of commercial fishermen experience no serious injuries, a better rate than in some other outdoor professions.

5. Investing

Simple Versions:

Hazard: Short-term momentum investors, who buy when high-performance stocks are on sale and sell as soon as the market price increases, often lose more money over time than investors who follow conventional strategies.

Benefit: Short-term momentum investors, who buy when high-performance stocks are on sale and sell as soon as the market price increases, often make more profit over time than investors who follow conventional strategies.

Complex Versions:

Hazard: Short-term momentum investors, who buy when high-performance stocks are on sale and sell when the market price of their stock increases, overestimate the strength of their strategy: critics argue that, due to changes in the market, the momentum strategy results in losses on 20% of stock purchases.
Benefit: Short-term momentum investors, who buy when high-performance stocks are on sale and sell when the market price of their stock increases, praise the strength of their strategy: proponents claim that the momentum strategy allows investors to profit on 80% of stock purchases.

6. Gardasil

Simple Versions:

Hazard: Many women who receive the Gardasil vaccine against cervical cancer also experience side effects.
Benefit: Most women who receive the Gardasil vaccine against cervical cancer do not experience side effects.

Complex Versions:

Hazard: Gardasil has been shown to protect women from types of human papilloma virus that cause the majority of cervical cancers. However, 7% of women who receive Gardasil experience side effects.
Benefit: Gardasil has been shown to protect women from types of human papilloma virus that cause the majority of cervical cancers. 93% of women who receive Gardasil experience no side effects.

7. Ground Beef

Simple Versions:

Hazard: Although many people find rare ground beef delicious, many ground beef patties contain bacteria that could cause illness if eaten rare.
Benefit: Many people find rare ground beef delicious. Most ground beef patties lack bacteria that could cause illness if eaten rare.

Complex Versions:

Hazard: Gardasil has been shown to protect women from types of human papilloma virus that cause the majority of cervical cancers. However, 7% of women who receive Gardasil experience side effects.
Benefit: Many people find rare ground beef patties delicious. However, 13% of ground beef patties contain bacteria that could cause illness if eaten rare.

8. Small businesses

Simple Versions:

Hazard: On average, four years after opening, a large percentage of small businesses have failed to turn a profit and have gone out of business.
Benefit: On average, four years after opening, a large percentage of small businesses are turning a profit and are still in business.

Complex Versions:

Hazard: Start-up costs and a difficult economic climate make starting a business difficult. On average, four years after opening, 66% of small businesses have failed to turn a profit and have gone out of business.

Benefit: Although start-up costs and a difficult economic climate make starting a business difficult, on average, four years after opening, 44% of small businesses are turning a profit and still in business.

9. Shepherds

Simple Versions:

Hazard: A recent study in the U.S. finds that, although German shepherds are a popular breed, they are responsible for more dog attacks than any other breed.

Benefit: A recent study in the U.S. finds that German shepherds, a popular breed, are responsible for only a small proportion of dog attacks.

Complex Versions:

Hazard: German shepherds are a popular choice of dog breed. However, they have a reputation for being aggressive, and a recent study in the U.S. notes that this breed is responsible for 11% of dog attacks.

Benefit: German shepherds are a popular choice of dog breed. Although they have a reputation for being aggressive, a recent study in the U.S. notes that other dog breeds are responsible for 89% of dog attacks.

10. Allergies

Simple Versions:

Hazard: Most children with Besnier prurigo disease must avoid peanuts because they can cause inflammation.

Benefit: Many children with Besnier prurigo disease can still enjoy peanuts without experiencing inflammation.

Complex Versions:

Hazard: 54% of children with Besnier prurigo disease—an auto-immune disorder—must avoid peanuts, despite their high fiber content, because they can cause inflammation.

Benefit: 46% of children with Besnier prurigo disease—an autoimmune disorder—can still eat peanuts, and benefit from their high fiber content, without experiencing inflammation.

Study Checks:

Same as study 1

Demographics:

Same as study 1

STUDY 4

Survey Materials

Emotion elicitation text:

Same as study 1

State affect scale:

Same as study 1

Credulity Scale:

Same as study 3, minus benefit items

Study Checks:

Same as study 1

Demographics:

Same as study 1

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