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How painful is a recession? An assessment of two future-oriented buffering mechanisms

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ABSTRACT

Rationale and objective: Guided by stress process theory, this study investigates the association between the economic downturn and chronic pain interference, as well as the role of two future-oriented buffering mechanisms (anticipated stressor duration and pre-recession financial optimism) in this relationship. This research integrates both an objective measure of the recession based on negative personal experiences, as well as subjective event-based appraisals of how the recession impacted people's lives.
Method: Drawing on longitudinal data from the National Survey of Midlife Development in the United States, linear lagged dependent variable models are used to estimate associations between recession-era stressors and chronic pain interference among 1113 adults. The analysis further examines the moderating influences of anticipated stressor duration and pre-recession financial optimism.
Results: Findings reveal that both an accumulation of adverse experiences and global appraisals of the economic recession have harmful associations with chronic pain interference; however, their magnitude varied according to future-oriented moderating factors. Specifically, people with high pre-recession financial optimism fared better when confronted with recession-related stressors than did those with low levels of financial optimism. Moreover, pain interference was greater among individuals who appraised the recession as having a negative impact on their lives, but only if they perceived the recession would extend into the future.
Conclusions: This study demonstrates distinctive links between two recession-related measures and pain interference. Findings suggest that positive future orientations can be protective during an economic crisis, whereas negative orientations heighten the pain.

1. Introduction

Chronic pain is a significant health issue for many Americans. A recent study indicates that 178 million adults reported painful health conditions unrelated to cancer in 2013–14, which is a 25% increase in prevalence over the preceding 18-year period (Nahin et al., 2019). Pain is associated with lower quality of life and psychosocial well-being (Ataoğlu et al., 2013; Demyttenaere et al., 2007) and with a higher frequency of hospitalizations and emergency rooms visits (Nahin et al., 2019). Additionally, pain is estimated to cost the U.S. economy as much as $560 to $635 billion annually due to health care utilization and lowered worker productivity (Gaskin and Richard, 2012). These estimated costs exceed those of heart disease, cancer, and diabetes (Gaskin and Richard, 2012), three of the leading causes of mortality in the U.S.

Pain is a biopsychosocial phenomenon (Williams and Craig, 2016). In addition to biological contributing factors, such as an underlying injury or disease, there is extensive evidence of the role of psychosocial factors, such as anxiety, depression, catastrophizing, perceived stress, and discrimination (Brown et al., 2018; Edwards, 2008; Linton, 2000; McWilliams et al., 2003, 2004). In particular, several empirical studies suggest an association between financial worry, strain, or insecurity and increased frequency or severity of pain (Chou et al., 2016; Jablonska et al., 2006; Rios and Zautra, 2011), even as the biological mechanisms linking stress and pain are a matter of continued investigation (Gatchel et al., 2007; McEwen, 2006).

The present study seeks to offer three main contributions to the study of financial stress and chronic pain. First, this research examines pain in the period surrounding the Great Recession. Little to no research using representative national data has examined the impact of a major financial crisis on chronic pain interference. The Great Recession that

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began in late 2007 (National Bureau of Economic Research, 2010) was reportedly the worst economic downturn in the U.S. since the Great Depression of the 1930s. Moreover, recession-related stressors persisted in the aftermath of the recession as individuals endured a slow economic recovery. This period had substantial effects on the financial well-being of U.S. residents, which in turn posed threats to the mental and physical health of those who suffered the recession (see Burgard and Kalousova, 2015). For example, several studies found that individuals who reported housing instability during the recession had increased odds of reporting fair or poor health relative to those in more stable housing conditions (Burgard et al., 2012, 2013). Relatedly, physical discomfort is likely to be among the important health outcomes shaped by recessionary experiences, and thus, the research presented here examines pre- and post-recession levels of chronic pain.

Second, this research integrates two ways of understanding the potential painfulness of the recession: (1) the influence of actual, objective adverse events experienced during the downturn, but also (2) the role of subjective event-based appraisals of how the recession impacted people's lives. Most studies examining the health consequences of the Great Recession utilize objective measures of financial hardship such as wealth declines (Boen and Yang, 2016; McInerney et al., 2013), housing difficulties (Burgard et al., 2012; Yilmazer et al., 2015), and job loss (Catalano et al., 2011; Tekin et al., 2018), or—as this study pursues—a combination of these interrelated events (Burgard et al., 2013; Kirsch and Ryff, 2016; Vijayasiri et al., 2012). Few studies have investigated the potential health effects of subjective assessments of the recession, despite the relative importance of perceived financial strain in comparison to more objective economic indicators (Wilkinson, 2016). Further, no prior studies have included measures of *both* stressful recession-related experiences and explicit event-based appraisals of the recession. Including objective and subjective indicators provides an opportunity to capture a wider range of ways through which recession-based stress may influence pain.

Consequently, the third contribution of this research is to extend current formulations of stress process theory by distinguishing two future-oriented moderating mechanisms. Positive expectations about the future have been identified as health-protective resources during times of stress, in large part because they foster coping strategies that help people alleviate stressors rather than avoid them. Outside the laboratory or surgical setting, however, this issue has been studied primarily in the form of dispositional optimism (Nes and Segerstrom, 2006). The present study introduces the concept of *anticipated stressor duration* as a complementary moderating mechanism. Duration perception is an especially relevant factor in contexts such as the Great Recession because macro-economic crises are times of pronounced economic uncertainty. This uncertainty makes it difficult for people to plan for the future and affects various aspects of their professional, financial, and personal lives (Ananat et al., 2013; Cherlin et al., 2013; Goda et al., 2011; Morgan et al., 2011). Interpreting such events as both damaging *and* likely to extend into the future, this study argues, is likely to maximize their painfulness because the stress has no perceptible reprieve.

2. Conceptual framework and study hypotheses

The stress process model marks an interdisciplinary effort to explain how adverse events and conditions harm health. In this framework, acute or chronic stressors first challenge people's adaptive capacity. Individuals appraise the nature of the threat and their ability to adjust—their ensuing emotional and behavioral responses altering physiological systems (e.g., neuroendocrine and immune) and subsequently their health. Sociological uses of the stress process framework tend to emphasize the upstream structural conditions that induce exposure to stressors (Aneshensel, 1992; Pearlin, 1989; Pearlin and Bierman, 2013), while health psychologists have generally been most attuned to people's modes of appraisal and the coping process (Folkman, 2013; Folkman et al., 1986; Taylor and Aspinwall, 1996). Both fields underscore that resources—social (e.g., support availability) or individual (e.g., optimism)—can mitigate the impact of the consequences of stressors on physical health (Cohen and Wills, 1985; Pearlin and Bierman, 2013; Thoits, 1995).

The present study begins from a stress process premise by acknowledging that macro-economic events such as recessions have varied health consequences in the population. More disadvantaged subgroups, on average, confronted the broadest constellation of stressors during the recent economic downturn, including job loss (Engemann and Wall, 2010; Hoynes et al., 2012), eviction or home foreclosure (Rugh and Massey, 2010), and consumer debt problems (Kim et al., 2017; Rix, 2011). Yet, many in the middle class, too, weathered multiple interrelated stressors (Pew Research Center, 2012). Not surprisingly, cross-sectional research suggests that those people accumulating the highest number of adverse experiences during the Great Recession also have tended to report an elevated number of health problems (Kirsch and Ryff, 2016). Building from this existing evidence, it is hypothesized that higher stressor exposure during the recession era is similarly linked to an increase in chronic pain interference (*Hypothesis 1*).

Importantly, the stress process framework also summons us to sites of contingency between adverse event and outcome. Appraisal is a juncture that could account for important variation in the recession's painfulness. In brief, stress appraisal encompasses whether people see an event as threatening, harmful, or challenging and whether or how people think they can respond to the event (Folkman, 2013). Though both aspects of appraisal orient one to expectations about the future—namely, how much harm the event is likely to cause or how well one expects to cope—little research on social stress has considered how people assess the permanence of the stressor itself in time. The present study refers to this process as *anticipated stressor duration*: How much longer will this bad event persist?

Duration estimates are a potentially overlooked aspect of the appraisal process that likely dictate the extent to which stressors impact health. On the one hand, the sense that a stressful event has passed or is near its end can renew hope and promote resilience. Though conceptualizations of resilience vary in the literature, one perspective is that overcoming adversities—especially those understood to be 'transitory'—fortifies people for future challenges (Davydov et al., 2010). The immunization brought on by a sense of stressor closure could offset threats to health. On the other hand, believing that a stressful event is far from over may reinforce fear of the future and trigger negative feelings. It may sustain worries that current personal troubles will persist and produce unease about the proliferation of yet more difficulties.

Existing research on pain attests to the power of expectation (Sobol-Kwakpinska et al., 2016). Experimental studies and research on clinical samples of patients following surgery or treatment have established that expectations of future pain modulate its intensity or severity (Hanssen et al., 2014; Ružić et al., 2017). Patients undergoing root canal surgery, for instance, report lower persistent pain six months after the procedure if they expressed the highest level of pre-treatment optimism in surgery outcome (Nixdorf et al., 2016). Likewise, experimental subjects evaluate unpleasant electrical stimulation as less painful if they are told to anticipate low intensity voltage, rather than high intensity shocks (Ružić et al., 2017).

In the context of the recession, estimates of stressor duration imply an attribution process emerging from the event. That is, for something as broad as the Great Recession to endure in any stressful sense, it must first be something people identify as an event; second, people must ascribe diverse negative experiences to it. Individuals will undeniably vary in the extent to which they assign a bundle of personal troubles as fallout from the recession. Yet, to the extent that they appraise the recession as having been harmful or threatening, people's evaluations of its continued duration should have negative health implications.

Specifically, the present study hypothesizes that viewing the Great Recession—in its totality—as an adverse event prompts chronic pain interference (*Hypothesis 2*), but pain interference is exacerbated to the extent that the recession is expected to endure past the short term (*Hypothesis 3*). To be clear, not all the negative effects of actual recession-era stressors must be transmitted through the above-mentioned attribution process; but the joint assessment of the recession's sting *and* the anticipated duration of that recession likely represents an important mechanism of the overall stress process and an explanation of variance in pain.

Introducing the concept of anticipated stressor duration raises a question as to whether such aspects of appraisal are distinct from personal resources that people bring into the stress process. Optimism, whether as a general or as a domain-specific disposition (e.g., optimism toward finances), has been identified as a powerful resource for coping positively with adversity and minimizing the health consequences of stressors (Friedman et al., 1992; Scheier et al., 1989; Thomas et al., 2011). This finding has been replicated in experimental pain studies, where, for instance, highly optimistic people rated cold-water stimulation as less painful than more pessimistic subjects (Hanssen et al., 2014). The present study therefore hypothesizes that pre-recession optimism buffers the increase in pain interference associated with experiencing adverse events during the Great Recession (*Hypothesis 4*). Still, the question remains whether a buffering effect of pre-recession optimism effectively washes out the role of future-oriented appraisals described in Hypothesis 3. Optimistic people likely take a rosier outlook in the midst of difficulty—does optimism ultimately override the potential variation explained by estimates of stressor duration?

Fig. 1 is a conceptual model which summarizes the main research questions and hypotheses from this study. Actual stressful experiences and global negative appraisals of the recession are each expected to increase levels of chronic pain interference from before to after the recession. Anticipated duration of the recession is expected to moderate the effect of recession appraisals, while optimism, as a personal resource, is expected to buffer the painful consequences of experiencing more stressors. This study leaves as an open question whether optimism also buffers the impact of event-based appraisals of the recession and potentially overrides the hypothesized moderation pattern implied by Hypothesis 3 (denoted by the question mark). Finally, dashed lines designate anticipated associations—not central to the study's focus on explaining pain variation—that will be investigated in supplementary analyses.

3. Method

3.1. Sample

This study uses three waves of data from the National Survey of Midlife Development in the United States (MIDUS). Baseline data for the MIDUS were collected in 1995–1996 by the MacArthur Midlife Research Network. The data investigators used random-digit dialing to obtain a national sample of non-institutionalized, English-speaking adults ages 25 to 74 living in the contiguous U.S., with oversamples of older adults and men. Respondents were first administered a telephone interview (70% response rate); for those who completed the telephone interview, a self-administered questionnaire was mailed to respondents (87% response rate), which resulted in an overall response rate of 61% ($0.70 \times 0.87 = 0.61$) or 3034 respondents. Of the 3034 respondents who were surveyed at the first wave, 2103 respondents completed the telephone interview when they were re-contacted in 2004–2006 for the second wave of data collection. In 2013–2014, the data investigators conducted a follow-up survey with the longitudinal respondents, which included detailed information on the economic recession. Of the 2103 longitudinal respondents, 1145 respondents completed both the telephone interview and the self-administered questionnaire at the third and most recent wave of data collection. The sample for this analysis was limited to respondents who participated in all three waves and had a valid score on both the dependent variable and the sample weight, resulting in a sample size of 1113 respondents.

3.2. Measures

Chronic pain interference. Beginning at Wave 2, respondents were asked a series of questions about their pain. Initially, respondents were asked, "Do you have chronic pain, that is, do you have pain that persists beyond the time of normal healing and has lasted anywhere from a few months to many years?" If respondents answered affirmatively, they were asked the extent to which their pain, during the past week, interfered with each of the following activities or feelings: general activity, mood, relations with other people, sleep, and enjoyment of life. Each item ranges from 0 (*did not interfere*) to 10 (*completely interfered*). A continuous scale was created from these five items using the row mean, and those who reported no chronic pain were coded as 0. Chronic pain interference is measured at Waves 2 and 3.

Recession measures. Two measures collected at Wave 3 were used to assess recession-related experiences. The first is a measure of the

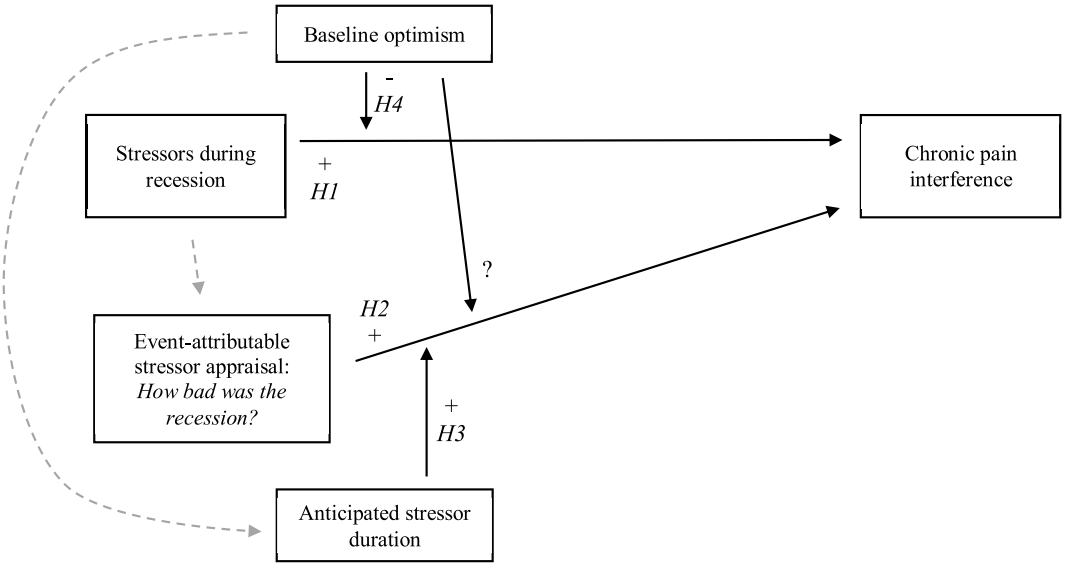

Fig. 1. Conceptual model of hypothesized processes.

actual, objective events that individuals experienced since the recession began in 2008. Specifically, respondents were asked to think about the recession and whether they had experienced any of 18 negative personal events related to their employment, home or living arrangement, and financial situation. Respondents were coded 1 for an affirmative response and 0 otherwise. Following Kirsch and Ryff (2016), these 18 items were summed together to create a count of *negative recession experiences*. See Appendix A for a complete list of the 18 items.

Second, a *subjective event-based appraisal* of the recession is derived from the question, "Thinking about the recession that began in 2008, which best describes the way you and your household have been affected by it?" Ordinal response categories include (1) "the recession has been a hardship and caused major changes," (2) "the recession has been difficult but not caused any major changes," (3) "the recession has not had much effect one way or the other," and (4) "overall, the recession has been good for me; I am better off now." Due to the small number of responses in the highest category, the top two categories were combined. Next, a series of binary variables was created for each of the response categories: recession has not had much effect or has been good (reference), recession has been difficult, and recession has been a hardship.

Future-oriented buffering mechanisms. Two items collected at Wave 3 were combined to measure *post-recession anticipated stressor duration*. Respondents were first asked whether they think the recession is over (yes/no). If respondents answered that the recession is not over, they were asked how much longer they think it will last, with response categories ranging from 1 (*less than a year*) to 4 (*more than 5 years*). Due to the small number of respondents who reported that the recession will last less than a year, the bottom two categories—"less than a year" and "1–2 years"—were combined. Information from both items was used to create an ordinal measure of post-recession anticipated stressor duration (hereafter, anticipated stressor duration) that includes the following response categories: (1) "recession is over," (2) "recession is not over and will last 2 years or less," (3) "recession is not over and will last 3–5 years," and (4) "recession is not over and will last more than 5 years." Based on these response categories, a series of binary variables was created: recession is over (reference), 2 years or less, 3–5 years, and more than 5 years.

Pre-recession *financial optimism* is assessed using the question, "Looking ahead ten years into the future, what do you expect your financial situation will be like at that time?" This single-item measure ranges from 0 (*worst*) to 10 (*best*). It was obtained at Wave 2.

Demographics and additional covariates. The analysis also includes age, sex, and race. Chronological *age* is measured in years. *Female* is coded 1 for female and 0 otherwise. *Nonwhite* is a binary variable coded 1 for nonwhite and 0 for white respondents. All were measured at Wave 1.

In addition to demographics, the analysis accounts for characteristics at Wave 2 that relate to both the recession measures and chronic pain. *Marital status* is measured using a series of binary variables for married, divorced/separated, widowed, and never married (reference group). *Education* measures the highest level of education completed and is coded into four categories: less than high school (reference group), high school, college, and postgraduate. Current or most recent *occupation* distinguishes between upper-white collar (e.g., professional and managerial), lower-white collar (e.g., sales, clerical, and service), and blue-collar (reference group; e.g., craft, operatives, and laborers) occupations, as other studies have done (Carr and Friedman, 2005). The analysis also includes a binary variable to indicate whether the respondent was *not employed* (1 = not employed). *Work stability* is a continuous measure that captures the proportion of time over the past 10 years in which respondents were employed. *Household income* is a continuous measure top-coded at $300,000 by the data investigators. The variable was recoded so that it is measured in thousands and ranges from 0 to 300. *Financial strain* is a single-item measure derived from the question, "In general, would you say you (and your family living with you) have more money than you need, just enough for your needs, or not enough to meet your needs?" Response categories range from 1 (*more money*) to 3 (*not enough money*). *Current financial situation* asks respondents to rate their financial situation on a scale of 0–10, with 0 being the *worst* and 10 being the *best*.

Morbidity is a count of the number of chronic conditions (e.g., hypertension, diabetes, and stroke) that respondents reported experiencing during the past year; the variable has a possible range of 0–30. *Psychological distress* is based on the six-item Kessler Psychological Distress Scale, which asks respondents how often, during the past 30 days, they experienced a range of emotions such as feeling nervous, hopeless, and worthless. Each item ranges from 1 (*all of the time*) to 5 (*none of the time*). These items were reverse-coded so that higher scores indicate greater psychological distress, and then a scale using the row mean was created.

3.3. Analytic plan

To examine the link between the economic recession and chronic pain interference, including the role of two future-oriented buffering mechanisms, Table 2 presents unstandardized coefficients from five ordinary least squares regression models predicting pain interference. The analysis estimated linear lagged dependent variable models, which adjust for pre-recession pain interference in all models. Coefficients in lagged dependent variable models can be interpreted as change in the dependent variable across the two waves associated with a covariate. The four hypotheses are sequentially evaluated, adjusting for demographics and additional pre-recession covariates (including marital status, education, occupation, employment, household income, financial strain, current financial situation, morbidity, and psychological distress) at each stage of the analysis. Model 1 includes the objective measure of negative recession experiences, whereas Model 2 includes subjective event-based appraisals of the recession. These models address Hypotheses 1 and 2, respectively. To evaluate Hypothesis 3, Model 3 adds the measure of anticipated stressor duration (i.e., expectations about how long the recession will last) to Model 2, as well as an interaction term between anticipated stressor duration and event-based appraisals of the recession. Model 4 includes negative recession experiences, financial optimism, and an interaction term between these two variables to address Hypothesis 4. Model 5 includes all recession measures and further adds an interaction term between pre-recession financial optimism and the summary appraisal of the recession.

Close to 12% of respondents had missing data on a single variable, while another 8% had missing data on more than one variable. There are several common tactics for dealing with this issue. Multiple imputation assumes that the data are missing at random, whereas listwise deletion holds the more rigorous assumption that the data are missing completely at random. Multiple imputation, however, will lead to unbiased estimates under either assumption (Sidi and Harel, 2018). Little's missing completely at random test found evidence that this assumption was likely violated (Li, 2013). To reduce potential bias and preserve statistical power, the analysis used multiple imputation by chained equations (imputations = 20) in Stata to handle item-missing data.

In addition, attrition is a potential problem given the gap in time between MIDUS Wave 2 and Wave 3. Of particular concern, respondents who experienced the greatest number of troubles during the period of the recession and those at highest risk of chronic pain may have been disproportionately likely to be lost between waves. To account for potential selection bias, a Heckman two-step sample selection model (Heckman, 1979) was implemented. The likelihood of Wave 3 inclusion was first predicted using a probit model with health and demographic variables derived from baseline (all variables used in the selection equation are listed in Table 1; see Appendix B in the online supplement for results of the selection equation). These estimates were then used to create a non-selection hazard variable, which was included as a control variable in all regression models. In sensitivity checks, we

Table 1
Descriptive statistics of study variables from the MIDUS (N = 1113).

Variable	Range	Mean	*SD*
Chronic Pain Interference, W3	0 to 10	1.36	2.41
Chronic Pain Interference, W2	0 to 10	1.10	2.07
Key Independent Variables			
Negative Recession Experiences, W3	0 to 15	1.90	2.22
Subjective Event-Based Appraisal, W3			
Recession Not Had Much Effect or Been Good	0, 1	0.48	
Recession Difficult	0, 1	0.37	
Recession Hardship	0, 1	0.15	
Post-Recession Anticipated Stressor Duration, W3			
Recession is Over	0, 1	0.27	
2 Years or Less	0, 1	0.25	
3–5 Years	0, 1	0.31	
More than 5 Years	0, 1	0.17	
Financial Optimism	0 to 10	7.24	2.11
Demographics			
Age, W1	20 to 74	46.56	11.39
Female, W1	0, 1	0.53	
Nonwhite, W1	0, 1	0.07	
Covariates			
Marital Status			
Married	0, 1	0.70	
Divorced/Separated	0, 1	0.16	
Widowed	0, 1	0.07	
Never Married	0, 1	0.08	
Education			
Less than High School	0, 1	0.06	
High School	0, 1	0.53	
College	0, 1	0.25	
Postgraduate	0, 1	0.17	
Occupation			
Upper-White Collar	0, 1	0.44	
Lower-White Collar	0, 1	0.39	
Blue Collar	0, 1	0.18	
Not Employed	0, 1	0.33	
Work Stability	0 to 1	0.79	0.36
Household Income[a]	0 to 300	74.35	62.85
Missing on Income, W1[b]	0, 1	0.03	
Missing on Wealth, W1[b]	0, 1	0.07	
Financial Strain	1 to 3	1.88	0.68
Current Financial Situation	0 to 10	6.60	2.10
Own Home, W1[b]	0, 1	0.81	
Years Lived in Neighborhood, W1[b]	0 to 40	12.03	10.89
Mother's Nativity Status, W1[b]	0, 1	0.09	
Father's Nativity Status, W1[b]	0, 1	0.09	
Ever Smoked, W1[b]	0, 1	0.50	
Self-Rated Health, W1[b]	0 to 10	7.53	1.51
Morbidity	0 to 16	2.34	2.31
Ever Had Heart Problems, W1[b]	0, 1	0.09	
Psychological Distress	1 to 4.83	1.50	0.54
Depression, W1[b]	0, 1	0.12	

Note. Descriptive statistics are from Wave 2 unless otherwise noted. Means (proportions) for marital status, education, and occupation do not sum to one due to rounding error. MIDUS, National Survey of Midlife Development in the United States.

[a] Measured in thousands of dollars.

[b] Variable only used in the Heckman selection model.

replicated our findings with inverse-probability-of-attrition weights, and as a further check, with standard sample weights without any explicit correction for attrition.

4. Results

Descriptive statistics for the study covariates are displayed in Table 1. Overall, respondents reported low levels of chronic pain interference: 65% and 64% of respondents experienced no pain interference at Wave 2 and Wave 3, respectively. The mean increased slightly across waves, though this may, at least partially, be due to age-related declines in health. Nearly one-half (48%) of respondents did not experience pain interference at either wave, while another 20% of respondents reported pain interference at both waves. Meanwhile, others reported the onset of pain interference (17%) or had pain interference subside (15%) from Wave 2 to Wave 3. On average, respondents reported few recession-related stressors. Close to one-half of respondents reported that the recession has not had much effect on them or has even been good. More than one-third of respondents indicated that the recession has been difficult for them, while a smaller proportion considered the recession to be a hardship that has caused major changes in their lives. Consistent with the dotted lines from Fig. 1, those who viewed the recession as a hardship were more likely to have experienced each of the negative recession-related events (see Appendix A). Further, the count of negative recession experiences was clearly graded across the range of appraisals, ranging from an average of about one recession-related stressor among those who saw the recession as benign, to four recession-related stressors among those who saw it as a hardship. Still, subjective event-based appraisals are only moderately correlated with negative recession experiences (Spearman's $\rho = 0.45$), suggesting that these variables are distinct measures of people's recessionary experiences.

In addition, about three-quarters of respondents believed that the recession was *not* over—most respondents anticipated that the recession would last another 3–5 years, with a smaller proportion believing that it would last more than 5 years. Yet, prior to the recession, respondents reported being relatively optimistic about their future financial situation.

Table 2 presents the results from ordinary least squares regression models to examine the role of future-oriented moderating factors in the recession-pain relationship. Model 1 evaluates whether the count of negative recession experiences is associated with pain interference, adjusting for pre-recession pain interference and all control variables. Results show that the count of negative recession experiences was non-significant in predicting change in pain interference in the period following the recession (*Hypothesis 1* is not supported). Model 2 examines subjective event-based appraisals of the recession and shows that, compared to respondents who reported that the recession had little to no effect on their lives or was even beneficial, those who viewed the recession as difficult or as a hardship experienced an increase in pain interference (*Hypothesis 2* is supported). Model 3 evaluates Hypothesis 3, which specifies that anticipated stressor duration will moderate the association between event-attributable stressor appraisal and chronic pain interference. Results indicate that anticipated stressor duration exacerbates the relationship. Specifically, reporting that the recession has been a hardship is associated with increased pain interference, but feeling that it would be longer-lasting was associated with greater increases in pain interference. As shown in the predicted values in Fig. 2, individuals who rated the recession as a hardship and anticipated that it would last more than five years presented the highest predicted value of chronic pain interference following the recession (*Hypothesis 3* is supported).

Model 4 assesses the role of pre-recession financial optimism and its potential to buffer the association between count of negative recession experiences and chronic pain interference. Indeed, financial optimism interacted with adverse recession-related events (*Hypothesis 4* is supported). Fig. 3 provides an illustration of this pattern using predicted values. People with high or moderate levels of pre-recession financial optimism did not experience recession-related events as especially painful, whereas those with relatively pessimistic financial outlooks saw an increase in pain interference for each additional negative experience during the recession. Supplementary analyses tested a global measure of optimism and found that it did not produce the same interactive pattern.

Model 5 is a fully adjusted model that adds an interaction term between pre-recession financial optimism and summary appraisals of the recession. The purpose of this model is to determine whether the apparent importance of anticipated stressor duration is explainable by the role of pre-recession optimism. Results of the earlier test addressing

Table 2
Linear regression of chronic pain interference at Wave 3 on recession measures: Testing future-oriented buffering mechanisms (N = 1113).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Negative Recession Experiences	0.06			0.52***	0.43**
	(0.05)			(0.15)	(0.17)
Subjective Event-Based Appraisal					
Recession Difficult		0.35*	0.40		0.22
		(0.15)	(0.27)		(0.74)
Recession Hardship		0.82**	−0.95		−0.86
		(0.26)	(0.50)		(0.99)
Post-Recession Anticipated Stressor Duration					
2 Years or Less			−0.22		−0.22
			(0.22)		(0.22)
3–5 Years			0.36		0.34
			(0.26)		(0.25)
More than 5 Years			0.19		0.18
			(0.33)		(0.33)
Recession Difficult × 2 Years or Less			0.37		0.28
			(0.39)		(0.39)
Recession Difficult × 3–5 Years			−0.42		−0.43
			(0.39)		(0.38)
Recession Difficult × More than 5 Years			−0.25		−0.29
			(0.54)		(0.54)
Recession Hardship × 2 Years or Less			1.50*		1.44*
			(0.68)		(0.69)
Recession Hardship × 3–5 Years			1.41*		1.36*
			(0.60)		(0.64)
Recession Hardship × More than 5 Years			2.70***		2.55***
			(0.70)		(0.75)
Financial Optimism				0.03	0.04
				(0.06)	(0.07)
Negative Recession Experiences x Financial Optimism				−0.06**	−0.06**
				(0.02)	(0.02)
Recession Difficult x Financial Optimism					0.03
					(0.09)
Recession Hardship x Financial Optimism					−0.02
					(0.11)
R^2	0.35	0.36	0.38	0.37	0.39

Note. Unstandardized regression coefficients with robust standard errors in parentheses. Models adjust for pre-recession chronic pain interference and all demographics and additional covariates displayed in Table 1 (except as noted), as well as the non-selection hazard variable. Reference categories are recession has not had much effect or has been good (subjective event-based appraisal) and recession is over (anticipated stressor duration).
*p < .05. **p < .01. ***p < .001.

Hypothesis 3 were unchanged. This suggests a unique contribution for anticipated stressor duration on shaping the impact of event-attributable stressor appraisals. Supplementary analyses also revealed that pre-recession financial optimism had little association with how long people expected the recession to persist (Spearman's ρ = −0.08), which adds further support to the idea that each variable captures a separate future-oriented buffering mechanism.

In sensitivity analyses, the analysis controlled for a quadratic term for age and change in morbidity between Wave 2 and Wave 3. In addition, pain interference was coded as a change score and subjected to

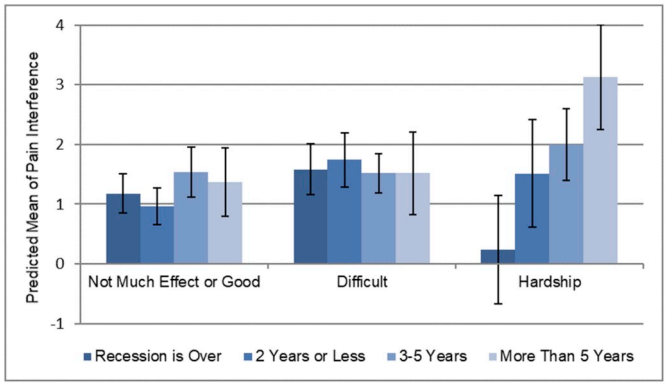

Fig. 2. Predictions of chronic pain interference by post-recession anticipated stressor duration and subjective event-based appraisals of the recession. This figure presents predictions based on results from Model 3 in Table 2 (95% confidence intervals are displayed).

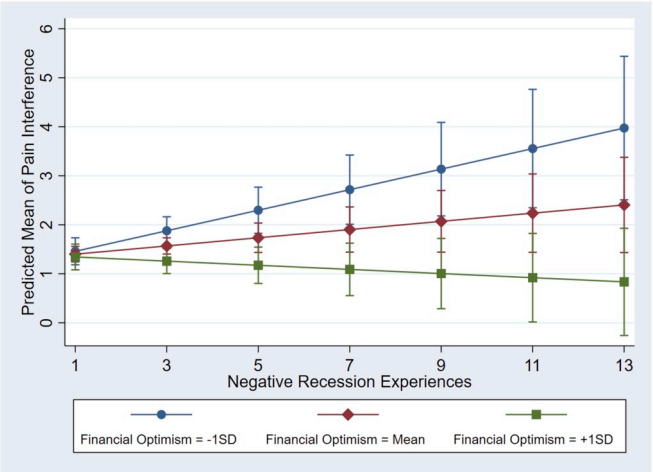

Fig. 3. Predictions of chronic pain interference by financial optimism and negative recession experiences. This figure presents predictions based on results from Model 4 in Table 2 (95% confidence intervals are displayed).

an inverse hyperbolic sine transformation. Conclusions remained robust across each of these model permutations. Systematic tests of Hypotheses 1–4 using additional estimation strategies (i.e., ordered logit, five categories; ordered logit, six categories) reached similar conclusions. The analysis also tested a two-part model using the -twopm- command in Stata (Belotti et al., 2015). Results revealed that some of our hypotheses seemed to operate more strongly at the distinction between having and not having pain interference, whereas other mechanisms appeared more consequential in whether level of pain interference increased. Predictions based on the combined first- and second-part models, though, closely matched those found using the more parsimonious linear model. The results were also compared to those estimated using listwise deletion. Most conclusions were unchanged, but the coefficient for negative recession experiences was significant in Model 1 using listwise deletion. Nonetheless, results estimated using multiple imputation were similar to those found using full information maximum likelihood—and the substantive conclusions were the same.

5. Discussion

This study continues investigation of the health consequences of the Great Recession. The bulk of earlier work has considered mental health outcomes and has tended to examine isolated stressors such as job loss or asset loss (Houle, 2014; Wilkinson, 2016; Yilmazer et al., 2015). The present study complements and extends an earlier cross-sectional analysis on physical health (Kirsch and Ryff, 2016), finding that both an accumulation of adverse experiences and global appraisals of the economic event had longitudinal associations with chronic pain (see Table 2). No prior study has distinguished personal experiences *during* the recession from *evaluations of the historical event itself* and considered how both were associated with health. Further, the painfulness of each varied according to future-oriented moderating factors. Specifically, people with high levels of financial optimism fared far better amidst stressor burden than did people entering the recession with low levels of optimism (see Fig. 3). Likewise, people who appraised the recession as having a bad effect on their lives suffered more chronic pain interference only if they believed the recession would continue on for the foreseeable future (see Fig. 2).

In general, findings support the perspective that positive future expectations lead to optimized health outcomes by buffering stressful events (Rasmussen et al., 2009). Some authors contend that such expectations provide resilience in the face of adversity and enable adaptive coping (Aspinwall, 2005; Nes and Segerstrom, 2006). At the same time, other research has suggested that adolescents exhibiting high hopefulness pre-adversity actually suffer the most distress following trauma, perhaps because they are ill-suited to the stressfulness of their environment (Fletcher, 2018). Yet, this study is the first to examine future-oriented moderation mechanisms with respect to chronic pain in a national sample of adults. Future research should further specify whether positive views of the future have outcome-specific influences and/or whether their buffering effects differ by stage of the life course. Because older adults can now expect greater longevity, it is important to understand how hopefulness or other proactive adaptations to age-related challenges help limit chronic pain and promote successful aging.

Though anticipated stressor duration and pre-recession financial optimism both appeared to moderate links between the recession and pain interference, it is important to distinguish their roles in the theorized stress process. Optimism stands as a pre-existing personal resource that equips people to deal with stressful events and conditions, helping them actively cope in adaptive ways (Nes and Segerstrom, 2006). Appraisals of stress duration, on the other hand, *emerge from* one's experience in the aftermath of stressor exposure. Greater optimism was only weakly associated with favorable prognoses about the future course of the recession, and these findings indicated that the latter is not reducible to a baseline personal resource. Emergent perceptions of the situation are a largely overlooked feature of the stress process, but such appraisals deserve close attention because they have the power to redirect people's future life trajectories and to explain health variance between people who otherwise experience similar objective conditions (Ferraro et al., 2009).

6. Limitations

Contributions of this study must be weighed against its limitations. Unfortunately, there is only one post-recession wave of MIDUS data currently available. All recession-related information and the outcome variable were measured several years after the onset of the downturn. This meant that the study was unable to assess potential indirect effects of recession experiences on pain through subjective appraisals, or to examine whether increased pain interference during the downturn shaped estimates of stressor duration or the subjective event-based appraisal. The analysis did, however, use a measure of pre-recession pain to account for possible selection processes (i.e., those suffering from chronic pain were hit disproportionately hard by the recession). Still, without random assignment into recessionary experiences, this research cannot make definitive causal assertions and rule out unmeasured confounders in the association between stressor and pain.

The potential for reverse causality is a related concern. People with heightened pain may have been more likely to hold a pessimistic view of the future—thinking that the recession would carry on longer—or remember the events of the near past as especially bleak. By definition, pain had to be present for at least a few months to be identified as chronic in the MIDUS survey, and thus, it could precede and perhaps even cause the appraisals. The analysis attempted to deal with this limitation by including a lagged measure of pain from Wave 2, but such a solution cannot account for cases where people experienced a sharp uptick in chronic pain for reasons unrelated to the recession.

Measurement validity of anticipated stressor duration may also vary across levels of socioeconomic status. In particular, the most educated MIDUS respondents likely had the strongest technical understanding of the Great Recession. Based on economic indicators, the event ended in June 2009 (National Bureau of Economic Research, 2010), and some participants undoubtedly used this macro-economic interpretive frame rather than their own personal or community circumstances when answering the survey question about recession duration. But, regardless of whether people evaluated the recession's staying power in light of their local experiences or whether they were merely misinformed about economic technicalities (or perhaps some of each), sensing that the downturn will go on seems to sharpen the recession's pain. Yet, caution should be taken when interpreting descriptive patterns of the variable across levels of education, as it is unclear whether the most advantaged respondents have better resources for providing optimistic outlooks or whether they are interpreting the question differently from their less-educated counterparts.

7. Conclusions

Findings from this study point to the distinctive associations of adverse events experienced during this economic crisis and subjective global appraisals of the recession with physical well-being and implicate protective mechanisms within these associations. Chronic pain is a pressing outcome because it is intertwined with other social problems associated with economic downturns and that pose additional threats to population health. These issues include long-term unemployment and worker disability and prescription and non-prescription drug addiction and abuse. Although examining these issues is beyond the scope of the current study, these findings suggest that positive future orientations could be protective mechanisms for additional health outcomes in the aftermath of an economic crisis.

Appendix A

Negative recession experiences by subjective event-based appraisals of the recession (N = 1113).

	Subjective event-based appraisal			
"Since the recession began in 2008, have you…"	Not much effect or good	Difficult	Hardship	p-value
Lost a Job	0.07	0.12	0.30	***
Started a New Job Did Not Like	0.03	0.04	0.14	***
Taken a Job Below Education or Experience	0.05	0.11	0.26	***
Taken on an Additional Job	0.05	0.10	0.18	***
Missed a Mortgage or Rent Payment	0.03	0.03	0.23	***
Been Threatened with Foreclosure or Eviction	0.01	0.03	0.18	***
Sold a Home for Less than It Cost	0.03	0.03	0.08	*
Lost a Home Due to Foreclosure	0.004	0.01	0.08	***
Lost a Home Due to Something Other than Foreclosure	0.01	0.01	0.08	***
Declared Bankruptcy	0.01	0.02	0.12	***
Had Family or Friends Move in to Save Money	0.07	0.11	0.24	***
Moved in with Family or Friends to Save Money	0.02	0.04	0.13	***
Missed a Credit Card Payment	0.05	0.09	0.24	***
Missed Other Debt Payments	0.03	0.02	0.18	***
Increased Credit Card Debt	0.12	0.27	0.36	***
Sold Possessions to Make Ends Meet	0.05	0.13	0.35	***
Cut Back on Spending	0.45	0.73	0.93	***
Exhausted Unemployment Benefits	0.04	0.05	0.22	***
Mean Number of Negative Recession Experiences	1.11	1.95	4.30	***

Note. Means (proportions); p-values from χ^2 tests and one-way analysis of variance.
*$p < .05$. **$p < .01$. ***$p < .001$.

Appendix B and C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2019.112455.

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