Involved but Inaccurate: When High-Stakes Lead To Anecdotal Bias

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Please also note that this manuscript is part of an ongoing project, the first part of which was submitted to a journal for review. The current manuscript overlaps with the first part of the project in studies 1 and 2; however, it extends the under-review paper by introducing individuals' thinking style as an important boundary condition for the visceral compatibility effect.

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ABSTRACT

Individuals often eschew more accurate statistical information in decision making, relying instead upon anecdotal evidence. The current research proposes that, contrary to what dual processing models predict, high involvement—when accompanied by high perceived vulnerability—can enhance an "anecdotal bias" rather than reduce it. We propose that this is primarily due to the *visceral compatibility effect*, wherein anecdotal information is favored in vivid decision environments. Four studies provide consistent support for this effect. Study 1 reconciles contradictory predictions, demonstrating that high involvement can decrease or enhance the anecdotal bias, depending on whether it is accompanied by high vulnerability. Study 2 replicates this finding in a different choice scenario and demonstrates that emotional engagement is the key mechanism underlying the visceral compatibility effect. Studies 3 and 4 reveal that analytic-holistic thinking style constitutes a boundary condition for this effect, with holistic thinkers exhibiting greater susceptibility to anecdotal bias than analytic thinkers.

Keywords: anecdotal bias, vulnerability, visceral compatibility effect, thinking style

1. Introduction

Imagine a situation where a decision maker has to choose from two alternate preventive medications to ward off a threatening disease. Assume that hearsay and anecdotal information favors one medication, while rigorous, statistically significant scientific evidence favors the other. Common sense rationality suggests that when the threat of such a disease is miniscule, either of the medications may be taken, but when vulnerability to the disease is perceived to be high, the choice is no longer inconsequential. In this case, one might imagine, better sense will prevail and the statistically proven medication would usurp the one which is merely supported by anecdotal evidence. That is, higher stakes would lead to better choices. In this paper, we provide evidence to the contrary. We demonstrate that greater likelihood of an event occurring can lead to more visceral decision making, which in turn can lead to suboptimal choices.

Understanding how information influences decision makers has been a subject of investigation for many decades. Researchers have demonstrated that—beyond just the amount of information—qualitative differences in information can affect how it is processed. Researchers have categorized information, exploring which types of information influence audience members more effectively and under which situations. For instance, the differential role of affective versus cognitive information in persuasion effectiveness has long been studied in marketing research (Petty, Cacioppo, and Schumann 1983). Message framing effects (e.g., "80% fat free" versus "20% fat"; "1/3 chance $600 will be saved and 2/3 chance of no money being saved" versus "$200 saved for certain") have been found to exert a significant impact on consumers' pre-purchase evaluations and post-purchase behavior (Levin and Gaeth 1988; Chandran and Menon 2004).

Another important qualitative distinction in information which is relatively

underexplored is that of anecdotal versus statistical[1] evidence. Simply put, anecdotal information describes a specific instance of a phenomenon or event, while statistical information provides a numerical summary of a series of instances (Rieke and Sillars 1984; Hornikx 2005). Anecdotal or narrative evidence usually takes the form of concrete, emotionally interesting information, such as a first-person account of someone who came to experience a particular condition that may also affect the message recipient. Typically, such narratives emphasize individuating information about a referent who is similar or compelling to the respondent. It has been suggested that, because such anecdotal testimonials enable a person to vicariously re-live an event, they exert strong emotional leverage on any subsequent decision about the event (Leiserowitz 2006). In contrast, statistical evidence refers to objective, factual assertions and abstract data. Messages featuring statistical evidence commonly come in the form of empirical statistics and facts presented as a summary of a larger number of cases (Allen and Preiss 1997). To illustrate the difference between anecdotal and statistical information, consider Merck's advertising for its Gardasil vaccination. In communicating the health and social benefits of this vaccination, Merck could tell the story of a specific person who suffered negative consequences when she contracted human papillomavirus (anecdotal evidence), or cite statistics about how many people will be affected by the virus in their lifetime (statistical evidence)—as the company does in its current advertising campaign for the product.

Objectively, statistical information is more informative in that an isolated anecdote can be used to support any position. Consistent with this assertion, normative decision making models propose that anecdotal information should be ideally ignored in the presence of contradicting statistical information, as the latter is based on a larger sample and should be

[1] Our use of the term 'statistics' does not strictly refer to the science that deals with the collection, classification, analysis, and inferences made from numerical data. Rather, we are referring to the more generic definition of the term. That is, 'statistics' are just the numerical facts or data themselves.

objectively more reliable in decision making than an isolated anecdote (Raghubir and Menon 1996). However, a substantial stream of literature suggests that such rational disregard rarely occurs, and that anecdotal evidence is more influential than statistical information for a variety of judgment tasks (c.f., Bar-Killel 1980; Taylor and Thompson 1982). Anecdotal information can—and often does—overwhelm statistical information, leading decision makers to overweight its relevance, even in the presence of more reliable statistical data (Hamill, Wilson, and Nisbett 1980; de Wit, Das, and Vet 2008). For example, deWit et al. (2008) found that personal accounts about risks and dangers were more effective than arguably more credible and compelling statistical data in persuading people to change risky sexual behaviors. This "anecdotal bias" has also been well-documented in the consumer research literature, across such varying contexts as consumer persuasion (Cox and Cox 2001), medical decision-making (Skowronski 1990), and charitable contributions (Small, Loewenstein, and Slovic 2007). Medical, legal, managerial and other professionals have often exhibited favoritism for using clinical over more accurate actuarial judgments (Dawes and Corrigan 1974; Dawes, Faust, and Meehl 1989). Even in business education, academicians have often argued over the relative advantages of using case studies versus stylized research facts in disseminating knowledge to students (Shugan 2006).

Anecdotal biases have largely been attributed to the greater vividness and ease-of-processing that characterizes stories, as compared to statistical forms of data—which tend to be more pallid and require more cognitive effort to process (Hamill et al. 1980; Kazoleas 1993; Baesler 1997). Subjectively, anecdotal information often evokes more interest and involvement among audience members (Cox and Cox 2001). The vividness and affective richness of an anecdote can prolong retention (Reisberg and Heuer 2004) and increase its availability as a cue during decision making, potentially leading to suboptimal decisions (de Wit et al. 2008; Block and Keller 1997). Other behavioral and perceptual biases like availability and representativeness,

including *base-rate neglect* (Locksley, Hepburn, and Ortiz 1982; Sloman et al. 2003), can be viewed as manifestations of consumers' insensitivity to statistical information in the presence of more visceral and vivid cues. While the presence of anecdotal bias and statistical neglect is apparent, no research has previously examined the contextual conditions which accentuate or ameliorate this effect.

In four studies, we investigate how contextual cues influence individuals' reliance on anecdotal information. We propose that the anecdotal bias should be less salient in high- versus low-involvement conditions, based upon the Elaboration Likelihood Model (ELM; Petty and Cacippo 1986). However, high involvement does not always reduce the anecdotal bias. In situations where high involvement induces a high level of perceived vulnerability among consumers, high involvement can in fact increase the anecdotal bias, by enhancing emotional engagement with the decision—a phenomenon we call the visceral compatibility effect (studies 1 and 2). To provide additional support for our visceral compatibility hypothesis, we further examine the moderating influence of consumers' thinking style on the effect of vulnerability on the anecdotal bias (studies 3 and 4). Previous literature suggests that holistic thinking encourages context-dependence and makes individuals more cognizant of the visceral nature of the decision context, thereby increasing their susceptibility to its influence. This argumentation forms the basis of our secondary hypothesis—that holistic (vs. analytic) thinking participants will display greater variance in anecdotal bias as a function of perceived vulnerability. In the high-vulnerability situation, holistic thinking should augment the anecdotal bias found in studies 1 and 2, but analytical thinking should reduce it. Studies 3 and 4 provide consistent findings in support of our expectations, as evidenced by both chronic and situationally primed thinking styles.

2. THEORETICAL BACKGROUND

2.1.1. The Elaboration Likelihood Model and Use of Anecdotal Information

One processing paradigm that has been used to understand and explain the differential use of anecdotal versus statistical information under different settings has been the Elaboration Likelihood Model (Petty and Cacippo 1986; Petty, Cacioppo, and Schumann 1983).The ELM suggests that involvement is a key determinant of how information is processed and what type of information is used in making choices. High involvement decisions often lead consumers to deliberately and consciously process those message elements that they believe are relevant in meaningfully and logically evaluating available choices. By contrast, low-involvement decision makers engage in little or no elaborate processing. The ELM provides a clear framework for predicting the situational dominance of statistical over anecdotal evidence, suggesting that involvement enhances discrimination of argument quality and enables decision makers to utilize higher quality evidence (e.g., statistical evidence) and ignore lower quality cues (e.g., anecdotal information).

As factors in the persuasion setting reduce a recipient's motivation or ability to think about an issue, their ability to discriminate between qualitatively different kinds of information diminishes. This occurs, for instance, when recipients chronically avoid effortful thinking (Cacioppo, Petty, and Morris 1983), view the appeal as being personally inconsequential (Petty and Cacioppo 1979), or are engaged in a distracting task during their exposure to the appeal (Petty, Wells, and Brock 1976). In situations when elaboration likelihood is low, the acceptance or rejection of evidence is not based on the careful consideration of issue-relevant information, but rather on: (a) the issue or object being associated with positive or negative cues, which have no intrinsic link to the attitude stimulus (e.g., an attractive model would likely serve as an

argument for the merits of a beauty product, but would more likely constitute a peripheral cue for an oven; Gorn and Goldberg 1982); or, (b) the recipient drawing a simple inference based on various cues in the persuasion context (e.g., the more arguments for a recommendation, the better it must be; Petty and Cacioppo 1984). Within such a framework, the prediction for the differential use of statistical versus anecdotal evidence is straightforward. Under high involvement, anecdotal information would receive less emphasis while the reverse would be true under reduced involvement. This expectation is also analogous to predictions emanating from the Effort-Accuracy paradigm (Payne, Bettman, and Johnson 1993). If reliance on anecdotal information reduces decision accuracy, such a bias would diminish when the motivation for accuracy is enhanced.

However, there are multiple causes for enhanced involvement. When a purchase is expensive or personally relevant, consumers often adopt a high-involvement mode of decision making. Similarly, asking a person to engage in reason-based thinking about a situation has been shown to increase involvement (Wilson and LaFleur 1995; Wilson et al. 1993). Vulnerability or probabilistic risk (i.e., the likelihood that a person will encounter an unwanted event) can also enhance a person's involvement in a given situation. We propose that inducing high involvement without a simultaneous activation of consumers' perceived vulnerability will reduce the anecdotal bias, as implied by the ELM. However, high involvement emanating from vulnerability will have an opposing effect and, in fact, increase the impact of anecdotal information on decision making, due to the visceral compatibility mechanism detailed below.

H1a: When involvement for a future event is enhanced without a corresponding increase in perceived vulnerability, reliance on anecdotal (versus statistical) information will decrease.

2.1.2. The Visceral Compatibility Hypothesis

Anecdotal and statistical information have several key distinctions. While the former is more vivid, contextualized, and visceral, the latter is relatively decontextualized, pallid, and aggregated over various contexts, situations, and individuals. This paints a picture of statistical information in the form of abstract generalizations (Brosius and Bathelt 1994; Cox and Cox 2001), with anecdotal information carrying a higher degree of visceral complexion. Baesler and Burgoon (1994) have proposed that anecdotal information is "more concrete, more imagery provoking, and more colorful than statistics that are often abstract, dry, and pallid" (p. 585). This notion has led several scholars to suggest the vividness effect, which proposes that vivid information serves as a heuristic cue and can be more persuasive and memorable than non-vivid information (Nisbett and Ross 1980; Taylor and Thompson 1982). Such visceral and vivid characterizations of anecdotal information have implications of when it would be utilized more than statistical information.

Research in the area of processing fluency suggests that compatibility or fit between evidence type and situational context enhances the use of fitting information (Jacoby and Whitehouse 1989; Reber, Schwarz, and Winkielman 2004). Specifically, in situations which are more vivid, and where the visceral content of the decision environment is high, we posit that decision makers will exhibit greater reliance on information that has similar visceral quality. Such compatibility between evidence type and situation specificity will cause enhanced susceptibility to the influence of anecdotal evidence for vivid and visceral decision environments (Lee and Aaker 2004).

Vulnerability is one such component of any situation which instigates a vivid and visceral mental construal. While a low level of vulnerability affords a decision maker the luxury of a

distant, abstract, neutral lens when examining a potential future event, high vulnerability accentuates one's visceral connection with that event. Support for this link between high vulnerability and visceral intensity is provided by VanBoven et al. (2010), who found that emotional intensity and perceived psychological proximity of an event are correlated. Frijda (1988, 1992) also posited that events which are objectively closer—as are events which are more likely to occur—are typically more emotionally intense. Because emotions serve, at least somewhat, to functionally direct behavior (Keltner and Gross 1999; Lazarus 1991), individuals typically feel more engaged when events are objectively closer (Loewenstein 1996; Metcalfe and Mischel 1999). To the extent that higher vulnerability reduces the psychological distance of events (Todorov, Goren, and Trope 2007; Wakslak et al. 2006), we propose that higher vulnerability will enhance the decision maker's visceral characterization of the event. This characterization will then enhance the use of visceral anecdotal evidence at the expense of decontextualized statistical evidence. On the basis of this rationale, we propose that the anecdotal bias will be enhanced when decision makers' vulnerability is higher, and that this relationship will be mediated by vulnerability-induced emotional engagement.

H1b: When involvement for a future event is enhanced by increasing vulnerability, reliance on anecdotal (versus statistical) information will increase.

H2: Consumers' emotional engagement increases when involvement for a future event is enhanced by increasing vulnerability, but not when involvement for the future event is enhanced without a corresponding increase in perceived vulnerability.

H3: Consumers' emotional engagement mediates the effect of involvement on reliance on anecdotal (versus statistical) information when involvement is enhanced by increasing vulnerability, but not when involvement is enhanced without a corresponding increase in perceived vulnerability.

2.1.3. The Moderating Role of Analytic-Holistic Thinking

We further propose that decision makers' thinking style should moderate the effect of vulnerability on the anecdotal bias, such that the visceral compatibility effect is substantially stronger for holistic thinkers than for analytic thinkers. The rationale underlying this expectation lies in the analytic and holistic differences in context dependence. In general, holistic thinkers are more likely to consider contextual factors than analytic thinkers. Analytic thinkers view the world as composed of separate elements that can be understood independently, while holistic thinkers focus on the relationships among different elements and the context (Nisbett et al. 2001). This also explains why analytic thinkers are superior to holistic thinkers in discriminating between information sources. Choi, Koo, and Choi (2007) provided the participants with a short scenario about a graduate student killing his advisor, along with a list of 97 items of information that might or might not be relevant in explaining the incident. The participants were then asked to eliminate the irrelevant information from the list. Holistic thinkers found it more difficult than analytic thinkers to judge a given piece of information as irrelevant and disconnected and to eliminate it from further consideration. This finding has direct implications for our research. It suggests that, while analytic-thinking individuals will easily be able to discard irrelevant information—vulnerability information in this case—when more relevant information (i.e., details about the available options) is available, holistic-thinking individuals will not be as discriminating. To illustrate this argument, imagine that a particular individual is considering two drugs: Drug X and Drug Y. If Drug X is better than Drug Y, the former would retain its superiority irrespective of what a particular individual's vulnerability to the disease is, thereby making vulnerability information redundant.

We anticipate that holistic thinkers are not only more attentive to irrelevant cues (e.g., vulnerability information), but are also more susceptible to its influence. Previous literature has demonstrated that one of the key differences between analytic and holistic individuals is their susceptibility to the influence of the context in making inferences. Nisbett et al. (2001) define holistic thought as involving an orientation to the context or field as a whole, including attention to relationships between a focal object and the field, and a preference for explaining and predicting events within the context in which they exist—even when such context is uninformative. In contrast, analytic thought calls for the detachment of the object from its context, a tendency to focus on attributes of the object to assign it to categories, and a preference for using rules about the categories to explain and predict the object's behavior. This suggests that holistic thinking will enhance an individual's susceptibility to being influenced by the context within which the decision is being made. The implication is that, to the extent that vulnerability enhances predisposition towards anecdotal information, holistic thinkers will be strongly influenced by vulnerability information while analytic thinkers will be largely impervious to it.

H4: Thinking style moderates the effect of vulnerability on the anecdotal bias, such that vulnerability increases reliance on anecdotal (versus statistical) information to a much greater extent for holistic thinkers than for analytic thinkers.

3. STUDY 1

3.1. Procedures and Measures

Study 1 tests H1a and H1b with a 2 (Involvement Method[2]: non vulnerability-based vs. vulnerability-based) × 2 (Involvement Level: low vs. high) between-subjects factorial design. Our sample was comprised of two hundred and ninety-three non-student panelists who completed the experiment online for financial compensation. We designed a decision scenario in which participants were asked to choose between two different automobile insurance policies for extended travel in a foreign country: one option was statistically superior, while the other was anecdotally superior. Statistical information took the form of customer satisfaction ratings, while a work colleague's personal experience provided contrary anecdotal information. In the vulnerability-based condition, participants' involvement level was manipulated through the information about the destination's ranking in terms of automobile accidents in that country. When the level of involvement was high [low], participants were asked to "*Imagine that you are traveling for work to a foreign country. This is a 30-day assignment that will require you to drive to and from work while you are there. One day, as you look through a reputable travel magazine, you come across a review article ranking automobile accidents in 100 cities in this country. You learn that the city where you will spend most of your time ranks very high (#2) [low (#97)] in the number of automobile accidents each year*."

In the non vulnerability-based condition, vulnerability was maintained at a moderate level (i.e., the city ranks #48 in the number of automobile accidents). Following Sengupta and Fitzsimons (2000), participants assigned to the high involvement condition were asked to provide reasons for their choice, whereas those in the low involvement condition were prompted to make a choice without being asked to provide reasons. Immediately following our

[2] We manipulate Involvement Method either using vulnerability-based or non vulnerability-based approaches. In the vulnerability-based conditions, Involvement Level was manipulated as high versus low by varying the statistics about respondents' vulnerability, whereas in the non vulnerability-based conditions, Involvement Level was manipulated as high versus low by asking or not asking the respondents to explain the reasons underlying their choices.

manipulation of Involvement Method and Involvement Level, participants were presented with two options of insurance policy: "*Company A has the highest customer satisfaction ratings (90%) of all companies offering international automobile insurance coverage. Company B has a relatively lower overall customer satisfaction rating (65%). Suppose you talk to a work colleague who has traveled to the city several times and has used both insurance companies. Your colleague tells you about a negative experience he had with Company A. When he had a collision in a foreign country, it took months to get reimbursed for his medical expenses and—contrary to his expectations—many of his expenses were not covered. Your colleague has not had any negative experiences with Company B*."

As a manipulation check of Involvement Level, we asked participants to respond to the following two items: (1) *How involved were you in making this decision?*, and (2) *How much thought did you put into making this decision?* (1 = *not at all*; 7 = *a lot*). We used the average of the two items to create an index for Involvement Level (α = .83). As another indicator of Involvement Level, we also asked participants to recall the city's rank in terms of automobile accidents. Our expectation was that higher involvement leads to more accurate recall (Anderson 1983; Srull and Wyer 1989). The response was coded as "accurate" if the respondent correctly recalled the city's rank in terms of automobile accidents.

3.2. Results

Manipulation checks. As expected, the two Involvement Method manipulations worked equally well in enhancing the perceived involvement in the task. There was a significant main effect of Involvement Level (F (1, 199) = 5.003, $p < .05$), but no significant effect of Involvement Method (F (1, 199) =.188, $p > .50$) and no significant interaction (F (1, 199) =.018,

$p > .50$). Perceived involvement was higher in high involvement conditions for both vulnerability-based ($M = 6.21$) and non vulnerability-based manipulations ($M = 6.12$), and lower in low involvement conditions for both vulnerability-based ($M = 5.84$) and non vulnerability-based manipulations ($M = 5.80$). We also expected higher involvement to lead to more accurate recall. Again, there was a marginally significant main effect of Involvement Level (Wald $\chi^2 = 3.467$, $\beta = .524$, exp (β) = 1.689, $p = .063$), with higher recall accuracy in high involvement conditions for both vulnerability-based ($R = .78$) and non vulnerability-based manipulations ($R = .80$), and lower recall accuracy in low involvement conditions for both vulnerability-based ($R = .70$) and non vulnerability-based manipulations ($R = .73$). Both of these manipulation checks rule out differential Involvement Level as an alternate explanation for our results, and confirm that Involvement Level was successfully and equally manipulated using both Involvement Method conditions.

Testing H1a and H1b. Our first hypothesis specifies that when involvement for a future event is enhanced without increasing vulnerability, reliance on anecdotal (vs. statistical) information decreases (H1a). By contrast, when involvement for a future event is enhanced by increasing vulnerability, reliance on anecdotal information increases (H1b). To test these predictions, we conducted a binary logistic regression analysis using Involvement Method (vulnerability-based vs. non vulnerability-based) and Involvement Level (low vs. high) as the key independent categorical variables and choice of the anecdotally superior option as the key dependent variable.

As expected, we found no significant main effects of either independent variables ($p > .10$). More pertinent to our hypotheses testing, we found a significant interaction between Involvement Method and Involvement Level (Wald $\chi^2 = 4.656$, $\beta = -1.038$, exp (β) =.358, $p < .05$). As presented in table 1, consistent with dual processing predictions, anecdotal bias

decreased with higher involvement in the non vulnerability-based condition (from 49% to 36%, ΔM = -13%). However, anecdotal bias increased with higher involvement in the vulnerability-based condition (from 38% to 50%, ΔM = +12%), as predicted by our visceral compatibility hypothesis. Therefore, both H1a and H1b are supported.

TABLE 1
Study 1 Results: % Choice of Anecdotally Superior Insurance Option

Involvement Method	**Involvement Level**	
	Low	High
Non Vulnerability-based manipulation	49%	36%
Vulnerability-based manipulation	38%	50%

3.3. Discussion

Study 1 provides support for our key assertion: high involvement can enhance or decrease anecdotal bias, depending on how involvement is induced. Consumers' reliance on anecdotal (versus statistical) information increases when involvement is enhanced through increasing their perceived vulnerability of the event, whereas the opposite is true when involvement is enhanced without increasing vulnerability perception. We speculated that such a visceral compatibility effect is due to increased emotional engagement under conditions of high vulnerability. However, study 1 did not directly test this proposed mechanism. Study 2 aims to shed some light on the visceral compatibility effect by directly examining differences in emotional engagement across vulnerability-based and non vulnerability-based conditions (hypothesis 2), and by assessing the mediating role of emotional engagement (hypothesis 3). We also extend the generalizability of our study 1 findings by using a different choice context (i.e.,

medical decision making).

4. STUDY 2

4.1. Participants and Procedures

One hundred and ninety-nine undergraduate students from a major university in the southern United States participated in the experiment to satisfy a class requirement. The research design, procedures, and measures in this study are identical to those in study 1, except for the following two differences. First, instead of the international travel scenario in study 1, we designed a decision scenario in which participants were asked to choose between two different medications for a stomach virus that sometimes affects tourists in a particular foreign country. One drug option was statistically superior (i.e., *Drug X was effective for 85% of those who tried it* vs. *Drug Y was effective for 70%*), while the other medication was anecdotally superior (i.e., *Drug X did not work for a co-worker who was afflicted with the virus when he was abroad, but Drug Y did the trick and cured him*).

In the vulnerability-based condition, when involvement was high [low], participants were asked to "*Imagine that you are traveling for work to a foreign country where your company recently set up new operations. A few days before you are to leave, your company sends a memo which informs you that the country you are heading to is experiencing a stomach flu infection which causes mild symptoms and including a few days of diarrhea. Out of the 100 odd employees of your company who have traveled to that country in recent days, 62 [2] have been infected by this virus."* In the non vulnerability-based condition, as in study 1, vulnerability was maintained at a moderate level (i.e., 22 out of 100). Participants assigned to the high involvement condition

were asked to provide reasons for their choice, whereas those in the low involvement condition were prompted to make a choice without being asked to provide reasons. Prior testing of the stimuli on a different set of participants indicated that participants in the high-vulnerability condition scored significantly higher on perceived vulnerability than those in the low condition (M_{high} = 43.8% vs. M_{low} = 16.8%, $p < .001$), suggesting vulnerability was successfully manipulated. Decision involvement was also higher for the high vulnerability task, as evidenced by higher recall accuracy of experimental stimuli in the high vs. low vulnerability conditions (R_{high} = 0.81 vs. R_{low} = 0.66, $p < .01$).

A second difference in study 2 is our inclusion of an emotional engagement measure comprised of the following three items: (1) *How emotionally engaged were you while making this decision*?; (2) *How worried were you while making this decision*?; and (3) *How anxious were you while making this decision*? (1 = *not at all*; 7 = *a lot*). We used the average of these three items to create an index for emotional engagement (α = .83).

4.2. Results

Retesting H1a and H1b. Consistent with study 1's findings, we found no significant main effects of either independent variables ($p > .10$), but there was a significant interaction between Involvement Method and Involvement Level (Wald χ^2 = 11.827, β = -2.047, exp (β) = .129, $p < .001$). As presented in table 2, anecdotal bias decreased with higher involvement in the non vulnerability-based condition (from 35% to 15%, ΔM = -20%). However, anecdotal bias increased with higher involvement in the vulnerability-based conditions (from 27% to 42%, ΔM = +15%), supporting H1a and H1b.

TABLE 2
Study 2 Results: % Choice of Anecdotally Superior Drug Option

Involvement Method	Involvement Level	
	Low	High
Non Vulnerability-based manipulation	35%	15%
Vulnerability-based manipulation	27%	42%

Effects of Emotional Engagement. A 2 (Involvement Method) × 2 (Involvement Level) ANOVA on emotional engagement revealed a significant interaction effect ($F(1,195) = 14.028$, $p < .001$). In the non vulnerability-based conditions, there was only marginally significant difference in negative emotional arousal across high vs. low involvement conditions (M_{high} = 3.32 vs. M_{low} = 3.96, $F(1, 95) = 3.51$, $p = .064$). However, in the vulnerability-based conditions, an increase in Involvement Level was accompanied by greater negative emotional arousal (M_{high} = 3.96 vs. M_{low} = 2.94, $F(1, 100) = 12.675$, $p < .001$). These results support hypothesis 2.

Mediation Analysis. The previous analyses indicate that Involvement Method moderates the effect of Involvement Level on both the anecdotal bias and the level of emotional engagement elicited by high vulnerability. We now present evidence that, under the vulnerability-based Involvement Method conditions, the effect of Involvement Level on consumers' preference for anecdotal (versus analytical) information is mediated by emotional engagement. However, this is not the case in the non vulnerability-based conditions.

To assess the proposed mechanism, we tested whether emotional engagement mediates the interaction effect of Involvement Level × Involvement Method on the anecdotal bias with the bootstrapping method (Preacher and Hayes 2008) using Hayes' (2013) PROCESS macro. A 95% confidence interval of the parameter estimates was obtained by running 5000 times of resampling. The final estimation results for this mediated moderation model are summarized in

table 3. Consistent with hypothesis 3, the results showed that the indirect effect of Involvement Level on the anecdotal bias through emotional engagement was significant in the vulnerability-based conditions (95% CI = .13 to .78), but not in the non vulnerability-based conditions (95% CI = -.61 to .004).

TABLE 3
Study 2: The Mediating Role of Emotional Engagement

Paths or Effects	Coefficient [a]	SE
Involvement Level × Involvement Method → Emotional Engagement (interaction effect on the mediator)	1.66^{***}	.44
Emotional Engagement → Anecdotal Bias (mediator to DV)	$.37^{***}$	.10
Involvement Level → Anecdotal Bias, controlling for Emotional Engagement (direct effect of IV on DV)	.10	.30
Involvement Level → Anecdotal Bias through Emotional Engagement in the non vulnerability-based conditions (conditional indirect effect of IV on DV at Moderator value = Non Vulnerability)	-.24[b]	.16
Involvement Level → Anecdotal Bias through Emotional Engagement in the vulnerability-based conditions (conditional indirect effect of IV on DV at Moderator value = Vulnerability)	$.38^{**}$[c]	.16

[a] * $p < .05$; ** $p < .01$; *** $p < .001$.
[b] 95% confidence interval for the bootstrap estimate of the indirect effect = [-.61; .004]
[c] 95% confidence interval for the bootstrap estimate of the indirect effect = [.13; .78]

4.3. Discussion

In the two previous studies we demonstrated how high vulnerability enhances the anecdotal bias due to a characteristic of the decision scenario—individuals' perceived vulnerability or probability of that event occurring. Study 2 further shows that the key mechanism underlying the visceral compatibility effect is consumers' emotional engagement, elicited by high vulnerability. But factors independent of the event or the context may also

enhance or diminish the anecdotal bias. In the next study we examine one such individually-specific factor: the decision maker's thinking style. We focus on how holistic vs. analytic thinking styles differentially influence the anecdotal bias. If our visceral compatibility hypothesis is true, holistic (vs. analytic) thinking should augment the anecdotal bias demonstrated in studies 1 and 2 when vulnerability is high.

5. STUDY 3

5.1. Participants and Procedures

The primary purpose of study 3 is to test hypothesis 4. This study features a 2 (Vulnerability: low vs. high) × 2 (Thinking Style: analytic vs. holistic) between-subjects research design. Two hundred and eighty-three undergraduate students from a major university in the southern United States participated in the experiment to satisfy a class requirement.

The medical decision scenario is the same as in study 2. Following exposure to the stimulus materials, participants first chose between Drug X and Drug Y. We then measured respondents' Thinking Style using the Analysis-Holism Scale (AHS) that asks respondents to agree or disagree (1 = *strongly disagree*; 7 = *strongly agree*) with a set of 10 statements, such as *Everything in the universe is somehow related to each other* and *The whole is greater than the sum of its parts* (Choi et al. 2003).

5.2. Results

Hypothesis Testing. Hypothesis 4 specifies that thinking style moderates the effect of

vulnerability on the anecdotal bias, in that vulnerability increases reliance on anecdotal (vs. statistical) information to a much greater extent for holistic thinkers than for analytic thinkers. To test this hypothesis, we conducted a binary logistic regression analysis using Vulnerability, Thinking Style, and their interaction term as the key independent variables and choice of the anecdotally superior option as the key dependent variable.

We found a significant main effect of Vulnerability (Wald $\chi^2 = 4.963$, $\beta = 3.012$, exp (β) = .049, $p < .05$), thereby replicating the results in previous studies (H1b). Consistent with hypothesis 4, we also found a marginally significant Vulnerability × Thinking Style interaction effect (Wald $\chi^2 = 3.644$, $\beta = .718$, exp (β) = 2.05, $p = .056$). As presented in table 4, upon median-splitting the participants on the basis of their AHS score, we found that vulnerability exerted less influence on the analytic participants (from 44% to 45%, $\Delta M = +1\%$, $p > .80$) than on holistic participants (from 31% to 53%, $\Delta M = +22\%$, $p < .05$).

TABLE 4
Study 3 Results: % Choice of Anecdotally Superior Drug Option

Chronic Thinking Style	**Perceived Vulnerability**	
	Low	High
Holistic	31%	53%
Analytic	44%	45%

To test differences in "context-dependence" across thinking styles, we examined the relationship between holistic thinking (as measured by AHS) and decision involvement (as measured by the accurate recall task). Holistic thinking was correlated with higher recall accuracy of vulnerability information ($r = .134$, $p < .05$). This relationship persisted even after collapsing the Vulnerability conditions. This result provides evidence of our context-dependence based theorizing, indicating that—relative to the more discriminating analytic thinkers—holistic

thinkers paid disproportionately greater attention to an irrelevant cue (vulnerability). This undue attention appeared to make them more susceptible to the anecdotal bias when vulnerability was high, and less susceptible when vulnerability was low.

5.3. Discussion

Study 3 replicates the visceral compatibility effect found in our previous studies, showing that as vulnerability increases, individuals' decision making relies more on anecdotal (vs. statistical) information. Furthermore, it also shows that chronic analytic-holistic Thinking Style moderates the effect of vulnerability on anecdotal biases, such that the visceral compatibility effect is stronger for holistic thinkers than for analytic thinkers. In the next study, instead of measuring analytic-holistic thinking as an individual level variable, we manipulate participants' thinking style. This enables us to rule out any individual-level confounding variables as drivers of our results.

6. STUDY 4

6.1. Procedures and Measures

In this study we used a 2 (Vulnerability: low vs. high) × 2 (Thinking Style: analytic vs. holistic) between-subjects factorial design. One-hundred and seventy-one undergraduate students from a major university in the southern United States participated in study 4 to satisfy a class requirement.

The procedures, vulnerability prime, and measures used in this experiment were identical

to those featured in study 3. The only difference is that we manipulated Thinking Style in this study following Monga and John's (2007) induction, which asked participants to view six pictures with embedded hidden images (e.g., a lion, a baby, a dolphin, and a devil face). Participants in the analytic condition were instructed to carefully inspect the pictures and try to figure out the hidden image embedded in each. In the holistic condition, we instructed subjects to focus on each picture as a whole and choose their favorite one, explaining what they liked about it.

6.2. Results

Re-testing H4. In this study we sought to test whether and how situationally primed analytic-holistic Thinking Style affects the visceral compatibility effect. We conducted a binary logistic regression analysis using Vulnerability (low vs. high) and situationally-activated Thinking Style (holistic vs. analytic) as the key independent categorical variables, and choice of the anecdotally superior option as the key dependent variable.

The results showed main effects of Vulnerability (Wald $\chi^2 = 8.649$, $\beta = 1.481$, exp (β) =.227, $p < .01$) and Thinking Style (Wald $\chi^2 = 4.870$, $\beta = 1.051$, exp (β) = 0.350, $p < .05$), as well as a significant Vulnerability × Thinking Style interaction effect (Wald $\chi^2 = 3.937$, $\beta =$ 1.348, exp (β) = 3.849, $p < .05$). Specifically, as presented in table 5, vulnerability information had a significantly lower impact on analytic thinkers (from 29% to 31%, $\Delta M = +2\%$) than on holistic thinkers (from 23% to 57%, $\Delta M = +22\%$; $z = 3.023$, $p < .01$). Therefore, H4 is supported when Thinking Style is primed as well as chronic.

Insert table 5 about here

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7. GENERAL DISCUSSION

Our findings demonstrate a counterintuitive result—that higher involvement can in fact lead to greater susceptibility to anecdotal evidence, seemingly in contradiction to the ELM framework. While intriguing, this result is not completely surprising. In fact recent theorizing in construal level theory (CLT) is in line with our findings. We contend that anecdotal evidence is more contextualized and vivid while statistical evidence is more abstract and decontextualized. According to CLT (Trope and Liberman 2000), a decision maker's construal level is contingent upon the psychological distance associated with the focal event, with less psychological distance invoking more concrete mental construals. Todorov, Goren, and Trope (2007) and Wakslak et al. (2006) have demonstrated that the probability or hypotheticality associated with any event is a measure of its psychological distance, where high likelihood translates into lower psychological distance and therefore more concrete, contextualized mental construal—exactly the kind of situation which would give rise to enhanced anecdotal bias. Extending this logic within the CLT framework, our research findings suggest that vulnerability could be viewed as another dimension of psychological distance, with greater vulnerability invoking a lower construal level and more concrete mindset—thereby enhancing one's likelihood of using anecdotal evidence at the expense of statistical evidence. A similar behavior is observed by Ledgerwood, Wakslak and Wang (2010) when they examined how temporal distance alters processing of persuasive information. Analogous to our results, they found that temporal distance increased the relative weight placed on aggregate (vs. individualized) information when participants were asked to choose between two options. In their study, consumers with a more concrete mindset were more influenced by information about an individual's personal experience, much like the anecdotal

information we test in our studies.

Beyond this, our four studies provide consistent support for the proposed visceral compatibility hypothesis. Study 1 reconciles contradictory predictions, demonstrating that high involvement can decrease or enhance the anecdotal bias, depending on whether it is accompanied by high vulnerability. In addition to replicating study 1's findings in a different decision context, study 2 further shows that consumers' emotional engagement is the key mechanism through which vulnerability affects anecdotal bias. Moreover, studies 3 and 4 reveal that an individual's thinking style constitutes a boundary condition for the visceral compatibility effect, such that the effect is stronger for holistic thinkers than for analytic thinkers. Besides just informing us about what contextual factors and individual traits influence the anecdotal bias, our results also speak to the general issue of which other information processing biases may be similarly influenced. A classic explanation for the persuasive effect of anecdotal evidence is derived from the notion of the availability heuristic (Tversky and Kahneman 1973), and holds that vividly presented information (e.g., a personal case history) is more likely to come to mind and is evoked more easily and faster when making judgments (c.f., Taylor and Thompson 1982). Evidence presented in the form of a personal narrative may also increase the ease with which message recipients can imagine an event or construct a scenario. Further, the simulation heuristic suggests that this ease of imagination should increase likelihood estimates (Tversky and Kahneman 1974), in particular when involvement is low (e.g., Rothman and Schwarz 1998).

As previously mentioned, several other behavioral and perceptual biases emanating from availability and representativeness, including base rate neglect, can be viewed as manifestations of a tendency to be insensitive to statistical information in the presence of more visceral, vivid, anecdotal cues. For example, Small and Loewenstein (2003) demonstrated a greater willingness to compensate individuals who had lost money and to contribute money to charity when the

victims or beneficiaries were identifiable and determined prior to decision-making. This "identifiable victim effect" may also share similar psychological underpinnings with other forms of statistical neglect. Some researchers have examined how people combine statistical and experiential information (Clemen and Winkler 1999; Fagerlin, Wang, and Ubel 2005). They conclude that the more vivid experiential information often overwhelms more pallid statistical information. Since the common theme across all of these effects is the relative dismissal of statistical evidence in favor of more vivid narrative cues, it is likely that these effects will be similarly influenced by vulnerability manipulations and analytic-holistic thinking style, as was demonstrated in our results.

Our findings also have significant bearings on research exploring the influence of higher stakes on decisional accuracy. Several attitude and decision models like the ELM (Petty and Cacioppo 1986) and the Adaptive Decision Maker paradigm (Payne, Bettman, and Johnson 1990), while acknowledging human fallibility, still paint an assuring picture. Such models suggest that many decision errors and susceptibility to irrelevant information diminish when an individual's involvement is high or the need for accuracy is elevated. Classical economists also adopt a dismissive attitude towards evidence of decision errors by suggesting that most of them will disappear when the stakes are high enough (Hertwig and Ortmann 2001). Our findings present a grimmer deconstruction of the effect of high stakes. Instead of improving decisions, higher vulnerability can in fact have a deleterious impact, as evidenced by our results. In that sense, these findings add to the emerging stream of evidence which presents a counterintuitive view of the rationalizing role of contextual cues and incentives on enhancing human performance. Economists and decision scientists widely agree that stronger incentives for better task performance induce harder work and result in higher output (Prendergast, 1999). Similarly, the presence of observers induces "social facilitation" which has been proposed to make subjects

more alert, and, as a consequence, better performers (Guerin 1993). However, recent evidence suggests that several of these factors in fact intensify stress, pressure, and "choking" and therefore have a detrimental effect on output (Ariely et al 2005; Zajonc 1965; Dohmen 2008). Higher stakes and rewards can in fact reduce task performance and creativity (Ariely et al. 2005; Dohmen 2008), while the presence of others can create pressure and induce individuals to choke (Zajonc 1965). Our results suggest that such degradation in decision making can also emerge when vulnerability is perceived to be high.

7.1. Managerial Implications

Our findings show that when consumers' perceived vulnerability is low, marketers should use objective, factual assertions and abstract data to persuade them. However, when consumers' perceived vulnerability is high, it should be more effective to use vivid, emotional, and contextualized appeals, such as a first-person account of someone who has experienced the same situation. These findings might necessitate a strategy change by many advertisers, who frequently employ statistical information in their claims to illustrate the commonality of certain problems in an effort to enhance consumers' perceived vulnerability—and to position their products and services as solutions. Consider the following claims, which have appeared recently in national advertising campaigns: *Four in ten people with psoriasis have psoriatic arthritis* (Amgen, Wyeth); *Two out of three people being treated for depression still have depressive symptoms* (Abilify, Bristol-Myers Squibb); *One in thirty U.S. homes could be infested with termites* (Terminix); *For two out of three, people exercise and healthy diet are not enough to lower high cholesterol* (Lipitor, Pfizer); *As many as 5.4 million Americans have Alzheimer's* (Alzheimer's Association); *65% of adults worldwide have been a victim of cybercrime* (Norton

Internet Security). The marketplace is littered with examples of ads employing such "incidence claims" based on statistical information to increase consumers' perceived vulnerability of a particular problem—when, in fact, using a poignant anecdote would likely be more persuasive.

Our findings also offer important managerial implications regarding how marketers can capitalize on the effect of situationally activated holistic-analytic thinking to enhance the effectiveness of their advertisements. The marketplace is characterized by situational contingencies that constantly shape and reshape consumers' thinking style. Different thinking styles can be primed, often subconsciously, by a variety of external stimuli such as communication appeals (e.g., context-dependent vs. context-independent). Our findings show that the anecdotal bias is especially strong for those primed with a holistic thinking style. Armed with this information, marketers can attempt to shift consumers' thinking style to match a particular information type. For example, when the ad features an anecdote, marketers can use communication appeals or contextual cues that will enhance consumers' perceived vulnerability and induce holistic thinking. By contrast, when the ad features statistical facts, marketers should deemphasize the vulnerability component of the message to prompt analytic thinking.

The visceral compatibility effect we demonstrate here also provides fertile ground for exploring a broader scope of managerial implications. Our findings suggest that consumers are more receptive to ads when their information type is congruent with the situational context. Specifically, in situations which are more vivid and where the visceral content of the decision environment is high, consumers rely more on information that has a similar visceral characterization. This suggests managers could enhance the effectiveness of an advertisement by increasing its visceral compatibility. As discussed earlier, one way to achieve this goal is to tailor an ad's information type to match with consumers' perceived vulnerability. Similarly, advertising should use compatible ad appeals (e.g., emotional vs. rational), feature congruent

product attributes (e.g., hedonic vs. utilitarian), and provide other consonant situational cues.

7.2. Limitations and Future Research

Despite the theoretical and managerial contributions emanating from this research, our findings must be interpreted in the context of certain limitations. First, our investigation dealt with the role of vulnerability in enhancing emotional engagement in an event which in turn enhances anecdotal bias. Future research could explore other factors which change emotional involvement as drivers of the anecdotal bias. For instance, a product's characteristics (e.g., whether it possesses hedonic or utilitarian benefits) or situational factors could enhance emotional engagement and increase the likelihood of an anecdotal bias. Second, the present research identifies holistic-analytic thinking style as an important moderating variable of the anecdotal bias. However, it is unclear how managers might be able to situationally drive holistic or analytic thinking when consumers view their marketing communications. Future research should feature studies that explore more actionable variables so that the manipulations can mimic real world tactics available to managers. Finally, our research only examines situations where vulnerability varies with respect to unwanted events (i.e., disease afflictions and car accidents). Future research can examine if an individual's probability of experiencing a positive event similarly influences one's susceptibility to the anecdotal bias.

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