

Waiting is the hardest part: a model of uncertainty navigation in the context of health news

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Waiting for any news can be a difficult experience, and waiting for health-related news presents additional challenges due to the potentially life-changing implications of diagnostic, prognostic or risk information. This paper introduces a model of uncertainty navigation as a novel theoretical framework of the strategies people use to mitigate the anxiety of waiting for health news. The model includes three overarching strategies for uncertainty navigation: consequence mitigation, reappraisal and emotion regulation. It also incorporates several factors that moderate the use of these strategies. Supportive empirical evidence for the use and effectiveness of these strategies is presented, and potential consequences, both good and bad, of using these strategies are described. Finally, some of the many future research directions that arise from this novel theoretical framework are discussed.

Keywords: uncertainty; information; bad news; bracing; health

‘I don’t care if the news is good or bad; I just want to know’. Anyone who has spoken these or similar words is likely all too familiar with the torment of awaiting uncertain news. Although painful waiting periods arise in all life domains, many of the most consequential waiting periods occur in anticipation of health news. In this context, people often await news that has ‘life or death’ implications, or that at least reveals the likelihood of experiencing pain and suffering. The purpose of this paper is to explore the various ways people manage the anxiety of uncertainty about their health and to present a model of uncertainty navigation that extends previous work on preparing for bad news to incorporate multiple preparative strategies. The model of uncertainty navigation also serves as a basis for discussing the functionality of various anxiety-management strategies in the context of health and pointing to key areas for future research.

A model of uncertainty navigation

We propose a model of *uncertainty navigation* that captures the array of strategies people use to navigate the difficult and often painful waiting period when they are waiting to learn something about their health, but they do not yet know the information.¹ This waiting period might occur during a diagnostic or prognostic

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process, as when people await results of a biopsy, blood test, genetic test, etc. or when they simply realise that something is amiss with their health but have not yet pursued a diagnosis.² The development of the model drew from diverse literatures on coping, goal management, preventative health behaviour and a variety of self-protective mechanisms to provide a novel theoretical approach to understanding uncertainty navigation in the context of health.

The model includes three overarching strategies people use to navigate uncertainty when awaiting information about their health: (1) consequence mitigation; (2) reappraisal; and (3) emotion regulation (Figure 1; also see Table 1 for descriptions of each strategy). Within the category of consequence mitigation are efforts to mitigate both objective and psychological consequences of health news. The model also includes three types of reappraisal: expectation management, benefit-finding and invalidating feedback. Although it is possible that people use other strategies to navigate uncertainty, the model provides a fairly exhaustive overview of the strategies that have current empirical support. The discussion of each of these strategies addresses the potential mental and physical health benefits, and in some cases the costs, of uncertainty navigation. Finally, the model includes a number of moderators of uncertainty navigation that influence the extent to which an awareness of uncertainty is anxiety-provoking.

Adoption of uncertainty-navigation strategies stems from an awareness of uncertainty, or an acknowledgement that things might not turn out as hoped. This awareness is distinct from expectation management or 'bracing' (Carroll, Sweeny, & Shepperd, 2006). Bracing is a strategic shift in expectations with the goal of reducing the emotional impact of bad news. In contrast, awareness of uncertainty might arise in response to external reminders of the unknown health outcome, new information about the health outcome or simply rumination about the health outcome. A key tenet of the model of uncertainty navigation is that uncertainty prompts anxiety, albeit with varying intensity. A number of theorists have argued that uncertainty creates a negative psychological state, particularly characterised by anxiety, and that people

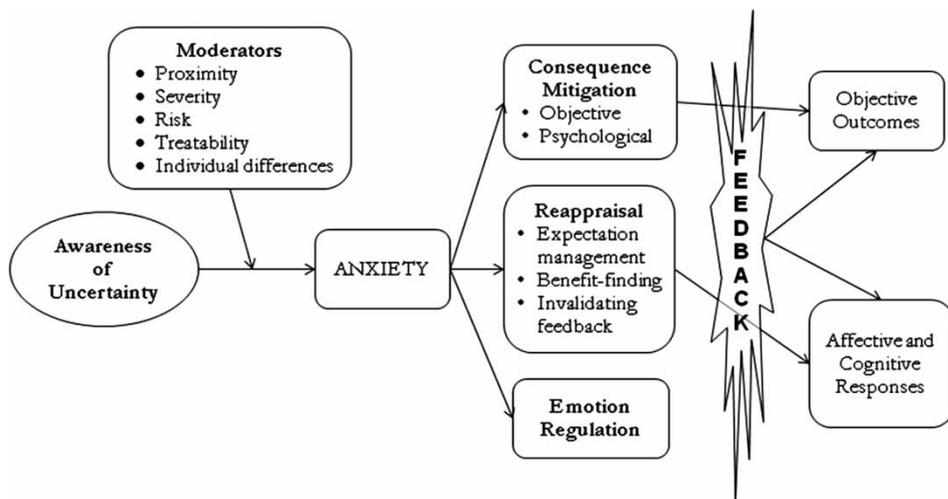


Figure 1. A model of uncertainty navigation in the context of health news.

Table 1. Strategies for navigating uncertainty.

Strategy	Description
Consequence mitigation	
Objective	Minimising the objective or non-psychological consequences of a bad health outcome.
Psychological	Minimising the emotional and cognitive consequences of a bad health outcome by preparing effective coping responses.
Reappraisal	
Expectation management	Reappraising the likelihood of good and bad health outcomes
Invalidating feedback	Reappraising the value of feedback by finding fault with the nature or source of the information itself
Benefit-finding	Reappraising the relative value of good and bad health outcomes
Emotion regulation	Mitigating anxiety in ways that are irrelevant to the health outcome itself

are motivated to mitigate this anxiety by reducing uncertainty (Afifi & Weiner, 2004; Connolly, 1980; Ellsberg, 1961; Izard, 1991; Loewenstein, 1994; Mandler, 1984; Parsons, 1980). In fact, both phenomenological and physiological investigations have revealed a strong link between uncertainty and anxiety (Behar, 2001; Penrod, 2001, 2002; Reiman, Fusselman, Fox, & Raichle, 1989). In many situations, people can reduce uncertainty-based anxiety by simply pursuing information or knowledge that resolves their uncertainty (Afifi & Weiner, 2004). However, the model of uncertainty navigation addresses situations in which the information needed to resolve uncertainty is not immediately available, and thus uncertainty may be particularly anxiety-provoking. Under these circumstances people must find alternative strategies to mitigate their anxiety, and one goal of the model of uncertainty navigation is to elucidate the strategies people are most likely to use.

Strategies for navigating uncertainty

Consequence mitigation

One strategy people use to manage uncertainty when facing potential bad news about their health is to take action to mitigate the consequences of a negative outcome. Although it may at first seem intuitive that people would prepare in advance for bad health news, some types of preparation incur costs of time, effort and even money, and thus it is not entirely obvious that people would actively attempt to mitigate the consequences of an outcome that has not yet occurred. One hypothesis deriving from the model of uncertainty navigation is that these costs are often worthwhile even when the outcome is uncertain because consequence mitigation serves not only to prepare for the future, but also to manage anxiety in the present.

Objective consequence mitigation

The model includes two types of consequence mitigation in the face of uncertain health news: objective and psychological. Turning first to objective consequence

mitigation, people may attempt to minimise a variety of non-psychological consequences of bad health news, such as financial costs, professional set-backs, time investment, etc. For example, a woman awaiting the results of a breast biopsy might make childcare arrangements in anticipation of a possible hospital stay, or she might speak to her employer to make arrangements to take time off from work. In a sense, this strategy mirrors the strategy of problem-focused coping following a stressful event, in which people take action to solve a problem or change a negative situation (Folkman & Lazarus, 1980, 1985) and is also related to proactive coping, in which people attempt to prevent a bad outcome or minimise its direct consequences (Aspinwall & Taylor, 1997). In contrast to problem-focused coping, however, objective consequence mitigation occurs prior to learning whether health news is good or bad.

Studies of risk perception support the proposition that an awareness of uncertainty can prompt efforts to mitigate objective consequences of bad news. For example, a meta-analysis of breast cancer risk perceptions and mammography concluded that women who felt more vulnerable to breast cancer were more likely to be screened (McCaul, Branstetter, Schroeder, & Glasgow, 1996). A mammogram would not reduce the chances that the women had cancer; however, it could mitigate objective consequences of cancer through early diagnosis. Similarly, other research finds that both perceptions of vulnerability and worry about prostate cancer predicted adherence to recommended prostate screening tests (Ward, Hughes, Hirst, & Winchester, 1997; Wolf, Philbrick, & Schorling, 1997). Again, adherence to recommended screening tests would not reduce the chances of developing prostate cancer, but early diagnosis that could result from the test would mitigate some of the objective consequences of a cancer diagnosis by improving the prognosis, minimising the course of treatment, etc. Together, these studies suggest that people may be more likely to attempt to mitigate objective consequences of bad news about their health when they become aware that their outcomes are uncertain and might be undesirable.

Psychological consequence mitigation

Another way people can manage their anxiety over uncertain health news is by making proactive efforts to mitigate the psychological consequences of the news. Although reappraisal strategies also influence psychological outcomes of bad health news, psychological consequence mitigation specifically refers to direct attempts to improve coping if the news is bad. For example, people might contemplate various coping strategies to determine the 'best' way to cope with a bad health outcome, or they might rehearse plans for responding to bad news with successful coping strategies (Feldman & Hayes, 2005; Taylor, Pham, Rivkin, & Armor, 1998). Psychological consequence mitigation mirrors emotion-focused coping efforts that often follow a negative event, in which people attempt to managing anxiety and other negative emotions arising from a stressful situation (Folkman & Lazarus, 1980, 1985).

Although few studies provide direct evidence for psychological consequence mitigation under conditions of uncertainty about health, one study of breast cancer patients waiting to learn the consequences of their chemotherapy found that women engaged in several forms of psychological consequence mitigation regarding their imminent hair loss. Interviews with these women revealed that they engaged in

affective rehearsal, in which they considered various emotional responses to hair loss to determine the most effective response, and made efforts to feel ready to cope with hair loss by trying on wigs and scarves (Frith, Harcourt, & Fussell, 2007).

Reappraisal strategies

A second strategy for uncertainty navigation is to reappraise the situation in one of a number of ways to reduce the anxiety-provoking nature of the uncertain health outcome. The model of uncertainty navigation includes three reappraisal strategies: (1) expectation management, in which people reappraise the likelihood of good and bad health outcomes; (2) benefit-finding, in which people reappraise the value of good and bad health outcomes; and (3) invalidating feedback, in which people reappraise the quality of feedback about health outcomes.

Expectation management

People who engage in expectation management in the face of uncertain health news can do so in one of two ways. First, people can manage their anxiety by 'bracing for the worst', or adopting a pessimistic outlook to prepare for bad news. Bracing is one strategy for managing uncertainty that has received a great deal of empirical support. Studies of bracing typically examine the relationship between anticipation of feedback and expectations about the upcoming feedback. These studies find that when people anticipate immediate feedback they have more dire expectations than when they do not anticipate feedback in the near future (see Carroll et al., 2006 for a review). Numerous studies that measure predictions find that people shelve optimism in favour of a more realistic or even pessimistic outlook as the moment of truth draws near. For instance, participants in one study believed they would or would not be tested for a fictitious medical condition, thioamine acetylase (TAA) deficiency, with severe consequences. All participants learned that 20% of students test positive for TAA deficiency then estimated the probability that they would test positive. Only participants anticipating testing supplied an estimate significantly greater than 20%. Moreover, as time passed, the estimates of the test participants climbed even higher whereas the estimates of no test participants remained the same (Taylor & Shepperd, 1998). Numerous studies across many domains demonstrate a robust tendency for people to lower their expectations when they anticipate imminent feedback (e.g., Armor & Sackett, 2006; Gilovich, Kerr, & Medvec, 1993; Sanna, 1999; Savitsky, Medvec, Charlton, & Gilovich, 1998; Shepperd, Ouellette, & Fernandez, 1996).

Bracing is a functional strategy in that lowering expectations can prepare people for potential negative outcomes by reducing the probability of unexpected negative outcomes, and thus disappointment (Shepperd & McNulty, 2002; Sweeny & Shepperd, in press). Furthermore, one study confirmed that people brace in response to anxiety over uncertainty (Shepperd, Grace, Cole, & Klein, 2005), presumably in an effort to reduce anxiety over being caught off-guard.

A second way people can manage their expectations in the face of uncertain health news is by embracing hope or optimism. Rather than preparing for bad news by embracing the worst possible outcome, people may also manage their anxiety over uncertainty by assuming the best. In fact, several studies find that although

expectations decline when people anticipate feedback they remain hopeful about their outcomes (Bruininks & Sweeny, 2008), which suggests that people may be able to garner the protective benefits of pessimism while also gaining the many benefits of hope. In fact, research supports a number of benefits of maintaining hope under difficult circumstances, such as better adjustment to breast cancer (Taylor, Lichtman, & Wood, 1984), reduced risk for of hypertension (Richman et al., 2005), increased immune functioning (Segerstrom, Taylor, Kemeny, & Fahey, 1998) and faster recovery from illness (Groopman, 2004). Furthermore, people recognise the potential benefits of optimism in the face of uncertain health outcomes (Armor, Massey, & Sackett, 2008), and uncertainty can even be pleasurable when people expect their outcomes to be positive (Wilson, Centerbar, Kermer, & Gilbert, 2005).

Benefit-finding

A second reappraisal strategy for navigating uncertainty is benefit-finding, or reappraising the value of health outcomes. Benefit-finding both reduces the value or importance of a good health outcome and looks for the benefits in a bad health outcome, such that people feel that either outcome is relatively acceptable. Regarding reappraisal of a good health outcome, qualitative studies of chronically ill patients support the notion that people protect themselves from threat by altering their perception of what it would mean to achieve a 'good' outcome. People who face chronic and deteriorating diseases often do not experience worse quality of life than other people (Breetvelt & Van Dam, 1991; cf. Walker, 2007), and their well-being typically does not diminish even as the illness progresses (Bach & Tilton, 1994; Schwartz, Sprangers, Carey, & Reed, 2004). Although this finding is somewhat surprising, one study suggests that chronically ill patients achieve stable quality of life by redefining satisfactory health with each set-back, a process called response shift (Schwartz et al., 2006; Sprangers & Schwartz, 1999). For example, a man with adult-onset diabetes might at first feel satisfied with his health as long as he can control his symptoms. If his symptoms become impossible to control, he might decide that he is satisfied with his health as long as he does not face amputation. If amputation becomes necessary, he might then decide that he is satisfied with his health as long as he is not bedridden. Although the literature on response shift does not typically measure patient's perceptions while they await specific health news, it may be that this process of shifting standards is most helpful in exactly those circumstances, when a new set-back may be imminent.

Perhaps even more important than devaluing a good health outcome, people can also look for value or benefit in the dreaded health outcome. Research suggests that people often reappraise a painful experience as an opportunity for growth (Davis, Nolen-Hoeksema, & Larson, 1998; Janoff-Bulman & Frantz, 1997). Furthermore, people who engage in benefit-finding following a negative event experience a number of positive outcomes. For example, one study found that people who found benefit or meaning in a recent trauma experienced less psychological distress than did people who did not find such benefit, controlling for pre-trauma distress (Davis et al., 1998). Similarly, a study of HIV + men and women found that benefit-finding was linked to higher levels of physical activity and less depression (Littlewood, Vanable, Carey, & Blair, 2008). Another study found that benefit-finding in women with breast cancer predicted greater well-being after the diagnosis for up to 5–8 years (Carver & Antoni,

2004). Although these studies examined benefit-finding following trauma, not in anticipation of it, people who find *potential* benefit in *possible* bad news will likely respond with less distress should the negative outcome actually occur.

Invalidating feedback

The third reappraisal strategy for navigating uncertainty is invalidating or finding fault with the upcoming feedback. Invalidating feedback can diminish the threat associated with unknown information by disregarding the nature or source of the information itself. People might seek to invalidate a human source of information, such as the opinion of a nurse or physician, or an instrument providing information, such as a machine or measurement scale. For example, a woman anxiously awaiting the results of a mammogram might remind herself that mammograms frequently produce 'false positives' or that doctors sometimes misread test results, and thus even a bad result might not be meaningful.

Although no research examines the strategy of invalidating feedback prior to receiving it, numerous studies have demonstrated people's inclination to invalidate threatening feedback after receiving a bad outcome. For example, one study found that women who are heavy caffeine drinkers were more skeptical of information on the risks of caffeine compared to non-caffeine drinkers, suggesting that caffeine drinkers invalidated the personally relevant and threatening feedback (Kunda, 1987). Similarly, smokers are less likely to be convinced by the Surgeon General's warnings against smoking than non-smokers (Kassarjian & Cohen, 1965), and students who believe their cholesterol to be in the high-risk range perceive high cholesterol to be less serious compared to students who believe their cholesterol to be in the desirable range (Croyle, Sun, & Louie, 1993). By and large, people are skeptical of any information that contradicts a favourable view of themselves (Gilovich, 1991), and people likely can set themselves up for such skepticism by contriving reasons to doubt the information prior to receiving it.

Emotion regulation

The final strategy for mitigating the anxiety of uncertainty about health outcomes is emotion regulation. In the context of the model of uncertainty navigation, emotion regulation refers to attempts to mitigate anxiety in ways that are irrelevant to the health outcome itself. In a sense, the experience of uncertainty is a stressful event in itself, so people may cope with the stressful experience with distraction or denial. In fact, taking one's mind off a stressful or anxiety-provoking situation can be beneficial when active responses to the situation are impractical or unavailable, which is exactly the case when people await news about their health (Lazarus, 1985). Similarly, both researchers and physicians argue that short-term denial is an appropriate and even beneficial response to certain negative health events (Bor, Miller, Goldman, & Scher, 1993; Faulkner, 1998; Greer, Morris, & Pettingale, 1979; Radziewicz & Baile, 2001). Although most aspects of the model of uncertainty navigation address outcome-oriented strategies, emotion regulation is a potentially important aspect of anxiety management in the face of uncertainty.

Outcomes of uncertainty navigation

Although the immediate outcome of uncertainty-navigation strategies is to reduce anxiety over uncertainty, the model of uncertainty navigation proposes that strategies for managing the anxiety of uncertainty can also affect both objective and psychological outcomes of health news, particularly if the news is bad. Objective consequence mitigation can affect the objective consequences of health news following feedback, and psychological consequence mitigation and reappraisal strategies can affect affective and cognitive responses to bad health news. Many of the affective consequences of uncertainty navigation have already been discussed. For example, expectation management can reduce the likelihood of experiencing disappointment and other negative emotions (Shepperd & McNulty, 2002; Sweeny & Shepperd, in press) and benefit-finding can increase well-being (Carver & Antoni, 2004; Sprangers & Schwartz, 1999) and decrease distress and depression (Davis et al., 1998; Littlewood et al., 2008). Though speculative, one hypothesis deriving from the model is that people who find reasons to believe that health feedback is unreliable, biased or otherwise invalid are also less likely to experience distress in response to bad news. For example, if the woman in the earlier example learned that her mammogram revealed something suspicious, she would likely be less distressed if she successfully convinced herself that most positive mammogram results are false positives.

Furthermore, many of the strategies for uncertainty navigation can affect cognitive responses to bad health news. Although uncertainty navigation likely affects a variety of specific cognitive responses to bad news, two major categories are of particular interest. First, uncertainty navigation may improve people's memory for and comprehension of bad news. People receiving bad news often find it difficult to understand and remember the information they receive (Croyle et al., 2006). For example, a patient may hear the word 'cancer' during a diagnostic conversation and fail to process any information thereafter. Memory for and comprehension of the content of feedback can be critical for improving long-term outcomes, avoiding confusion and distress and even increasing satisfaction with the experience of receiving bad news (Baile et al., 2000; Ellis & Tattersall, 1999; Fallowfield & Jenkins, 2004; Loge, Kaasa, & Hytten, 1997; Quill, 1991). Though speculative, uncertainty navigation may provide the preparation that people need to be ready to hear bad news. People who spend time reappraising the likelihood and nature of bad news and designing strategies to cope with it if it occurs are likely to be in a proactive rather than reactive mindset, which may better prepare them to hear, comprehend and remember the details of a bad news communication. Furthermore, anxiety can have detrimental effects on information processing and comprehension (Lerman et al., 1995), so it is likely that any effort to reduce the anxiety of uncertainty promotes better comprehension of bad news if it comes.

Second, uncertainty navigation may increase acceptance in response to bad news. People who accept their circumstances can seek meaning in their suffering, reduce their dread over what lies ahead and seek social support to cope (Gamliel, 2000). Acceptance often involves cognitive responses that entail looking for reasons why the negative event occurred, i.e., sense-making and focusing on positive changes resulting from the tragedy, i.e., benefit-finding (Davis et al., 1998; Rabow & McPhee, 1999). Uncertainty navigation lays the groundwork for acceptance most notably through

expectation management and benefit-finding. One type of expectation management is bracing for the worst, and this 'pre-acceptance' of the inevitability of bad news may promote acceptance of any negative outcomes that actually occur. Similarly, benefit-finding prior to learning health news almost certainly eases the process of sense-making and benefit-finding if bad news comes.

Moderators of anxiety over uncertainty

Although the strategies described in the model of uncertainty navigation are intended to apply to a broad range of uncertain situations, the model includes several moderators that might influence uncertainty navigation. Specifically, situational and personal factors can moderate the extent to which uncertainty is anxiety-provoking: (1) proximity to news; (2) severity of potential bad news; (3) risk of bad news; (4) treatability of potential bad outcomes; and (5) individual differences in anxiety over uncertainty. This list is unlikely to be exhaustive, but these five moderators represent factors that have received some degree of empirical attention in the context of anxiety over uncertainty, albeit not generally in the context of health news.

First, people are more likely to feel anxious about uncertain health outcomes when the health feedback is imminent rather than far in the future. As discussed earlier, research on bracing for the worst finds that people who expect to receive feedback about an uncertain outcome in the near future experience more anxiety and report greater pessimism about their outcomes than people who do not expect to receive feedback for some time (Shepperd et al., 1996, 2005; Sweeny & Shepperd, 2007; Taylor & Shepperd, 1998). For example, one study found that people awaiting results of a test for a fictitious severe disease experienced greater negative affect and were more pessimistic when they were moments from learning their test results vs. several weeks from learning their results (Taylor & Shepperd, 1998). Although no studies have examined the effect of feedback proximity on people's use of other uncertainty-navigation strategies, the relationship between proximity and anxiety suggests that people have a greater need to manage their anxiety as the moment of truth draws near.

Second, people are more likely to feel anxious about uncertain health outcomes when the health feedback has the potential to be more severe. This point is somewhat intuitive: clearly people experience more anxiety awaiting the results of a tumour biopsy than they do when awaiting the results of a test for strep throat. Furthermore, the study in which people awaited the results of a fictitious medical test found that people experienced greater negative affect and were more pessimistic when they believed the health condition was severe vs. not severe (Taylor & Shepperd, 1998). Again, this study only provides conclusive evidence for the relationship between severity of feedback and expectation management, but the relationship between severity and negative affect suggests that people are more likely to use other anxiety-management strategies when the feedback is more severe.

Third, people are more likely to feel anxious about an uncertain health outcome to the extent that they feel at risk for bad news. People actively manage their expectations about health news, either by becoming more pessimistic or more hopeful, but they may also have some sense of the objective likelihood that the health news will be bad. People derive their risk perceptions from a wide variety of sources,

including family history, personal health experiences and information from health care providers or other sources (e.g., Helzlsouer, Ford, Hayward, Midzenski, & Perry, 1994; Honda & Neugut, 2004), but, however, they determine their risk for bad health outcomes, one hypothesis deriving from the model is that they are more likely to experience worry and anxiety when they perceive their risk to be high. Numerous studies find that higher risk perceptions for breast, prostate and colon cancers, heart disease and diabetes predict worry about those conditions (DiLorenzo et al., 2006; McCaul et al., 1996; McQueen, Vernon, Meissner, & Rakowski, 2008; Schnur et al., 2006).

Fourth, people are more likely to feel anxious about an uncertain health outcome when the health outcome is not treatable or controllable. The model of uncertainty navigation specifically addresses situations in which people can no longer control the *content* of uncertain health news, but people may have more or less control over the *outcomes* of the news once they receive it. In fact, one study found that people experienced more distress in anticipation of learning their risk for alopecia, a chronic hair loss condition, when the condition was described as untreatable vs. treatable (Dawson, Savitsky, & Dunning, 2006).

Finally, a number of individual difference variables likely moderate the extent to which people experience anxiety over uncertainty, in various ways. First, such variables might reflect differences in how people experience uncertainty in general, such as intolerance of uncertainty (Dugas, Gosselin, & Ladouceur, 2001), uncertainty orientation (Sorrentino & Short, 1986) and need for closure (Webster & Kruglanski, 1994). Based on the general characteristics of these individual differences, people high in intolerance for uncertainty, people who have an uncertainty orientation and people high in need for closure would likely experience greater anxiety in the face of uncertainty.

Second, individual differences in anxiety over uncertainty might reflect differences in people's general expectations about the future, such as dispositional optimism (Scheier, Carver, & Bridges, 1994) and defensive pessimism (Norem & Cantor, 1986). People high in dispositional optimism likely feel less anxiety in the face of uncertainty due to their generally positive outlook on future events (Scheier et al., 1994). In contrast, defensive pessimists experience great anxiety in the face of uncertainty, although this uncertainty can be mitigated if they are allowed to adopt a pessimistic outlook (Norem & Cantor, 1986).

Third, individual differences in anxiety over uncertainty might reflect differences in people's general ability to weather threatening events, such as self-esteem (Rosenberg, 1989; Shepperd et al., 1996) and resilience (Mancini & Bonanno, 2009). In fact, one study found that people high in self-esteem experienced less anxiety in the face of uncertain feedback (Shepperd et al., 1996), and people high in resilience may be similarly buffered from anxiety. In addition, people's cultural background and context, including religious and spiritual beliefs, may influence the extent to which they experience anxiety over uncertainty. One study of cultural differences in dealing with uncertainty assigned an 'uncertainty avoidance index' to various countries. The results of this effort suggest that most Latin countries are marked by greater uncertainty avoidance than most Germanic countries, Asian countries ranged from very low to very high in uncertainty avoidance and Islamic countries were in the mid-to-high range (Hofstede, 2001). Although this approach is

limited in its specificity, the results are supportive of pervasive cultural differences in anxiety over uncertainty.

Additional considerations

Are uncertainty-navigation strategies always beneficial?

Thus far, the discussion has focused on the objective, affective and cognitive benefits of uncertainty-navigation strategies. Although uncertainty navigation is very often beneficial, it is also important to recognise that some strategies can have negative consequences. Some negative consequences of uncertainty navigation may result from engaging in a strategy unnecessarily or for too long a duration. For example, a woman whose cancer is in remission may suffer psychological consequences if she actively engaged in uncertainty-navigation strategies each time she thought about the possibility of her cancer returning. Instead, she might be best served to simply distract herself from that possibility. In fact, several studies confirm that repeatedly imagining a feared outcome diminishes people's capacity to respond effectively if the negative outcome actually occurs (Dijksterhuis & Smith, 2002), and extensive research on rumination reveals that excessive focus on negative or anxiety-provoking thoughts exacerbates depression, interferes with problem-solving, reduces motivation to engage in beneficial behaviours and undermines social support (Nolen-Hoeksma, Wisco, & Lyubomirsky, 2008). Furthermore, engaging in uncertainty navigation, particularly consequence mitigation and expectation management, while awaiting health news might prompt people to pursue additional, unnecessary medical tests, which could result in a range of physical, emotional and financial costs (Armstrong et al., 2006; Olsen & Gotzsche, 2001). Returning to the woman whose cancer is in remission, undue uncertainty navigation might prompt her to pursue more frequent check-ups or even to insist on invasive test procedures that are not medically required.

Uncertainty-navigation strategies may also be problematic if the news actually turns out to be good. Although preparing for the worst can make even good news feel better than it otherwise would have (Sweeny & Shepperd, in press), the relationship between uncertainty navigation and responses to good news may be more complex. Recent research suggests that although preparing for bad news buffers the emotional impact of bad news and heightens the emotional impact of good news, it also undermines the motivation to improve future behaviour. In one study, people learned that their 'toxin levels' were ostensibly lower or higher than they anticipated. Although people who were pleasantly surprised felt better than people who were caught off-guard, they also reported lower intentions to avoid toxin exposure in the future (Sweeny, Dillard, & Fox, 2010). It also seems likely that invalidating feedback would similarly undermine people's likelihood of reducing unhealthy behaviours or taking appropriate preventative or ameliorative steps after receiving a bad diagnosis or prognosis.

In addition, uncertainty-navigation strategies might complicate the ability to fully enjoy good news. Specifically, the strategy of invalidating feedback is almost certain to undermine the impact of good news. For example, recall the woman awaiting her mammogram results who comes to doubt physicians' ability to read mammograms. If this woman learns from her physician that her mammogram showed nothing of

concern, she may be unsure whether she can trust this good news. These potential negative consequences of uncertainty navigation remain speculative and call for further research to examine the relative benefits and costs of engaging in these strategies.

Future directions

This paper is the first to provide a comprehensive theoretical approach to understanding and predicting the processes by which people navigate uncertainty about their health. Although uncertainty-navigation strategies may be helpful under many types of uncertainty, the focus of the current paper is the application of these strategies in the frequently experienced and often life-changing context of health news. Although some aspects of the model of uncertainty navigation, particularly expectation management, have received attention in the empirical literature, most aspects of the model remain relatively untested. Namely, much of the research cited in this paper as support for the model focuses on coping with known information rather than coping with the uncertainty of unknown health information. One key goal of this paper is to draw attention to the need for more research on uncertainty navigation by both providing a testable theoretical framework and pointing to specific unanswered questions about uncertainty navigation.

First, are people equally likely to engage in any or all of the uncertainty-navigation strategies? It may be the case that some strategies complement each other, and other strategies may conflict with each other. For example, if people are able to convince themselves they care little about the awaited health news, for example, by invalidating the feedback or devaluing a good health outcome, they may feel little need to engage in expectation management to prepare for the possibility of bad news. Similarly, some strategies may be riskier than others, and thus people might spend more time engaging in uncertainty-navigation strategies that carry relatively little risk. Specifically, consequence mitigation and benefit-finding are likely to be relatively low-risk strategies, whereas invalidating feedback is far riskier. Of course, consequence mitigation requires some degree of time and energy, so people may balance the relative risks of each strategy. Future research can further explore how people make these trade-offs and when they are most likely to use each uncertainty-navigation strategy.

Second, does the process of uncertainty navigation change throughout the period of waiting for potentially bad health news? Longitudinal studies of uncertainty navigation could provide valuable insight into people's use of other strategies over the course of the waiting period. For example, longitudinal studies would reveal whether people are more likely to rely on different strategies to manage anxiety immediately following a diagnostic or prognostic test than they would days or weeks later when the news is impending. One literature that may be relevant to this question is the research on ego depletion (Muraven & Baumeister, 2000). Research on ego depletion suggests that self-control is a limited resource, such that dealing with one challenging situation makes it more difficult to successfully respond to another, or to the same situation at a later time. Thus, it may be that putting effort towards one uncertainty-navigation strategy depletes self-control resources, thus making it more difficult to engage other strategies throughout the waiting period.

Third, does uncertainty navigation work better, or perhaps differently, in some health contexts than others, or for some people than others? Some health news has the potential to be life-changing or even life-threatening, but sometimes health news has only the potential to create a minor inconvenience. As previously discussed, people are almost certainly less likely to engage in the range of uncertainty-navigation strategies to the extent that they perceive the health news as relatively unimportant or mild. Furthermore, people may use these strategies differently when they await news about a close other, such as a spouse, child, parent, etc. vs. news about themselves. For example, several studies find that people do not lower their expectations for others' outcomes in anticipation of bad news unless their own outcomes are also at stake (Sweeny, Shepperd, & Carroll, 2009). In fact, the nature of uncertain health news varies widely from uncertainty about one's risk for a disease, to uncertainty about the diagnosis of a health condition and to uncertainty about one's prognosis following a medical procedure. These various situations differ on countless dimensions beyond severity and personal relevance, and future research can identify which aspects of uncertain health situations are most important for predicting use of uncertainty-navigation strategies.

Fourth, what is the role of information-seeking in uncertainty navigation? Although it is certainly the case that many people channel uncertainty about their health into a search for helpful, or perhaps not-so-helpful, information (Miller, 1987, 1995; Miller & Mangan, 1983), it remains unclear whether information-seeking while waiting for health news always serves to reduce the anxiety of uncertainty. The advent of online medical forums and collaborative 'encyclopedia' outlets such as WebMD and Wikipedia makes it possible for people to self-diagnose by obtaining nearly infinite amounts of health information without the support or guidance of health professionals. Furthermore, seeking information about worst-case scenarios may set in motion a feedback loop, whereby the possibility of a negative health outcome seems increasingly likely and thus anxiety-provoking. Yet in many cases, information-seeking may be a healthy strategy that helps people prepare for the diagnosis of a medical condition, thereby serving as a type of anticipatory coping. Whether information-seeking is a beneficial response to uncertainty presumably depends on both situational and individual factors, including well-established individual differences in preferences for health information (Miller, 1987; Miller & Mangan, 1983).

Conclusions and implications for health care

The model of uncertainty navigation represents a theoretical approach to understanding and predicting how people navigate the psychologically painful experience of waiting for news about their health. Identification of the strategies people naturally use to navigate uncertainty could help dispel harmful myths about how people should react in the face of uncertain health outcomes. Research on coping finds that myths about the 'right' ways to cope can be damaging to people who choose to cope in different ways (Wortman & Silver, 1989), and it seems likely that myths about coping with uncertainty would have similar effects. For example, patients who are encouraged to 'think positively' as they await news about their health might have trouble managing their expectations towards pessimism in an effort to brace for bad news. Conversely, patients who are encouraged to 'face the

harsh reality' as they await health news might have difficulty managing their anxiety by invalidating the feedback or embracing a hopeful outlook. The model of uncertainty navigation includes an array of potentially effective strategies for mitigating the anxiety of uncertainty, any of which might be more effective under some circumstances or for some people than others, and one contribution of the model is that it reveals the diversity of reasonable responses to uncertainty.

Similarly, the model has the potential to enrich patient–provider interactions. Health providers who understand the strategies their patients might use to navigate uncertainty are likely to be more empathic to their patients' experience, and empathy is a key element of successful patient–provider relationships (Ellis & Tattersall, 1999; Omne-Pontén, Holmberg, & Sjöden, 1994; Penson et al., 2005; Ptacek & Ptacek, 2001; Roberts, Cox, Reintgen, Baile, & Gibertini, 1994). Furthermore, as research on the model further reveals the benefits and costs of each strategy, health providers can guide patients towards the best strategies given both situational and individual considerations. Most importantly, practitioners with knowledge of this model might be able to recognise when patients are using a potentially harmful strategy to navigate their uncertainty. Ultimately, the model of uncertainty navigation promises benefits to patients in reducing the anxiety of uncertainty, and health care providers can partner in this effort by acknowledging and encouraging patients to use self-protective strategies that people naturally employ when facing potentially bad news.

Notes

1. A 'waiting period' in the context of this paper refers to any period of time during which people lack information about their health but anticipate receiving this information in the foreseeable future.
2. In this paper, the terms 'information', 'feedback' and 'news' interchangeably refer to the target of people's uncertainty during a waiting period. Although uncertainty about these types of health news carries differing implications and may proceed along different timelines, they all share in common the painful experience of waiting.

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