



# Cross-sectional study of psychosocial and pain-related variables among patients with chronic pain during a time of social distancing imposed by the coronavirus disease 2019 pandemic

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## Abstract

The COVID-19 pandemic has had a tremendous impact, including on individuals with chronic pain. The social distancing policies necessary to slow the spread of SARS-CoV-2 have involved increased levels of social isolation. This cross-sectional survey study examined pain severity and interference among individuals with chronic pain during an early phase of social distancing mandates and identified characteristics of individuals who were most impacted. Approximately 4 to 8 weeks after social distancing mandates commenced in the state of Massachusetts, 150 patients with fibromyalgia, chronic spine, and postsurgical pain completed demographic, pain, social distancing, and validated psychosocial questionnaires. Patients self-reported an overall significant increase in pain severity and pain interference, compared with before social distancing, although both pain severity and interference were quite variable among individuals under conditions of social distancing. Several demographic, socioeconomic, and psychosocial factors were associated with greater pain severity and interference during social distancing. Multivariable linear regression demonstrated that female sex, nonwhite race, lower education, disability, fibromyalgia, and higher pain catastrophizing were independently associated with greater pain severity, while female sex and pain catastrophizing were independently associated greater pain interference. The findings suggest that individual differences among patients with chronic pain should be considered in the planning, development, and prioritization of interventions to improve pain care and to prevent worsening of symptoms during the continuing COVID-19 pandemic.

**Keywords:** Chronic pain, Social distancing, COVID-19, Isolation, Psychosocial factors

## 1. Introduction

Pain is modulated not only by sensory, emotional, and cognitive components but also by social factors including social connection.<sup>68</sup> Despite the recognition of the importance of social factors in shaping the pain experience under the biopsychosocial model,<sup>46</sup> their influence remains understudied. Unfortunately, the COVID-19 pandemic has imposed significant changes in social conditions of the majority of individuals worldwide, including persons with chronic pain. The World Health Organization has encouraged governments to regard slowing the spread of severe acute

respiratory syndrome coronavirus 2 (SARS-CoV-2) as a top priority,<sup>55</sup> in which social distancing mandates have become an essential tool. As a result, individuals were relatively suddenly subjected to elevated levels of social isolation.<sup>9,54,69,72</sup> Although the first wave of COVID-19 has abated in some areas, spread continues in other areas. It is projected that subsequent waves of recurrence may necessitate social distancing to varying degrees in years to come, possibly into 2022.<sup>38</sup>

Previous research has suggested that social isolation can result in adverse health outcomes in general, including worsening mental and physical health, and is associated with increased likelihood of emergency department admissions and greater length of hospital stay.<sup>20,30,61</sup> Social interactions may also play an important role in modulating pain and the ability to cope with chronic pain.<sup>46</sup> Thus, individuals with chronic pain may be at an increased risk of both physical and mental health deterioration<sup>31</sup> during social distancing.<sup>36</sup> Worsening of pain may contribute to a reliance on maladaptive coping strategies, such as substance abuse and increased suicidal ideation, which are already elevated among individuals with chronic pain.<sup>35</sup> In addition, social distancing mandates have restricted or eliminated access to many adjunctive therapies for pain, including acupuncture, massage, physical therapy, rehabilitation therapy, and counseling services, potentially further contributing to worsening pain and stress.<sup>3,7,23</sup>

The aim of this study was to measure the impact of the externally imposed social isolation during the COVID-19 pandemic on pain. We queried patients with chronic pain about the degree of current

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social and physical isolation as well as patient pain severity and interference under the social distancing mandate and compared current reports with patient recalled isolation and pain from before social distancing. We hypothesized that current pain severity and interference would be greater while under conditions of increased social isolation. In addition, as an exploratory analysis to see whose current pain was impacted the most by changes imposed by social distancing, we carefully assessed the relationship between pain outcomes and psychosocial factors known to be important to impact the modulation of pain with the intentions of gaining greater insight into where to focus innovative pain management during future waves of COVID-19.

## 2. Methods

### 2.1. Study design and participants

This observational cross-sectional cohort study was conducted at an academic medical center in Boston, Massachusetts, between April 28, 2020, and May 22, 2020. The study was approved by the Partners Human Research Committee (PHRC)/Institutional Review Board (IRB). Participants were recruited through Partners Healthcare Rally website, an online platform that provides the public with information about current research studies they may be eligible to participate in. In addition, we contacted patients from our previous studies that belonged to cohorts that had postsurgical pain (mastectomy, TKA, C-section, thoracotomy, and spine surgery), fibromyalgia, and/or low back pain and invited them to complete the survey. Individuals who expressed interest in participating in the study were emailed a link to a secure data entry system to complete the eligibility survey.

Individuals were eligible to participate if they self-reported persistent pain for 3 months or longer, were English speaking, were  $\geq 18$  years of age, and were Massachusetts residents under the statewide social distancing rules at the time of survey. All participants ( $N = 150$ ) who completed the survey provided consent and were compensated with a \$20 Amazon electronic gift code. The study survey took approximately 30 to 45 minutes to complete.

### 2.2. Measures

Participants completed a series of questionnaires assessing sociodemographic, clinical, psychosocial characteristics, as well as degree of social and physical distancing, pain severity, and pain interference, which included both free form questions and validated questionnaires.

#### 2.2.1. Sociodemographic and social distancing questions

In addition to basic demographics, participants completed the Brief Basic Needs Questionnaire. This questionnaire contains items relevant to basic needs security.<sup>27</sup> This measure included 1 question with a 5-point Likert scale (very hard, hard, somewhat hard, not very hard, or not hard at all) on financial resource strain in which participants were asked how challenging it is for them to afford basic necessities such as food, housing, medical care, and heating. In addition, there were 2 items assessing food insecurity, 2 items examining transportation needs, and 3 items specific to housing stability. The questionnaire has a range of 1 to 14 in which higher score suggests increased challenges in obtaining basic needs. Participants also reported number of household residents, changes in employment, and whether they received a stimulus check. Patients were also asked if they got tested for COVID-19 and also if they had a positive test result. Participants were queried regarding perceived changes in

physical and social isolation during COVID-19, access to health care, use of pain self-management techniques, and methods of social communication and connection since social distancing, including social media usage. Specifically, participants were also asked to indicate a percentage (operated a slider initially set at 50% to indicate %) of both social and physically isolation, with anchors at 0% being “not isolated at all” and 100% being “completely isolated.” Participants also reported utilization of various self-management techniques, physical and behavioral pain management resources, from a checklist. For those selected, they further indicated one of 3 choices regarding their utilization of the modality (it has decreased, it has stayed the same, or it has increased). Social contact was also examined by asking patients to indicate one of 6 options regarding video chat, phone calls or texting, connecting with social media, online classes, and in-person events (N/A—I have never performed this, I stopped doing this completely since I started social distancing, I do this less now than before social distancing, I do this the same amount now as before social distancing, I do this more often now than before social distancing, or I only started doing this since I started social distancing).

#### 2.2.2. Pain outcomes

The 9-item Brief Pain Inventory (BPI) questionnaire was used to assess the primary outcomes of pain severity and pain interference with general functioning. The BPI has high test–retest reliability, construct validity, and criterion validity in chronic pain populations.<sup>21</sup> Patients filled out this questionnaire twice consecutively, once with the text of each item referring to the time “before social distancing,” and once with the text referring to “Now, since social distancing.” Participants were asked to provide a 5-point Likert-scale (0 = “strongly disagree” to 4 = “strongly agree”) rating to indicate how much they attributed changes in pain to different elements of social distancing, including loneliness, mood, exercise, and access to pain treatments or self-management practices.

#### 2.2.3. Psychosocial characteristics

The Pain Catastrophizing Scale (PCS) was used to examine catastrophic thinking associated with pain, including the domains of magnification, helplessness, and rumination. The PCS consists of 13 items scored from 0 to 4, resulting in a total possible score of 52, with higher scores indicating greater pain-related catastrophic thinking. The PCS has been widely validated in populations within both pain and controls.<sup>64,65</sup> The validated 3-item UCLA Loneliness Scale (Version 3) was used to assess loneliness and has been found to be highly reliable, both in terms of internal consistency and test–retest reliability. Each question is rated on a 3-point scale, and all items are summed to give a total score of up to 9, with higher scores indicating greater loneliness.<sup>32,57</sup> The 10-item extroversion and introversion subscale from the Myers–Briggs Type Indicator (MBTI) was used to assess introversion. The MBTI has been found to have construct validity. The introversion subscale has a range of 0 to 10, with higher scores indicating a preference towards higher levels of introversion.<sup>27</sup> The Distress Intolerance Index is a 10-item tool which was used to examine participants’ ability to tolerate distress, with scores ranging from 10 to 40 with higher scores representing higher distress intolerance, and has demonstrated good internal consistency and reliability in pain patients and has been used to assess cognitive/affective responses and avoidance behaviors in response to distress.<sup>44</sup> The Perceived Stress Scale (PSS) is a 10-item validated questionnaire used to assess the extent patients find their lives unpredictable, uncontrollable, and overloaded,<sup>17</sup> with higher scores indicating greater perceived stress. The Primary Care

PTSD Screen for DSM-5 (PC-PTSD-5) was used to capture the prevalence of PTSD in our sample. The PC-PTSD-5 is a 5-item measure that reflects the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) PTSD diagnostic criteria and has demonstrated validity, with a score of 3 or higher considered as positive for PTSD.<sup>10</sup> In addition, validated short-form instruments from the Patient-Reported Outcome Measurement Information System (PROMIS) were used to assess anxiety, depressive symptoms, and sleep disturbance.<sup>12,16</sup>

### 2.3. Statistical approach

Descriptive statistics were used to examine frequencies, percentages, and measures of central tendency for demographics and behavioral health characteristics. Paired *t* tests were used to compare participants' current vs recalled ratings of outcomes (social isolation, physical isolation, pain severity, and pain interference), and effect sizes are reported as differences in the means with 95% confidence intervals (CI). Our power analysis was based on our previous chronic pain study where patients reported a worst pain severity with mean of 6.5 with SD of 2.6.<sup>58</sup> Using a power of 80% and 2-sided level of significance of 5%, we calculated that to detect a small effect size<sup>16</sup> in a paired group comparison, 135 subjects would be needed, so we planned to recruit 150 patients in case of missing questionnaire items. To correct for multiple testing of changes related to the social distancing mandate across 4 outcomes (social isolation, physical isolation, pain severity, and pain interference), we used a Bonferroni correction and considered  $P < 0.0125$  significant for these outcomes.

We used linear regression to assess associations between patient characteristics and both pain outcomes (pain severity and pain interference). Categorical variables were dichotomized or made continuous when possible to decrease degrees of freedom. First, we performed univariable (simple) linear regression analyses for each individual baseline characteristic and each pain outcome. Next, we conducted a multivariable (multiple) linear regression analysis for each pain outcome, including all variables that were associated with the outcome in the univariable analyses at the  $P < 0.1$  level. Multicollinearity between candidate predictors in the multivariable linear regression models was assessed using variable inflation factor (VIF) values, with a score of  $VIF > 5$  considered problematic for model stability.<sup>63</sup> VIF score ranges for predictor variables included in each model indicated minimal instability from multicollinearity amongst predictors (VIF range 1.11-3.52). All statistical analyses were performed using SPSS version 26.

## 3. Results

### 3.1. COVID-19 in Massachusetts, stay at home advisory, and phased reopening

**Figure 1** depicts the development of the COVID-19 pandemic in Massachusetts from March 10, 2020, to June 15, 2020. Importantly, participants completed the survey between April 28 and May 22, representing a time of early social distancing in MA. All residents were required to practice proper hygiene, maintain social distancing, and use facial coverings when it was absolutely necessary to go to public places. Individuals who were at a higher risk of contracting COVID-19 (eg, people older than 65 years and those with underlying health conditions) were given additional guidance that strongly encouraged them to stay at home, with the exception of essential errands such as going grocery shopping and attending to health care needs.

### 3.2. Participant recruitment and study flow

**Figure 2** outlines the process of study recruitment, which included email invitations to patients with chronic pain including a general email blast through the Partners Healthcare System (Rally) research enrollment site, as well as outreach to patients participating in previous studies. Of the eligibility surveys completed, 204 eligible participants were emailed the main study survey, and 150 ultimately completed the study survey.

### 3.3. Participant demographics

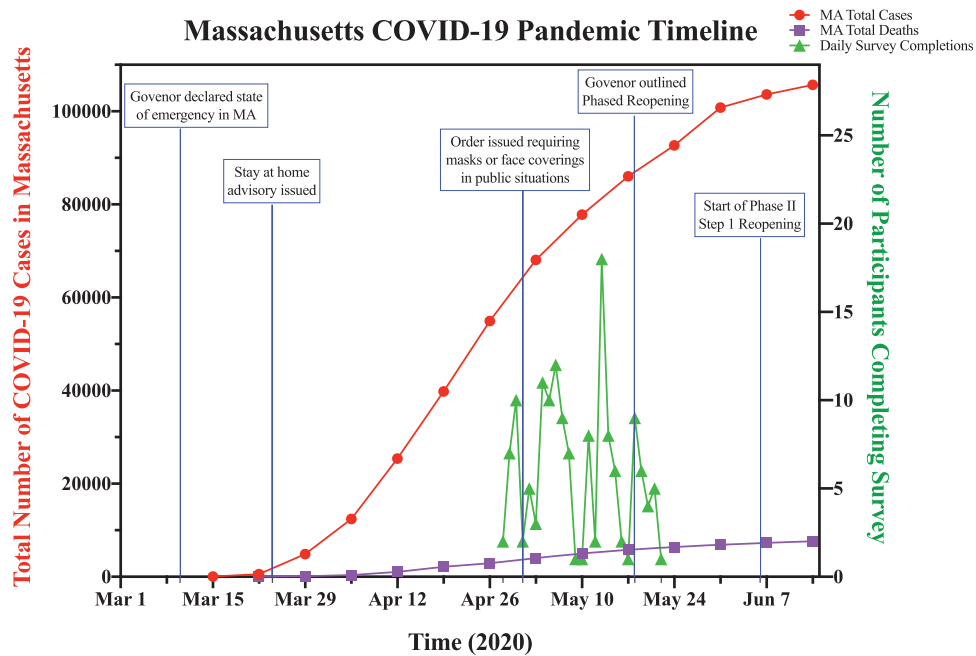
Participants had a mean age of 41 years, were female majority, and predominantly non-Hispanic Anglo-American, with most having some postsecondary education (**Table 1**). Employment status before the pandemic included 60.1% employed full-time and 10.8% reporting receiving disability benefits. A range of incomes were reported, with relatively few participants reported outright job loss due to the pandemic. Most participants (72%) received a COVID-19 economic stimulus check. Questions regarding economic hardship indicated some difficulty with transportation to medical care or employment (10%-12%), as well as difficulty with food (14%), or housing (11%) security. Approximately 18% of participants reported being tested for COVID-19 and, only 1 participant screened positive for SARS-CoV-2. When participants were asked to self-report the nature of their chronic pain, 57% reported back pain, 25% fibromyalgia, 11% persistent postsurgical pain, and 58.7% other pain, with many participants reporting multiple sites/types of chronic pain (Appendix Figure 1, available at <http://links.lww.com/PAIN/B221>). A minority reported taking opioid medications (12.7%) for their pain condition.

### 3.4. Degree of social and physical distancing, loneliness, and use of social media and technology

The majority of participants reported engaging in social distancing practices for an average of 4 to 8 weeks at the time of survey completion. Comparing current state with recalled state from before social distancing, most respondents reported a significant increase in both physical ( $t = 20.50, P < 0.001$ ) and social isolation ( $t = 16.80, P < 0.001$ ) at the time of survey completion (**Fig. 3A**). On average, participants reported feeling 54% more physically isolated (95% CI: 49%-59.11%) and 42% more socially isolated (95% CI: 37%-47%) compared with before social distancing. Participants reported changes in use of electronic means of communication and connection (**Fig. 3B**). Compared with before social distancing, 65% of participants reported an increase in phone usage (talking or texting), 91% reported an increase in video chatting, 43% reported an increase in using social media to connect with others, and 67% reported taking online classes. Unsurprisingly, 71.2% of participants reported no longer attending in-person community or religious gatherings. Approximately 14% of the study sample reported living alone, with the remaining participants reporting a mean of  $2 \pm 1$  other household members. Participants reported a mean loneliness score of  $6.2 \pm 2$  (range 1-9) and average introversion scores of  $4.9 \pm 3$  (range 0-10).

### 3.5. Changes in pain severity and interference under social distancing

Participants' average pain severity and pain interference, measured by the Brief Pain Inventory, was quite variable (**Fig. 4**). Compared with patients' recall of pain before social

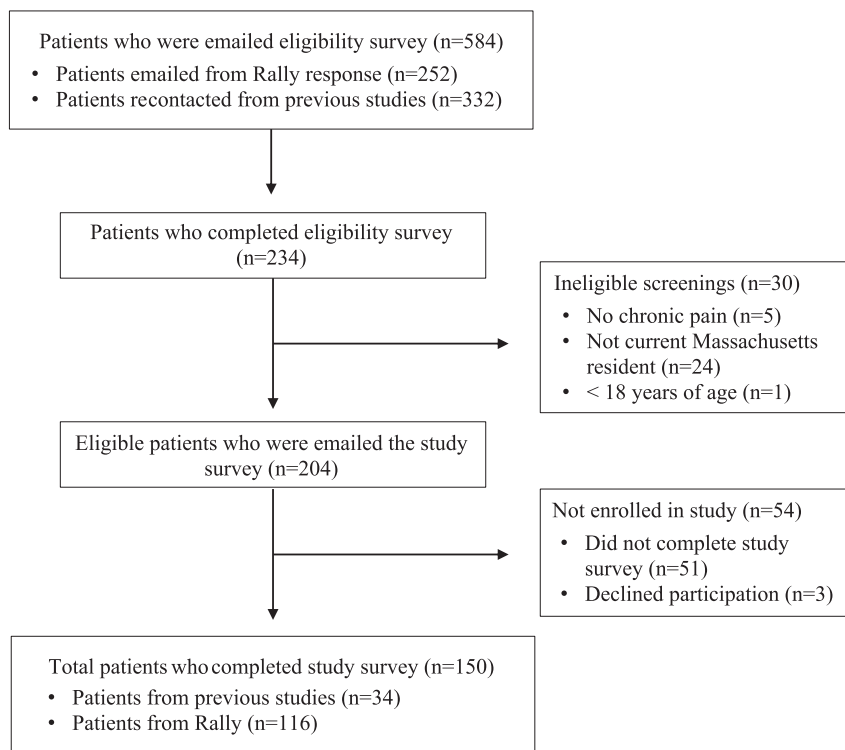


**Figure 1.** Study timeline in relation to COVID-19 pandemic in Massachusetts. All study surveys were completed between April 28 and May 22. The timeline includes key dates relevant to social distancing mandates in Massachusetts around the time of survey administration.

distancing, both current pain severity and pain interference significantly increased (pain severity:  $t = 7.15, P < 0.001$ ; pain interference:  $t = 3.93, P < 0.001$ ). Current pain severity increased an average of 8% (0.79/10 points; 95% CI: 0.53-1.01), and current pain interference increased by 6% (4.28/70 points; 95% CI: 2.13-6.43), although this was quite variable between participants.

**3.6. Factors associated with worse pain severity and interference under social distancing**

Univariable (simple) regression analyses were performed to assess patient characteristics associated with greater pain severity and interference during social distancing (Table 2), revealing association of several factors with worse pain. Female



**Figure 2.** Study flow chart.



**Table 1**  
**Baseline patient characteristics.**

Variables	N (total)	N, mean	%, SD
<b>Demographics</b>			
Age	150	40.6	± 15.7
Sex	150		
Female		125	83.3
Male		21	14.0
Other		4	2.7
Race	149		
White		126	84.6
Black		11	7.4
Other		12	8.1
Hispanic ethnicity	149	5	3.4
Education	150		
High school diploma		11	7.3
Associate's degree or trade/tech school		15	10.0
Bachelor's degree		65	43.3
Graduate degree		59	39.3
Employment	148		
Full-time		89	60.1
Part-time		15	10.1
Unemployed		6	4.1
Student		12	8.1
Disability		16	10.8
Retired		10	6.8
Employment changed since COVID	150	108	72.0
Received a stimulus check	149	106	71.1
Annual household income	135		
< \$25,000		16	11.9
\$25,000 to \$34,999		17	12.6
\$35,000 to \$49,999		24	17.8
\$50,000 to \$74,999		23	17.0
\$75,000 to \$99,999		23	17.0
\$100,000 to \$149,999		12	8.9
≥ \$150,000		20	14.8
Brief Basic Needs Questionnaire (1-14)	150	2.86	± 2.2
Nature of chronic pain	150		
Back pain		86	57.3
Fibromyalgia		38	25.3
Postsurgical pain		17	11.3
Taking opioids for pain		19	12.7
Isolation factors			
Duration of social distancing	150		
3-6 weeks		30	20.0
7-8 weeks		70	46.7
9-10 weeks		29	19.3
11-12 weeks		16	10.7
≥ 3 mo		5	3.3
Total number of household residents	147	1.72	± 1.2
Lives alone		21	14.3
Degree of social isolation (0-100)	146	68.9	± 21.8
Degree of physical isolation (0-100)	148	76.5	± 24.0
Loneliness (3-9)	150	6.2	± 2.0
<b>Psychosocial characteristics</b>			
Pain catastrophizing (0-52)	150	17.8	± 13.5
Distress tolerance (10-40)	150	20.7	± 7.6
Perceived stress (0-40)	150	9	± 2.0
Sleep disturbance (4-20)	150	13.2	± 4.1
Anxiety (7-35)	150	21.8	± 7.1
Depression (8-40)	150	19.5	± 8.3
Introversion (0-10)	150	4.9	± 3.1
PTSD	150	32	21.3

**Table 1 (continued)**

Variables	N (total)	N, mean	%, SD
Substance use frequency			
Tobacco use frequency	147		
Never		131	89.1
Less than monthly		5	3.4
Daily or almost daily		11	7.5
Alcohol use frequency	150		
Never		109	72.7
Less than monthly		18	12.0
Monthly		8	5.3
Weekly		9	6.0
Daily or almost daily		6	4.0
Drug use frequency	150		
Never		119	79.3
Less than monthly		2	1.3
Monthly		3	2.0
Weekly		9	6.0
Daily or almost daily		17	11.3

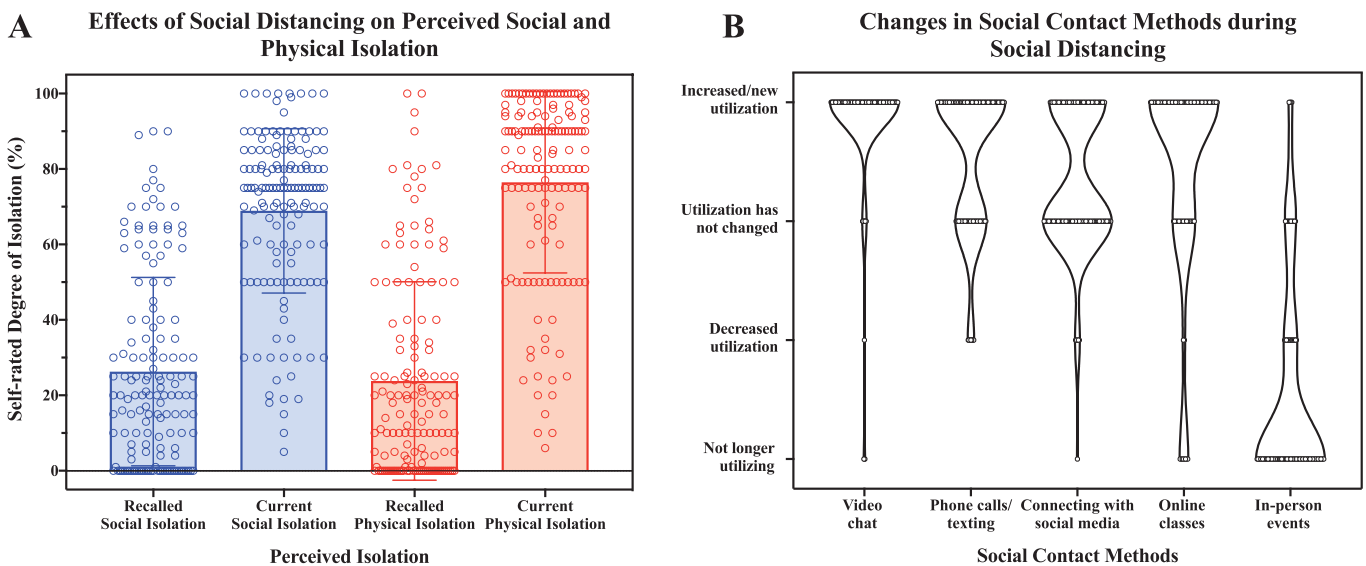
sex, lower education, and higher Brief Basic Needs Questionnaire scores were associated with both worse pain severity and interference. Older age was associated with greater pain interference, but not pain severity, while nonwhite race was associated with greater pain, but not pain interference. Regarding isolation, a greater degree of social and physical isolation was weakly associated with greater pain severity, but more strongly associated with greater pain interference. Similarly, self-reported loneliness was related to pain interference but not to pain severity. Psychological factors were also variably related to pain severity and interference. Higher pain catastrophizing, sleep disturbance, anxiety, and depression were associated with greater pain severity and interference. Perceived stress was associated only with pain interference. More frequent drug use was associated with greater pain severity and interference, while alcohol use was only marginally related to pain severity.

**3.7. Multivariable linear regression of factors predicting worse pain outcomes under social distancing**

Recognizing that many of the variables in the univariable analysis are closely related, we used multivariable (multiple) linear regression to examine factors that were independently associated with worse pain outcomes during social distancing, including variables that were significantly associated with the outcomes on univariable (simple) regression analysis at the  $P < 0.1$  level. Model 1 explained 43.3% of the variance in pain severity and revealed female sex, nonwhite race, lower education, disability employment status, fibromyalgia, and higher pain catastrophizing scores as independently associated with worse pain severity (Table 3). Similarly, model 2 explained 48.4% of the variance in pain interference and revealed only female sex and higher pain catastrophizing as significant independent predictors.

**3.8. Perceived impact on care and causes for pain worsening**

Generally, participants reported decreased usage of pain management services and at the same time reported overall increased use of self-management techniques for pain (Fig. 5A and B). Patients endorsed the importance of treatment restrictions (70.7% agreed or strongly agreed) and decreased activity levels (66.7% agreed or strongly agreed) due to social distancing as an important reason for their pain worsening. In addition,



**Figure 3.** Effects of social distancing on isolation and social contact methods. (A) compares participants' recalled perceived social and physical isolation before social distancing to perceived isolation at the time of survey completion under conditions of social distancing. (B) depicts reported changes in how often participants use various social contact methods since they started distancing, compared with how often they recall using the method before social distancing.

increased stress (67.3% agreed or strongly agreed) and lower mood (53.4% agreed or strongly agreed) due to social distancing was cited as important to pain worsening as well. Interestingly, fewer participants cited loneliness (46.7% agreed or strongly agreed) as responsible for worsening pain (Fig. 5C).

#### 4. Discussion

This study examined the natural social experiment imposed on patients with chronic pain by the COVID-19 pandemic. We observed a self-reported increase in both pain severity and interference under social distancing conditions. Notably, pain severity and interference were quite variable among individuals with chronic pain during social distancing. Our subsequent exploratory assessment of factors that were related to greater pain severity with social distancing implicated a number of sociodemographic and psychosocial factors known from previous work to be related to pain. These exploratory findings may suggest that certain demographics (female sex, nonwhite race, lower education, and disability status) and psychosocial characteristics (higher pain catastrophizing) convey higher risk under conditions of social isolation. If there are future waves requiring another social distancing mandate, patients with these characteristics may benefit more from curated, targeted interventions.

##### 4.1. Sociodemographic factors impacting pain

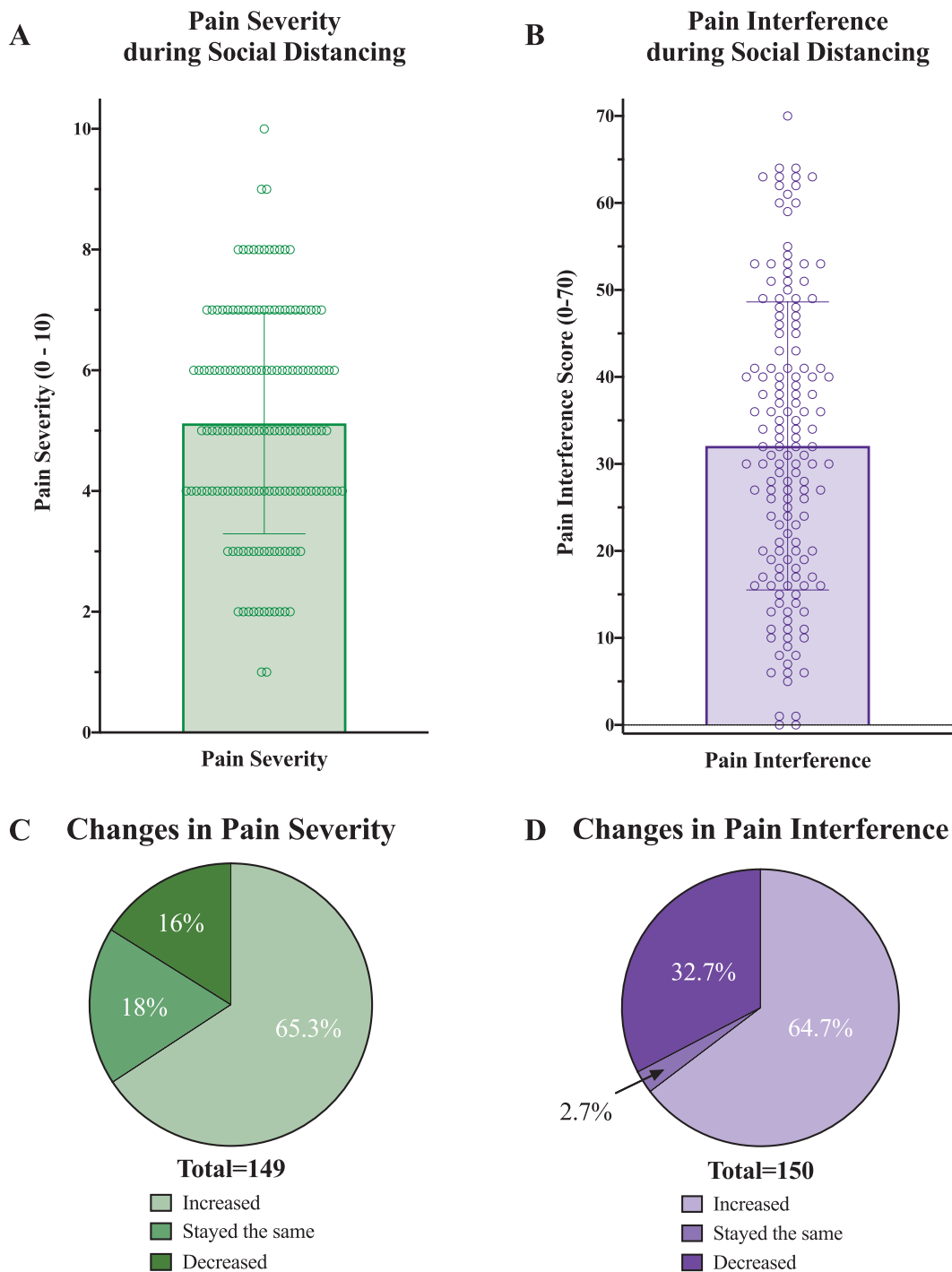
Although chronic pain is common, some individuals are at higher risk.<sup>62</sup> Pain susceptibility seems to be influenced by sociodemographic factors, including sex,<sup>26,47,50,52</sup> race and ethnicity,<sup>11,37,55</sup> education,<sup>29,51,56</sup> and employment,<sup>22</sup> making individuals with these characteristics more vulnerable.<sup>4,8,21,33,34</sup> In addition, the impact of social context in which an individual experiences pain has been understudied compared with biological and psychological constructs.<sup>39,45</sup> The current study examined pain severity and interference in a sample of individuals with chronic pain during a period of newly imposed social isolation, shortly after the institution of social distancing mandates to prevent SARS-CoV-2 spread in Massachusetts. We observed that female sex,

nonwhite race, lower education, and disability employment status were independently associated with greater pain severity during newly imposed social isolation. This effect was seen despite the study having a relatively small number of nonwhite participants and a large proportion of female participants.

Throughout the COVID-19 pandemic, sociodemographic factors have played an important role, with inequities in case incidence, morbidity, and mortality amongst minorities, and this pattern is expected to worsen.<sup>59</sup> COVID-19 has revealed broader disparities within our society, providing an opportunity to prioritize strategic efforts to address inequity, including basic needs, access to medical services, and appropriate pain care.<sup>1,48</sup> Despite our study sample having a relatively small number of minority participants, we still observed an association with greater pain severity, which suggests that it would be beneficial to develop additional research and programs targeting and rectifying this inequity. Furthermore, it is a priority to combat the structural inequity of resources for marginalized populations, which lead to greater risk of chronic pain incidence, as well impact their ability to self-manage their pain. More proximal changes include targeting pain research to underrepresented minorities and involving researchers with diverse backgrounds in study design and conduct.<sup>54</sup> This would allow for a more informed understanding of what mechanisms may be distinctly at work among minority patients, thus allowing also more effective and inclusive therapies for them.<sup>5</sup> Furthermore, increasing the recognition of diversity of pain processing pain between individuals (even within a given demographic group) will support better-informed and more personalized medicine.<sup>6</sup>

##### 4.2. Psychosocial characteristics, including pain catastrophizing

We were interested in investigating how psychosocial characteristics may interact with the social isolation imposed by the COVID-19 pandemic, which is itself associated with significant uncertainty and fear.<sup>40,67</sup> Interestingly, although loneliness was associated with worse pain interference on the univariable regression analysis, we did not observe that loneliness per se



**Figure 4.** Participants' average pain severity and pain interference under social distancing conditions. (A) shows the distribution of current pain severity scores amongst participants during social distancing. (B) shows the distribution of current pain interference scores amongst participants during social distancing. (C) reports proportion of patients with changes in perceived pain severity since starting social distancing compared with their recalled pain. (D) reports proportion of patients with change in perceived pain interference since starting social distancing.

was independently associated with worse pain outcomes in the multivariable regression analysis. This is consistent with the fact that patients did not cite feelings of loneliness per se as the most important drivers of pain increase during social distancing.

Under normal conditions, anxiety, depression, and stress are frequently comorbid with chronic pain and may in turn exacerbate and meaningfully worsen the experience of painful symptoms.<sup>13,44</sup> Although we found that anxiety, stress,

depression, and sleep disturbance were all associated with worse pain under conditions of social isolation, pain catastrophizing was the only psychosocial variable that was independently predictive of worsening of pain severity and interference. It seems plausible that being physically and socially isolated may contribute to higher levels of catastrophic thinking, including feelings of helplessness, rumination, and magnification. Catastrophic thinking has also been shown to

**Table 2****Univariable association of patient characteristics with pain severity and pain interference during social distancing.**

Variable	BPI pain severity (0-10)		BPI pain interference (0-70)	
	$\beta$ (95% CI)	<i>P</i>	$\beta$ (95% CI)	<i>P</i>
<b>Demographics</b>				
Age	0.01 (−0.01 to 0.03)	0.471	0.02 (−0.15 to 0.20)	0.786
Female	1.11 (0.33 to 1.88)	0.005	8.68 (1.63 to 15.73)	0.016
White, Non-Hispanic	−1.00 (−1.76 to −0.25)	0.010	−4.60 (−11.56 to 2.36)	0.194
Bachelor's degree	−1.48 (−2.23 to −0.74)	<0.001	−8.24 (−15.19 to −1.29)	0.021
Employment status as disability	2.37 (1.49 to 3.26)	<0.001	16.44 (8.12 to 24.76)	<0.001
Brief Basic Needs Questionnaire	0.32 (0.20 to 0.45)	<0.001	3.38 (2.27 to 4.49)	<0.001
Fibromyalgia	1.43 (0.79 to 2.07)	<0.001	8.43 (2.42 to 14.44)	0.006
<b>Isolation factors</b>				
Duration of social distancing	−0.05 (−0.34 to 0.24)	0.715	1.99 (−0.61 to 4.58)	0.133
Degree of social isolation	0.01 (0.00 to 0.03)	0.056	0.29 (0.17 to 0.40)	<0.001
Degree of physical isolation	0.01 (0.00 to 0.02)	0.204	0.20 (0.09 to 0.30)	<0.001
Loneliness	0.08 (−0.07 to 0.23)	0.298	2.90 (1.61 to 4.20)	<0.001
<b>Psychosocial characteristics</b>				
Pain catastrophizing	0.07 (0.05 to 0.09)	<0.001	0.79 (0.64 to 0.94)	<0.001
Perceived stress	0.11 (−0.04 to 0.26)	0.146	2.25 (0.93 to 3.58)	0.001
Sleep disturbance	0.14 (0.07 to 0.21)	<0.001	1.69 (1.08 to 2.29)	<0.001
Anxiety	0.04 (0.00 to 0.08)	0.070	0.94 (0.59 to 1.28)	<0.001
Depression	0.06 (0.02 to 0.09)	0.002	0.99 (0.71 to 1.27)	<0.001
Introversiveness	−0.04 (−0.14 to 0.05)	0.403	0.25 (−0.61 to 1.10)	0.566
PTSD	0.40 (−0.32 to 1.12)	0.271	10.99 (4.70 to 17.28)	0.001
<b>Substance use frequency</b>				
Alcohol use	0.23 (−0.04 to 0.50)	0.096	−0.02 (−2.48 to 2.43)	0.985
Drug use	0.21 (0.00 to 0.41)	0.054	2.02 (0.14 to 3.90)	0.035

be higher amongst many individuals with fibromyalgia, which was also associated with worse pain outcomes in our sample.<sup>9</sup> Pain catastrophizing may represent an essential communicative function during socializing for patients with chronic pain. Collectively, it may be that the heightened pain expression exemplified by catastrophizing serves a useful purpose,

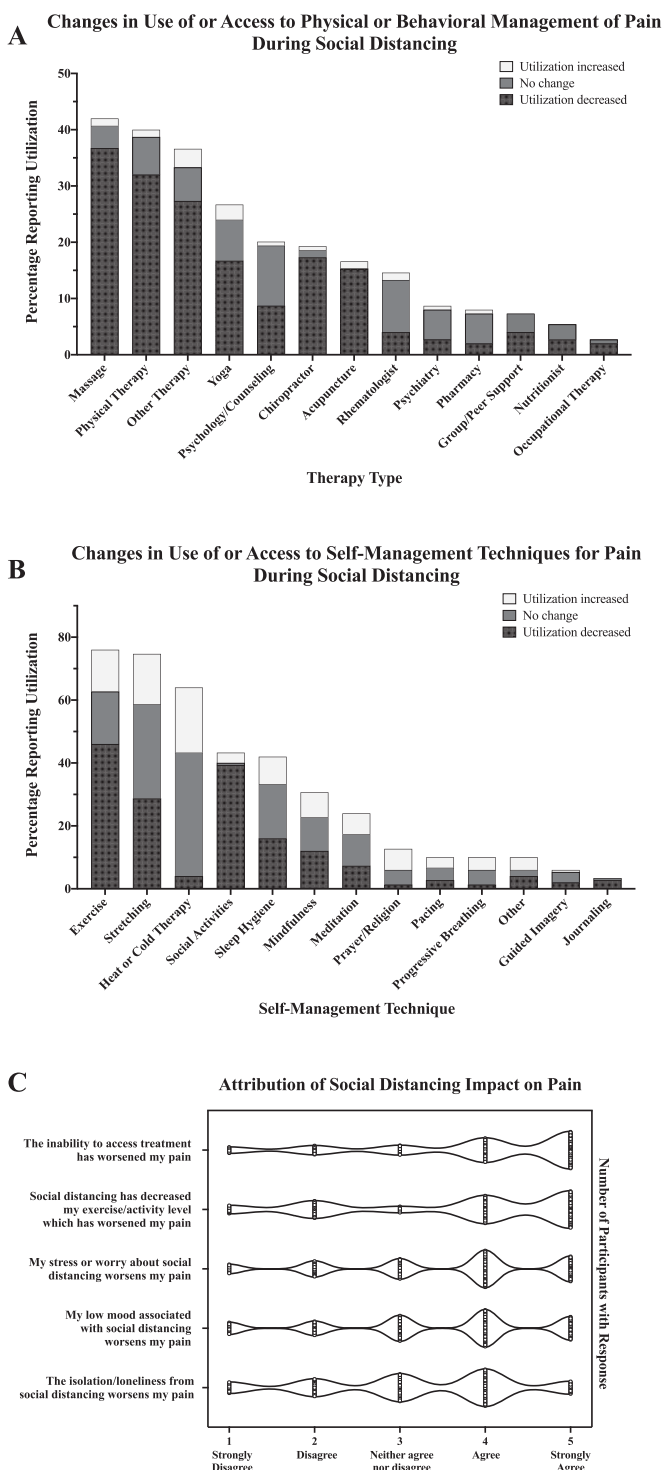
allowing the individual's distress about pain to be recognized and managed within their social context.<sup>36</sup> Pain catastrophizing may therefore simultaneously fulfill adaptive functions (eg, recruiting social support) and maladaptive functions (eg, amplifying pain severity and disability),<sup>35</sup> a process that is consistent with our study findings.

**Table 3****Multivariable analyses.**

Model 1: pain severity			Model 2: pain interference		
	$\beta$ (95% CI)	<i>P</i>		$\beta$ (95% CI)	<i>P</i>
Female	0.82 (0.16 to 1.49)	0.015	Female	6.31 (0.53 to 12.09)	0.033
White, Non-Hispanic	−0.85 (−1.47 to −0.23)	0.007	Bachelor's degree	−4.77 (−10.77 to 1.24)	0.119
Bachelor's degree	−0.86 (−1.54 to −0.18)	0.014	Brief Basic Needs Questionnaire	0.73 (−0.47 to 1.93)	0.231
Brief Basic Needs Questionnaire	0.00 (−0.14 to 0.14)	0.980	Employment status as disability	4.36 (−3.07 to 11.80)	0.248
Employment status as disability	1.00 (0.17 to 1.83)	0.019	Fibromyalgia	2.91 (−2.09 to 7.90)	0.252
Fibromyalgia	0.73 (0.16 to 1.30)	0.012	Degree of social isolation	0.12 (−0.02 to 0.25)	0.088
Degree of social isolation	0.00 (−0.01 to 0.02)	0.562	Degree of physical isolation	0.04 (−0.08 to 0.15)	0.557
Pain catastrophizing	0.05 (0.03 to 0.07)	0.001	Loneliness	0.25 (−1.11 to 1.60)	0.719
Sleep disturbance	0.05 (−0.02 to 0.11)	0.198	Pain catastrophizing	0.41 (0.20 to 0.63)	0.001
Anxiety	−0.02 (−0.07 to 0.03)	0.391	Perceived stress	0.86 (−0.30 to 2.01)	0.145
Depression	−0.01 (−0.06 to 0.04)	0.760	Sleep disturbance	0.47 (−0.12 to 1.06)	0.119
Alcohol use	−0.03 (−0.25 to 0.20)	0.829	Anxiety	−0.05 (−0.49 to 0.40)	0.835
Drug use	0.12 (−0.05 to 0.29)	0.177	Depression	0.13 (−0.31 to 0.58)	0.551
			PTSD	−1.30 (−7.16 to 4.57)	0.662
			Drug use	0.60 (−0.87 to 2.07)	0.422

CI, confidence intervals.





**Figure 5.** Effects of social distancing on utilization of pain management strategies, access to treatments, and quality of life. (A) shows what physical and behavioral pain management resources patients recalled using before social distancing and whether utilization of the resource has been affected since social distancing. (B) shows what self-management techniques for pain participants recalled engaging in before social distancing and how usage of each technique has been affected by social distancing. (C) depicts the extent participants attribute social distancing changes to factors contributing to changes in reported pain.

**4.3. Implications for pain management services**

Our study findings suggested that fibromyalgia was independently associated with greater pain severity during newly imposed social isolation. This is consistent with previous research

demonstrating that in patients with fibromyalgia, increased stress has a potent impact on symptom severity,<sup>2,28,49</sup> and suggests that targeting individuals with fibromyalgia during social distancing may be of particular importance. However, many patients with chronic pain will likely benefit from the development and targeting of novel approaches to help improve care. Before the pandemic, telemedicine and eHealth approaches to chronic pain were already under development,<sup>15,24</sup> and the current pandemic has accelerated the development and implementation of these approaches. There has been an increased demand and recommendation to use remotely supported eHealth pain management services with the outbreak, which brings unique changes in service delivery of pain management.<sup>18,25</sup> A recent systematic review found that teletherapy and remote online cognitive behavioral therapy (CBT) strategies can be effective in improving quality of life among persons with chronic pain,<sup>41</sup> with 1 study suggesting that online group CBT may be as effective in improving coping among persons with chronic pain as in-person groups.<sup>42</sup> Such findings are promising, although additional research is needed to evaluate the impact of eHealth while recognizing the unique challenges created by the pandemic. Our study sample reported a significant disruption to their lives, including restricted access to pain-related service, and a need to increasingly rely on self-management techniques and remote/online forms of communication for social support.<sup>66</sup> The increase in global use of social media platforms to maintain connections while social distancing<sup>14,19,43,53</sup> suggests that people are becoming more accustomed and open to remote formats, perhaps making it an ideal time to implement these therapies into regular practices. Pandemic conditions aside, improvements in eHealth services could provide lasting impact on addressing the current dearth in necessary providers needed to meet overwhelming rates of individuals with chronic pain.

**5. Limitations**

Although this study offers valuable information regarding the experience of patients with chronic pain during social distancing, some important limitations should be considered when interpreting these findings. This study recruited participants with chronic pain from an urban academic medical center in Massachusetts, and participants were predominately white and female with higher formal education, thus limiting the generalizability to a broader population of patients with chronic pain across the United States or in other countries. The sample size was relatively small, likely precluding sufficient power for the exploratory regression analysis investigating who was had worse pain under social distancing mandates. Despite both these limitations, however, this analysis still observed racial, sex, and educational differences in pain under social distancing, hinting at the perhaps great extent of this problem. In addition, it should be acknowledged that our study participants had online access, as the survey required an email and an Internet connection. Thus, this study may not be adequately representative of individuals who do not have as much access to technologies and who also, unfortunately, would be less likely or unable to participate in remote-based therapies. Further research is needed to better understand the needs of these marginalized patients. In addition, it is possible that a self-selection bias may have impacted findings, with an overrepresentation of participants who were more impacted by the pandemic being willing to participate. Another important limitation is that the cross-sectional study design is open to the potential for recall bias, as we asked patients to reflect back to their condition weeks before the survey. Future

research should use a longitudinal design within larger samples, including collection of preratings and postratings in real time, to limit issues around recall bias. In addition, it is important to note that there was a potential for confirmation bias present in the questions regarding social and physical isolation during social distancing mandates. The unforeseen circumstances of the rapidly imposed social distancing precluded this type of design in the current study, making a cross-sectional design a more feasible option to rapidly collect data, and to provide a snapshot of how social distancing impacts chronic pain.

## 6. Conclusion

In planning for the future of service delivery for patients with chronic pain, it is imperative to develop a more comprehensive understanding regarding the impact of social distancing amongst different types of patients with pain in other geographic locations variably impacted by COVID-19, specifically allowing for identification of those for whom it is most problematic. This information could be beneficial in better understanding the impact of social isolation on pain and guide development of innovative approaches to support this vulnerable population in the case of potential subsequent waves of COVID-19 where social distancing mandates may continue to be in effect.

## Conflict of interest statement

The authors have no conflicts of interest to declare.

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## Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at <http://links.lww.com/PAIN/B221>.

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