

The Effects of Expectation Disconfirmation on Appraisal, Affect, and Behavioral Intentions

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People's risk perceptions can have powerful effects on their outcomes, yet little is known about how people respond to risk information that disconfirms a prior expectation. We experimentally examined the affective, cognitive, and behavioral consequences of expectation disconfirmation in the context of risk perceptions. Participants were randomly assigned and then prompted toward either a high or low personal risk estimate regarding a fictitious health threat. All participants then received the same risk feedback, which presented either a negative disconfirmation experience (i.e., worse than expected) in the high-risk estimate condition or a positive disconfirmation experience (i.e., better than expected) in the low-risk estimate condition. Participants who experienced the negative disconfirmation reported stronger intentions to prevent the threat in the future compared to participants who experienced the positive disconfirmation. This effect was mediated by both disappointment about the risk feedback and perceptions of the severity of the threat. These findings have implications for risk communication, suggesting that the provision of objective risk information may improve or diminish the likelihood of behavior change depending on people's initial expectations and their emotional and cognitive reactions to the information.

KEY WORDS: Bracing; disappointment; expectations; perceived severity; risk perceptions; unrealistic optimism

1. INTRODUCTION

Risk perceptions provide potentially powerful comparison targets against which people evaluate outcomes they actually receive, such as objective risk feedback about some health or other threat.⁽¹⁾ For example, imagine two women who spend hours each week pursuing the perfect tan by sunbathing. The first woman believes that despite her sun-worshipping habits, she has a very low risk of developing skin cancer, certainly less than a 10% risk in her lifetime.

The second woman, in contrast, fears that her risk for skin cancer is quite high, perhaps as high as 75% in her lifetime. Now imagine that both of these women visit a physician who tells them that based on their sunbathing behavior and other risk factors, they each have approximately a 30% risk of developing skin cancer over the course of their lifetimes. How will each woman feel in response to this objective risk information, and which woman is most likely to subsequently curtail her tanning obsession? In this study, we address this question by examining reactions to personally relevant risk feedback that disconfirms prior risk perceptions, defined as specific predictions about one's risk of encountering a particular threat. Specifically, we examine how objective risk feedback in the context of a novel threat influences affective, cognitive, and behavioral responses of people whose expectations are disconfirmed.

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1.1. The Consequences of Unrealistic Expectations

Research suggests that it is advantageous to believe that more good than bad things will happen in one's life.⁽²⁻⁵⁾ However, the beneficial outcomes of optimism are limited. Unrealistic optimism (believing oneself to be less at risk than an objective measure would suggest)⁽⁶⁻¹⁰⁾ is related to lower intentions to quit smoking and lower intentions to change risky health and sexual behavior.^(6,8,10,11) Recent prospective studies have found that unrealistically optimistic expectations also predict college students' likelihood of experiencing negative health events such as having unprotected sexual encounters and experiencing problems due to alcohol.^(7,12) These empirical findings support numerous theories of health behavior that also link optimistic risk perceptions to diminished preventive behavior.⁽¹³⁻¹⁷⁾ Although these findings suggest that unrealistic optimism has a deleterious effect on behavior, in none of the studies were participants given objective, definitive feedback about their risk. Thus, unrealistic optimists may be less likely to engage in beneficial behaviors, but perhaps only to the extent that they are unaware that their risk perceptions are unrealistic.⁽¹⁸⁾

In contrast, research on bracing for bad news highlights the consequences of learning that one's expectations were unrealistic. Although the literature on bracing focuses on temporal declines in expectations, toward pessimism, as people approach the point of feedback,^(19,20) several studies have examined the affective consequences of expectation disconfirmation. Such studies find that people benefit from unrealistic pessimism in at least one way: they feel better about their feedback when receiving it.^(21,22) How people feel about feedback depends in part on what they expected, such that they feel elation when feedback is better than expected and disappointment when feedback is worse than expected.⁽²³⁻²⁵⁾ Therefore, bracing for bad news may protect people from disappointment, but whether the benefits of positive disconfirmation extend to behavior is presently unknown.³

³Research on defensive pessimism also addresses the relationship between expectations and behavior.⁽²⁶⁾ However, defensive pessimism is not a response to feedback; it is a response to uncertainty. That is, defensive pessimists harness pessimism while they still have control over a particular performance or outcome in order to motivate preparative efforts. Thus, behavioral effects of defensive pessimism are not relevant to our inquiry regarding responses to expectation disconfirmation after one's fate is sealed

Together, the literature on unrealistic optimism and bracing for bad news begins to paint a picture of the consequences of unrealistic risk perceptions. On one hand, unrealistically optimistic risk perceptions predict weak intentions to engage in preventive behavior, at least when people are unaware of their inaccurate perceptions. On the other hand, bracing for bad news by adopting unrealistically pessimistic expectations leads to less disappointment over unpleasant feedback once it arrives, although its effect on intentions and behavior is yet unknown. Considering these existing findings, one would conclude that unrealistic optimism is the less-adaptive strategy because it impedes preventive behavior and feels worse in the face of unpleasant feedback. However, despite the apparent risks of unrealistic optimism, previous research only provides part of the story. Namely, little research has examined both emotional and behavioral consequences of coming face to face with objective risk information that disconfirms one's risk perceptions, whether better or worse than expected. In the present studies, we test the relationships between risk perceptions and behavioral intentions by providing people with risk feedback that contradicts their expectations. Moreover, we tease apart the effect of expectation disconfirmation from the effect of the risk feedback itself by manipulating expectations and keeping risk feedback constant.

1.2. Proposed Mechanisms

In addition to examining behavioral intentions in response to disconfirming risk information, we also sought to identify mediators of this relationship. In other words, why might disconfirmed risk expectations increase or decrease behavioral intentions? Drawing from the literature on bracing for bad news, our study investigated disappointment as a mechanism by which people may respond to expectation disconfirmation with greater or lesser intentions to engage in positive behavior change. This proposed mechanism ultimately derives from a body of research on the purpose of negative emotions, which concludes that negative emotions serve as cues that action is required.⁽²⁷⁻²⁹⁾ Research on the action tendencies associated with disappointment confirms this general and robust finding. Specifically, disappointment promotes heightened attention to the threatening outcome⁽³⁰⁾ and, most relevant to

and motivation to perform well and prevent a bad outcome is rendered irrelevant.

our study, a desire to do something different from the behavior that led to the disappointment.^(25,31) Thus, we hypothesized that people would experience disappointment when their optimistic expectations are dashed^(21,22) and that disappointment would prompt people to take a closer look at their behavior and make positive changes where possible.

We also propose another possible mechanism of the relationship between expectation disconfirmation and behavioral intentions. Perceptions of severity or seriousness are a key predictor of action in several models of preventive behavior,⁽¹⁷⁾ most notably the health belief model,^(13,16,32) the parallel response model,⁽³³⁾ protection motivation theory,^(14,15) and the extended parallel process model.^(34,35) With regard to expectation disconfirmation, one possible but untested explanation for the affective consequences of disconfirmation is that an unexpected negative outcome “feels” more severe than an outcome for which the recipient was fully prepared and, thus, is more upsetting. To the extent that people interpret the agonizing blow of being caught flat-footed by risk feedback as an indicator of the severity of the threat, we would anticipate that like disappointment, perceptions of severity would mediate the relationship between expectation disconfirmation and behavioral intentions.

In an effort to provide a conservative test of our hypothesized mechanisms, we also included measures of anxiety, relief, and surprise as alternative mediators of the relationship between expectation disconfirmation and behavioral intentions. We included relief and surprise due to their conceptual overlap with expectation disconfirmation, in that surprise is a response to something unexpected,⁽³⁶⁾ and relief is the inverse of disappointment, a reaction to something better than anticipated.⁽³⁷⁾ We included anxiety because a number of studies have demonstrated a positive relationship between risk perceptions and anxiety^(38,39) and a positive relationship between anxiety and behavior change, although the latter relationship is somewhat inconsistent.^(40–47)

1.3. Overview and Hypotheses

We conducted an experimental study to bridge critical gaps in our knowledge about the consequences of risk information that disconfirms a prior expectation. To this end, we manipulated whether people perceived themselves to be at high or low risk for a novel threat and measured disappointment, perceptions of severity, and behavioral intentions following objective risk feedback. We hypothesized that

people would form stronger intentions to prevent a threat when they learned that their risk for that threat was unexpectedly high than when they learned that their risk was unexpectedly low (holding the risk feedback constant) and that disappointment and perceptions of severity of the threat would mediate this effect.

Our study had several strengths. First, we assessed personal risk perceptions prior to feedback and then provided feedback that confirmed or disconfirmed those expectations. This approach stands in contrast to studies that treat a population-based risk estimate or a provided baseline risk estimate (e.g., the overall incidence of a threat) as equivalent to a personally generated expectation.^(21,48) Learning, for example, that 20% of college students have a marker for a disease, although potentially powerful, is not the same as believing that one’s own risk for that disease marker is 20%.^(49,50) Because we were interested in examining the consequences of disconfirming a personal risk perception, we asked participants in our studies to generate a personal risk perception prior to receiving risk feedback rather than providing an impersonal baseline risk estimate or determining participants’ baseline risk based on their risk factors.^(8,51)

Second, we experimentally manipulated participants’ risk perceptions and then provided all participants with the same risk feedback, such that the feedback was consistent across participants but its relationship with their initial expectations varied. This experimental paradigm has strengths compared to other research using naturally occurring feedback situations (e.g., course exams)⁽²²⁾ or correlational designs,⁽¹⁾ which introduce unavoidable confounds and alternative explanations for their findings. By manipulating expectations and keeping feedback constant, we provide a strong and clear test of the effect of expectation disconfirmation *per se*, separate from the effects of the risk feedback itself. In addition to examining the effects of expectation disconfirmation on behavioral intentions, the experimental designs in our studies provided an opportunity to examine the mechanisms that drive this relationship.

2. METHODS

2.1. Development and Pilot Test of Manipulation

Prior to data collection, we completed two stages of pilot testing to ensure the appropriateness and effectiveness of our manipulation. As described in

more detail in the description of experimental procedures, the cover story for the study was that participants would be tested for their exposure to toxins found in everyday products. We first developed two versions of a paper-and-pencil toxin assessment that would serve as the expectation manipulation and pilot-tested the two versions of the assessment in an undergraduate psychology course for extra credit ($N = 244$). Each version of the assessment included 10 yes/no items related to environmental toxin exposure. In the *low-risk* condition, the items were selected to elicit primarily “no” responses (e.g., “Have you ever had direct contact with asbestos?” “Do you have regular and direct contact with pesticides?”), whereas the items in the *high-risk* condition were selected to elicit primarily “yes” responses (e.g., “Do you store food in plastic containers?” “Do you regularly use scented soap?”). As expected, participants made far more “yes” checks in the *high-risk* condition ($M = 7.14$, $SD = 1.7$) than in the *low-risk* condition ($M = 1.99$, $SD = 1.2$), $t(242) = 28.16$, $p < 0.0001$, $d = 3.62$. More importantly, participants in the *high-risk* condition estimated higher personal toxin levels ($M = 66.07$, $SD = 11.5$) than did participants in the *low-risk* condition ($M = 47.43$, $SD = 18.6$), $t(236) = 9.32$, $p < 0.0001$, $d = 1.21$.

We then completed a pilot version of our experimental methods to determine a level of feedback that would generally create a positive disconfirmation in the *high-risk* condition and a negative disconfirmation in the *low-risk* condition. Although participants in the initial pilot study provided risk estimates, we were concerned that the risk estimates of people who simply read about a health threat in a large group setting could differ significantly from people who learn about the risk in a setting with high experimental realism. Thus, we ran a pilot version of our experimental procedures to identify appropriate risk feedback in that context.

Participants ($N = 61$) came to the lab and were greeted by an experimenter who explained that participants would be tested for toxins found in everyday products. Participants then completed one of two versions of the paper-and-pencil toxin exposure assessment developed in the initial pilot study (*low risk* or *high risk*) with the ostensible goal of examining the relationship between self-reported toxin exposure and toxin levels in the body. Finally, participants completed a questionnaire that included a prediction of their personal toxin level (“Toxin levels can range from 0 ppm to 100 ppm, where ppm is parts per million. Please estimate your toxin levels”). Results

from the pilot study indicated that the average expectation in the *low-risk* condition was a toxin level of 40.8 ppm ($SD = 22.4$), and the average expectation in the *high-risk* condition was a toxin level of 54.2 ppm ($SD = 14.5$). Thus, the feedback level for the primary study was set at 47.5 ppm (± 6.7 ppm from the average expectations in each condition) with the goal that participants in the *low-risk* condition would experience positive disconfirmation and the participants in the *high-risk* condition would experience negative disconfirmation.

2.2. Procedures

Undergraduate students ($N = 110$, 65% female; 34% Asian, 34% Hispanic/Latino, 6% white/Caucasian, 4% black/African American, 4% Middle Eastern, 1% native Hawaiian/other Pacific Islander, 17% multiple) participating for partial course credit were greeted by an experimenter who explained that participants would be tested for toxins found in everyday products. Participants were then randomly assigned to complete one of two versions of the paper-and-pencil toxin exposure assessment (*low risk* or *high risk*) as described in the pilot study.

The experimenter explained that the participant would provide a saliva sample using a cotton swab. Participants were then given a cotton swab inside a plastic bag and instructed to hold the swab in their mouth for several seconds before placing the swab back in the plastic bag. After participants provided the sample, the experimenter informed them that the sample would be tested in a laboratory just down the hall and that they would receive feedback about their toxin levels at the end of the session.

While the experimenter ostensibly walked the sample down to the lab, participants completed the first questionnaire. This questionnaire included the item measuring participants’ expectations about their toxin levels, as described in the pilot study.

When the participant had completed the first questionnaire, the experimenter returned with the participant’s toxin level feedback. On the basis of the results of the pilot data, we provided all participants with feedback of 47.5 ppm. After receiving their feedback, participants completed the final questionnaire. This questionnaire included the target measures of disappointment over the test results (“I feel disappointed about my toxin level test results”; 1 = *strongly disagree*, 9 = *strongly agree*), perceptions of the severity of the health risk (“I think environmental toxins are a serious problem for

Table I. Means by Condition

	Low Risk	High Risk	<i>t</i> (<i>d</i>)
Mean toxin level estimate (out of 100 ppm)	39.0 (16.1)	57.9 (14.2)	6.54* (1.26)
Manipulation check	2.4 (1.2)	3.7 (1.1)	5.97* (1.15)
Intentions	4.8 (1.3)	4.3 (1.4)	2.31* (0.44)
Disappointment	4.5 (1.5)	3.5 (1.5)	3.48* (0.67)
Perceived severity	5.4 (1.2)	4.8 (1.3)	2.51* (0.48)
Anxiety	3.5 (1.5)	3.0 (1.3)	2.09* (0.40)
Relief	3.2 (1.5)	3.9 (1.6)	2.16* (0.42)
Surprise	4.8 (1.6)	4.5 (1.5)	1.04 (0.20)

Note: Numbers in parentheses are standard deviations. The *df* for all *t*-tests was 108.

* $p < 0.05$.

me personally”; 1 = *strongly disagree*, 9 = *strongly agree*),⁴ and a three-item measure of behavioral intentions (“How likely are you to try to avoid toxin exposure in the next month?” “How likely are you to avoid plastic food and liquid containers in the next month?” and “How likely are you to seek out additional information about environmental toxins in the next month?”; 1 = *not at all likely*, 9 = *very likely*; Cronbach’s $\alpha = 0.85$). To examine other possible mediators, the questionnaire also included an eight-item measure of state anxiety (e.g., “I feel anxious”; Cronbach’s $\alpha = 0.95$; adapted from Ref.⁽⁵⁶⁾) and measures of relief and surprise (“I feel relieved/surprised”).

Participants were then probed for suspicion and fully debriefed. No participant indicated significant suspicion about the procedures, and a three-item measure of suspicion (e.g., “I am skeptical about the accuracy of the toxin test”) did not differ between conditions, $t(108) = 0.59$, $p = 0.56$, $d = 0.11$.

3. RESULTS

3.1. Manipulation Checks

We first examined the success of our manipulation. As expected, participants in the *low-risk* condition predicted lower toxin levels than did participants in the *high-risk* condition (see Table I for means and differences by condition). In addition, a secondary manipulation check (“How did your toxin level results compare to your expectations?” 1 = *much higher (worse) than I expected*, 5 = *much lower (better) than I expected*) also revealed a sig-

nificant difference between conditions. Furthermore, the mean for the *low-risk* condition was significantly below the midpoint of the scale, as expected, $t(55) = 3.90$, $p = 0.0003$, and the mean for the *high-risk* condition was significantly above the midpoint of the scale, $t(53) = -4.59$, $p < 0.0001$.

Following the recommendation of O’Keeffe to test manipulation checks as mediators of hypothesized effects,⁽⁵⁷⁾ we used methods developed and recommended by Preacher and Hayes to estimate the path coefficients in a mediator model and generated bootstrap bias-corrected confidence intervals (CIs; 2,000 bootstrapped samples) for the specific indirect effect of risk condition on intentions through the manipulation check (rating of feedback as better vs. worse than expected).⁽⁵⁸⁾ As expected, the direct effect of the manipulation check on intentions was statistically significant, $b = -0.33$, $p = 0.004$, and the bias-corrected 95% CI for the indirect effects of risk condition on intentions through the manipulation check did not contain zero (CI = -0.83 to -0.14). We also examined the mediating role of the manipulation check in the relationship between risk condition and our specified mechanisms (disappointment and perceived severity). Again as expected, the direct effects of the manipulation check on disappointment and perceived severity were statistically significant, $bs = -0.63$ and -0.36 , $ps < 0.0001$ and 0.0003 , respectively; and the bias-corrected 95% CIs for the indirect effects of risk condition on disappointment and perceived severity through the manipulation check did not contain zero (for disappointment, CI = -1.23 to -0.47 ; for perceived severity, CI = -0.90 to -0.19).

Finally, participants’ estimates in the *low-risk* condition were significantly lower than the feedback provided, $t(55) = -3.97$, $p = 0.0002$, $d = 1.07$, and significantly higher in the *high-risk* condition, $t(53) = 5.39$, $p < 0.0001$, $d = 1.48$.

3.2. Primary Analyses

Our primary hypothesis was that participants in the *low-risk* condition, who experienced negative disconfirmation, would report stronger intentions to prevent toxin exposure than would participants in the *high-risk* condition, who experienced positive disconfirmation. This hypothesis was supported by the results of an independent *t*-test (see Table I for all comparisons). We also examined differences by condition in our proposed (disappointment, perceived severity) and alternative mediators (anxiety, relief, surprise). As hypothesized, participants in the *low-risk*

⁴Single item measures of disappointment^(22,52,53) and perceived severity^(54,55) are common in related research.

Table II. Correlations Among Study Variables

	Condition	Intentions	Disappointment	Perceived Severity	Anxiety	Relief
Risk condition	1.0	–	–	–	–	–
Intentions	–0.22*	1.0	–	–	–	–
Disappointment	–0.32*	0.44*	1.0	–	–	–
Perceived severity	–0.23*	0.54*	0.42*	1.0	–	–
Anxiety	–0.20*	0.28*	0.63*	0.31*	1.0	–
Relief	0.20*	–0.21*	–0.24*	–0.25*	–0.11	1.0

Note: Coefficients with an “*” are significant at $p < 0.05$. Expectation condition was coded as 0 = low risk, 1 = high risk.

condition reported greater disappointment and perceived the threat as more severe than did participants in the *high-risk* condition. Participants in the *low-risk* condition were also more anxious and less relieved, but surprise did not differ by condition.

3.3. Mediation Analyses

Having confirmed that prefeedback expectations influenced behavioral intentions, we next sought to identify mechanisms. We first examined the correlations between intentions and the potential mediators that differed by risk condition (disappointment, perceived severity, anxiety, and relief) to assess the need to add potential mediators to the path model. As seen in Table II, each of these variables was significantly correlated with intentions. Thus, we included all four potential mediators in the mediation analyses.

Using methods developed and recommended by Preacher and Hayes, we estimated the path coefficients in a multiple mediator model and generated bootstrap bias-corrected CIs (2,000 bootstrapped samples) for specific indirect effects of risk condition on intentions through disappointment, perceived severity, anxiety, and relief.⁽⁵⁸⁾ These procedures are preferable to a Sobel test, which does not allow for multiple mediators.

Although relief and anxiety predicted intentions in the bivariate correlation analyses, in the specified mediation model the direct paths—between anxiety and intentions, $b = -0.03$, $p = 0.74$, and between relief and intentions, $b = -0.04$, $p = 0.63$ —were not statistically significant. Furthermore, bias-corrected 95% CIs for the indirect effects of risk condition on intentions through relief and anxiety contained zero, indicating that the effect was not reliable (for anxiety, CI = -0.09 to 0.19 ; for relief, CI = -0.14 to 0.05).

In contrast, our hypothesized mediators were supported in the model. The direct effects of disappointment, $b = 0.23$, $p = 0.02$, and perceived severity,

$b = 0.47$, $p < 0.0001$, were statistically significant, and the bias-corrected 95% CIs for the indirect effects of risk condition on intentions through disappointment and perceived severity did not contain zero (for disappointment, CI = -0.51 to -0.06 ; for perceived severity, CI = -0.63 to -0.07). A pairwise contrast between the indirect effects for disappointment and perceived severity indicated that they were equally strong (95% bias-corrected CI = -0.41 to 0.27). Furthermore, pairwise contrasts between the indirect effects for disappointment and perceived severity on the one hand and anxiety and relief on the other indicated in all cases that the indirect effects for disappointment and perceived severity were stronger than for anxiety and relief (all bias-corrected 95% CIs contained zero).

4. DISCUSSION

The goal of this study was to examine the effect of expectation disconfirmation on behavioral intentions and to identify the mechanisms by which the relationship occurs. Consistent with our predictions, we found that people who received risk feedback that was worse than expected had stronger intentions to prevent the threat in the future than did people who received risk feedback that was better than expected. Importantly, both groups received identical risk feedback. Furthermore, our study provides the first evidence that positive and negative expectation disconfirmation lead to differing perceptions of a threat's severity, such that people perceive a threat as more severe when otherwise equivalent risk feedback comes as an unpleasant rather than pleasant surprise. Finally, we found that disappointment and perceived severity, and not anxiety or relief, mediated the relationship between expectation disconfirmation and behavioral intentions. It bears repeating that these findings are not merely evidence of an effect of feedback valence (i.e., whether people receive good or bad news) but instead reveal important

consequences of receiving risk feedback that disconfirms initial risk perceptions. The findings suggest that how one reacts and responds to objective risk feedback may depend on one's initial expectations prior to the feedback.

Our findings add critical pieces to the previously incomplete picture of the consequences of expectation disconfirmation. Ours is the first experimental investigation of the relationship between expectation disconfirmation and behavioral intentions in the context of personal risk perceptions, and the first study to examine the process by which intentions might rise or fall in response to unexpected risk feedback. One previous study that took a correlational approach to questions very similar to ours asked participants to estimate their cholesterol levels and then provided results from a cholesterol test.⁽¹⁾ The study measured participants' desire to lower their cholesterol in response to feedback and found that negative feedback was associated with greater desire to lower cholesterol when the feedback was expected rather than unexpected. This finding is inconsistent with our finding of strong preventive intentions in the face of unexpected unpleasant risk feedback. It is possible that participants in that study who both predicted and received negative feedback were simply knowledgeable about cholesterol and their own cholesterol levels, and thus may have entered the study with intentions to lower their cholesterol (the study did not measure prefeedback intentions). Our studies avoided these confounds by manipulating the expectedness of novel risk feedback.

4.1. Implications

As previously discussed, recent studies examining the consequences of unrealistic optimism in health domains have found that greater optimism is associated with less preventive behavior.^(7,12) However, our studies show that when people are faced with objective feedback to the contrary, they may adapt their behavior to fit the new risk information. In our studies, participants who learned that their risk was higher than they expected, mimicking the experience of having unrealistic optimism shattered by objective reality, formed relative strong intentions to take preventive action. This finding suggests that the previous conclusion that unrealistic optimists take fewer precautions may only apply when unrealistic optimists remain oblivious to their erroneous risk perceptions.

Similarly, our studies provide an important caveat to the conclusion that bracing for bad news by adopting a pessimistic outlook has many affective benefits with few costs.⁽²²⁾ Although our studies confirmed that people who learned that their risk was lower than expected, mimicking the pleasant surprise of besting one's unrealistic pessimism, felt relatively good in the face of feedback (i.e., they experienced less disappointment and anxiety and more relief), they also formed relatively weak intentions to take preventive action. Bracing is a robust phenomenon, demonstrated across numerous context,⁽²⁰⁾ yet our study is one of the first to examine potential behavioral consequences of this phenomenon at the moment of truth. Our findings point to an important tradeoff people face when managing their expectations as they await feedback: maintaining optimism leaves people open to disappointment, but bracing for the worst may undermine future motivation to improve. In light of both the pervasiveness⁽²⁰⁾ and intuitive appeal of bracing,⁽⁵⁹⁾ it seems that people find the emotional consequences of being caught off-guard more compelling than the potential for elation to undermine their motivation to change their behavior in response to feedback.

Beyond the implications of our findings for the academic literature lies an important application in the context of risk communication. Namely, our findings suggest that if people fail to engage in preventive behavior because they are naively optimistic about their chances of a negative outcome, someone may need only to present them with objective risk information to boost their preventive behavior. In contrast, if people are instead naively pessimistic, presenting objective risk information might undermine any existing motivation to engage in preventive behavior. In this situation, risk communicators face a serious dilemma: Should they withhold accurate risk information from unrealistic pessimists to avoid undermining their perceptions of the severity of their potential consequences and ultimately their motivation for preventive behavior? To return to the example of the two "sun worshippers," should the doctor withhold risk information from the woman who incorrectly believes her risk of skin cancer to be 75%, but relay risk information to the woman who incorrectly believes her risk to be less than 10%? The question reveals a tension between the goals of health behavior promotion and informed patient decision making that has plagued researchers in several health domains, most notably with regard to women's often overly pessimistic perceptions of their

breast cancer risk.^(60,61) Our findings cannot resolve this tension but rather point to the need for further consideration of the potential consequences of risk communication.

A related and key implication of our findings is that disappointment and perceived severity seem to serve as equal proxies between expectation disconfirmation and behavioral intentions. Although in the face of objective risk feedback, unrealistic optimists (albeit contrived optimists in our studies) experienced more anxiety and less relief than (contrived) unrealistic pessimists, only disappointment and perceived severity mediated the effect of disconfirming risk feedback on changes in behavioral intentions.

Our mediation findings also suggest that health communicators may have two avenues to improving the intentions of unrealistic optimists: convince them of their objective risk or simply increase their perceptions of the severity of the threat. Although disappointment could in theory be an equally effective target of intervention, disappointment is a direct response to worse-than-expected feedback⁽²⁵⁾ and would thus be a difficult target for direct intervention (i.e., without providing disconfirming feedback). Future research can examine whether taking aim at unrealistic optimists' perceptions of severity is as effective as changing their risk perceptions, but at the very least our findings suggest that anxiety and relief are merely byproducts of having one's expectations disconfirmed and not powerful influence on subsequent behavior in this context.

4.2. Limitations and Future Directions

Although our findings present a compelling case for the benefits of unrealistic optimism and the costs of unrealistic pessimism in the face of objective feedback, several limitations deserve note. First, our study designs do not allow us to draw firm causal conclusions regarding the mediating effects of disappointment and perceived severity. The manipulation of expectation disconfirmation allows at least tentative causal conclusions about the effect of disconfirmation on affect, cognition, and behavioral intentions, but as we have measured our mediators simultaneously with intentions, only several minutes apart, we must be cautious in concluding that disappointment and/or perceived severity prompted behavioral intentions. Future studies should utilize longitudinal designs to examine the temporal order of affective, cognitive, and behavioral responses to expectation disconfirmation.

Second, we did not include a condition in which participants received feedback that was unsurprising, consistent with their initial expectations. In part, this decision was a practical one. Because we manipulated but did not constrain participants' initial risk perceptions in an effort to maintain a degree of external validity, providing risk feedback that exactly confirmed participants' initial estimates while maintaining consistent feedback across conditions would have proved challenging and perhaps impossible. Though speculative, we suspect that people respond to risk feedback that confirms initial expectations with similar affect, appraisals, and intentions to those of people who receive feedback that comes as a pleasant surprise. Prospect theory indicates that people's responses to the *status quo* (in this case, feedback that confirms expectations) are more similar to how they respond to gains than how they respond to losses.⁽⁶²⁾ That is, to the extent that people perceive positive disconfirmation as a windfall of sorts,⁽²³⁾ we anticipate that responses to positive disconfirmation would diverge little from responses to the *status quo* of confirming feedback.

Third, participants were likely less familiar with their risk for "toxin exposure" than they would be with risks in their everyday lives, and we only tested our hypotheses in this single risk context. Although this may have limited the generalizability of our findings, we deliberately chose an unfamiliar and only loosely factual threat^(63,64) to minimize the chances that participants would have a firm sense of their personal risk and thus maximize the believability of risk feedback. That is, people may not respond to objective feedback as they did in our studies if they feel they already have a clear sense of their own risk. In fact, the possibility that our findings are dependent on a relatively unfamiliar context would reconcile our findings with the finding that it is difficult to change risk perceptions and subsequent behavior in the context of familiar health conditions.^(51,65) Thus, increasing the behavioral intentions of unrealistic optimists (or decreasing the intentions of unrealistic pessimists, if desirable) may be more difficult than simply presenting them with objective risk feedback when the context is a familiar one. On the other hand, people are almost certainly naive to their risk for a variety of threats, and in these cases our findings provide insight into a potentially effective intervention strategy.

Similarly, the effectiveness of presenting objective risk feedback to increase optimists' behavioral intentions may depend on the source of the

individual's unrealistic expectations. If people exhibit unrealistic optimism because they simply do not know their risk, then objective feedback may indeed boost their preventive behavior. If, however, people adopt an optimistic outlook as a self-protective strategy to avoid anxiety about their risk, then simply presenting them with objective feedback may do little to change their behavior. Thus, the applicability of our findings may also depend on whether the source of an error in expectations is due to ignorance or motivated reasoning. Although future research should examine these and other moderators of our findings, our studies point to a potential danger of unrealistic pessimism and a relatively simple strategy to mitigate the dangers of unrealistic optimism about personal risks.

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