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Title

Health behavior during periods of stressful uncertainty: associations with emotions, cognitions, and expectation management.

Permalink

<https://escholarship.org/uc/item/06z546jq>

Journal

Psychology & health, 35(10)

ISSN

0887-0446

Authors

Howell, Jennifer L
Sweeny, Kate

Publication Date

2020-10-01

DOI

10.1080/08870446.2020.1713323

Peer reviewed

Health Behavior During Periods of Stressful Uncertainty:
Associations with Emotions, Cognitions, and Expectation Management

Words = 169 (abstract) + 7667 (main text) + 1695 (references) + 350 (tables)

Abstract

Objective: The present study examined how cognitions and emotions characteristic of awaiting uncertain news influenced healthy (diet/exercise) and unhealthy (alcohol use) behaviors in three samples of people awaiting important news.

Design: Study 1 examined voting-eligible citizens during the month prior to learning the results of the 2016 U.S. presidential election. Study 2 examined the experience of law graduates across four months while they awaited the results of their bar exam (i.e., the licensing exam they need to pass to practice law). Study 3 examined current or recent PhD students searching for a job on the academic job market.

Results: Though the findings were somewhat mixed across studies, they generally suggest a relationship between positive emotions and health promoting behaviors and between worry and alcohol use, with less consistent relationships between outcome expectations and health behaviors.

Conclusion: Taken together, these results offer a promising set of initial findings to understand health behavior in the context of awaiting uncertain news and provide a foundation for future investigations into on the topic.

Abstract word count = 169

Physical and psychological well-being are inextricably related: When one suffers, the other typically does as well (Beekman et al., 1997; Croyle & Rowland, 2003; El-Gabalawy, Mackenzie, Shooshtari, & Sareen, 2011; Kurtz, Kurtz, Given, & Given, 2004; Paluska & Schwenk, 2000; Strine, Chapman, Kobau, Balluz, & Mokdad, 2004). The causal nature of the relationship between physical and psychological health appears to be bidirectional, with psychological suffering manifesting in physical ill-being and physical suffering manifesting in psychological ill-being (Cavanaugh, Furlanetto, Creech, & Powell, 2001; Johnston-Brooks, Lewis, Evans, & Whalen, 1998; Katon & Sullivan, 1990; Logan & Barksdale, 2008).

One of the more robustly researched physical-psychological health links is the link between stress and physical health (Pearlin, Schieman, Fazio, & Meersman, 2005). While the link between stress and health has often been attributed to biological functions, including allostatic load due to overactivation of the hypothalamic pituitary adrenal (HPA) axis (Logan & Barksdale, 2008; McEwen, 1998), a non-trivial mediator of the link between stress and physical health is health-relevant behavior (Glanz & Schwartz, 2008; Siegrist & Rödel, 2006; Wiebe & McCallum, 1986). When people experience everyday stress they may turn to either healthy behaviors, like exercise (Berger & Owen, 1988; B. Cohen & Williamson, 1979) or unhealthy behaviors, like alcohol use (Cooper, Russell, Skinner, Frone, & Mudar, 1992; Laitinen, Ek, & Sovio, 2002) to manage their stress. The aim of the present paper was to examine health behavior in response to the stressful uncertainty associated with awaiting uncertain news.

Awaiting Uncertain News: A Stop along a Stressful Journey

Stress can take many forms. People experience stress resulting from major disruptive life events like serious injury (Davydow et al., 2009) or loss of a loved one (Schneider, 1984). They also experience stress during more minor, everyday events like work (Siegrist & Rödel, 2006),

parenting (J. O. Berry & Jones, 1995), and traffic (Gee & Takeuchi, 2004). The present studies focused on a specific type of stress: the stress that arises when one is awaiting uncertain news (Sweeny & Cavanaugh, 2012; Sweeny & Falkenstein, 2014).

Waiting for uncertain news represents a period during which one has neither control over a stressor nor certainty about the outcome of that stressor (Sweeny, 2018). Consider a hypothetical student who will take a midterm exam in her psychology class. Although she may be uncertain about her eventual grade leading up to an exam or while taking the exam, she has some degree of control over that outcome by studying and preparing for and then putting maximal effort forth on the exam (Rovira, Fernandez-Castro, & Edo, 2005). Moreover, after grades are posted, although she has no control over her performance on the exam, she is certain about her performance and can adapt (e.g., in the case of failure by studying more for the final or withdrawing from the class). However, after she submits her exam, and before she learns her grade the student must endure a period of waiting. At this point, uncertainty about her exam outcome is still high—the exam has not been graded—but all control over her outcome has evaporated. Although each phase of the student’s experience can be stressful, particularly if the student performs poorly on the exam (K. Berry & Kingswell, 2012; Burns, 2004; Rovira et al., 2005; Zeidner, 1995), the waiting stage may be the most difficult phase because it is marked by both low certainty about and low control over the outcome (Portnoy, 2010; Sweeny, 2018; Sweeny & Cavanaugh, 2012; Sweeny & Falkenstein, 2014). Often people must wait for news that is more consequential than a college exam grade—like medical diagnoses, professional licensing exam results, or pregnancy test results (Sweeny & Andrews, 2014; Sweeny, Andrews, Nelson, & Robbins, 2015; Sweeny & Falkenstein, 2015). In the present study, we focus specifically on this high-uncertainty, low-control stop along a common trajectory of stress.

Health Behavior in Waiting Periods

Unfortunately, while the link between various stressors and health behavior has enjoyed considerable empirical investigation (Berger & Owen, 1988; S. Cohen, Evans, Stokols, & Krantz, 2013; Glanz & Schwartz, 2008; Park, Armeli, & Tennen, 2004; Siegrist & Rödel, 2006), little is known about health behavior in the context of the stress of awaiting uncertain news (Howell & Sweeny, 2016; Sweeny, Reynolds, Falkenstein, Andrews, & Dooley, 2016). The closest investigation of subjective physical health during a stressful waiting period linked the experience of waiting for important news to poorer self-reported health and sleep disruption (Howell & Sweeny, 2016). To our knowledge, no investigation has systematically examined health behavior in the context of a stressful waiting period. More importantly, no investigation has systematically investigated whether cognitive and emotional responses in this context predict health behaviors.

Given the uniquely stressful nature of waiting experiences (Sweeny & Falkenstein, 2015), paired with the well-established link between life stress and health behaviors (Glanz & Schwartz, 2008), it may seem clear that waiting periods would influence health behavior. However, our interest is not in the overall effect of waiting on health behaviors, nor the comparison between a waiting period and a period free from such stress. Instead, we were interested in whether the affective signature of the wait itself, as well as attempts to engage in expectation management, would predict health behavior during this period of stressful uncertainty.

Individual Differences in Reactions to Awaiting Uncertain News

Not everyone responds in the same way to the same to waiting periods (Sweeny, 2012a; Sweeny & Andrews, 2014; Sweeny & Howell, 2017; Sweeny et al., 2016). Indeed, people vary

in their emotional responses, coping strategies, and, consequentially, in their psychological and physical well-being (Howell & Sweeny, 2016; Sweeny & Andrews, 2014; Sweeny et al., 2016).

On the cognitive and emotional front, the wait for uncertain news is typically characterized by decreased positive emotion and increased negative emotion, and in particular, very high levels of worry (Sweeny & Dooley, 2017; Sweeny & Falkenstein, 2015; Sweeny et al., 2016).

Nevertheless, some people seem particularly unlikely to worry and seem to manage their waiting period with aplomb (Sweeny, 2012b; Sweeny & Andrews, 2014; Sweeny & Howell, 2017; Sweeny et al., 2016).

Additionally, people differ in the types of strategies they employ to cope with the wait (Sweeny & Andrews, 2014; Sweeny et al., 2016). One coping strategy that appears particularly key to well-being during and after the wait is expectation management (Sweeny et al., 2016).

Attempting to keep one's expectations low, or bracing for the worst, can help people to manage their reaction to bad news if it ultimately arrives (Sweeny & Dooley, 2017; Sweeny & Howell, 2017; Sweeny & Shepperd, 2010). In contrast to bracing, some people opt to maintain hope and optimism during the wait—a strategy called positive expectation management (Sweeny, 2012b; Sweeny et al., 2016). Engaging in positive expectation management can be an effective way to combat worry, but it can also set people up to experience a harsh emotional blow should they receive bad news (Sweeny et al., 2016). Both theorizing and empirical evidence have connected these strategies to well-being during and after the wait (Sweeny et al., 2016); nevertheless, their links to behavior, and particularly health behavior, remains uninvestigated.

Overview and Hypotheses

The aim of the present studies was to examine whether the emotional and coping dynamics that arise during waiting periods relate to health behaviors while awaiting uncertain

news. As mentioned earlier, the link between stress and health is somewhat complex, with stress engendering both positive and negative health behaviors (Berger & Owen, 1988; e.g., Buckner, Schmidt, Bobadilla, & Taylor, 2006; Cooper et al., 1992). Thus, it is difficult to form strong hypotheses regarding how the stress of waiting might steer health behavior.

Nevertheless, some indirect evidence suggests that waiting may engender negative health behavior. Specifically, both a lack of perceived personal control and a sense of uncertainty (sometimes operationalized as a lack of meaning), two hallmarks of awaiting uncertain news, have been linked to negative health behaviors, though neither has been explored in great depth. For instance, when people feel uncertain about their identities, they sometimes turn to unhealthy behaviors that can help them to establish their sense of self as part of a group (Dickerson, Gruenewald, & Kemeny, 2011; Hogg, Siegel, & Hohman, 2011). In one study, participants who wrote about a time when they felt uncertain about themselves were more open to risky drug and alcohol use than were those who wrote a control essay (Howell, Hua, & Sosa, 2018). Similarly, when people feel that they lack control, they become increasingly likely to use substances (Newcomb & Harlow, 1986). Indeed, greater perceived control relates to a reduced likelihood of adolescent substance use (Adalbjarnardottir & Rafnsson, 2001) as well as a greater likelihood of healthy eating and exercise (Cobb-Clark, Kassenboehmer, & Schurer, 2014).

Returning to the signature experience of waiting, worry has been linked to both positive and negative health behaviors. For instance, worry predicts health-promoting behaviors, including vaccination and health screening (Chapman & Coups, 2006; Ferrer, Portnoy, & Klein, 2013; Hay, McCaul, & Magnan, 2006). However, worry also predicts negative health behaviors, including alcohol use (Crum, Storr, Chan, & Ford, 2004). In one particularly relevant study, people who lost sleep as the result of worry, an effect that occurs among those awaiting uncertain

news (Howell & Sweeny, 2016), were particularly likely to develop disorders of alcohol use (Crum et al., 2004).

Given prior evidence linking stress, uncertainty, and lack of control to negative health behaviors, we generally expected that when waiting was its most difficult (e.g., when expectations were lowest, and emotions were the most negative/least positive) people would likely show increased negative health behavior. The link to expectations and expectation management strategies is perhaps less clear. We speculate that expectations and expectation management influence health behavior by changing people's subjective stress and well-being and by orienting them temporally toward the present moment (in the case of bracing) or toward the future (in the case of optimism). For instance, although lowering expectations can prepare people to deal with bad news, it is unpleasant and stressful in the moment (Sweeny et al., 2016). Thus, when people lower their expectations, they may be more prone to using health behaviors to combat the acute stress associated with waiting. By contrast, when people raise their expectations, or are optimistic, they orient positively toward the future and future goals (Hazlett, Molden, & Sackett, 2011; Oettingen & Mayer, 2002). Consequently, they may be focused on promoting their own long-term health and thus increase their positive health behaviors.

Given that health behaviors have not, to our knowledge, been studied in the context of awaiting uncertain news, and that the link between stress, emotions, and health is mixed, we took a generally exploratory approach to our endeavor. That is, we examined both self-reported negative and positive health behaviors among people waiting for three different types of news and facing waiting periods of various lengths. We studied voting-aged citizens awaiting the results of the 2016 U.S. presidential election (Study 1), law graduates awaiting their bar exam results (Study 2), and current or recent PhD students on the academic job market (Study 3). We

investigated alcohol use (Studies 1-3) and healthy diet and exercise (Studies 2-3) during these periods, with a particular focus on how positive and negative emotions, worry, and expectation management strategies related to these behaviors. We examined both general relationships between these health behaviors and emotions/expectation management (Studies 1-3) as well as within-subjects relationships between personal changes in these emotions and cognitions and personal changes in health behavior over the course of a waiting period (lasting 4 months, Study 2; lasting 7 months, Study 3).

We specifically focused on alcohol use, diet, and exercise for two reasons. First, a variety of prior research suggests that people attempt to combat stress with exercise (Berger & Owen, 1988; B. Cohen & Williamson, 1979), eating behavior (Adam & Epel, 2007; Janet Tomiyama, Finch, & Cummings, 2015; Laitinen et al., 2002; Torres & Nowson, 2007), and alcohol use (Cooper et al., 1992; Laitinen et al., 2002). As such, these behaviors represented outcomes that we thought would be influenced by the processes we examine here. Second, we wanted to examine common health behaviors in which we believed participants would generally engage. Rarer health behaviors (e.g., drug use) would require large or targeted samples and findings may be confounded by factors that influence engaging in those rare health behaviors to begin with.

Study 1

Method

Participants and procedure. Participants ($N = 669$; 330 Donald Trump supporters, 339 Hillary Clinton supporters; $M_{age} = 34.6$ years; 44% female; 1% did not complete high school, 43% completed high school only, 44% completed college only, 12% completed a higher degree) were recruited in the seven weeks leading up to the 2016 presidential election via Amazon's Mechanical Turk and compensated US\$1 for their time. Some participants ($n = 476$) also

completed a post-election survey for an additional US\$2, this survey was not relevant to the current investigation, but is instead the subject of another research endeavor which shares only participants with this study (Rankin & Sweeny, 2019). Participation was restricted to those eligible to vote in the United States; 18 years of age or older and a United States citizen.

We recruited fifty unique supporters of each presidential candidate (Clinton and Trump) each week for the seven weeks preceding the presidential election to complete a survey about their political preferences and physical and mental well-being. The eighth and final data recruitment and collection wave occurred one day before the election. We chose to recruit 100 participants at each time point based on a rule-of-thumb of having 50 participants in each “cell” of a two-cell design.

For all analyses that compare Trump and Clinton supporters, we identify participants by the candidate for whom they indicated support in the pre-election survey—the survey from which we obtained all data for this study. Due to a survey programming error, race and ethnicity data are not available. All materials are available as Supplemental Materials online and on the Open Science Framework at https://osf.io/7j3ca/?view_only=ebc925e8707f49bf9d3517d56553d5d9 (link anonymized for peer review), and full data are available upon request per Institutional Review Board guidelines.

Measures.

Worry. Participants indicated their worry about the outcome of the presidential election using three items, which captured both the affective and cognitive components of worry (Sweeny & Dooley, 2017; “I feel anxious every time I think about the outcome of the presidential election,” “I am worried about the outcome of the presidential election,” “I can’t seem to stop

thinking about the outcome of the presidential election”; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 4.21$, $SD = 1.55$, Cronbach’s $\alpha = .86$).

Emotions. All participants reported their emotional state by responding to an adapted version of the Affect Adjective Checklist (Warr, Barter, & Brownbridge, 1983). We combined these items into a positive emotion composite (happy, pleased, joyful, enjoyment/fun; 1 = *not at all*, 7 = *extremely*; $M = 4.62$, $SD = 1.47$; $\alpha = .92$) and a negative emotion composite (angry/hostile, frustrated, depressed/blue, unhappy; 1 = *not at all*, 7 = *extremely*; $M = 2.35$, $SD = 1.39$; $\alpha = .90$).

Expectations. We assessed outcome expectations and expectation management strategies in three ways. First, participants indicated the likelihood (0% to 100%) that their preferred candidate (Clinton or Trump) would win the election ($M = 65.54$, $SD = 19.62$). Second, participants indicated the extent to which they were bracing for the worst with two items adapted from other studies of waiting experiences (Sweeny & Andrews, 2014; Sweeny et al., 2016; “I’m bracing for the worst when it comes to the results of the outcome of the presidential election,” “I want to make sure I keep my expectations low when it comes to the results of the outcome of the presidential election”; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 4.28$, $SD = 1.51$, $\alpha = .67$). Third, participants indicated the extent to which they were embracing a positive outlook (i.e., positive expectation management) with two items, similarly adapted from the same previous research on waiting (“I’m hoping for the best when it comes to the outcome of the presidential election,” “I’m trying to be optimistic about the outcome of the presidential election”; 1 = *strongly disagree*, 7 = *strongly agree*; $M = 5.50$, $SD = 1.18$, $\alpha = .77$).

Primary outcome: Health behavior. For this study, we focused on drinking behavior. The measure consisted of two dichotomous-response items adapted from the NIAA Task Force

Recommended Alcohol Questions (2003), both of which assessed whether participants had engaged in drinking that exceeded moderate drinking (two drinks or more in one sitting, more than seven drinks in a week) in the past week (“During the past week, have you had three or more alcoholic beverages in one sitting?” “During the past week, have you had more than seven alcoholic beverages total?”; 27% and 28% responded yes, respectively). If participants answered yes to either question, they were given a score of 1 for drinking behavior (29%), indicating greater-than-moderate drinking; if they answered no to both questions, they were given a zero (71%), indicating moderate drinking or less (US Department of Health and Human Services, 2017)¹. We also asked about nicotine use, but only 16% of the sample indicated any nicotine use (via cigarettes/cigars, chewing tobacco, or electronic cigarettes), so we focused on drinking behavior for our analyses.

Results

Participants who were more worried about the outcome of the election were more likely to report high levels of drinking, $r(748) = .07, p = .049$. However, drinking behavior was unassociated with general positive emotion, $r(748) = -.01, p = .89$, and negative emotion, $r(748) = .04, p = .33$. Regarding expectation management, participants who reported bracing more for the outcome of the election were more likely to report heavy drinking, $r(748) = .10, p = .007$. However, neither positive expectation management, $r(748) = -.04, p = .29$, nor outcome expectations, $r(748) = -.04, p = .27$, were associated with drinking behavior.

We also conducted exploratory analyses to ensure that the observed effects were not due to candidate preference, time to election, or individual differences (optimism, defensive pessimism, intolerance of uncertainty, neuroticism). Regression analyses controlling for these

¹ We chose to set our threshold at a moderate level, rather than a binge drinking level, to detect even slightly above-recommended drinking levels among our participants.

variables were generally consistent with the bivariate correlational analyses: drinking behavior was associated with worry (albeit falling short of traditional cutoffs for statistical significance), $\beta = .07$, $p = .086$, and bracing, $\beta = .11$, $p = .007$, and not with positive emotion, $\beta = -.03$, $p = .46$, negative emotion, $\beta = .05$, $p = .22$, positive expectation management, $\beta = -.06$, $p = .14$, or outcome expectations, $\beta = -.03$, $p = .52$.

Discussion

Study 1 partially confirmed our hypotheses that people would engage in unhealthy behavior to the extent that they were distressed and bracing for the worst while awaiting uncertain news, in this case the outcome of a presidential election. Participants who were more worried and who were managing their expectations by bracing for the worst were more likely to engage in drinking at greater-than-moderate levels. However, neither negative nor positive emotions predicted drinking behavior, nor did efforts toward hope and optimism or one's expectations for the election outcome.

Although these findings point to a possible pathway by which people's health may suffer during particularly challenging moments of a waiting period, Study 1 was limited in several key ways. Most notably, we did not include a measure of healthy behavior, and we cannot be sure whether dispositional differences in worry or distress account for the associations we observed, despite our efforts to control for potential third variables. A longitudinal approach provides a better sense of whether people engage in unhealthy behavior when they are distressed and pessimistic or whether people who tend to be distressed and pessimistic also tend to be unhealthy overall. We remedy these two limitations in Studies 2 and 3.

Study 2

Method

Participants and procedure. Participants were 124 law school graduates (61% female; $M_{age} = 27.74$; 61.1% Caucasian, 18.1% Asian, 6.7% Hispanic/Latino(a), 2.0% African-American, 0.7% Native Hawaiian or other Pacific Islander, 11.4% other/multiple) who took the California bar exam—the licensing exam to practice law in the state of California—in the summer of 2016. Participants were recruited by emailing law school deans, student bar associations, and other student and university groups relevant to law students and recent graduates who might be taking the bar exam. In California, the bar exam is administered twice annually. All law graduates who take the exam must wait approximately four months to receive their pass/fail result. In the end, most of our participants (68%) reported passing the bar exam.

Participants completed a total of eight surveys for this study. First, all participants completed an initial baseline survey within the month preceding the exam itself. Next, all participants completed a survey within three days after finishing the bar exam. We used the next three surveys to capture participants' experiences during the wait. To reduce participant burden across the study, while still capturing the longitudinal nature of the waiting period (see Sweeny, 2018), we randomly assigned participants to one of five groups ($n = 25$ per group). Participants then completed surveys once every five weeks while they waited for their bar exam result (e.g., Group 1 completed surveys during weeks 1, 6, and 11; Group 2 completed surveys during weeks 2, 7, and 12). The sixth survey was completed by all participants within 24 hours prior to receiving their bar exam result. Participants also completed two surveys following receipt of the result. We focus here on responses to the five surveys completed during the waiting period (from immediately after the bar exam result to immediately prior to receiving one's result). Participants completed a total of 8 surveys and were compensated \$10 for each survey they completed; participants could receive up to \$80 for completing all 8 surveys.

All study measures are publicly available on the Open Science Framework (https://osf.io/mpnqt/?view_only=ca5dd15f2b934f838676e08da745bc76 link anonymized for peer review), and full data are available upon request.

Measures.

Worry. Similar to Study 1, worry was assessed with 3 items (“I feel anxious every time I think about the bar exam,” “I am worried about my bar exam result,” “I can’t seem to stop thinking about the bar exam”); 1 = *strongly disagree*, 7 = *strongly agree*; $M_{overall} = 4.42$, $SD_{overall} = 1.24$, $\alpha s > .77$).

Emotions. We assessed emotional states experienced over the past week the same measures as in Study 1 (negative emotions: $M_{overall} = 3.84$, $SD_{overall} = 1.20$, $\alpha s > .84$; positive emotions: $M = 5.36$, $SD = .90$, $\alpha s > .85$).

Expectations. Similar to Study 1, we had three measures of expectations. First, participants indicated the likelihood (0% to 100%) that they would pass the bar exam ($M_{overall} = 67.85$, $SD_{overall} = 18.12$). Second, they indicated the extent to which they were bracing for the worst (“I’m bracing for the worst when it comes to my bar exam result,” “I want to make sure I keep my expectations low when it comes my bar exam result”); 1 = *strongly disagree*, 7 = *strongly agree*; $M_{overall} = 4.30$, $SD_{overall} = 1.50$, $\alpha s > .77$). Third, they indicated the extent to which they were embracing a positive outlook (i.e., positive expectation management) using the items “I’m hoping for the best when it comes to my bar exam result,” and “I’m trying to be optimistic about my bar exam result”) 1 = *strongly disagree*, 7 = *strongly agree*; $M_{overall} = 5.97$, $SD_{overall} = .92$, $\alpha s > .68$).

Health behavior. As in Study 1, the drinking measure consisted of two dichotomous-response items (across surveys, between 33% and 43% indicated they had consumed three or

more drinks in a sitting, and between 26% and 37% indicated they had consumed seven or more drinks in the past week). If participants answered yes to either question, they were given a score of 1 for drinking behavior; if they answered no to both questions, they were given a zero. We again asked about nicotine use, but only 5-11% of the sample indicated any nicotine use during the waiting period, so we focused exclusively on drinking behavior.

We also assessed healthy behavior with five items that assessed whether participants engaged in exercise and healthy eating on more days than not (i.e., aerobic physical activity, strengthening exercises, fruit and vegetable consumption, and recommended water consumption). We summed participants' responses on these items to create a healthy behavior composite ($M_{overall} = 2.85/4$, $SD_{overall} = 1.36$, $\alpha s > .57$).

Results

Given the longitudinal nature of our data, we used multilevel modeling to examine the relationship between waiting experiences and health behavior across the waiting period, nesting repeated measurement point (Level 1) within individuals (Level 2). Analyses predicting healthy behavior were conducted with the SAS 9.4 PROC MIXED procedure and controlled for both linear and quadratic time and their interaction effects, given that healthy behavior showed a quadratic pattern over time, as did many of our predictor variables.² Due to problems with model convergence, which were likely due to the inclusion of time as a random effect, we did not allow the person-centered predictors to vary randomly in these models, only the intercept. Analyses predicting drinking behavior, a categorical variable, were conducted in MPLUS 7. Because drinking showed a linear pattern, we controlled for linear time in these analyses. Table 1 shows

² For healthy behavior, a quadratic growth model fit best, $\Delta\chi^2 = 22.3$, $p < .01$ (compared to a linear growth model), and the fixed effect of quadratic time was significant, $t = -3.65$, $p = .0004$. The linear fixed effect was not significant, $t = 1.46$, $p = .15$. See Sweeny and Howell (2017; Study 1) for longitudinal growth model results for worry, emotions, bracing, and hope/optimism.

key model parameters. Specifically, it shows the results of each of the predictors that are grand-mean centered (i.e., “between-persons”) and person-mean centered (i.e., “within-person”).

The between-persons effects are grand-mean centered and can be interpreted as the relationship between average levels of each predictor, across the wait, and average levels of each health behavior outcome across the wait. A positive coefficient suggests that people who reported higher levels of the predictor, in general, also reported greater levels of the relevant health behavior, in general. The within-person effects are person-mean centered and can be interpreted as the relationship between each predictor and each health behavior controlling for these average trends. A positive coefficient suggests that when people experience elevated levels of the predictor, compared to their own average across the wait, they also experience elevated levels of the relevant health behavior.

As displayed on the left side of Table 1, only worry predicted drinking behavior in Study 2. Consistent with Study 1, the between-persons effect of worry was significant, such that people who were more worried across the waiting period were more likely to engage in drinking behavior at greater-than-moderate levels. The within-person effect was not significant, suggesting that people did not necessarily drink more during periods when they particularly worried about the bar exam. No other between-persons or within-person effects was a significant predictor of drinking behavior.

As displayed on the right side of Table 1, the pattern differed for healthy behavior. Here, the within-person effect of positive emotion was significant, such that people engaged in more healthy behavior during times when they were experiencing particularly strong positive emotions. The between-persons effect of positive emotions was also positive but fell short of statistical significance.

In addition, the between-persons effect of outcome expectations was significant, such that people who were particularly optimistic also tended to engage in more healthy behavior overall. The within-person effect of outcome expectations was not significant, nor was either effect for worry, negative emotion, bracing, or positive expectation management.³

Discussion

The results of Study 2 extend the findings from Study 1. In both studies, participants who were more worried about their outcome were more likely to drink alcohol at greater-than-moderate levels, although Study 2 revealed that this relationship emerged between participants and did not reflect a tendency for people to drink when they were feeling particularly worried. Study 2 failed to replicate the relationship between bracing and drinking behavior from Study 1. We will provide a further test of these relationships in Study 3 in another real-world waiting context, namely the academic job market.

Turning to healthy behavior, Study 2 showed that people behaved in particularly healthy ways at times when they experienced particularly intense positive emotions. It may be that positive emotions buffer the ill effects of uncertainty-related stress on behavior or that healthy behavior led to more positive emotions, or perhaps a third variable fluctuated simultaneously with positive emotions and healthy behavior and was the true cause of their movement. Outcome expectations were also associated with healthy behavior, such that people who tended to be optimistic overall also tended to engage in more healthy behavior across the waiting period. We provide a further test of both of these relationships in Study 3.

³ We also conducted analyses with each health behavior separately, using MPLUS to appropriately address the categorical nature of the individual items. The conclusions are generally the same at the item level, such that all individual items show a within-subject association for positive emotion; some show a weak between-subjects association for positive emotion; and three out of five items show a between-subjects association for outcome expectations. Other individual-item associations were several within-subject associations with worry, negative emotion, and bracing (more worry/negative emotion/bracing = less healthy behavior).

Study 3

Method

Participants and Procedure. Participants were 141 PhD students (59% female; $M_{age} = 30.14$; 74.5% Caucasian, 10.6% Asian, 5.7% Hispanic/Latino(a), 2.1% African-American, 1.4 Native American, 5.7% other/multiple) from a variety of academic fields who were on the academic job market (i.e., seeking employment in academic or related sectors) during the 2016-2017 academic year. Participants were recruited from professional listservs for various academic organizations to which we could gain access and via emails to administrators relevant to graduate education at various universities. Participants completed a set of monthly surveys between October 2016 and April 2017 about their experience on the academic job market as well as three 5-day bursts of ecological momentary assessments (i.e., brief measures multiple times a day in October, January and April), though we focus on the monthly surveys here. Participants who completed all aspects of the study received \$80 in Amazon.com gift cards.

At the start of each monthly survey, participants indicated whether they had secured a position since completing the previous survey. For the purpose of our analyses, we include responses from participants who had not yet secured a position and thus were still enduring a period of uncertainty. That is, participants “drop out” of the analyses at the point they accepted a job. The measures described here are part of a larger data set; all study measures are publicly available on the Open Science Framework

(https://osf.io/ek9bu/?view_only=acf757b76fe24fb9b5f4e4d338609c8c).

Measures.

Worry. As in Studies 1 and 2, worry was again assessed with three items (“I feel anxious every time I think about the job market,” “I am worried about my prospects on the job market,”

“I can’t seem to stop thinking about the job market”; 1 = *strongly disagree*, 7 = *strongly agree*; $M_{overall} = 4.69$, $SD_{overall} = 1.10$; $\alpha_s > .69$).

Emotions. We assessed emotional states experienced over the past week with the same measure described in Study 1 (negative emotions: $M_{overall} = 3.47$, $SD_{overall} = 1.30$; $\alpha_s > .82$; positive emotions: $M_{overall} = 4.73$, $SD_{overall} = 1.13$; $\alpha_s > .87$).

Expectations. We again assessed outcome expectations and expectation management strategies in three ways. First, participants indicated the likelihood (0% to 100%) that they would secure any acceptable position that year ($M_{overall} = 59.66$, $SD_{overall} = 28.33$). Second, participants indicated the extent to which they were bracing for the worst (“I’m bracing for the worst when it comes to the job market this year,” “I want to make sure I keep my expectations low when it comes to the job market this year”; 1 = *strongly disagree*, 7 = *strongly agree*; $M_{overall} = 4.80$, $SD_{overall} = 1.12$, $\alpha_s > .65$). Third, participants indicated the extent to which they were embracing a positive outlook (i.e., positive expectation management) using the items “I’m hoping for the best when it comes to the job market this year” and “I’m trying to be optimistic about the job market this year” (1 = *strongly disagree*, 7 = *strongly agree*; $M_{overall} = 5.36$, $SD_{overall} = 1.14$, $\alpha_s > .74$).

Health behavior. In Study 3, we used continuous measures of drinking and healthy behavior. We used one item to assess drinking behavior (“During the past week on how many days have you had three or more alcoholic beverages in one sitting?” 1 = *never*, 8 = *every day*). Responses were positively skewed, so we log-transformed them prior to analysis ($M_{overall} = 0.43$, $SD_{overall} = 0.56$). We used the same five items to assess healthy behavior as described in Study 2, but using a continuous scale for each item and thus averaging rather than summing (1 = *never*, 8 = *every day*; $M_{overall} = 4.58$, $SD_{overall} = 1.18$, $\alpha_s > .60$)

Results

We again used multilevel modeling to examine the relationship between waiting experiences and health behavior across the waiting period, nesting repeated measurement point (Level 1) within individuals (Level 2). Because all health behavior measures were continuous in Study 3, all analyses were conducted with the SAS 9.4 PROC MIXED procedure. All models controlled for both linear and quadratic time at both the fixed and random levels (models predicting drinking behavior failed to converge with time included as a random effect and so time was only included as a fixed effect) and their interaction effects.⁴ Due to problems with model convergence, we once again did not allow the person-centered predictors to vary randomly in these models. Table 2 shows key model parameters.

As displayed on the left side of Table 2, only positive emotion and positive expectation management predicted drinking behavior in Study 3, in contrast to Studies 1 and 2. The between-persons effect of positive emotion was negative, such that people who experienced more positive emotion also engaged in greater-than-moderate alcohol use somewhat less frequently overall, but fell short of statistical significance. The between-persons effect of positive expectation management was significant, such that people who tried to be more hopeful and optimistic across the waiting period engaged in greater-than-moderate alcohol use less frequently. None of the within-person effects were significant.

⁴ For healthy behavior, a quadratic growth model fit best, $\Delta\chi^2 = 13.9, p < .01$ (compared to a linear growth model), and the fixed effect of both quadratic time, $t = 4.61, p < .0001$, and linear time, $t = -1.89, p < .06$, were significant or marginally significant. For drinking, a quadratic growth model also fit best, $\Delta\chi^2 = 3.8, p = .05$, and the fixed effect of quadratic time was marginally significant, $t = 1.75, p = .08$ (linear time: $t = -1.62, p = .11$). Similarly, the fixed effect of quadratic time was significant for negative emotion, $t = -1.99, p = .050$, and positive emotion, $t = 2.67, p = .01$. Although other variables did not show a quadratic pattern, we nonetheless controlled for time in all analyses to be conservative.

As displayed on the right side of Table 2, positive emotion and outcome expectations predicted healthy behavior, largely consistent with Study 2. Here, the between-persons effect of positive emotion was significant, such that people who experienced more positive emotions also engaged in more healthy behavior overall. The between-persons effect of outcome expectations was also significant, such that people who were more optimistic about their chances on the job market also engaged in more healthy behavior overall. As with drinking, none of the within-person effects were significant.

Discussion

In three studies we explored the link between six predictor variables: positive and negative emotions, worry, outcome expectations, bracing for bad news, and positive expectation management (i.e., attempting to maintain hope and optimism) and two criterion variables: alcohol use (Studies 1-3) and healthy diet/exercise behavior (Studies 2 & 3). The findings across studies were somewhat mixed. Table 3 presents a list of studies where we observed significant relationships between each of the predictor variables and the two relevant outcomes. Study 1 examined the experience of a sample of voting-eligible citizens in advance of the 2016 U.S. presidential election. In Study 1, worry about the election results and efforts to brace for one's candidate to lose were associated with a greater likelihood of greater-than-moderate alcohol use.

In Study 2, a longitudinal investigation of law graduates' experience awaiting bar exam results, higher levels of worry about the exam predicted a greater likelihood of greater-than-moderate alcohol use. Turning to the findings on healthy behavior, positive emotion predicted a greater likelihood of healthy behavior within-subjects, suggesting that moments of personally-high positive emotion related to personally-high levels of health behavior. Further, expectations for good news were also likely to engage in the most healthy behavior.

The results of Study 3 differed somewhat from those in the other two studies. In general, alcohol consumption was less likely to the extent that people expected good news and to the extent that they intentionally engaged in optimism—that is, putting efforts toward positive expectation management. As in Study 2, those who experienced the most positive emotion were also the most likely to engage in healthy behavior, as were those who maintained the most optimism about their eventual outcome.

In sum, the two studies examining healthy behaviors implicated optimism and positive emotion in healthy diet/exercise; two of the three studies implicated worry in increased alcohol use, yet general negative emotions were unrelated to either type of health behavior; and efforts to brace for bad news were associated with increased alcohol use only among voters awaiting Election Day (Study 1), whereas expectations for good news were associated with decreased alcohol use only among academics on the job market (Study 3). Interestingly, the effects were primarily between-subjects, suggesting that overall experiences with the wait, rather than within-person fluctuations, primarily drove the observed relationships.

Implications and Future Directions

At first blush, the somewhat inconsistent nature of the present findings (see Table 3) may seem to indict an underlying assumption that these three groups were experiencing a common stressor of awaiting uncertain news. Nevertheless, we see the differences that emerged between the studies as an opportunity for future theorizing and research. Specifically, they suggest that research broadly characterizing waiting and stress should further consider the context of waiting. Our aim was to offer an initial foray into understanding predictors of health behavior in the context of awaiting uncertain news, not to provide the final word. Indeed, future studies are needed to examine a wider range of health behaviors in these and other populations and across

other waiting periods. Additionally, the somewhat mixed findings across waiting contexts suggest important considerations both for the literature on waiting and for the linking stress to health behavior, a point to which we turn next.

From the perspective of the waiting literature, these three waiting periods differed in meaningful ways. For instance, the presidential election produces a societal outcome that is permanent (at least for four years), whereas both the bar exam and the academic job market produce personal outcomes, both of which can be repeated—one can take the bar exam again approximately 6 months later, and one can enter the job market again the following year. The wait for both election and bar exam results has a fixed end date and very little control over the outcome during the wait, whereas those on the academic job market do not know when their wait will end and can continue to apply to jobs throughout the wait to increase their prospects of success. Of course, prior research suggests that certain coping strategies and some well-being outcomes are consistent across different types of waiting periods (see Sweeny, 2018 for a review). Still, the present data underline the probability that these common elements do not necessarily yield equivalent downstream effects across waiting periods. That is, the present findings suggest that that different waiting periods may have different behavioral health consequences. While we are unable to empirically speak to the mechanism that might underlie these differences—the various waiting periods were incomparable in many ways—the findings do suggest that theorizing about situational moderators (e.g., duration, whether the end date is fixed, whether the outcome is mutable) of experiences during waiting periods is warranted. As such, research is needed that examines the precise mechanisms that underlie the links between waiting experiences and health behavior during various types of waiting periods.

Of course, the samples also differed demographically in meaningful ways. Indeed, whereas the first study was comprised of general population adults (only 12% had an advanced degree), the latter two were comprised of people with advanced degrees. Although we suspect that demographic differences like these might correlate with overall levels of both emotional experience and health behavior, we do not suspect that demographic differences between studies interact with our predictor variables to influence their relationship with health behavior. Nevertheless, future research is needed to examine whether demographic factors like education moderate the relationships observed here.

The present research also offers further evidence that the effects of stressful life events are nuanced. Sometimes the emotional, cognitive, and coping responses to a stressor are associated with positive health behaviors (e.g., healthy diet, exercise), sometimes negative health behaviors (e.g., substance use), and sometimes both (as in Study 2 here). The patterns that did emerge may suggest general underlying processes related to uncertainty and health. For instance, in both studies where healthy behavior was measured, people's expectations and positive emotions related to healthy behavior: Expecting the best and experiencing positive emotions was related to healthier behavior. By contrast, the more negatively-tinged responses to waiting (worry, negative emotion, and bracing for the worst) were unrelated to healthy behavior. This pattern of findings suggests that healthy behavior, a positive outcome, may be supported or protected by generally positive experiences during the wait. By contrast, most of the positively-tinged experiences (positive emotion, outcome expectations, and with one exception, hope/optimism) did not predict alcohol use. This pattern may suggest that alcohol use, a negative behavior, stems from negative cognitions—in particular worry and bracing. Notably, however, alcohol use was not related to general negative emotions, suggesting that it might stem from

negative cognitions and emotions that are specific to periods of acute uncertainty. Of course, these explanations are post-hoc in nature and await future empirical confirmation. Indeed, future research can seek to identify the situational moderators and mediators that create the seemingly-divergent behavioral pathways we observed here.

Limitations

Of course, the present studies are not without limitations. Perhaps the most critical limitation is that we did not include measures of uncertainty and control in this study. Unfortunately, theorizing about the roles of certainty and control during the wait primarily occurred after the design of these studies and collection of data (e.g., Sweeny, 2018). We suspect that these three waiting periods differ on the extent to which they offer certainty and control—with the academic job market perhaps conferring the most control (i.e., because one can apply for more and varied jobs while they await news from their applications) and the bar exam perhaps conferring the most certainty (i.e., as exam-takers likely have a sense about how well they performed). Still, our assumptions about certainty and control remain somewhat speculative, although theoretically driven, and as such research is needed that better examines the role of certainty and control in shaping health behaviors during waiting periods.

Another important limitation was in the breadth of health behaviors we assessed. Unfortunately, due to time and space limitations, and in an effort to reduce participant burden during a broader study, we were only able to include a short measures of health behavior. In Studies 1 and 2, for example, we were only able to assess alcohol use with two yes-no questions. Future studies can both replicate and extend the current findings by using more detailed measures of alcohol use (e.g., those suggested by the National Institute on Alcohol Abuse and Alcoholism, 2003). Additionally, we created an index of healthy behaviors from a series of

single-item questions assessing healthy diet and exercise. Future research can expand these to include more in-depth measures of diet and exercise, as well as additional health behaviors like substance use, exposure to unhealthy environments (e.g., second-hand smoke), and sexual risk-taking (Berrigan, Dodd, Troiano, Krebs-Smith, & Barbash, 2003; Spring, Moller, & Coons, 2012).

Finally, our conclusions are inevitably limited by the correlational nature of our studies. We were most interested in determining how stress and coping efforts during waiting periods might shape health behavior in ways that could explain links between these experiences and poor health (Howell & Sweeny, 2016). Although some relationships, like those between worry and drinking, are most parsimoniously explained in the proposed causal order, others—most notably the link between positive emotions and healthy behaviors—could reflect effects of behavior on emotional experiences. It may also be that third variables like personality traits or unmeasured subjective experiences could explain these relationships. The goal of the present studies was to provide an ecologically-sound initial look at health behavior during real-world waiting periods of personal consequence to our participants. A clear next step for research on this topic is experimental studies that can nail down causal relationships.

Conclusion

In sum, the present study offered a first look at how cognitions and emotions characteristic of awaiting uncertain news were associated with unhealthy (alcohol use) and healthy (diet/exercise) behaviors in three waiting contexts: among voting-eligible citizens awaiting U.S. presidential election results, among law graduates awaiting results of their bar exam, and among PhD students searching for a job on the academic job market. Although the findings were somewhat mixed, they generally implicated worry in alcohol use and positive

emotions in healthy behaviors. They also showed mixed relationships between optimism and expectation management strategies and health behavior. Taken together, these results offer a promising first step in understanding nuances of health behavior in the context of awaiting uncertain news. They also provide interesting fodder for future investigations into on the topic and open the possibility for examining moderators of the observed effects. Ultimately, this line of inquiry can lead to empirically-supported interventions to buffer people from the ill effects of acute uncertainty on their health.

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