

# Is waiting bad for subjective health?

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**Abstract** The present study examined the possibility that waiting is bad for one's subjective health. Specifically, we examined longitudinal trends in the self-reported health, self-reported sleep disruption, distress, and emotion regulation strategies of law school graduates waiting for their bar exam results. Multilevel analyses suggest that waiting was particularly detrimental to participants' self-reported health and sleep disruption at the beginning and end of the waiting period. Moreover, distress and most emotion regulation efforts were associated with poorer subjective health on average, and personal increases in distress and emotion regulation were largely associated with personal increases in poor self-reported health and sleep disruption. Our results suggest that waiting periods can take a toll on subjective health and that individual and temporal variations in distress and emotion regulation efforts are associated with these health trajectories.

**Keywords** Waiting · Uncertainty · Emotion regulation · Well-being · Sleep · Subjective health

## Introduction

Waiting is a ubiquitous and often stressful human experience, particularly when one must wait for uncertain news (Portnoy, 2010; Sweeny & Cavanaugh, 2012). Patients wait for results of medical tests, job candidates wait to

learn whether they will be hired, and researchers wait to receive peer reviews of their work. Although a vast literature has addressed distress and coping in response to known stressors (e.g., receiving a dire diagnosis, falling into unemployment, having a manuscript rejected), recent research reveals key differences between responses to known stressors and responses to uncertainty while awaiting news (Sweeny & Andrews, 2014). Does the anticipation of a potential stressor have the same ill effects on subjective health that are so well-established in the face of clear and present stressors (e.g., Antonovsky, 1979; Cooper, 2004)? In the present study, we examine people's subjective health as they wait for uncertain news—specifically their bar exam results.

When awaiting uncertain news, people attempt to manage the worry that arises during uncertain waiting periods (i.e., a combination of preservative thinking about possible future outcomes and accompanying anxiety; McCaul et al., in press; Segerstrom et al., 2000) by managing their expectations, proactively coping with the feared outcome, or suppressing their emotions, among other strategies (Sweeny & Andrews, 2014; Sweeny & Cavanaugh, 2012). Unfortunately, recent findings suggest that these strategies do little to minimize worry and may even exacerbate the distress associated with waiting for news (Sweeny et al., 2015). Indeed, the anxiety associated with awaiting uncertain news often outweighs the anxiety associated with receiving bad news (Boivin & Lancaster, 2010; Sweeny & Falkenstein, 2015).

In light of the distress associated with uncertain waiting periods, the goal of this paper is to answer a seemingly simple question: Is waiting bad for people's subjective health? Considerable evidence links stressful experiences to deleterious health outcomes (Antonovsky, 1979; Cooper, 2004). Indeed, heightened stress is associated with

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increased cell death (O'Donovan et al., 2012), greater risk for disease (Boscarino, 1997; Dube et al., 2009; Stansfeld & Marmot, 2002), increased insomnia (Morin et al., 2003), poorer memory encoding (Kuhlmann et al., 2005), and poorer immune function (Cohen et al., 1991). Moreover, perseverative thoughts may exacerbate the health consequences of stress and lead to more persistent detrimental health effects (see Brosschot et al., 2006), and such thoughts have been specifically linked to poor sleep quality and longer sleep onset latency (Querstret & Cropley, 2012; Thomsen et al., 2003; Zoccola et al., 2009). Perseverative thoughts also seem to have direct physiological consequences by interfering with cortisol recovery patterns and increasing inflammatory markers (Zoccola et al., 2014).

Nevertheless, little work has examined whether the stress of waiting periods may be linked to poorer health. In a notable exception, evidence suggests that women awaiting breast biopsy results suffer decreased immune function (Montgomery & McCrone, 2010) and that women with an uncertain diagnosis of breast cancer experience increased cortisol levels equivalent to those of women with a malignant diagnosis (Lang et al., 2009). In fact, the literature on breast cancer diagnosis concludes that for many women, the period of uncertainty prior to diagnosis presents the greatest emotional and psychological challenge (e.g., Montgomery & McCrone, 2010; Poole, 1997)

## Overview and hypotheses

The current study examined the self-reported health and sleep disruption of law graduates awaiting the result on the California bar exam. Specifically, we sought to answer three broad questions: (a) Do self-reported health and sleep disruption fluctuate in predicted ways over the course of a waiting period? (b) Do people who experience greater psychological distress and who use more emotion regulation strategies during the waiting period report poorer health and greater sleep disruption? (c) Within a given person's waiting experience, do personal increases in psychological distress and emotion regulation efforts correspond with particularly poor personal self-reported health and greater self-reported sleep disruption?

We hypothesized that, like psychological health (Sweeny & Andrews, 2014), subjective physical health would suffer the most at the beginning and end of waiting periods. Moreover, given the robust link between psychological distress and physical health and evidence that emotion regulation efforts may actually increase psychological distress (Sweeny et al., 2015), we hypothesized that increased psychological distress and emotion regulation efforts would be associated with poorer subjective health on average (between-persons) and that personal increases

in distress and emotion regulation efforts would be linked to personal declines in subjective health (within-persons).

The strategies on which we focused fell into two broad, empirically-established categories: (1) direct emotion management (i.e., attempts to directly reduce negative emotions), and (2) cognitive reappraisal strategies (i.e., thinking differently about the upcoming news; Sweeny & Cavanaugh, 2012; Sweeny et al., 2015). Specifically, we examined six strategies, two types of direct emotion management (distraction and suppression) and four cognitive reappraisal strategies (bracing, positive expectation management, preemptive benefit finding, and distancing). We discuss each construct further in the method section.

Although our predictions regarding these emotion regulation efforts run counter to bodies of work suggesting that some emotion regulation strategies can improve well-being (e.g., Gross & John, 2003), several studies have revealed during uncertain waiting periods, people's efforts to manage their feelings of worry tend to be associated with greater worry rather than reductions in worry (Sweeny & Andrews, 2014; Sweeny et al., 2015). Based on this work, we hypothesized that greater use of emotion regulation strategies during a waiting period would be associated with poorer self-reported health and greater sleep disruption. We recognize that the six strategies we examined are semantically, empirically, and practically distinct (Sweeny & Cavanaugh, 2012). Thus, some strategies might be worse or better than others for subjective health and well-being.

## Method

### Participants

Participants were 230 law school graduates (139 women, 90 men;  $M_{\text{age}} = 27.60$ ,  $SD_{\text{age}} = 4.59$ ) who took the California bar exam in July of 2013. Participants represented 27 different law schools in the United States (12 states and Washington, DC) and participated in exchange for an Amazon.com gift card. Participants were predominately White ( $n = 137$ ) or Asian ( $n = 51$ ), and the majority (84.8 %) reported passing the exam. A simulation study confirmed that a sample size of 50 at Level 2 (here Level 2 is the sample size; see description of analyses below) is sufficient to avoid biased estimation (Maas & Hox, 2005).

### Procedure

Approximately every 2 weeks throughout the 4 month waiting period—from just before they took the bar exam to just after they received their results—participants completed one of 10 surveys. All participants took the bar exam

and received their results on the same day. The measures relevant to the present endeavor occurred at only the middle eight measurement points, which were completed during the waiting period, and therefore we discuss only those measures here. Full questionnaire content for all measurement points is available as Supplemental Material online. Participants completed the eight waiting period surveys approximately every 2 weeks during the four-month period while they waited to learn their exam result. 74 % of participants completed all eight of the measures relevant for the current analyses. Participants who completed all surveys reported better self-reported health on average ( $M = 2.81$ ,  $SD = .75$ ) compared to participants who missed at least one survey ( $M = 3.07$ ,  $SD = .75$ ),  $t(228) = 2.11$ ,  $p = .04$ ,  $d = .28$ , but did not differ significantly on any other measure ( $ts < .89$ ,  $ps > .47$ ,  $ds < .12$ ).

During each survey, participants reported their subjective health and sleep disruption, their psychological state (i.e., perseverative thinking, anxiety, positive affect, negative affect), and their use of emotion regulation strategies (i.e., distraction, suppression, bracing, positive expectation management, benefit finding, and distancing). Questionnaires were identical at all measurement points, and the measures of perseverative thinking, anxiety, and emotion regulation strategies were adapted from Sweeny and Andrews (2014).

### Subjective health<sup>1</sup>

We assessed two subjective health outcomes throughout the waiting period: self-reported health and self-reported sleep disruption. We assessed self-reported health with a single item from the SF-36 (Ware Jr & Sherbourne, 1992), “In the past week, would you say your health has been...” (1 = *excellent*, 5 = *poor*;  $M = 2.84$ ,  $SD = 1.05$ ). Although single-item measures have some disadvantages compared to multi-item scales, this single-item measure of self-rated health has a long history and has been extensively validated (Bowling, 2005; Kempen, 1992; Stewart et al., 1978; Stewart, 1992; Ware et al., 1980).

We measured self-reported sleep disruption with three items adapted from the Sleep Hygiene Index (Mastin et al., 2006) and five items adapted from the Pittsburg Sleep Quality Index (PSQI; Buysse et al., 1989). From the Sleep Hygiene Index, we chose the three items that seemed most likely to indicate the effects of psychological stress: “I stay in bed longer than I should two to three times a week,” “I go to bed feeling stressed, angry, upset, or nervous,” and “I think, plan, or worry when I am in bed” (1 = *never*, 5 = *always*). From the PSQI, we chose five items that could reasonably fluctuate from week to week, reflecting

our goal to assess change across the waiting period: “During the past 2 weeks, how often have you had trouble sleeping because... you cannot get to sleep within 30 min?” “...you had bad dreams?” “...you wake up in the middle of the night or early morning?” and “...of other reasons?” (1 = *not in the past 2 weeks*, 4 = *three or more times a week*), and “During the past 2 weeks, how would you rate the quality of your sleep overall?” (1 = *very good*, 4 = *very bad*). We scored all items so that higher scores indicated greater reported sleep disruption, z-scored the items, and averaged them into a single sleep disruption composite ( $M = -.01$ ,  $SD = .63$ , Cronbach’s  $\alpha = .79$ ).

### Psychological states

#### Worry

We assessed worry with separate measures of perseverative thinking and anxiety that have been used successfully in other studies of uncertain waiting periods (Sweeny & Andrews, 2014; Sweeny et al., 2015). To assess perseverative thinking, participants responded to one item adapted from the Rumination about an Interpersonal Offense scale (Wade et al., 2008; “I cannot seem to stop thinking about the bar exam,” 1 = *strongly disagree*, 5 = *strongly agree*) and two items assessing behaviors reflective of perseverative thinking (“How often in the past 3 days have you thought about the bar exam prior to starting this survey?” “How often in the past 3 days have you brought up the bar exam in conversation with other people?” 1 = *not at all*, 5 = *almost constantly*;  $M = 2.90$ ,  $SD = 1.00$ ,  $\alpha$  for all three items = .86). To assess anxiety, participants indicated the extent to which they felt anxious during the past 3 days on a 10-item measure of anxiety (e.g., “In the past 3 days I have felt worried,” “I feel anxious every time I think about the bar exam;” 1 = *not at all*, 5 = *extremely*;  $M = 2.79$ ,  $SD = .99$ ,  $\alpha = .93$ ).

#### Positive affect

Participants completed six positive-affect items adapted from the Positive and Negative Affect Schedule Expanded Form (PANAS-X; Watson & Clark, 1999). Specifically, they indicated the extent to which they felt inspired, relieved, grateful, happy, content, and at peace (1 = *very slightly or not at all*, 5 = *extremely*). We averaged these items into a single index of positive affect ( $M = 3.06$ ,  $SD = .92$ ,  $\alpha = .81$ ).

#### Negative affect

Participants completed nine negative-affect items adapted from the PANAS-X. Specifically, they indicated the extent

<sup>1</sup> When we report scale properties (e.g., internal consistency, measures of central tendency), we give the average across all time points.

to which they felt hostile, upset, ashamed, afraid, disappointed, regretful, depressed, discouraged, and angry (1 = *very slightly or not at all*, 5 = *extremely*). We averaged these items into a single index of negative affect ( $M = 1.97$ ,  $SD = .90$ ,  $\alpha = .93$ ).

### Emotion regulation strategies

#### *Distraction*

We assessed participants' efforts to distract themselves from thoughts about the bar exam with a single item, "I've been trying to distract myself from thinking about my bar exam results" (1 = *strongly disagree*, 5 = *strongly agree*;  $M = 2.91$ ,  $SD = 1.30$ ).

#### *Suppression*

Participants indicated the extent to which they were engaging in emotional and expressive suppression with two items: "I've been trying to stop myself from thinking about the bar exam," and "I've been trying to hide my feelings about the bar exam from other people" (1 = *strongly disagree*, 5 = *strongly agree*;  $M = 2.63$ ,  $SD = 1.09$ ,  $\alpha = .75$ ).

#### *Bracing*

We measured the extent to which participants were bracing for the possibility of failure with two items: "I'm bracing for the worst when it comes to my bar exam results," and "I want to make sure I keep my expectations low when it comes to my bar exam results" (1 = *strongly disagree*, 5 = *strongly agree*;  $M = 3.21$ ,  $SD = 1.07$ ,  $\alpha = .80$ ).

#### *Positive expectation management*

Participants indicated the extent to which they were trying to maintain a positive outlook with two items: "I'm hoping for the best when it comes to my bar exam results," and "I'm trying to be optimistic about my bar exam results" (1 = *strongly disagree*, 5 = *strongly agree*;  $M = 4.11$ ,  $SD = .73$ ,  $\alpha = .67$ ).

#### *Benefit finding*

We measured the extent to which participants preemptively attempted to find a silver lining in failure using three items: "It might be for the best if I fail the bar exam," "I feel like I would grow as a person if I fail the bar exam," and "I feel like I'll learn something from the experience if I fail the bar

exam" (1 = *strongly disagree*, 5 = *strongly agree*;  $M = 1.94$ ,  $SD = .92$ ,  $\alpha = .75$ ).

#### *Distancing*

We measured the extent to which participants derogated the bar exam as a valid measure of their skills, thus creating psychological "distance" from the outcome, with five items (e.g., "The bar exam doesn't really measure anything important," "The bar exam is overvalued in my profession"; 1 = *strongly disagree*, 5 = *strongly agree*;  $M = 3.49$ ,  $SD = .84$ ,  $\alpha = .84$ ).

### Analyses

We used multilevel modeling of (also called latent growth-curve modeling) nesting measurement time point (Level 1) within participants (Level 2) to examine our three primary questions: (a) Do self-reported health and self-reported sleep disruption fluctuate over the course of a waiting period? (b) Do people who experience greater distress and who use more emotion regulation strategies report poorer health and greater sleep disruption? (c) Within a given person's waiting experience, do increases in distress and emotion regulation effort above one's personal average correspond with personally poorer self-reported health and greater self-reported sleep disruption? Multilevel modeling allowed us to capture, and control for, within-person variation while examining between-person effects.

As in any multilevel model, we estimated both fixed effects (i.e., average effects in the population) and random effects (i.e., the within-person variability of these effects). In all final models we allowed the intercept and all time-varying predictors to vary randomly. We used a model-comparison approach first estimating the null/unconditional-means model, and then comparing subsequent growth models to this original model (see Raudenbush & Bryk, 2002; Singer & Willett, 2003). Below we present the results of our final models.

### Results

#### Fluctuation in subjective health across the waiting period

To examine temporal patterns in subjective health across the waiting period, we estimated the linear and quadratic relationships between subjective health (self-reported health and self-reported sleep disruption using separate models) and time, consistent with the approach taken with

similar data by Sweeny and Andrews (2014). Specifically, we built up to the following model<sup>2</sup>:

$$Health = b_{00} + (b_{10} + u_{1j})(Time-5) + (b_{20} + u_{2j})(Time-5)^2 + u_{0j} + r_{ij}$$

Looking first at the pattern of self-reported health across the waiting period, the intra-class correlation (ICC<sup>3</sup>) suggested that approximately 44 % of the variance in self-reported health was between persons (individual differences) and 66 % within-persons over time. Turning to self-reported sleep disruption, the ICC suggested that approximately 52 % of the variance in reported sleep disruption was between persons, and 48 % was within-persons over time. Figures 1 and 2 present a spaghetti plot of participants' subjective health over time, with higher scores indicating poorer subjective health. The bolded line represents the average trend in subjective health (note that this is the average across people and does not take into account individual differences in intercept or slope).

As the first rows of Tables 1 and 2 show, there were significant linear and quadratic effects of time on self-reports of both health and sleep disruption. To examine whether, as expected, waiting was worst for subjective health at the beginning and end of the waiting period, we coded the first and last time points as "1" and all other time points as "0" and replaced our time variables with this dichotomous time variable in the multilevel model. This represented the simplest test of our hypothesis that subjective health would be worst at the beginning and end of the waiting period. Consistent with our hypotheses, both self-reported health [ $b = .24, SE = .05, t(241.18) = 5.03, p > .001, R^2_{psuedo} = .05$ ] and self-reported sleep disruption [ $b = .33, SE = .03, t(227.91) = 11.68, p < .001, R^2_{psuedo} = .18$ ] were worse at the beginning and end of the waiting period than at the other time points.

**Fluctuation in psychological states and strategy use across the waiting period**

Sweeny and Andrews (2014) established the temporal patterns in distress and use of emotion regulation strategies in a different sample of law graduates awaiting their bar exam results. Nonetheless, readers may be interested in the

trajectories of psychological states and strategy use in the present study. Table 3 presents the fixed effects of linear and quadratic time on each of the primary outcomes. As with subjective health, we observed significant negative linear trajectories for perseverative thinking, positive affect, bracing, positive expectation management, benefit finding, and distancing. No such trends emerged for anxiety, negative affect, distraction, or suppression. Similarly, we found positive quadratic effects for all psychological states except positive affect, which had a negative quadratic effect, and all emotion regulation strategies other than benefit finding, which had a marginally negative quadratic effect, suggesting that people were engaging in the most perseverative thinking, had the most anxiety and negative affect, the least positive affect, and were most using emotion regulation strategies (other than benefit finding) at the beginning and end of the waiting period. Benefit finding had a marginally-significant negative quadratic trajectory suggesting that people used it least at the beginning and end of the waiting periods. A deeper investigation into the strategy use of participants in the present data are the subject of another inquiry (Sweeny et al., 2015). As such, we refer the reader to that paper for more detail and discussion.

**Predictors of subjective health during the waiting period**

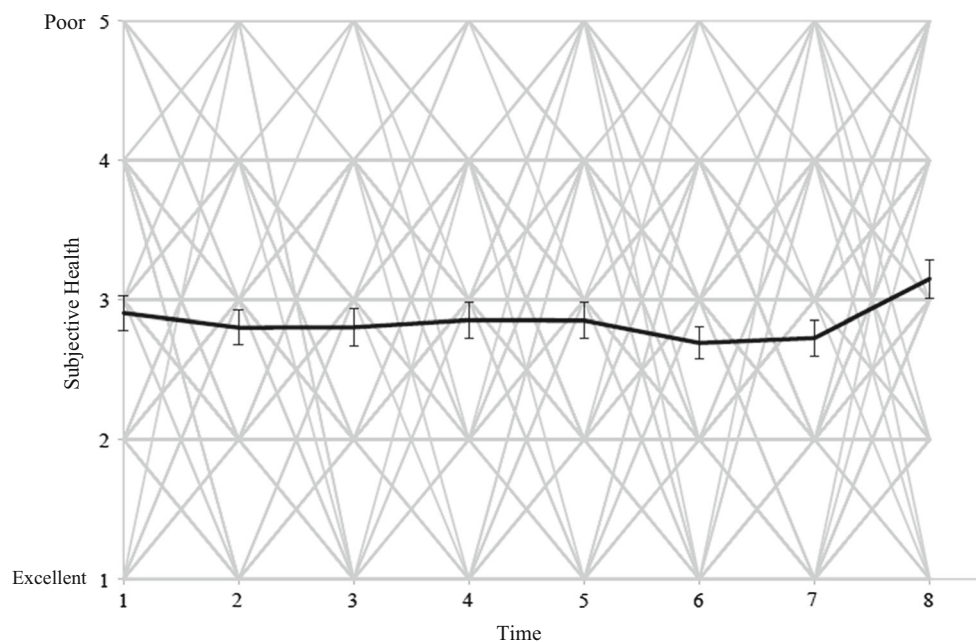
To test whether individual differences in psychological states and emotion regulation strategies predicted subjective health during the waiting period, we examined the following model (specific predictors are listed in the method section and in Tables 1, 2):

$$Health = b_{00} + b_{01}Mean Predictor_{grand-mean centered} + (b_{10} + u_{1j})Predictor_{person-mean centered} + (b_{20} + u_{2j})Dichotomous Time + b_{02}Dichotomous Time \times Mean Predictor_{grand-mean centered} + (b_{30} + u_{3j})Dichotomous Time \times b_{01}Mean Predictor_{person-mean centered} + u_{0j} + r_{ij}$$

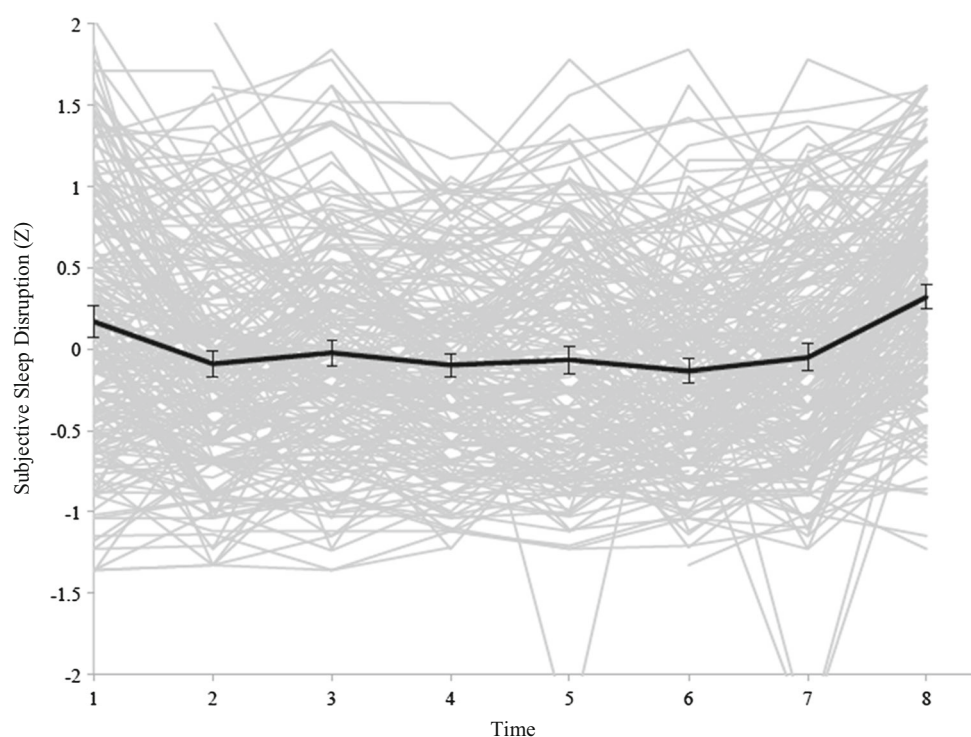
This model includes two parameters of interest. First,  $b_{01}$  examines the between-subjects influence of psychological distress and emotion regulation strategies on subjective health. That is, this parameter indicates whether people are subjectively healthier (or less healthy) on average to the extent that they report certain psychological distress (e.g., perseverative thinking, anxiety) or engage in certain emotion regulation strategies (e.g., distraction, bracing) on average during the waiting period. This set of findings addressed our second question, indicating whether people who experience greater distress and who use more

<sup>2</sup> In all models we used a conservative covariance structure that assumed no correlation between time points (i.e., variance components structure). Importantly, opting to allow nearby measurements to correlate most with one another (i.e., a diagonal covariance structure) or even adopting a completely unstructured covariance structure (i.e., allowing all time points to correlate according to the data) produced no substantive difference in the pattern of results.

<sup>3</sup> The ICC is calculated as between person variance/(between person variance + within person variance).



**Fig. 1** Subjective health throughout the waiting period



**Fig. 2** Subjective sleep disruption throughout the waiting period

emotion regulation strategies report poorer subjective health overall.

Second,  $b_{10}$  examines the within-subjects influence of psychological states and emotion regulation strategies on subjective health. That is, this parameter indicates whether people experienced better (or worse) subjective health at

the measurement points when they also reported better (or worse) psychological states than they typically reported, or when they engaged in emotion regulation strategies more (or less) than they typically reported. This set of findings addressed our final question, indicating whether personal increases in distress and emotion regulation effort corre-

spond with particularly poor personal subjective health within a given person's waiting experience.

The final three parameters contain the main effect of dichotomous time (1 at beginning and end of waiting period, 0 at all other points) and interactions between temporal trends and the primary predictors (psychological distress, emotion regulation strategies). Including these outcomes statistically controls for the fact that poor subjective health, psychological distress, and emotion regulation strategy use are all highest at the beginning and end of the waiting period. Controlling for this trend provides a purer examination of the unique roles of within and between person variance in psychological distress and strategy use in predicting subjective health. Specifically, it controls for the correlation between strategies that would emerge simply as a result of similar time trends. We chose to use this dichotomous time predictor because it captures the primary trend in our variables (i.e., worst at the beginning and end) but adds half as many predictive parameters as would including linear and quadratic time and their interactions with our predictors. Importantly, including these other two time parameters instead of dichotomous time does not change the pattern of results reported here.

#### *Self-reported health*

Table 1 presents the results from the multilevel models predicting self-reported health from psychological states and use of emotion regulation strategies. As the estimates show, participants who reported greater distress (perseverative thinking, anxiety, negative affect) and less positive affect on average during the waiting period also reported poorer health on average. Similarly, during times when participants reported greater distress and less positive affect than was typical for them (a personal increase in distress or decrease in positive affect), they also reported poorer health.

Turning to emotion regulation strategies, participants reported poorer health on average to the extent that they engaged in distraction, suppression, and braced for the worst during the waiting period. Those who engaged in positive expectation management (i.e., those who most tried to be hopeful and optimistic) reported better overall health during the waiting period. Within subjects, during times when people personally most engaged in distraction and (marginally) bracing, they also reported poorer health.

#### *Subjective sleep disruption*

As Table 2 shows, the results for self-reported sleep disruption emerged in a pattern consistent with those for self-reported health. Participants who reported greater psycho-

logical distress (by all measures) and less positive affect on average during the waiting period also reported greater sleep disruption on average. Also consistent with the findings for self-reported health, during times when participants reported personal increases in distress (other than preservative thinking) and decreases in positive affect, they also reported greater sleep disruption.

Turning to emotion regulation strategies, participants reported greater sleep disruption, on average, to the extent that they engaged in distraction, suppression, braced for the worst, and (marginally) tried to find benefit in failure during the waiting period. Moreover, those who engaged in positive expectation management also reported less sleep disruption during the waiting period. Within subjects, during times when people personally most engaged in distraction, suppression, and bracing they also reported greater sleep disruption.

## **Discussion**

We began with a simple but novel question: Is waiting bad for your subjective health? Our findings suggest that waiting for uncertain news may pose a subjective health hazard for people who experience acute distress in the face of this type of uncertainty, at times when people experience increases in distress, and in particular at the beginning and end of the waiting period. Similarly, we confirmed that use of emotion regulation strategies was associated with decrements in subjective health. Specifically, efforts to distract oneself, suppress one's emotions, and brace for the worst were consistently predictive of poorer self-reported health and self-reported sleep disruption. The sole bright spot was that those who generally embraced hope and optimism across the waiting period to report better health and less sleep disruption.

### **Theoretical and practical contribution**

Our results are the first to suggest that waiting is associated with fluctuations in subjective physical health in ways that mirror the psychological health trajectories described in previous work (Sweeny & Andrews, 2014). That is, as the significant quadratic trend demonstrates, at the start and end of a waiting period when the target of uncertainty is most at the forefront of one's mind, people report the poorest health and most disrupted sleep. Although these findings are consistent with earlier work examining psychological distress, they considerably extend those findings by establishing that the consequences of waiting go beyond mild irritation or discomfort.

Our findings also add to a nascent body of research suggesting that emotion regulation strategies presumably

**Table 1** Parameter and model fit estimates from models predicting subjective (Poor) health

Predictor	<i>b</i> ( <i>SE</i> )	<i>t</i>	$R^2_{psuedo}$	Improvement from intercept-only model		
				−2LL	AIC	BIC
<b>Time</b>						
Linear	−.02 (.01)	−2.31*	.08	11.86**	7.86 <sup>+</sup>	−7.05
Quadratic	.02 (.00)	3.85**				
<i>Psychological states</i>						
<b>Perseverative thinking</b>						
Within-person	.12 (.04)	2.82**	.07	82.03**	76.03**	59.69**
Between-persons	.36 (.07)	4.94**	.14			
<b>Anxiety</b>						
Within-person	.26 (.04)	6.88**	.08	123.34**	119.34**	108.44**
Between-persons	.56 (.08)	7.18**	.27			
<b>Negative affect</b>						
Within-person <sup>x</sup>	.25 (.04)	5.61**	.11	132.75**	126.75**	110.41**
Between-persons	.48 (.07)	6.70**	.21			
<b>Positive affect</b>						
Within-person <sup>x</sup>	−.24 (.04)	−5.67**	.11	134.05**	130.05**	119.16**
Between-persons <sup>x</sup>	−.50 (.08)	−6.62**	.22			
<i>Emotion regulation strategies</i>						
<b>Distraction</b>						
Within-person <sup>x</sup>	.07 (.03)	2.13*	.06	83.70**	81.70**	76.27**
Between-persons	.20 (.05)	4.00**	.12			
<b>Suppression</b>						
Within-person	.05 (.04)	1.33	.05	73.28**	71.28**	65.84**
Between-persons <sup>x</sup>	.27 (.05)	4.92**	.16			
<b>Bracing</b>						
Within-person <sup>x</sup>	.09 (.05)	1.77 <sup>+</sup>	.10	64.81**	58.81**	42.47**
Between-persons	.16 (.05)	2.95**	.06			
<b>Positive expectation management</b>						
Within-person	.05 (.06)	.85	.08	59.29**	53.29**	36.95**
Between-persons	−.20 (.09)	−2.27*	.03			
<b>Benefit finding</b>						
Within-person	.07 (.05)	1.19	.07	49.27**	45.27**	34.38**
Between-persons	−.04 (.06)	−.65	.01			
<b>Distancing</b>						
Within-person	−.02 (.08)	−.22	.10	66.78**	60.78**	44.44**
Between-persons	.04 (.07)	.58	.02			

\*  $p < .05$ ; <sup>+</sup>  $p < .10$ . A significant positive within-person effect indicates that personal increases in that variable were linked to personal increases in poor health. A significant between-persons effect indicates that average levels in that variable were associated with average levels of health. Due to model convergence errors the random-effect of the interaction between dichotomous time and benefit finding, positive affect, anxiety, suppression, and distraction and the random main-effects of suppression and distraction were removed from the model

<sup>x</sup> Significant predictor when controlling for other psychological states or emotion regulation strategies

aimed at reducing distress, such as distraction or bracing for bad news, may actually exacerbate the detrimental effects of uncertain waiting periods (Sweeny & Andrews, 2014; Sweeny et al., 2015), even when controlling for typical time trends in health, psychological states, and emotion regulation strategy use. Indeed, heightened use of most emotion regulation strategies,

whether heightened across people or within a person across time, were associated with declines in subjective health in this study. Although the correlational nature of the data prevent us from definitively concluding that these strategies harm subjective health, it seems safe to conclude that, at minimum, they are unlikely to confer health benefits.



**Table 2** Parameter and model fit estimates from models predicting subjective sleep disruption

Predictor	<i>b</i> ( <i>SE</i> )	<i>t</i>	<i>R</i> <sup>2</sup> <sub><i>psuedo</i></sub>	Improvement from intercept-only model		
				−2LL	AIC	BIC
<b>Time</b>						
Linear	−.04 (.01)	−6.42**	.27	202.04**	198.04**	183.14**
Quadratic	.03 (.00)	10.74**				
<i>Psychological states</i>						
<b>Perseverative thinking</b>						
Within-person	−.04 (.03)	−1.25	.26	356.52**	350.52**	334.17**
Between-persons	.12 (.02)	5.13**	.23			
<b>Anxiety</b>						
Within-person	.21 (.02)	9.42**	.31	453.43**	447.43**	431.08**
Between-persons	.48 (.05)	9.67**	.33			
<b>Negative affect</b>						
Within-person <sup>x</sup>	.23 (.02)	10.34**	.32	514.21**	508.21**	491.87**
Between-persons	.48 (.04)	11.02**	.36			
<b>Positive affect</b>						
Within-person <sup>x</sup>	−.17 (.02)	−7.27**	.32	397.23**	391.23**	374.89**
Between-persons <sup>x</sup>	−.29 (.05)	−5.54**	.12			
<i>Emotion regulation strategies</i>						
<b>Distraction</b>						
Within-person <sup>x</sup>	.09 (.02)	4.91**	.26	328.48**	322.48**	306.15**
Between-persons	.20 (.03)	6.59**	.20			
<b>Suppression</b>						
Within-person	.12 (.02)	5.50**	.27	346.10**	340.10**	323.76**
Between-persons <sup>x</sup>	.26 (.03)	7.43**	.24			
<b>Bracing</b>						
Within-person <sup>x</sup>	.06 (.03)	2.22*	.28	299.23**	293.23**	276.89**
Between-persons	.16 (.04)	4.49**	.08			
<b>Positive expectation management</b>						
Within-person	−.04 (.03)	−1.45	.27	280.44**	274.44**	258.1**
Between-persons	−.13 (.06)	−2.27*	.02			
<b>Benefit finding</b>						
Within-person	.04 (.03)	1.41	.25	263.43**	257.43**	241.09**
Between-persons	.08 (.04)	1.91 <sup>+</sup>	.01			
<b>Distancing</b>						
Within-person	.05 (.04)	1.22	.25	275.98**	269.98**	253.64**
Between-persons	.07 (.04)	1.60	.02			

\* *p* < .05; + *p* < .10. A significant positive within-person effect indicates that personal increases in that variable were linked to personal increases in poor health. A significant between-persons effect indicates that average levels in that variable were associated with average levels of health

<sup>x</sup> Significant predictor when controlling for other psychological states or emotion regulation strategies

Of course, one might wonder if our findings are simply a replication of the robust health effects of stress (e.g., Cooper, 2004). This work is certainly related, but our research is novel in two important ways. First, despite the ubiquity of uncertain waiting periods, nearly all research on stress and coping examines clear and present stressors, such as failing the bar exam, losing one’s job, or living with

a chronic health condition. Both anecdotal accounts and a small but growing body of empirical evidence confirm that waiting is as or more stressful than knowing, even when the known outcome is grim (e.g., a breast cancer diagnosis; Lebel et al., 2003; Poole, 1997), yet the subjective health consequences of this type of stressor were previously unexplored territory.

Second, our findings suggest that the health consequences of awaiting uncertain news fluctuate in predictable ways that are somewhat unique to waiting periods. That is, waiting is stressful, but it is different from other stressors, perhaps most notably in its time course. The type of waiting periods of interest in this paper have a beginning, a period of relative stagnation, and a point of resolution. Unlike other stressors that are limited in duration (e.g., startling stimuli, which are immediately unpleasant and then taper off; Bradley & Lang, 2000) or continuous in duration (e.g., chronic pain, which generally either decreases or increases in unpleasantness over time; Riedl et al., 2011), waiting periods are most stressful at their temporal extremes. This distinctive pattern highlights the need to target waiting experiences for study rather than presuming the generalizability of other work on stress and coping.

### Future directions and unanswered questions

The novelty of the present study provides insight into how best to target health interventions during waiting periods. Because subjective health was poorest at the beginning and end of the waiting period, those points may be ideal targets for interventions aimed at mitigating detrimental health outcomes. Additionally, the present results suggest that the need for, and timing of, interventions may differ between people. Indeed, variance in self-reported health and sleep disruption was nearly equally large within and between persons, suggesting that some people experience the detrimental subjective health effects of waiting periods more so than do others, and yet nearly everyone's subjective health fluctuated across the waiting period.

In addition to helping understand when and for whom health interventions may be effective, the present study suggests a need for creativity when developing interventions to improve subjective health during waiting periods. Because self-generated attempts to regulate distress during the waiting period were associated with poorer subjective health, interventions aimed at improving health may need to take a less direct approach (e.g., inducing self-affirmation; Steele, 1988).

Another question that might need to be answered before designing future interventions is which psychological states or emotion regulation strategies should be targeted. As this was not the primary question of our inquiry, our data can only tentatively point toward targets for intervention. Nevertheless, because some readers might be interested in comparing strategies and states when accounting for their covariance, we indicated in Tables 1 and 2 which findings remained significant in exploratory multilevel analyses in which all the psychological states and, in a separate model, emotion regulation strategies simultaneously predicted our

self-reported health and sleep outcomes (notated by <sup>x</sup>). The only psychological states that consistently predicted both outcomes were within-person variability in anxiety and negative affect. Emotion regulation strategies that predicted both subjective health outcomes were within-person distraction and bracing and between-person emotional suppression. Of course, the strategies we evaluated represent just some of many that participants might have employed. For instance, they might have sought social support, started studying for the next exam, or engaged in different types of reappraisal that were not fully captured by our measures. Thus, we are careful not to make too much of the findings comparing strategies here but hope to spark future investigations into possible targets of intervention.

We also recognize the need to replicate and extend the current work. For example, although the "real world" setting and longitudinal design of the current study are strengths, our findings are fundamentally correlational. Perhaps subjective health fluctuates during waiting periods due to currently unidentified causes, and then distress and emotion regulation efforts arise in response to diminished health and disrupted sleep. In either case, our study provides consistent evidence of a link between diminished psychological and subjective physical health in this context, but experimental work is necessary to definitively establish causality.

Furthermore, the present results are somewhat limited in their generalizability to other populations and waiting periods. Both the waiting period (waiting for bar exam results) and population (law students) are unique in several ways. For example, waiting for bar exam results takes 4 months, the results are released at a specified date and time, and people can retake the exam should they fail. Although these characteristics make the bar exam an interesting and feasible target of study, it is unclear whether the patterns we observed here would generalize to shorter waiting periods (e.g., awaiting biopsy results), waiting periods of unknown duration (e.g., waiting to hear about a job interview), or waiting for an outcome that cannot be overturned by future behavior (e.g., a HIV diagnosis). Furthermore, law school students are likely more educated and better resourced than the average person. As a result, they may be more resilient to stressors and better equipped to manage health threats. Of course, this idiosyncrasy would imply that people with fewer resources may experience even worse subjective health and sleep when awaiting important news, but broader examinations of other populations and other waiting periods are necessary to establish generalizability.

Due to the geographical range of our sample and our desire to reduce participant burden, our assessment of subjective health was limited to short, subjective, self-re-

**Table 3** Parameter estimates from models examining the linear and quadratic temporal trends in psychological states and strategy use

	Linear		Quadratic	
	b (SE)	<i>t</i>	b (SE)	<i>t</i>
Psychological states				
Perseverative thinking	-.03 (.01)**	-4.06	.11 (.003)**	35.09
Anxiety	.01 (.01) <sup>+</sup>	1.69	.07 (.004)**	18.87
Negative affect	.01 (.01)	1.47	.02 (.004)**	5.96
Positive affect	-.05 (.01)**	-6.10	-.02 (.003)**	-5.15
Emotion regulation strategies				
Distraction	-.02 (.01)	-1.42	.08 (.005)**	16.58
Suppression	.002 (.01)	.20	.04 (.003)**	12.72
Bracing	-.04 (.01)**	-4.98	.02 (.003)**	8.08
Pos. expectation management	-.02 (.01)**	-3.16	.01 (.003)**	4.33
Benefit finding	-.02 (.01)**	-2.77	-.005 (.002) <sup>+</sup>	-1.85
Distancing	-.02 (.01)**	-3.39	.01 (.002)**	3.51

\*\*  $p < .01$ ; \*  $p < .05$ ; <sup>+</sup>  $p < .10$

port measures. To maximize validity and reliability, we used well-established items for assessing self-reported health and sleep disruption. Nonetheless, reports may have been biased by self-presentation (Leary et al., 1994), faulty memory (Smith et al., 2008), or motivated reasoning (Kunda, 1990). Moreover, our short measures may have detected less variance than could longer, more substantive measures, and our measure of sleep sacrificed the established validity of a single measure in an effort to include items that would be most pertinent to waiting experiences. As such, future studies should examine whether our findings extend to alternative and objective measures of physical health and sleep quality. Doing so will examine the reliability of the present findings while also extending this work to additional health outcomes such as symptoms of illness, cortisol reactivity, or immune function.

Finally, without a non-waiting control group, we cannot know whether the correlations between personal fluctuations in psychological states, emotion regulation strategies, and subjective health observed here differ in magnitude from those same correlations in non-waiting individuals. The purpose of our study was to understand subjective health trajectories during a waiting period, not to compare people who are waiting to people who are not. Nevertheless, this is likely a fruitful avenue for future research.

## Conclusion

The present study is novel and theoretically generative and provides unique insight into a potentially critical and previously unidentified consequence of awaiting uncertain news. Our results suggest that waiting periods can take a

toll on subjective health and that individual and temporal variations in distress and emotion regulation efforts are associated with these health trajectories. This work contributes to a growing body of research examining the experience of waiting for uncertain news and provides a rich foundation for future research and health interventions.

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## Compliance with ethical standards

**Conflict of interest** Jennifer L. Howell and Kate Sweeny declare that they have no conflict of interest.

**Human and animal rights and Informed consent** All procedures followed were in accordance with ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

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