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The Importance of Positive Events when Living with Chronic Pain

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF ARTS

in Social Ecology

by

Julie A. Kircher

Thesis Committee:
Professor Susan Turk Charles, Chair
Associate Professor Michael A. Hoyt
Assistant Professor Amy L. Dent

2020

DEDICATION

To

my friends and family

Your enduring support and encouragement maintained my perseverance and drive throughout this academic journey.

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ABSTRACT OF THE THESIS

The Importance of Positive Events when Living with Chronic Pain

by

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Master of Arts in Social Ecology

University of California, Irvine, 2020

Professor Susan Turk Charles, Chair

Chronic pain is a common physical condition often related to high levels of anxiety and depression. One reason for its link with affective distress may be that pain interferes with how people respond to enjoyable activities as well as limits their exposure to those activities in their daily life. Few studies, however, have examined how exposure and reactivity to daily events vary by chronic pain status. The eight-day diary substudy from the second wave of the Midlife in the United States (MIDUS) longitudinal study queried people about their daily events and positive and negative affect. Participants ($N = 1,733$; $n_{\text{ChronicPain}} = 658$, $n_{\text{NoPain}} = 1,075$) were predominately White (91%), 56% female and averaged 56.24 years-old ($SD = 12.20$). Chronic pain status was related to the frequency of positive events, even after adjusting for demographic covariates [$M_{\text{ChronicPain}} = 1.14$, $M_{\text{NoPain}} = 1.13$; $b = .06$, $F(8, 13,327) = 156.42$, $p < .001$, 95% CI = (.04, .08)]. Multi-level models revealed that although people with chronic pain had lower levels of daily positive affect, they reacted more positively to daily events ($\gamma = .077$, 95% CI [.037, .118], $p < .001$). As a result, levels of daily positive affect on days when people experienced a positive event did vary by pain status ($M_{\text{ChronicPain}} = 2.68$, $M_{\text{NoPain}} = 2.72$). In addition, people with chronic pain averaged higher levels of daily negative affect compared to people without chronic

pain ($M_{\text{ChronicPain}} = .23$, $M_{\text{NoPain}} = .18$), but they also had a greater decrease in their negative affect on days when they experienced a positive event ($\gamma = -.035$, 95% CI $[-.055, -.015]$, $p < .01$).

Findings suggest that positive events have a stronger association with affect for those with chronic pain than individuals without chronic pain, and suggest that increasing the frequency of positive events among those suffering from chronic pain may help to increase their affective well-being.

CHAPTER 1

INTRODUCTION

Chronic pain is a pervasive and persistent condition experienced by roughly 20 to 25% of the U.S. adults (Barbour, Boring, Helmick, Murphy, & Qin, 2016; Crofford, 2015). Often related to heightened levels of distress, anywhere from 20 to 50% of people with chronic pain experience clinical levels of depression and anxiety (Asmundson & Katz, 2009; Bair, Robinson, Katon, & Kroenke, 2003; Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006; Day, 2019; Mills, Nicolson, & Smith, 2019). One possible contributing factor for the strong ties between affective distress and chronic pain is that chronic pain often interferes with the daily lives of individuals (Bjornsdottir, Jonsson, & Vladimarsdottir, 2013). This interference may result in both an increase in daily stressors (e.g. preventing people from accomplishing chores or driving), and a decrease in daily positive activities (e.g. visiting family and friends; Breivik et al, 2006). Researchers have examined how chronic pain is related to exposure and reactivity to daily stressors (Davis, Affleck, Zautra, & Tennen, 2006; Davis, Zautra, & Smith, 2004; Finan & Garland, 2016; Zautra, Johnson, & Davis, 2005), but less studied is how chronic pain is related to the frequency of and affective experience related to daily positive events. The purpose of this study is to examine the frequency of both negative events (stressors) and positive events, and how daily stressors and positive events relate to daily affective experiences among adults in midlife with and without chronic pain.

Features of Pain

Pain is defined by unpleasant experiences incorporating sensory, emotional and cognitive components (Crofford, 2015; Dahlhammer et al., 2018). A diagnosis of chronic pain requires that pain must be present on most days or every day for at least three months or longer (Pitcher, Von

Korff, Bushnell, & Porter, 2019). Although pain is often related to physiological damage, this association is not straightforward. According to the Gate Control Theory, neurophysiological pathways responsible for pain are influenced by thoughts, emotions, and behavioral processes. Emotional experiences influence the sensory experience, which in turn shapes pain-related cognitive appraisals (Bushnell, Ceko, & Low, 2013). A dynamic, bidirectional relationship exists between cognitive and emotional factors in the context of pain. Experiencing pain can have a negative effect on emotions and cognitive function, but negative emotional states can also lead to more pain and certain cognitive states can also increase or reduce pain (Bushnell et al., 2013). This relationship between cognitive and emotional factors may explain the co-morbidity of anxiety and depressive disorders among people with chronic pain. In addition, this theory underscores the need to understand how psychosocial factors influence the chronic pain experience (Day, 2019).

Emotional Impact of Chronic Pain

Chronic pain disorders can lead to long-term mental health consequences, including reductions in reported quality of life, lower affective well-being, and greater numbers of daily hassles (Piazza, Charles, & Almeida, 2007; Reid, Eccleston, & Pillemer, 2015; Whitten & Cristobal, 2005; Zautra, Smith, Affleck, & Tennen, 2001). Depression and anxiety are associated with lower quality of life ratings and greater distress (Dahlhammer et al., 2018) and are among the most likely comorbid conditions of chronic pain. For example, one study found that across three different pain conditions (arthritis, migraines, and back pain), higher levels of pain were related to higher rates of depression, panic attacks, and anxiety disorders even after adjusting for other medical conditions (McWilliams, Goodwin, & Cox, 2004). Moreover, an estimated 40 to 50% of people living with chronic pain have a depressive disorder, and they endorse anxiety symptoms 44 to 51% of the time (Day, 2019). Even among those with no

diagnosed affective disorders, chronic pain is associated with lower positive affect and greater negative affect (Whitten & Cristobal, 2005; Zautra, Johnson, & Davis, 2005; Zautra et al., 2001).

Daily Stressors and Positive Events

One potential reason for higher rates of affective distress is that chronic pain interferes with activities of daily living by increasing the frequency of daily stressors and decreasing positive or pleasant events. Daily stressors are events such as avoiding a disagreement, being overloaded, or experiencing a threat to your finances (Almeida, 2005). People with chronic illnesses experience a greater number of daily stressors compared to their healthier peers (Piazza et al., 2007). Similarly, chronic pain is associated with limitations in functioning and discomfort (Bjornsdottir, Jonsson, & Vladimarsdottir, 2013), which may increase the frequency of daily stressors. Although not explicitly studying the frequency of daily stressors, Breivik et al. (2006) found that chronic pain interfered with maintaining an independent lifestyle, completing household chores, and driving.

Along with an increased presence of daily stressors, chronic pain may decrease the frequency of positive events. Daily positive events, referred to as “pleasant activities” or “uplifts” in previous literature, include events like sharing a laugh with a friend, a positive interaction at work, being relaxed, or meeting your responsibilities (Charles et al., 2010; Kanner, Coyne, Schaefer, & Lazarus, 1981; Lewinsohn & Libet, 1972). Chronic pain may make activities such as attending social gatherings or working outside of the home more difficult if not impossible, leading to greater time alone (e.g., Breivik et al., 2006). This reduction of engagement in enjoyable activities, ultimately leads to lower quality of life and greater levels of distress among people with chronic pain (Davis, Zautra, & Smith, 2004).

Affective Reactivity, Daily Stressors, and Chronic Pain

Chronic pain may also change how people respond to daily occurrences. For instance, the kindling hypothesis posits that one's initial emotional reaction to stressors becomes sensitized when additional stressors continue to be introduced (Post, 1992). Greater sensitization may translate to greater affective reactivity to stressors, defined as either an increase in negative affect or a decrease in positive affect in response to a stressor. Chronic pain has also been classified as a type of chronic stressor (Abdallah & Geha, 2017; Davis et al., 2004), and researchers have argued that greater sensitization would be expected among people with chronic pain (Monroe & Harkness, 2005). Consistent with this hypothesis, those with chronic pain are more vulnerable to the impact of daily stressors on their affect reactivity (Davis et al., 2006; Finan & Garland, 2016; Zautra et al., 2005).

To date, no research has examined affective reactivity using the kindling hypothesis to compare the experience of positive events among those with and without chronic pain. Some research, however, has studied the pain experience during times of stress. A review of studies including 21 different types of daily negative interpersonal events found that chronic pain was more strongly related to negative affect under times of stress (Davis et al., 2004). However, pain was unrelated to positive affect during a stressful event. Another study evaluated daily self-reported pain, stress, as well as negative and positive affect among participants with rheumatoid arthritis (Davis, Affleck, Zautra, & Tennen, 2006). Pain and stress were related to greater levels of negative affect and lower levels of positive affect. Furthermore, positive affect predicted lower levels of pain, and negative affect predicted higher levels of pain, in subsequent weeks. Better understanding the day to day variability in affective reactivity to daily stressors could help improve the quality of life for individuals with chronic pain.

Affective Reactivity, Daily Positive Events, and Chronic Pain

Research on daily events and their associations with negative and positive affect in the context of chronic health conditions among has generally focused on daily stressors or hassles and has largely ignored the impact of positive events (Zautra et al., 2005). Studies of healthy adults have found that daily positive events were unrelated to negative affect, but to higher positive affect (Charles et al., 2010; Sin, Graham-Engeland, & Almeida, 2015; Sin, Ong, Stawski, & Almeida, 2017). Other research has found that positive events have stress-buffering properties on responses to daily stressors (Sin & Almeida, 2018). Currently, no studies have examined how daily positive events relate to changes in daily negative and positive affect among those with and without chronic pain. Our study aims to fill the research gap. There are two equally viable possibilities when considering how daily positive events will impact affect. It may be that pain interferes with people's ability to enjoy positive events which leads to lower levels of positive affect. Alternatively, the fragility of positive affect theory states that some people are more dependent on external events for their happiness than others, so their happiness levels are more fragile to the vagaries of daily life (Ong & Ram, 2017). From this reasoning, it may be that people with chronic pain experience greater positive affect when they experience positive events. If people with chronic pain have lower levels of positive affect and are more at risk for depression than those without chronic pain, they may also be those who have more fragile positive affect, and hence more reactive to positive events.

The Current Study

The purpose of the current study is to examine the frequency of both positive and negative events (stressors), as well as predict how positive and negative daily events relate to daily affective experiences among adults with and without chronic pain. We hypothesized that adults with chronic pain will experience more daily stressors and fewer daily positive events

compared to those without chronic pain. We also hypothesized people with chronic pain will, on average, have higher levels of daily negative affect and lower positive affect compared to people without chronic pain, a finding observed in prior studies (Finan & Garland, 2015; Whitten & Cristobal, 2005; Zautra, Johnson, & Davis, 2005; Zautra et al., 2001). We expect that, in general, people will experience higher levels of positive affect and lower levels of negative events on days positive events occur.

Regarding how chronic pain may moderate these relationships, we hypothesize that on days when there is a stressor present, those with chronic pain will have greater stressor-related negative and lower stressor-related positive affect compared to those without chronic pain, a prediction based on the kindling hypothesis. For positive events, we examine two alternative and opposite hypotheses. People with chronic pain may result in less of a decrease in negative affect in response to positive events, because they experience greater levels of average negative affect. Similarly, people with chronic pain may have a blunted response for positive affect as well, because pain may interfere with their enjoyment of the positive events. Alternatively, people with chronic pain may experience greater fragility of positive affect and thus may experience higher levels of positive affect on days they report a positive event. Given that the fragility theory is specific to positive affect, it is unclear if those with chronic pain would also experience lower levels of negative affect when positive events occur.

CHAPTER 2

METHOD

Procedure

The Midlife in the United States (MIDUS), a National Longitudinal Study of Health and Wellbeing was conducted between 1995 and 1996 and included 7,108 participants aged 25 to 75 (Radler, 2014). The primary goal MIDUS was to investigate the behavioral, psychological, and social factors related to physical and mental health and well-being. The study included a phone interview and a self-administered mailed survey. In addition, a subset of MIDUS respondents also participated in the National Study of Daily Experiences (NSDE) substudy. The NSDE is an 8-day diary study that included a 1,499 of the original MIDUS participants. Each day, participants completed a 15-20-minute telephone interview that asked about their thoughts, emotions, physical symptoms and activities that occurred in the prior 24 hours.

MIDUS and NSDE were repeated between 2004 and 2006 (MIDUS II; Ryff et al., 2007; Ryff & Almeida, 2009). Figure 1 depicts the flow of participants for the final subsample of this study. The second daily dairy study (i.e. NSDE II) consisted of a total of 14,912 daily interviews captured across the eight days for the 2,022 participants, which was a 92% adherence rate. Compared to the participants who only completed the self-assessed questionnaires from the MIDUS II study ($N = 5,123$), those who participated in the NSDE II ($N = 2,022$) were more likely to be older ($M_{\text{NSDE}} = 56.52$, $M_{\text{MIDUS}} = 54.79$), white (NSDE = 89.20%, MIDUS = 10.80%), male (Male = 53.33%, Female = 46.67%), married (Married = 70.71%, NotMarried = 29.29%), working (Working = 64.49%, NotWorking = 35.51%), and more educated ($M_{\text{NSDE}} = 7.38$, $M_{\text{MIDUS}} = 7.09$), but had a lower household income ($M_{\text{NSDE}} = \$327,929$, $M_{\text{MIDUS}} = \$677,402$).

Participants

Exclusion criteria for the current study were missing data on chronic pain ($n = 287$), daily and affective measures and daily events ($n=159$), resulting in a final sample of 1,733 people, including 1,075 without chronic pain and 658 individuals with chronic pain. The 287 (5.8%) participants who had missing data for chronic pain tended to be younger ($M_{\text{sample}} = 56.59$, $M_{\text{missing}} = 54.16$), less educated ($M_{\text{sample}} = 7.42$, $M_{\text{missing}} = 6.71$), have a lower household income ($M_{\text{sample}} = \$71,129.4$, $M_{\text{missing}} = \$50,879.7$), and less likely to be of white/Caucasian ethnicity (Sample = 90.91%, Missing = 85.32%). There were no differences in gender, work status, or marital status. The participants included in the current study ranged in age from 33 to 84 with a mean age of 56.2 ($SD = 12.7$). Among those in the sample, 30% had completed at least some college and 34% of the sample had at least 16 years of education.

Measures

Chronic Pain

As part of the self-administered survey in MIDUS II, participants answered the question “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?” with either yes (1) or no (0).

Negative Events (Stressors)

The negative events, or daily stressors, were assessed in NSDE (Almeida, Wethington, & Kessler, 2002). Participants were asked about seven different types of negative stressful interpersonal interactions that occurred in the last 24 hours. The questions were prompted with “Since this time/we spoke yesterday...” and asked if they had: an argument or disagreement with anyone; anything happen that they could have argued about but decided to let pass in order to

avoid a disagreement; anything happen at work or school (other than what you already mentioned) that most people would consider stressful; anything happen at home (other than what you already mentioned) that most people would consider stressful; experienced discrimination on the basis of such things as race, sex, or age; anything happen to a close friend or relative (other than what you've already mentioned) that turned out to be stressful for you; anything else happen that people would consider stressful. For the analyses, stressors were dichotomized into whether or not participants reported the occurrence of at least one stressor. any type of stressor occurred or did not occur that day and was used as a predictor.

Positive Events

Daily phone interviews included questions about five different types of positive events that could have occurred in the previous 24 hours. Participants were asked, "Since this time/we spoke yesterday" whether they had: an interaction with someone that most people would consider particularly positive (for example, sharing a good laugh with someone, or having a good conversation); an experience at (work/volunteer position) that most people would consider particularly positive; an experience at home that most people would consider particularly positive; anything happen to a close friend or relative (other than what you've already mentioned) that turned out to be particularly positive for you; or anything else that most people would consider particularly positive. A variable was created for each day to indicate any type of positive event did (1) or did not (0) occur, and the average number of daily positive events was calculated to adjust for average level of weekly positive events in the models.

Negative and Positive Affect

Negative and positive daily affect was captured using a scale created for the MIDUS study that is similar to the positive and negative affect schedule (Kessler et al., 2002; Mroczek &

Kolarz, 1998; Watson, Clark, & Tellegen, 1988). Respondents reported how much of the time over the past 24 hours they felt a series of positive (good spirits, cheerful, extremely happy, calm and peaceful, satisfied, full of life, close to others, like they belong, enthusiastic, attentive, proud, active, and confident) and negative (angry, frustrated, ashamed, upset, afraid, jittery, irritable, that everything was an effort, hopeless, lonely, nervous, worthless, so sad that nothing could cheer you up) emotional experiences. . The items for this scale were on a Likert-type scale ranging from 0 “none of the time” to 4 “all of the time”.

Covariates

Demographics

In the MIDUS self-administered questionnaires, participants reported their date of birth, gender (male/female), marital status (married/not married) and the race or races of their parents, grandparents, and other ancestors. Racial categories included White, Black and/or African American, Native American or Alaska Native Aleutian Islander/Eskimo, Asian, Native Hawaiian or Pacific Islander, or other. They were also asked if they are of Spanish, Hispanic, or Latino descent including Mexican, Mexican American, Chicano, Puerto Rican, Cuban, or other Spanish origin. Participants also reported the highest level of education completed, which was broken down into 12 different categories, ranging from no school/some grade school to completing a doctoral degree. A value for total household income was captured by taking the reported amount from wages, pension, social security, and other government assistance for all members of the household and converted it into a standardized z-score. In addition, participants were asked about current work status for a measure classifying people as working (1) or not working (0).

Chronic Conditions

Chronic pain is a chronic condition; thus it was important to statistically adjust for the number of other chronic conditions among participants. They were asked to endorse whether they have condition from 16 chronic condition categories (e.g. cancer, heart problems, autoimmune disorders, diabetes, hay fever, digestive conditions, etc.); emotional distress conditions (i.e. anxiety/depression) were excluded. Chronic conditions were summed and found to be positively skewed. To address the skewness, the summed values ranged from zero to five or more.

Analytic Strategies

We ran multi-level models using SAS version 9.4 (PROC MIXED) to examine how within-person daily experiences of stressors, positive events, and affect (Level 1 variable) are related to between-person individual differences (Level 2 variables), including the average number of stressors and positive events, and having chronic pain. Models tested whether daily negative affect (in one model) or daily positive affect (in another model) was associated with daily presence of a stressor or positive event, and how this association was modified by chronic pain status calculated as the change (slope) in affect as a result of the interaction between chronic pain and daily events. In all analyses, we adjusted for variables associated with chronic pain and daily affect, including demographics (age, gender, ethnicity, education, income, and work status), and other chronic conditions. In addition, the total number of stressors and positive events were averaged across interview days and used as a covariate to adjust for average number of daily stressors and daily positive events.

CHAPTER 3

RESULTS

Table 1 provides demographics and descriptive statistics for the sample. There was a 38% prevalence of chronic pain in this sample. People with chronic pain were significantly older, more likely to be female, more educated, married, and not working compared to those without chronic pain. Race/ethnicity composition did not vary by pain status. People with chronic pain were more likely to have other chronic illnesses. For example, among those with chronic pain, 27% had five or more chronic illnesses, whereas only 7.3% of those without pain had five or more chronic illnesses.

Chronic Pain, Daily Stressors, and Positive Events

We hypothesized that those in chronic pain would report more stressors and fewer positive events in their daily lives. We used ordinary least squares regression to examine whether the average number of weekly stressors varied by chronic pain status. Consistent with our hypothesis, a greater average number of stressors across the week was related to chronic pain, even after adjusting for demographic covariates [$M_{\text{ChronicPain}} = .53$, $M_{\text{NoPain}} = .50$; $b = .08$, $F(8, 13,327) = 179.69$, $p < .001$, 95% CI = (.06, .09)] We then examined whether positive events was related to chronic pain. Contrary to our prediction, chronic pain status was related to more, not fewer, daily positive events, even after adjusting for demographic covariates [$M_{\text{ChronicPain}} = 1.14$, $M_{\text{NoPain}} = 1.13$; $b = .06$, $F(8, 13,327) = 156.42$, $p < .001$, 95% CI = (.04, .08)].

Chronic Pain, Daily Stressors, and Negative Affect

We next tested our hypotheses that chronic pain would be related to higher levels of daily negative affect and greater stressor-related negative affect. Results for the main effects of our multi-level model are provided in Table 2. Consistent with prior research and our hypotheses,

having chronic pain was related to higher daily negative affect. Higher levels of negative affect were also related to greater stressor frequency and stressor occurrence, and to higher levels of education, being older, married, employed and having more chronic illnesses. Gender, race/ethnicity, and household income were not significant. The interaction between stressor occurrence and chronic pain testing whether people with chronic pain exhibited greater stressor reactivity was not significant [$\gamma = .005$, 95% CI = (-.016, .027), $p = .63$].

Chronic Pain, Daily Stressors, and Positive Affect

When positive affect was the outcome, chronic pain was related to lower daily positive affect in a model just examining main effects (see Table 3). Daily positive affect was significantly lower among people who reported a higher average number of stressors and on days when a stressor occurred. In addition, older age, and being female were associated with greater positive affect whereas higher education, being married, employed, and having chronic illnesses, were all associated with lower positive affect. The interaction between stressor and chronic pain was not significant, [$\gamma = -.005$, 95% CI = (-.040, .031), $p = .80$].

Chronic Pain, Daily Positive Events, and Negative Affect

We next examined predictions regarding chronic pain, negative affect, and positive events. A model predicting negative affect with only the main effects replicated the finding above regarding chronic pain and daily negative affect [$\gamma = .047$, 95% CI = (.021, .072), $p < .001$]. Negative affect was related to a lower average number of positive events [$\gamma = -.056$, 95% CI = (-.073, -.039), $p < .001$] as well as whether a positive event occurred that day [$\gamma = .018$, 95% CI = (.005, .030), $p < .01$]. We then entered the interaction between positive event occurrence and chronic pain, revealing a significant result. Table 4 presents the full model, including this interaction.

Post-hoc simple slope analysis was used to test each of the slopes within the interaction (Refer to Figure 2). Among those without chronic pain, negative affect was significantly higher on days when a positive event occurred compared to days when they did not occur [$b = .018$, $t(1,155) = 2.71$, $p < .01$, 95% CI = (.005, .030)]. For adults with chronic pain, negative affect was related to the occurrence of positive event [$t(1,155) = -2.14$, $p = .03$, 95% CI = (-.034, -.001)]. Examining levels of negative affect on days with and without positive events further revealed that levels of negative affect on non-positive events days were higher among people with chronic pain compared to people without chronic pain. On days when positive events occur, levels of negative affect looked similar across pain status ($M_{Chronicpain} = .22$, $M_{Nopain} = .21$).

Chronic pain, Daily Positive Events, and Positive Affect

In a model where positive affect was the outcome, entering just the main effects revealed the same relationship between daily positive affect and chronic pain, as was found previously. The average number of positive events was related to daily positive affect [$\gamma = .211$, 95% CI = (.159, .264), $p < .001$]. Additionally, positive affect was higher on days when a positive event occurred, [$\gamma = .079$, 95% CI = (.059, .099), $p < .001$]. Entering the interaction between a positive event occurrence and chronic pain status revealed a significant effect (see Table 5 for the results for the full model). Results revealed that positive affect increased on days with a positive event to a greater extent among people with chronic pain compared to those without chronic pain. Post-hoc simple slope analysis was performed to test each of the slopes within the interaction (Refer to Figure 3). Analysis revealed that both people with and without pain had significantly higher levels of positive affect on days when a positive event occurred [chronic pain: $b = .13$, $t(1,155) = 7.78$, $p < .001$, 95% CI = (.095, .159); no pain: $b = .05$, $t(1,155) = 3.86$, $p < .001$, 95% CI = (.024, .075)]. Older age, being female, higher education, being married, having lower

neuroticism and higher extraversion, and fewer chronic illnesses, were all significantly associated with greater positive affect.

CHAPTER 4

DISCUSSION

Prior research has primarily focused on how chronic pain impacts exposure and reactivity to daily stressors (Davis et al., 2006; Davis et al., 2004; Finan & Garland, 2016; Zautra et al., 2005). Less studied in the context of chronic health conditions is the frequency of and reactivity to daily positive events. This was the first study to examine both the frequency of daily positive events and stressors, as well as the role of positive events and stressors on daily negative and positive affective experiences, among people with and without chronic pain. The primary finding from this study is that on days with a positive event, those with chronic pain had a greater decrease in negative affect and greater increase in positive affect compared to those without chronic pain.

Chronic Pain, Average Daily Affect, Daily Stressors and Positive Events

We found that chronic pain is related to higher daily negative and lower daily positive affect. These findings are consistent with previous literature examining the relationship between chronic pain and affective experiences (Zautra et al., 2005; Zautra et al., 2001). Researchers find that having higher positive affect can be protective and act a buffer for the ill-effects of negative affect (Zautra et al., 2005). Positive emotions could be a psychological resource for people with chronic pain, especially when a stressor occurs.

Also consistent with our hypotheses, those in chronic pain experience more daily stressors on average. Chronic pain interferes with activities of daily living, which leads to limitations in one's functioning and ability to have an independent lifestyle (Breivik et al., 2006). Our findings support previous research where chronic pain is related to greater numbers of daily stressors (Bjornsdottir et al., 2013). Experiencing a greater number of stressors has implications

for health outcomes among people with chronic pain. For example, Skinner, Zautra, & Reich (2004) found that both financial and interpersonal stressors were related to increased physical health complaints and increased pain symptoms for people with chronic pain.

Past literature would suggest that because people in chronic pain experience greater levels of distress and subsequently more stressors in their daily life, they are more likely to have fewer daily positive events. Also, since people with chronic pain tend to have lower average positive affect and more functional limitations (Bjornsdottir et al., 2013; Finan & Garland, 2016), it is expected that they would also encounter fewer daily positive events. Thus, we speculated in our study that people in chronic pain would experience fewer daily positive events. Contrary to our expectations, results revealed that chronic pain was related to a small, albeit significant, higher average number of positive events ($M_{\text{chronicpain}} = 1.14$, $M_{\text{nopain}} = 1.13$). This finding suggests people with chronic pain did not allow their chronic conditions to curtail their daily pleasant events. Early research on positive events found that higher reports of daily positive events was related to higher quality of life (Zautra & Reich, 1981), which means that working to increase the number of positive events in those with chronic pain could be beneficial. Daily positive events in the lives of those with chronic pain is understudied and these findings help to build the body of literature on positive events in chronic illness.

Chronic Pain Moderates Daily Affect and Positive Events

People with chronic pain had lower daily levels of positive affect yet on days when people with chronic pain had a positive event, their levels of positive affect were like adults without chronic pain. These findings underscore the importance of understanding the context of daily experiences. The literature provides two contrasting views regarding how positive events may impact positive affect. The fragility of positive affect theory (Ong & Ram, 2017) speculates

that for people who are vulnerable to depression, positive affect changes in the context of external events, and the emotional circumstances of people become reliant on these events. This theory becomes especially relevant for those in chronic pain because pain reflects an additional vulnerability in which it is already difficult to maintain positive affect (Finan, Zautra, & Davis, 2009).

Our findings suggest that this theory applied to those in chronic pain, revealing that for people in chronic pain, having a positive event occur was related to one's daily affect more so than for people without chronic pain. People with chronic illness experience poorer emotional regulation (Ong & Ram, Symth & Arigo, 2009), and the research on the fragility of affect suggests that positive affect is more easily influenced by one's environment when there is poor emotional regulation.

The utility of positive affect is highlighted in research on positive psychology and physical health (Park et al., 2016). One large review found that positive affect was related to improved health outcomes (Park et al., 2016). If positive events can help to increase positive affect, findings from the current study suggests that increasing positive events could be particularly useful for future positive psychological interventions among those with chronic pain. Previous research examined positive affect in the context of stressful events rather than through positive events (Zautra et al., 2005). Considering the null hypothesis that positive events do not impact daily affect, the current findings are especially important for the area of positive psychology research.

Our results further revealed that chronic pain also moderated the relationship between positive events and daily negative affect. On days when a positive event occurred, people with chronic pain experienced a significant decrease in their negative affect. The body of research on

daily positive events and negative affect has mixed results. Some studies found that positive events were only related to higher positive affect and not related to negative affect (Sin et al., 2015; Sin et al., 2017). Conversely, positive events might possess stress-buffering properties (Sin & Almeida, 2018). When positive events occur during times of stress, they could have a more important role in decreasing negative affect. Paradoxically, on days when people who did not have chronic pain experienced a positive event, there was a significant increase in their negative affect. This might demonstrate that positive events for healthy adults may not hold the same enhancing effect as it does for people with chronic pain. Cumulatively, these findings help to fill the gap in research concerning how positive events relate to affective responses.

Daily Stressors, Chronic Pain, and Affect

Although we found that chronic pain moderated the effect of daily positive events on daily affect, our findings were not the same for stressor-related negative and positive affect. The kindling hypothesis posits that repeated exposure to stressors leads to sensitization in affective reactivity as more stressors are introduced (Monroe & Harkness, 2005; Post, 1992). Consistent with this theory, research has found that people in chronic pain are generally more reactive to stressful events (Davis et al., 2006; Zautra et al., 2005). Yet, we did not find greater stressor-related negative affect among those with chronic pain. Instead of sensitization occurring among people with chronic pain, it could be habituation to repeated stressors (Grissom & Bhatnagar, 2009). It should be noted, however, that most studies examining stressor-related affect in chronic pain do not have a comparison group of people without chronic pain. Our study provides a comparison group to better understand the influence of chronic pain in stressor-related affective reactivity.

Limitations and Future Directions

One limitation is that causality cannot be assumed since this study was a cross-sectional design. However, the study does provide valuable information about the relationship between chronic pain, positive events, and affective processes. Although the sample used from MIDUS was nationally representative for the time, roughly 90% were White. Therefore, the results may not generalize to other ethnicities/races. Another limitation of the study is that we lacked detail for the description of positive events. Considering if the positive events were organized or planned would help to identify the context of affective experiences. Additionally, understanding the temporal nature and interpretation of positive events is important because the daily affect rating may not be event-related reactivity. It could instead be that an individual began their day in a positive mood and also subsequently interpreted events as more positive. Future studies using ecological momentary assessment could help to fill the knowledge gap surrounding the description and temporal natures of positive events and the subsequent event-related affect.

Future research should also consider incorporating measures on opioid use to examine the relationship with affective experiences of those in chronic pain. Research is finding that opioid medication use among people with chronic pain has been increasing, despite other findings that opioids are not an effective treatment against chronic pain (Breivik, 2005; Dahlhammer et al., 2018; Garland, Froeliger, Zeidan, Partin, & Howard, 2013). Additionally, regular use of opioid medication is associated with increased rates of depression and anxiety (Sullivan, Edlund, Steffick, & Unutzer, 2005), which would be further exacerbated by chronic pain. Understanding how this population of people with chronic pain fair when taking opioid medication is an important area for future studies to consider. Future research needs to focus on finding alternative ways to treat and combat the debilitating symptoms of chronic pain.

Sin et al. (2014) found that the frequency of positive events was associated with inflammatory markers, suggesting that positive events may be a significant factor for health outcomes. Future research should work to incorporate immunological measures when evaluating daily positive events and affective reactivity. Working to understand the influence of positive events on physiological processes could help to provide a more complete picture for people with chronic pain. Moreover, Finan and Garland (2016) discuss that daily increases in positive interpersonal events can act a buffer for the effects of daily pain on daily affect in patients with fibromyalgia or osteoarthritis. Additional research on positive events should also consider the direct impact on pain severity and how bolstering positive affect could in turn help lessen the impact of pain symptoms.

Conclusion

Our findings on the association between daily positive events and affect among people with and without chronic pain are novel. This study adds to the current body of research on chronic illness and demonstrates the importance of positive events for people with chronic pain. Positive events are more meaningful to the well-being of those in chronic pain. Working to increase the daily positive events in the lives of those living with chronic pain can help to foster better emotional experiences, which in turn could help to mitigate some detriments of chronic pain.

REFERENCES

- Asmundson, G. J. G., & Katz, J. (2009). Understanding the co-occurrence of anxiety disorders and chronic pain: State-of-the-art. *Depression and Anxiety, 26*, 888 – 901.
<https://doi.org/10.1002/da.20600>
- Abdallah, C. G., & Geha, P. (2017). Chronic pain and chronic stress: Two sides of the same coin? *Chronic Stress, 1*, 247054701770476. <https://doi.org/10.1177/2470547017704763>
- Almeida, D. M. (2005) Resilience and vulnerability to daily stressors assessed via diary methods. *Current Directions in Psychological Science, 14*(2), 62-68.
- Almeida, D. M., Wethington, E., & Kessler, R. C. (2002). The Daily Inventory of Stressful Events: An interview-based approach for measuring daily stressors. *Assessment, 9*, 41–55.
- Bair, M. J., Robinson, R. L., Katon, W., & Kroenke, K. (2003) Depression and pain comorbidity. *Archives of Internal Medicine, 163*, 2433-2445.
- Barbour, K. E., Boring, M., Helmick, C. G., Murphy, L. B., & Qin, J. (2016). Prevalence of severe joint pain among adults with doctor-diagnosed arthritis—United States, 2002-2014. *Morbidity and Mortality Weekly Report, 65*(39), 1052–1056.
<https://doi.org/10.15585/mmwr.mm6539a2>
- Bjornsdottir, S. V., Jonsson, S. H., & Vladimarsdottir, U. A. (2013). Functional limitations and physical symptoms of individuals with chronic pain. *Scandinavian Journal of Rheumatology, 42*(1), 59-70. <https://doi.org/10.3109/03009742.2012.697916>
- Breivik, H. (2005). Opioids in chronic non-cancer pain, indications and controversies. *European Journal of Pain, 9*, 124-130. doi:10.1016/j.ejpain.2004.05.013

- Breivik, H., Collett, B., Ventafridda, V., Cohen, R., & Gallacher, D. (2006). Survey of chronic pain in Europe: Prevalence, impact on daily life, and treatment. *European Journal of Pain*, *10*, 287-333. doi:10.1016/j.ejpain.2005.06.009
- Bushnell, M. C., Ceko, M., & Low, L. A. (2013). Cognitive and emotional control of pain and its disruption in chronic pain. *Nature Reviews Neuroscience*, *14*(7), 502-511. doi: 10.1038/nrn3516
- Charles, S. T., Luong, G., Almeida, D. M., Ryff, C., Strum, M., & Love, G. (2010). Fewer ups and downs: Daily stressors mediate age differences in negative affect. *Journal of Gerontology: Psychological Sciences*, *65*(3), 279-286. doi: 10.1093/geronb/gbq002
- Charles, S. T., Piazza, J. R., Mogle, J., Sliwinski, M. J., & Almeida, D. M. (2013). The wear and tear of daily stressors on mental health. *Psychological Science*, *24*(5), 733-741. doi: 10.1177/0956797612462222
- Crofford, L. J. (2015). Chronic pain: Where the body meets the brain. *Transactions of the American Clinical and Climatological Association*, *126*, 167-177.
- Dahlhamer, J., Lucas, J., Zelaya, C., Nahin, R., Mackey, S., DeBar, L., Kerns, R., Von Korff, M., Porter, L., & Helmick, C. (2018). Prevalence of chronic pain and high-impact chronic pain among adults—United States, 2016. *Morbidity and Mortality Weekly Report*, *67*(36), 1001–1006. <https://doi.org/10.15585/mmwr.mm6736a2>
- Davis, M. C., Affleck, G., Zautra, A. J., & Tennen, H. (2006). Daily interpersonal events in pain patients: Applying action theory to chronic illness. *Journal of Clinical Psychology*, *62*(9), 1097–1113. <https://doi.org/10.1002/jclp.20297>

- Davis, M. C., Zautra, A. J., & Smith, B. W. (2004). Chronic pain, stress, and the dynamics of affective differentiation. *Journal of Personality*, 72(6), 1133–1160.
<https://doi.org/10.1111/j.1467-6494.2004.00293.x>
- Day, M. A.(2019). Chronic pain. In T.A. Revenson & R.A.R. Gurung (Eds.), *Handbook of Health Psychology* (pp. 369-380). New York: Routledge.
- Finan, P. H., & Garland, E. L. (2015). The role of positive affect in pain and its treatment. *The Clinical Journal of Pain*, 31(2), 177–187.
<https://doi.org/10.1097/AJP.0000000000000092>
- Finan, P. H., Zautra, A. J., & Davis, M. C. (2009). Daily affect relations in fibromyalgia patients reveal positive affective disturbance. *Psychosomatic Medicine*, 71(4), 474–482. <https://doi.org/10.1097/PSY.0b013e31819e0a8b>
- Garland, E. L., Froeliger, B., Zeidan, F., Partin, K., & Howard, M. O. (2013). The downward spiral of chronic pain, prescription opioid misuse, and addiction: Cognitive, affective, and neuropsychopharmacologic pathways. *Neuroscience & Biobehavioral Reviews*, 37(10), 2597–2607. <https://doi.org/10.1016/j.neubiorev.2013.08.006>
- Kanner, A. D., Coyne, J. C., Schaefer, C., & Lazarus, R. S. (1981). Comparison of two models of stress management: Daily hassles and uplifts versus major life events. *Journal of Behavioral Medicine*, 4(1), 1 – 39. <https://doi.org/10.1007/BF00844845>
- Kennedy, J., Roll, J. M., Schraudner, T., Murphy, S., & McPherson, S. (2014). Prevalence of persistent pain in the U.S. adult population: New data from the 2010 national health interview survey. *The Journal of Pain*, 15(10), 979–984.
<https://doi.org/10.1016/j.jpain.2014.05.009>

- Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S. L., et al. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, *32*, 959–976.
- Lachman, M. E., Teshale, S., & Agrigoroaei, S. (2015). Midlife as a pivotal period in the life course: Balancing growth and decline at the crossroads of youth and old age. *International Journal of Behavioral Development*, *39*(1), 20–31.
<https://doi.org/10.1177/0165025414533223>
- Lewinsohn, P. M., & Libet, J. (1972). Pleasant events, activity schedules, and depressions. *Journal of Abnormal Psychology*, *79*(3), 291 – 295. <https://doi.org/10.1037/h0033207>
- McWilliams, L. A., Goodwin, R. D., & Cox, B. J. (2004). Depression and anxiety associated with three pain conditions: Results from a nationally representative sample: *Pain*, *111*(1), 77–83. <https://doi.org/10.1016/j.pain.2004.06.002>
- Mills, S. E. E., Nicolson, K. P., & Smith, B. H. (2019). Chronic pain: A review of its epidemiology and associated factors in population-based studies. *British Journal of Anaesthesia*, *123*(2), 273 – 283. doi: 10.1016/j.bja.2019.03.023
- Monroe, S. M., Harkness K.L. (2005). Life stress, the "kindling" hypothesis, and the recurrence of depression: Considerations from a life stress perspective. *Psychological Review*, *112*(2), 417-445. doi:10.1037/0033-295X.112.2.417
- Mroczek, D. K., & Kolarz, C. M. (1998). The effect of age on positive and negative affect: a developmental perspective on happiness. *Journal of Personality and Social Psychology*, *75*, 1333–1349.

- Mroczek, D. K., & Almeida, D. M. (2004). The effect of daily stress, personality, and age on daily negative affect. *Journal of Personality*, 72(2), 1-24. <https://doi.org/10.1111/j.0022-3506.2004.00265.x>
- Ong, A. D. (2010). Pathways linking positive emotion and health in later life. *Current Directions in Psychological Science*, 19(6), 358–362. <https://doi.org/10.1177/0963721410388805>
- Ong, A. D., & Ram, N. (2017). Fragile and enduring positive affect: Implications for adaptive aging. *Gerontology*, 63(3), 263–269. <https://doi.org/10.1159/000453357>
- Piazza, J. R., Charles, S. T., & Almeida, D. M. (2007). Living with chronic health conditions: Age differences in affective well-being. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 62(6), P313–P321. <https://doi.org/10.1093/geronb/62.6.P313>
- Piazza, Jennifer R., Charles, S. T., Sliwinski, M. J., Mogle, J., & Almeida, D. M. (2013). Affective reactivity to daily stressors and long-term risk of reporting a chronic physical health condition. *Annals of Behavioral Medicine*, 45(1), 110–120. <https://doi.org/10.1007/s12160-012-9423-0>
- Pitcher, M. H., Von Korff, M., Bushnell, M. C., & Porter, L. (2019). Prevalence and profile of high-impact chronic pain in the United States. *The Journal of Pain*, 20(2), 146–160. <https://doi.org/10.1016/j.jpain.2018.07.006>
- Potter, P. T., Zautra, A. J., & Reich, J. W. (2000). Stressful events and information processing dispositions moderate the relationship between positive and negative affect: Implications for pain patients. *Annals of Behavioral Medicine*, 22(3), 191–198. <https://doi.org/10.1007/BF02895113>

- Post, R. M. (1992). Transduction of psychosocial stress into the neurobiology of recurrent affective disorder. *American Journal of Psychiatry*, 149(8), 999-1010.
- Radler, B. T. (2014). The midlife in the United States (MIDUS) series: A national longitudinal study of health and well-being. *Open Health Data*, 2(1). <https://doi.org/10.5334/ohd.ai>
- Reid, M. C., Eccleston, C., & Pillemer, K. (2015). Management of chronic pain in older adults. *British Medical Journal*, 350(feb13 2), h532–h532. <https://doi.org/10.1136/bmj.h532>
- Ryff, C., Almeida, D. M., Ayanian, J., Carr, D. S., Cleary, P. D., Coe, C., Davidson, R., Krueger, R. F., Lachman, M. E., Marks, N. F., Mroczek, D. K., Seeman, T., Seltzer, M. M., Singer, B. H., Sloan, R. P., Tun, P. A., Weinstein, M., & Williams, D. (2007). *Midlife in the United States (MIDUS 2), 2004-2006: Version 7* [Data set]. ICPSR - Interuniversity Consortium for Political and Social Research. <https://doi.org/10.3886/ICPSR04652.V7>
- Ryff, C. D., & Almeida, D. M. (2009). *Midlife in the United States (MIDUS 2): Daily Stress Project, 2004-2009: Version 2* [Data set]. ICPSR - Interuniversity Consortium for Political and Social Research. <https://doi.org/10.3886/ICPSR26841.V2>
- Sin, N. L., & Almeida, D. M. (2018). Daily positive experiences and health: Biobehavioral pathways and resilience to daily stress. In *The Oxford Handbook of Integrative Health Science*. doi: 10.1093/oxfordhb/9780190676384.013.10
- Sin, N. L., Graham-Engeland, J. E., Almeida, D. M. (2014). Daily positive events and inflammation: Findings from the national study of daily experiences. *Brain, Behavior, and Immunity*, 43, 130-138. <https://doi.org/10.1016/j.bbi.2014.07.015>
- Sin, N. L., Ong, A. D., Stawski, R. S., & Almeida, D. M. (2017). Daily positive events and diurnal cortisol rhythms: Examination of between-person differences and within-person

variation. *Psychoneuroendocrinology*, 83, 91–100.

<https://doi.org/10.1016/j.psyneuen.2017.06.001>

Skinner, M. A., Zautra, A. J., & Reich, J. W. (2004). Financial stress predictors and the emotional and physical health of chronic pain patients. *Cognitive Therapy and Research*, 28(5), 695 – 713. <https://doi.org/10.1023/B:COTR.0000045572.33750.6c>

Sullivan, M. D., Edlund, M. J., Steffick, D., & Unützer, J. (2005). Regular use of prescribed opioids: association with common psychiatric disorders. *Pain*, 119(1-3), 95-103.
doi:10.1016/j.pain.2005.09.020

Whitten, C. (2005). Chronic pain is a chronic condition, not just a Symptom. *The Permanente Journal*, 9(3). <https://doi.org/10.7812/TPP/04-139>

Zautra, A. J., Johnson, L. M., & Davis, M. C. (2005). Positive affect as a source of resilience for women in chronic pain. *Journal of Consulting and Clinical Psychology*, 73(2), 212–220.
<https://doi.org/10.1037/0022-006X.73.2.212>

Zautra, A. J., Reich, J. W. (1981). Positive events and quality of life. *Evaluation and Program Planning*, 4(3-4), 355-361. [https://doi.org/10.1016/0149-7189\(81\)90034-3](https://doi.org/10.1016/0149-7189(81)90034-3)

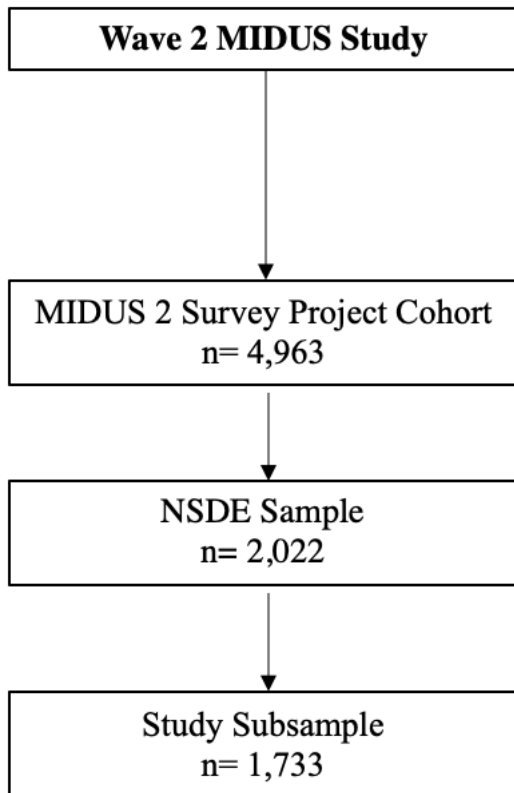
Zautra, A. J., & Smith, B. W. (2001). Depression and reactivity to stress in older women with rheumatoid arthritis and osteoarthritis. *Psychosomatic Medicine*, 63(4), 687–696.
<https://doi.org/10.1097/00006842-200107000-00022>

Zautra, A., Smith, B., Affleck, G., & Tennen, H. (2001). Examinations of chronic pain and affect relationships: Applications of a dynamic model of affect. *Journal of Consulting and Clinical Psychology*, 69(5), 786–795. <https://doi.org/10.1037//0022-006X.69.5.786>

APPENDIX A
TABLES AND FIGURES

Figure 1.

Participant Flow Diagram



Note. Full MIDUS Cohort includes all those who completed the MIDUS Wave 2 survey. NSDE subsample includes all those from the Full MIDUS 2 who were selected to take the daily diary survey. The study subsample includes those who answered questions about chronic pain, daily affect, and daily events.

Table 1.

Demographic Characteristics

Participants	Chronic Pain (<i>N</i> = 658)		No Chronic Pain (<i>N</i> = 1,075)		<i>t</i> -test/ Chi-Square
	<i>M</i> (Range)	<i>SD</i>	<i>M</i> (Range)	<i>SD</i>	
Age	57.91 (34-84)	12.12	55.78	12.12	-10.07***
Household Income	63,102.61	55,395.17	75,954.66	58,989.11	12.74***
	N	%	N	%	
Gender					55.10***
Female	398	60.5	581	54.0	
Male	260	39.5	494	46.0	
Ethnicity*					25.40***
White/Caucasian	598	91.0	973	90.50	
Black/African American	21	3.20	31	2.90	
Latinx	23	3.50	31	2.90	
Education					15.15***
Highschool/Some College	373	56.80	548	51.20	
College Degree or Greater	225	34.20	484	45.20	
Marital Status					62.62***
Not Married	206	31.40	271	25.20	
Married	450	68.60	804	74.80	
Work Status					333.23***
Not Working	308	47.10	338	31.60	
Working	346	52.90	732	68.40	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
# of Chronic Illnesses	2.89	1.71	1.69	1.51	1687.75***
# of Stressors	0.55	0.46	0.51	0.46	-2.51*
# of Positive Events	1.14	1.14	1.13	0.66	-0.79
Negative Affect	0.23	0.28	0.18	0.24	-11.55***
Positive Affect	2.63	0.75	2.78	0.67	11.98***

Note. Ethnicity* = 2.30% (Chronic Pain) and 3.4% accounts (No Chronic Pain) for Asian, Native American/Alaska Native, and Other; * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2.

Parameter Estimates for the Main Effects Predicting Negative Affect

Fixed Effects (Intercept, slopes)	γ (SE)	t	p	CI_{95}	
				Lower	Upper
Intercept	.066 (.021)	3.15	<.01	.025	.108
Age	-.002 (.000)	- 4.63	<.001	-.003	.001
Gender	-.004 (.010)	-.42	.67	-.024	.016
Ethnicity	.000 (.005)	.08	.94	-.010	.011
Education	-.006 (.002)	-2.78	<.01	-.010	-.002
Household Income	-.005 (.006)	-.91	.36	-.016	.006
Marital Status	.037 (.011)	3.22	< .01	.015	.060
Work Status	.037 (.012)	3.04	< .01	.013	.061
Chronic Illnesses	.012 (.003)	3.79	<.001	.006	.019
Experiencing a Positive Event	.004 (.005)	.81	.42	-.006	.014
Average Number of Positive Events	-.056 (.009)	-6.51	< .001	-.073	-.039
Experiencing a Stressor	.158 (.005)	29.06	< .001	.147	.169
Average Number of Stressors	.205 (.013)	15.90	< .001	.180	.231
Chronic Pain	.022 (.011)	2.01	.04	.001	.043
Random Effects	σ (SE)	z	p		
Intercept	.028 (.001)	18.87	< .001		
Experiencing a Stressor	.008 (.001)	10.31	< .001		
Experiencing a Positive Event	.002 (.001)	2.63	< .01		
Residual	.038 (.001)	64.07	<.001		

Note. $N = 1,665$. All estimates are from the main effects model.

Table 3.

Parameter Estimates for Main Effects Predicting Positive Affect

Fixed Effects (Intercept, slopes)	γ (SE)	t	p	CI_{95}	
				Lower	Upper
Intercept	3.02 (.066)	45.62	< .001	2.89	3.15
Age	.011 (.002)	6.90	< .001	.008	.014
Gender	.082 (.032)	2.53	.01	.018	.145
Ethnicity	-.001 (.017)	-.08	.93	-.034	.031
Education	-.016 (.007)	-2.37	.02	-.030	.003
Household Income	.010 (.018)	.55	.59	-.025	.045
Marital Status	-.083 (.037)	-2.26	.02	-.156	-.011
Work Status	-.088 (.039)	-2.29	.02	-.164	-.013
Chronic Illnesses	-.063 (.010)	-6.07	< .001	-.083	-.042
Experiencing a Stressor	-.144 (.010)	-16.22	< .001	-.162	-.127
Average Number of Stressors	-.459 (.039)	-11.70	< .001	-.536	-.382
Experiencing a Positive Event	.079 (.010)	7.78	< .001	.059	.099
Average Number of Positive Events	.211 (.027)	7.87	< .001	.159	.264
Chronic Pain	-.070 (.034)	-2.05	.04	-.137	-.003
Random Effects	σ	z	p		
Intercept	360 (.014)	25.95	< .001		
Experiencing a Stressor	.011 (.002)	4.87	< .001		
Experiencing a Positive Event	.011 (.003)	4.50	< .001		
Residual	.134 (.002)	65.26	< .001		

Note. $N = 1,665$. All estimates are from the main effects model.

Table 4.

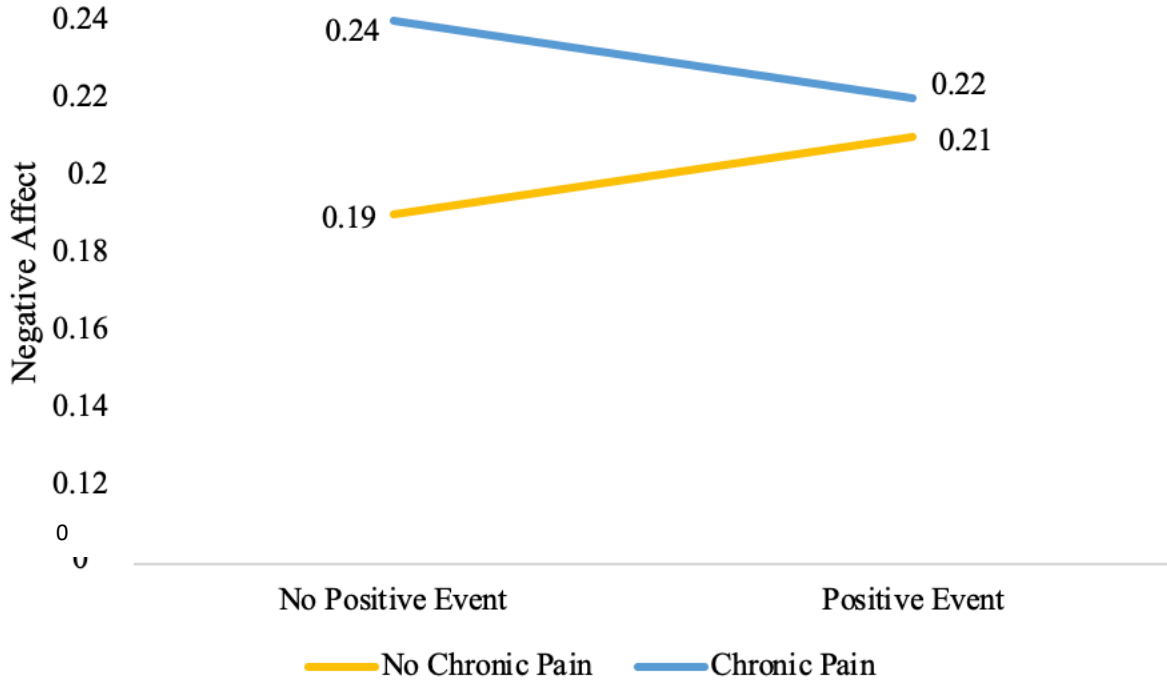
Parameter Estimates for Negative Affect and Interaction Between Chronic Pain and Experiencing a Positive Event

Fixed Effects (Intercept, slopes)	γ (SE)	t	p	CI_{95}^a	
				Lower	Upper
Intercept	.057 (.021)	2.70	< .01	.016	.099
Age	-.001 (.000)	-4.63	<.001	-.003	-.001
Gender	-.004 (.010)	-.41	.68	-.024	.016
Ethnicity	-.000 (.005)	.08	.93	-.010	.011
Education	-.006 (.002)	-2.79	.01	-.010	-.002
Household Income	-.005 (.006)	-.91	.36	-.016	.006
Marital Status	.038 (.012)	3.23	< .01	.015	.060
Work Status	.037 (.012)	3.00	< .01	.013	.061
Chronic Illnesses	.012 (.003)	3.76	<.001	.006	.019
Experiencing a Stressor	.158 (.005)	29.08	< .001	.147	.169
Average Number of Stressors	.206 (.013)	15.95	< .001	.180	.231
Experiencing a Positive Event	.018 (.006)	2.71	.01	.005	.030
Average Number of Positive Events	-.056 (.009)	-6.54	< .001	-.073	-.039
Chronic Pain	.047 (.013)	3.58	< .001	.021	.072
Chronic Pain * Experiencing a Positive Event	-.035 (.010)	-3.40	< .01	-.055	-.015
Random Effects	σ (SE)	z	p		
Intercept	.028 (.001)	18.90	< .001		
Experiencing a Stressor	.008 (.001)	10.34	<.001		
Experiencing a Positive Event	.002 (.001)	2.48	< .01		
Residual	.038 (.001)	64.06	< .001		

Note. $N = 1,665$. All estimates are from the final interaction model.

Figure 2

Interaction between Pain and Positive Events for Negative Affect



Note. Both slopes were significantly different from zero ($p < .001$).

Table 5.

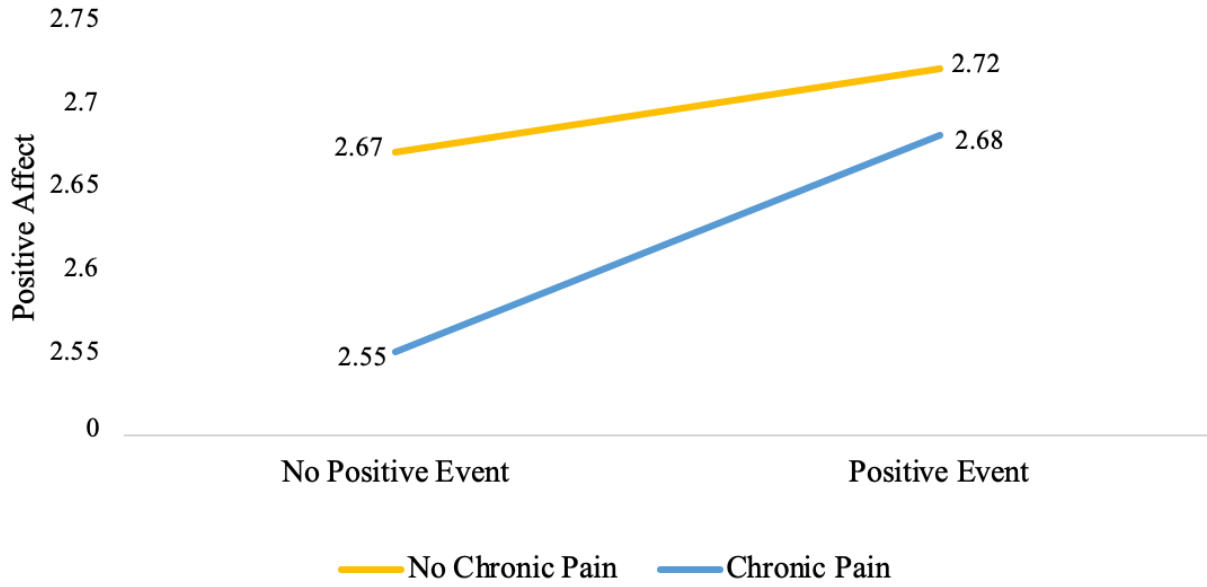
Parameter Estimates for Positive Affect and Interaction Between Chronic Pain and Experiencing a Positive Event

Fixed Effects (Intercept, slopes)	γ (SE)	t	p	CI_{95}	
				Lower	Upper
Intercept	3.04 (.066)	45.82	< .001	2.91	3.17
Age	.011 (.002)	6.91	< .001	.008	.014
Gender	.081 (.032)	2.52	.01	.018	.145
Ethnicity	-.001 (.017)	-.09	.93	-.034	.031
Education	-.016 (.007)	-2.37	.02	-.034	-.003
Household Income	.010 (.018)	.54	.59	-.025	.045
Marital Status	-.083 (.037)	-2.26	.02	-.155	-.011
Work Status	-.087 (.039)	-2.26	.02	-.163	-.011
Chronic Illnesses	-.062 (.010)	-6.06	< .001	-.083	-.042
Experiencing a Stressor	-.144 (.009)	-16.22	< .001	-.162	-.127
Average Number of Stressors	-.460 (.039)	-11.74	< .001	-.537	-.383
Experiencing a Positive Event	.050 (.013)	3.86	< .001	.024	.075
Average Number of Positive Events	.212 (.027)	7.89	< .001	.159	.264
Chronic Pain	-.125 (.037)	-3.37	< .001	-.197	-.052
Chronic Pain * Experiencing a Positive Event	.077 (.021)	3.74	< .001	.037	.118
Random Effects	σ (SE)	z	p		
Intercept	.360 (.014)	25.97	< .001		
Experiencing a Stressor	.010 (.002)	4.83	< .001		
Experiencing a Positive Event	.011 (.003)	4.40	< .001		
Residual	.134 (.002)	65.28	< .001		

Note. $N = 1,665$. All estimates are from the final interaction model.

Figure 3

Interaction between Pain and Positive Events for Positive Affect



Note. Both slopes were significant different from zero ($p < .001$).