

Impact of the COVID-19 pandemic on patients with chronic pain in Germany: Associations with expectations and control beliefs

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Abstract

Background: While the COVID-19 pandemic is affecting people's well-being worldwide, it may place a particularly high burden on people with chronic pain, as pain is known to be influenced by societal and psychological conditions.

Methods: In this observational study, we conducted telephone interviews with 196 patients with chronic pain to assess the impact of the pandemic on various aspects of their pain and everyday life. The initial interviews were conducted between April and May 2020 and were followed up by a second interview between August and December 2020.

Results: A substantial percentage of patients (39% at the first and 32% at the second interview) reported an increase in pain intensity due to the pandemic. Exploratory analyses revealed that patients who already suffered from greater pain and who experienced greater restrictions due to the pandemic were more likely to express pain worsening. Psychological factors such as negative expectations about the development of their pain and pain treatment and a high external locus of control were also associated with increases in pain.

Conclusions: These findings illustrate the complexity of chronic pain, suggesting that not only the impact of the pandemic on various areas of life but also the severity of the pain-symptoms themselves and psychological factors influence the course of patients' symptoms during the pandemic.

Significance: This study underlines the importance of psychosocial factors in chronic pain and demonstrates that the societal and psychological impact of the COVID-19 pandemic can affect patients' pain and their ability to cope with it. The extent to which patients experience pain aggravation seems to interact with other psychological factors such as pain expectations and control beliefs.

1 | INTRODUCTION

The outbreak of the COVID-19 (SARS CoV-2) pandemic is affecting the everyday life and well-being of people worldwide. In addition to the uncertainty about its health, economic, and societal consequences, measures to curb the spreading of the virus have led to broad restrictions in social contacts and everyday-life routines. Studies on mental health consequences of the pandemic and its ensuing restrictions have found a significant impact on people's mental health and psychological well-being, particularly in terms of increased levels of anxiety, depression, and psychological distress (Bäuerle et al., 2020; Petzold et al., 2020; Vindegaard & Benros, 2020; Wang et al., 2020). Although the pandemic is a global problem, certain groups of society might be more vulnerable to its consequences than others.

People with chronic pain are likely to experience a particularly high burden due to the bio-psychosocial nature of pain conditions (Engel, 1977). Karos et al. (2020) illustrated how the COVID-19 pandemic may exacerbate chronic pain through psychosocial changes such as reduced access to healthcare and increased social inequalities and isolation. An online survey from the early phase (April–May 2020) of social distancing mandates in Massachusetts, USA, found that patients with chronic pain reported an increase in pain severity and interference, which was associated with socio-demographic and psychological factors such as gender, education, and pain catastrophizing (Hruschak et al., 2021). The negative impact of the pandemic on the physical and psychological well-being of people with chronic pain in Spain was summarized in a recent review (Carrillo-De-la-Peña et al., 2021). Thus, in addition to suffering from general pandemic-related psychological distress, people with chronic pain seem to be at risk of also experiencing a worsening of their pain symptoms. The experience of pain and the outcome of pain treatments are known to be influenced by patients' beliefs and expectations. Positive expectations about the outcome of a pain treatment are associated with a greater reduction in pain and disability, while the opposite effect has been observed for negative expectations (Bingel, 2020; Bingel et al., 2011; Colloca & Barsky, 2020; Cormier et al., 2016). Treatment outcomes may also differ depending on whether patients believe that they themselves are in control of the outcomes of events (internal locus of control, LOC) or whether they attribute the control to external forces (external LOC). A higher external LOC seems to be related to more pain and disability and poorer treatment outcomes (Härkäpää, 1991; Pastor et al., 1993), while a higher internal LOC has been associated with less pain and disability and better coping strategies (Conant, 1998; Fisher & Johnston, 1998; Härkäpää, 1991).

To better understand how patients with chronic pain are affected by the pandemic and its resulting restrictions, we

conducted semi-structured telephone interviews with patients at the pain clinic of the University Hospital in Essen, Germany. To investigate whether possible effects were specific to the early phase of the pandemic (April–May 2020 in Germany) or whether they persisted over several months, we conducted second interviews between August and December 2020. In an explorative analysis, we compared patients who reported a worsening of their pain symptoms to those who experienced no such change. Moreover, we compared patients with respect to their expected pain change due to the pandemic and examined possible associations with their LOC.

2 | METHODS

2.1 | Study procedure

We considered all patients with chronic pain who had sought treatment in our out-patient clinic in the previous quarter as eligible to participate in the survey ($N = 379$). Of these, we were able to interview 197 patients. Since one patient had to be excluded for being less than 18 years old, the final sample comprised $n = 196$ patients. Patients were contacted by telephone and were asked if they were willing to participate in an interview about the perceived impact of the COVID-19 pandemic on various aspects of their everyday life and pain. They were informed that their participation was voluntary, their answers would be recorded and anonymized, that they were free to end the interview at any point, and that their participation would not affect their treatment in any way. All patients gave oral informed consent prior to starting the interview. The study protocol is in accordance with the Declaration of Helsinki and was approved by the local ethics committee (20-9271-BO, Medical Faculty of the University of Duisburg-Essen, Essen, Germany). The study was registered at the German Clinical Trials Register (DRKS00022395), which is part of the WHO International Clinical Trials Registry Platform. Data will be made available upon request.

The interviews were conducted by three trained interviewers and lasted between 7 and 37 min. At the end of each interview, patients were asked for permission to link their answers to their medical records and to be contacted again for a follow-up interview a few months later. Interview 1 was conducted between April and May 2020 and Interview 2 between August and December 2020. On average, the interviews were separated by 170 ± 36 (range: 84–246) days.

2.2 | Demographic questions

At Interview 1, we asked patients about the number of current household members and whether that had

changed due to the pandemic, their main source of income, weekly number of private and other contacts, weekly frequency of support by others, and whether they do the shopping themselves. At Interview 2, we asked whether anything about their housing or employment situation had changed and how they rated that change in terms of school grades (1 = “very good”, 6 = “fail”). Additionally, patients were asked whether they themselves or a close relative/friend had suffered from COVID-19 and how high they estimated the risk of becoming severely ill with COVID-19 (0 = “no risk at all” to 10 = “very high risk”). Finally, we estimated patients’ general LOC by having them rate the 4 statements of the LOC short scale. The LOC short scale has previously been shown to have an adequate reliability and validity (Kovaleva et al., 2012). Internal LOC was assessed by the agreement with the statements “I have my life in my own hands” and “If I make an effort, I will be successful”. External LOC was probed with the statements “Whether privately or professionally, my life is largely determined by others” and “My plans often get thwarted by fate”. Agreement was expressed on a 6-pt scale (0 = “does not apply at all” to 5 = “applies completely”). Patients’ age, gender, and pain diagnoses were retrieved from their medical records.

2.3 | Questions about the impact of the pandemic on everyday life and psychological well-being

Patients were asked on an 11-pt. scale (0 = “not at all” to 10 = “completely”) how much they are mentally preoccupied with the pandemic, how stressed they feel by it, and how much their everyday life had changed due to the pandemic in the past 2 weeks. Using multiple-choice questions, we asked patients to rate whether certain areas of life “became less”, “stayed the same”, or “became more”. These questions referred to: mobility, possibilities for distraction, physical activity, social contacts, health-related worries, loneliness, and quality of life.

2.4 | Questions about pain

Patients were asked whether certain aspects of their pain had changed due to the pandemic. These aspects were: pain intensity, pain tolerability, and pain threat. Answer alternatives were: “increased”, “stayed the same”, and “decreased”. Regarding their efforts to self-regulate the pain, we asked patients to rate on an 11-pt. scale (0 = “not at all” to 10 = “completely”)

how much they felt restricted in their coping efforts. Moreover, patients completed a standardized questionnaire (Von Korff et al., 1992) about their pain intensity (average and maximum over the past 4 weeks and current intensity) and pain-related disability (impairment in the fields of everyday life, leisure, and work/household). Answers were rated on an 11-pt scale (0 = “no pain/no impairment” to 10 = “worst imaginable pain/complete impairment”). At Interview 1, patients were asked how they expected the pandemic to affect their pain and pain-treatment. Answer alternatives were: “it will worsen,” “it will stay the same” and “it will improve.” At Interview 2, these questions were substituted by questions about how the pandemic has affected their pain/treatment so far (answer alternatives: “My pain/treatment has worsened/stayed the same/improved”). An English translation of both interview questionnaires can be found in [Supplement 1](#).

2.5 | Analysis

Patients’ pain intensity and disability due to pain was assessed using composite scores of the respective items on the von Korff pain questionnaire (Von Korff et al., 1992). Descriptive statistics were used to calculate frequencies, percentages, and means. We used chi-squared tests to examine possible associations between response frequencies of categorical variables such as between expected and perceived pain changes and between pain worsening and negative changes in different life areas. To compare the means of questions with numerical response scales, we used independent samples *t* tests for comparisons between patients and paired-samples *t* tests for comparisons between interviews. Correlations between numerical variables were calculated using rank-order-based (Spearman) correlations. All statistical analyses were performed using the R software package.

3 | RESULTS

A total of 196 patients completed the first interview. Of these, 145 patients (94 female, mean age: 58.8 ± 14.6 , range: 24–88) also completed the second interview. The 51 patients who did not participate in the second interview did not seem to differ from those who completed both interviews, i.e., the mean age (57.5 ± 14.7), gender distribution (52.9% females), mean composite pain score (6.3 ± 1.9), and mean composite disability score (4.9 ± 2.2) of dropout patients were not significantly different from the remaining patients (all $p > 0.05$). We thus only analysed data of patients who completed both interviews. [Table 1](#) shows

Variable	Interview 1	Interview 2
Interview date range	14.04–19.05.2020	11.08–17.12.2020
N	196	145
Females	121 (62%)	94 (65%)
Age (mean \pm SD [range])	58.5 \pm 14.6 [24–88]	58.8 \pm 14.6 [24–88]
F45.41 diagnosis	93 (47%)	71 (49%)
Sources of income		
Work	62 (31.6%)	46 (31.7%)
Retirement	90 (45.9%)	70 (48.3%)
Combination	10 (5.1%)	7 (4.8%)
Other	51 (26.0%)	35 (24.1%)
Number of other household members (mean \pm SD [range])	1.3 \pm 1.1 [0–6]	1.3 \pm 1.1 [0–6]
Patients whose household size had changed since interview 1		6 (4%)
Changes in Work situation		
Home office		9 (6.2%)
New job		4 (2.8%)
Employment loss		2 (1.4%)
Reduced working hours		2 (1.4%)
Reduced income		6 (4.1%)
Infection with SARS CoV-2		
Self		1 (0.7%)
Close relative/friend		11 (7.6%)
Estimated risk of becoming severely ill with COVID-19 (mean \pm SD [range])		5.2 \pm 2.6 [0–10]

TABLE 1 Interview and patient characteristics

an overview of the main interview and patient characteristics. All patients had primarily sought treatment at our clinic due to chronic pain, and almost half (49%) of the patients fulfilled the diagnostic criteria for a Chronic Pain Disorder with Somatic and Psychological Factors (F45.41) according to the ICD-10 criteria.

3.1 | General effects of the COVID-19 pandemic

First, we assessed the general effects of the COVID-19 pandemic. At Interview 1, more than half of the patients indicated that they had experienced negative changes in their everyday life, such as reductions in mobility (72%), opportunities for distraction (50%), physical activity (60%), social contacts (70%) and quality of life (46%). At the same time, 48% of the patients reported an increase in general health worries and 27% reported an increase in loneliness. Changes in various areas of life are displayed in [Figure 1](#).

Patients also rated how strongly they were mentally and practically affected by the pandemic. Mean ratings for Interviews 1 and 2 are shown in [Table 2](#). Paired

samples *t*-tests revealed a significant decrease in everyday life changes between the first and second interview [$t(143) = 4.80, p < 0.001$]. Moreover, there was a trend towards a decrease in the intensity of thoughts about COVID-19 ($t(143) = 1.96, p = 0.052$) and less of a reduction of coping possibilities ($t[142] = 1.96, p = 0.052$) at Interview 2.

3.2 | Composite scores of pain and disability

The mean composite scores for Pain Intensity and Disability are shown in [Table 2](#). Paired *t*-tests showed no difference in pain intensity or disability between the interviews (both $p > 0.05$).

3.3 | Changes in pain

Patients were asked to indicate whether the pandemic had affected their pain. More than one third (39%) reported an increase in pain intensity (54% reported no change and 6%

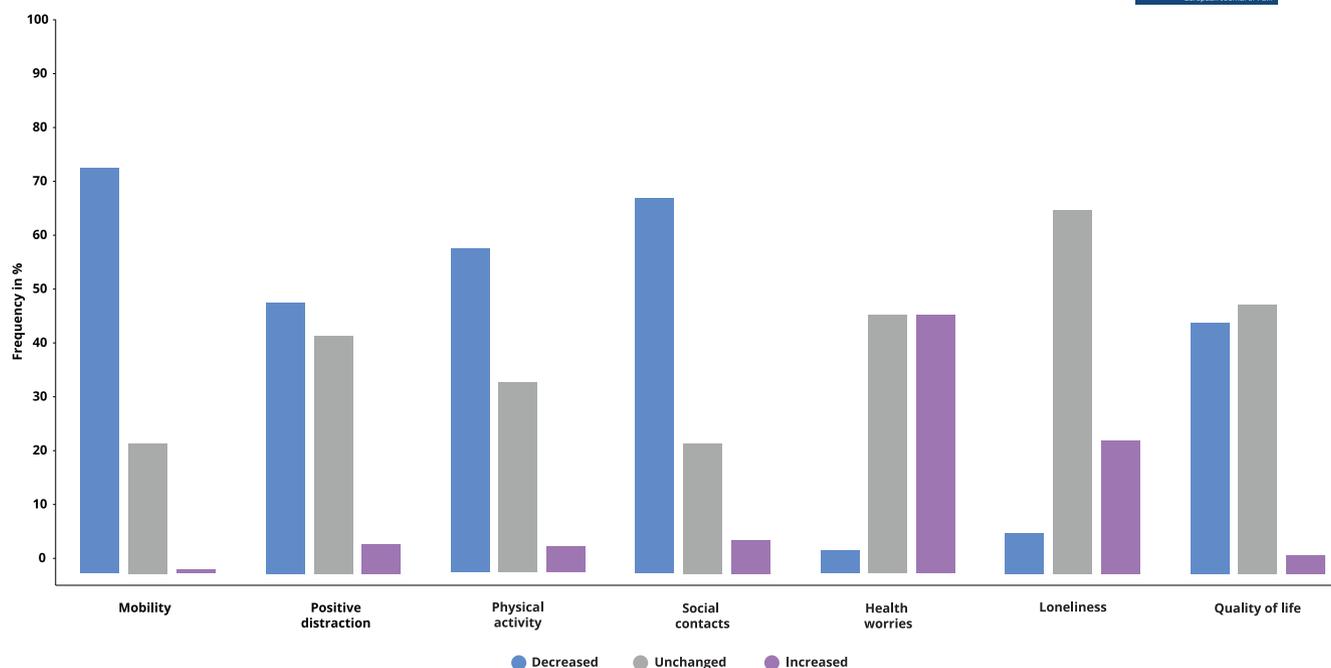


FIGURE 1 Percentage of patients who experienced changes in various areas of life at interview 1

TABLE 2 Differences in the effects of the COVID-19 pandemic and in pain and disability scores between the first and second interview

Variable	Interview 1 mean (SD)	Interview 2 mean (SD)	Difference P-value (95% CI)
Thoughts about COVID-19	6.57 (2.1)	6.16 (2.3)	0.052 (−0.003 to 0.795)
Stress due to COVID-19	4.88 (2.7)	4.85 (2.5)	0.896 (−0.390 to 0.446)
Everyday life changes	5.80 (2.9)	4.41 (3.1)	<0.001 (0.800 to 1.922)
Reduction of coping possibilities	5.37 (3.1)	4.81 (3.2)	0.052 (−0.005 to 1.068)
Composite pain score	6.13 (1.9)	6.11 (1.9)	0.925 (−0.257 to 0.283)
Composite disability score	5.15 (2.7)	5.17 (2.9)	0.867 (−0.522 to 0.440)

a decrease) due to the pandemic. Similarly, 21% reported that the pain threat had increased, (no change: 72%, decrease: 6%) and 32% found that their pain tolerability had decreased (no change: 62%, increased: 6%). At Interview 2, patients still reported similar, albeit slightly weaker negative effects of the pandemic. The percentages of patients who experienced (no) changes in different aspects of pain are displayed in [Figure 2](#).

To test whether patients' impression of a pain worsening due to the pandemic aligned with changes in their pain scores between the two interviews, we compared changes in pain and disability scores separately for those who reported a pain worsening, no pain change, or a pain improvement at interview 2. Paired samples *t*-tests revealed that for patients who, at the second interview, reported that their pain had worsened due to the pandemic there was a significant increase in pain intensity ($t[45] = -2.10$, $p = 0.041$) and disability ($t[45] = -2.04$, $p = 0.048$) scores from interview 1 (pain: $M = 6.72$, disability: $M = 5.49$) to

interview 2 (pain: $M = 7.04$, disability: $M = 6.14$). Thus, patients' retrospective impression of a pain worsening is also reflected in the change in their pain scores between the two interview timepoints. For patients who reported no pain change or a pain improvement due to the pandemic, there was no difference in mean pain intensity or disability between the two interviews ($p > 0.05$).

3.4 | Differences between patients whose pain worsened vs. stayed the same

Since 39% of the patients reported a pain increase due to the pandemic, we conducted further exploratory analyses to examine in which further aspects patients whose pain worsened differed from those who reported no pain changes. We thus divided patients into two groups (pain worsened vs. no pain change). Since few patients (6%) reported an improvement of their pain, we only compared

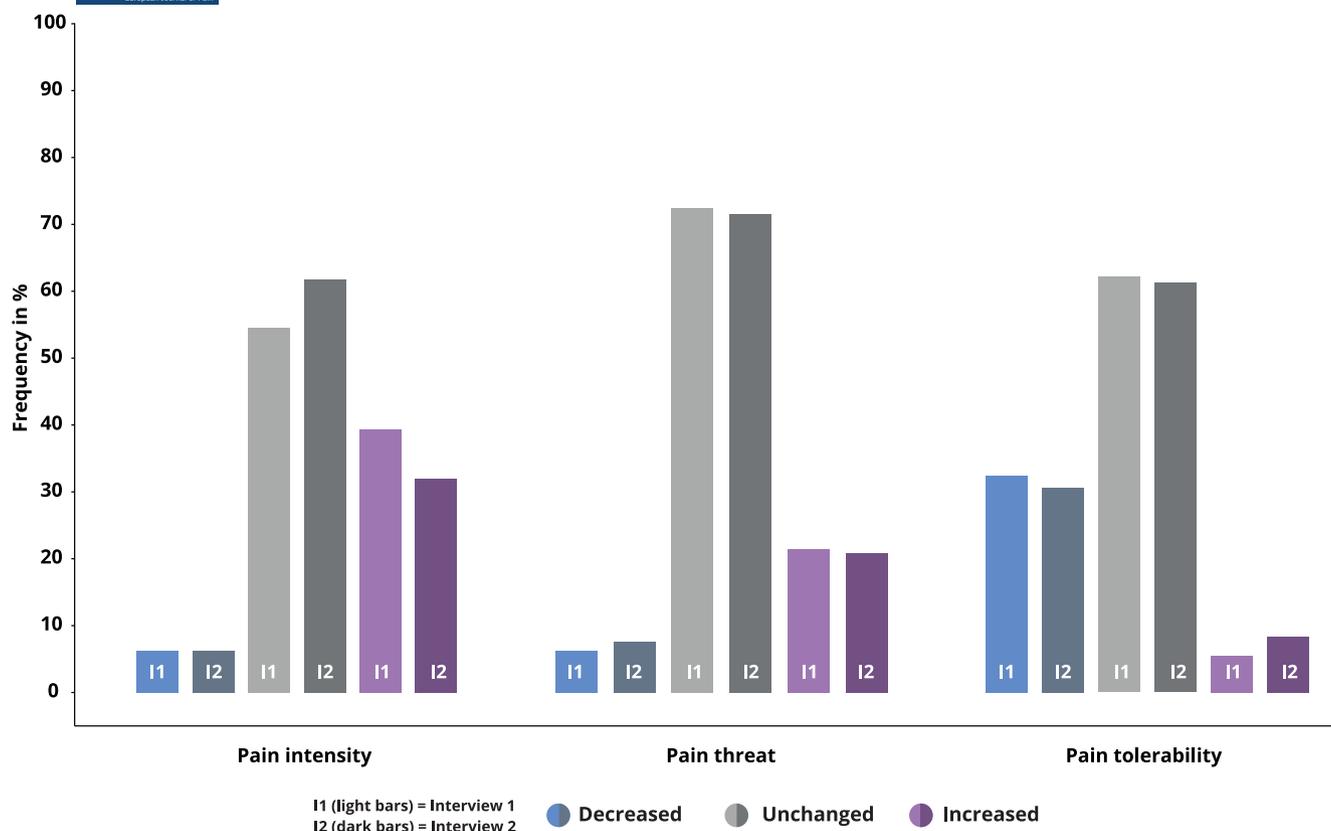


FIGURE 2 Reported changes in pain due to the pandemic

patients whose pain worsened to those whose pain stayed the same. Independent samples *t*-tests revealed that patients who reported a pain worsening at the first interview scored higher on Pain Intensity [Interview 1: $t(130.7) = 3.16, p = 0.002$; interview 2: $t(123.5) = 4.22, p < 0.001$] and Disability [Interview 1: $t(122.4) = 2.79, p = 0.006$; interview 2: $t(116.8) = 2.78, p = 0.006$] than those who reported no pain change. At Interview 1, patients whose pain worsened also reported larger restrictions in coping mechanisms [$t(134.6) = 3.58, p < 0.001$], more thoughts about Corona [$t(132.8) = 2.31, p = 0.023$], higher stress due to Corona [$t(122.3), p = 0.008$], and more life changes due to Corona [$t(122.4) = 3.04, p = 0.003$]. Except for thoughts about Corona ($p > 0.05$), these differences were also present at Interview 2 [Reductions in Coping Mechanisms: $t(91.3) = 3.58, p < 0.001$, Stress Due to Corona: $t(103.3) = 3.04, p = 0.003$, and Life Changes Due to Corona: $t(96.2) = 3.33, p = 0.001$]. **Figure 3** shows ratings of pain, disability, and effects of the pandemic separately for both patient groups (worse pain vs. no pain change).

Next, we tested whether there was an association between pain worsening and negative changes in different life areas. At Interview 1, chi-squared tests revealed that patients whose pain worsened were significantly more

likely to also report a reduction in physical activity ($\chi^2(1) = 3.91, p = 0.048$) and quality of life ($\chi^2(1) = 16.45, p < 0.001$), and an increase of general health worries ($\chi^2(1) = 36.86, p < 0.001$) and loneliness ($\chi^2(1) = 9.5, p = 0.002$). At Interview 2, patients who reported a pain worsening were significantly more likely to report a decrease in mobility ($\chi^2(1) = 5.4, p = 0.002$) and quality of life ($\chi^2(1) = 5.81, p = 0.016$) and an increase in general health worries ($\chi^2(1) = 8.95, p = 0.003$).

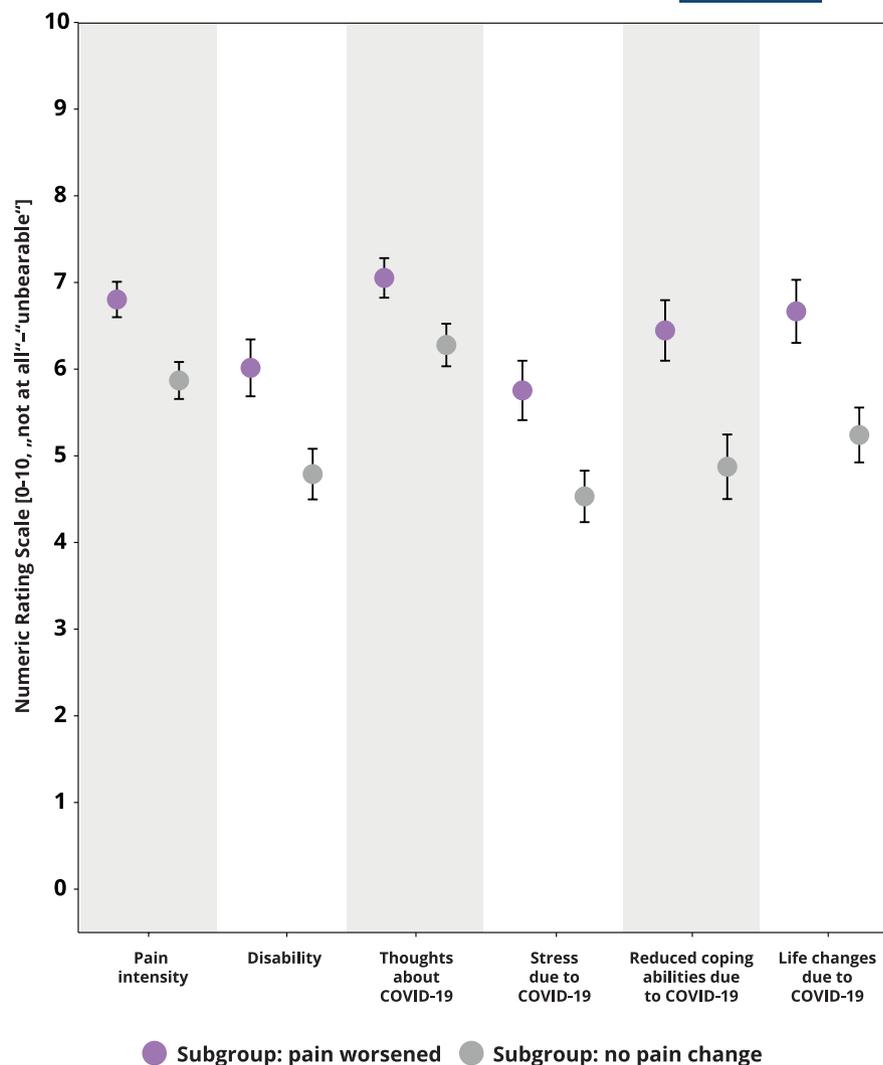
There was no association between pain worsening and gender (Interview 1: $\chi^2(1) = 1.21, p = 0.27$; Interview 2: $\chi^2(1) = 0.50, p = 0.48$).

Finally, we tested whether patients whose pain worsened differed in their locus of control compared to patients whose pain did not change. Patients whose pain worsened had a lower internal [$t(112.4) = -2.27, p = 0.025$] and a higher external LOC [$t(116.7) = 2.19, p = 0.031$] than those whose pain did not change.

3.5 | Expectations about pain and treatment

At Interview 1, patients were asked whether they expected their pain or treatment to change due to the pandemic.

FIGURE 3 Patients whose pain worsened vs. did not change. Mean ratings of pain, disability, and different effects of the pandemic for patients whose pain worsened vs. did not change at interview 1. For all variables, the differences between subgroups were significant at $p < 0.05$. Error bars show SEM



More than one third (35.2%) expected a worsening of their pain and 43.4% expected a worsening of their treatment. More than half of the patients expected no change in pain (59.3%) or treatment (50.3%). Only 6.9% and 4.8% expected an improvement in their pain and treatment, respectively.

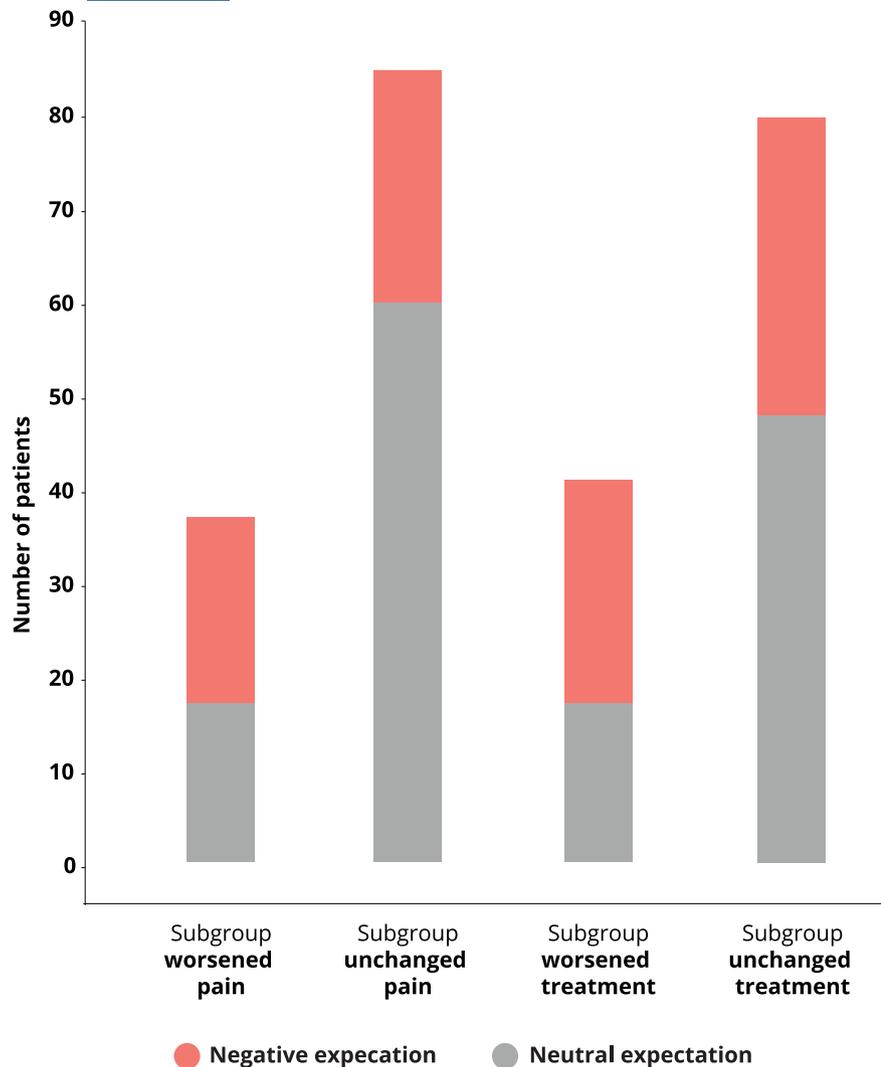
Since there were too few patients who expected and/or perceived an improvement of their pain or treatment (i.e., there were no patients who expected *and* perceived an improvement of their pain or treatment), we did not include the categories “positive expectation” and “improved pain/treatment” in the analyses. The distribution of patients across expected and perceived changes in pain and treatment are shown in [Figure 4](#). The distribution of patients across all categories (i.e., including expected and perceived improvements) can be found in [Supplement 2a](#).

Chi-squared tests revealed a significant relationship between expected and perceived changes in both pain ($\chi^2(1) = 7.93, p = 0.005$) and treatment ($\chi^2(1) = 3.87, p = 0.049$). Thus, patients who expected a worsening of their pain/treatment at Interview 1 were more likely to report a worsening of their pain/treatment at Interview

2. Additional chi-squared tests revealed that patients who had negative expectations about their pain were significantly more likely to report already at Interview 1, that their Pain Intensity ($\chi^2(1) = 23.15, p < 0.001$), Pain Tolerability ($\chi^2(1) = 7.78, p = 0.005$), and Pain Threat ($\chi^2(1) = 16.67, p < 0.001$) had worsened due to the pandemic.

Further, we used Chi-square tests to analyse whether there was an association between pain expectations and the effects of the pandemic on different areas of life at Interview 1. Again, since only few patients reported positive consequences of the pandemic, we restricted the analysis to patients who reported either negative or no changes due to the pandemic. Negative pain expectations were significantly related to increased feelings of Loneliness ($\chi^2(1) = 10.75, p = 0.001$) and decreased Quality of Life ($\chi^2(1) = 9.52, p = 0.002$), and there was a trend for an association with decreased Mobility ($\chi^2(1) = 3.62, p = 0.057$) and reduced Physical Activity ($\chi^2(1) = 3.35, p = 0.067$). Thus, patients with negative pain expectations were more likely to have experienced negative consequences of the pandemic. There were no significant associations

FIGURE 4 Expectations of patients whose pain did vs. did not worsen



between pain expectations and Possibilities for Distraction ($p = 0.57$), Social Contacts ($p = 0.41$), and Health Worries ($p = 0.16$). The distribution of patients with negative and neutral expectations across negative and neutral pain and life changes is shown in [Figure 5](#). Distributions across all categories (i.e., including positive expectations and positive pain and life changes) can be found in [Supplement 2B](#).

To further characterize possible factors related to pain expectations we directly compared the Pain Intensity and Disability scores of patients with negative and neutral (i.e., expecting no change) pain expectations at both interview timepoints. Independent samples t -tests revealed that patients with negative expectations had higher scores of Pain Intensity [Interview 1: $t(118.8) = 2.6$, $p = 0.011$; Interview 2: $t(115.9) = 2.43$, $p = 0.017$] and Pain-Related Disability [Interview 1: $t(101.1) = 2.36$, $p = 0.020$; Interview 2: $t(114) = 2.19$, $p = 0.031$] compared to patients with neutral expectations. Moreover, they experienced more Coping Limitations [Interview 1: $t(15.6) = 4.49$, $p < 0.001$; Interview 2: $t(97.4) = 3.2$, $p = 0.002$] and Corona-related Stress [Interview 1: $t(106.2) = 3.09$, $p = 0.003$; Interview 2: $t(93.8) = 3.22$,

$p = 0.002$]. The Intensity of Corona-related Thoughts and Changes in Everyday Life did not differ between patients with negative and neutral expectations ($p > 0.05$).

Finally, we compared whether patients with negative and neutral pain expectations differed in terms of their locus of control. Patients with negative pain expectation expressed a higher external LOC than patients with neutral pain expectations [negative expectations: $M = 2.18 \pm 1.19$, neutral expectations: $M = 1.68 \pm 1.26$, $t(105.6) = 2.30$, $p = 0.024$] but did not differ in terms of internal LOC [negative expectations: $M = 3.88 \pm 0.98$, neutral expectations: $M = 4.07 \pm 1.07$, $t(108.5) = -1.03$, $p = 0.30$].

3.6 | Locus of control and pain

To examine whether patients' LOC was correlated to their pain and disability ratings, we performed Spearman rank correlations on the respective composite scores. At Interview, 1 there was a significant positive correlation between external LOC and both pain intensity

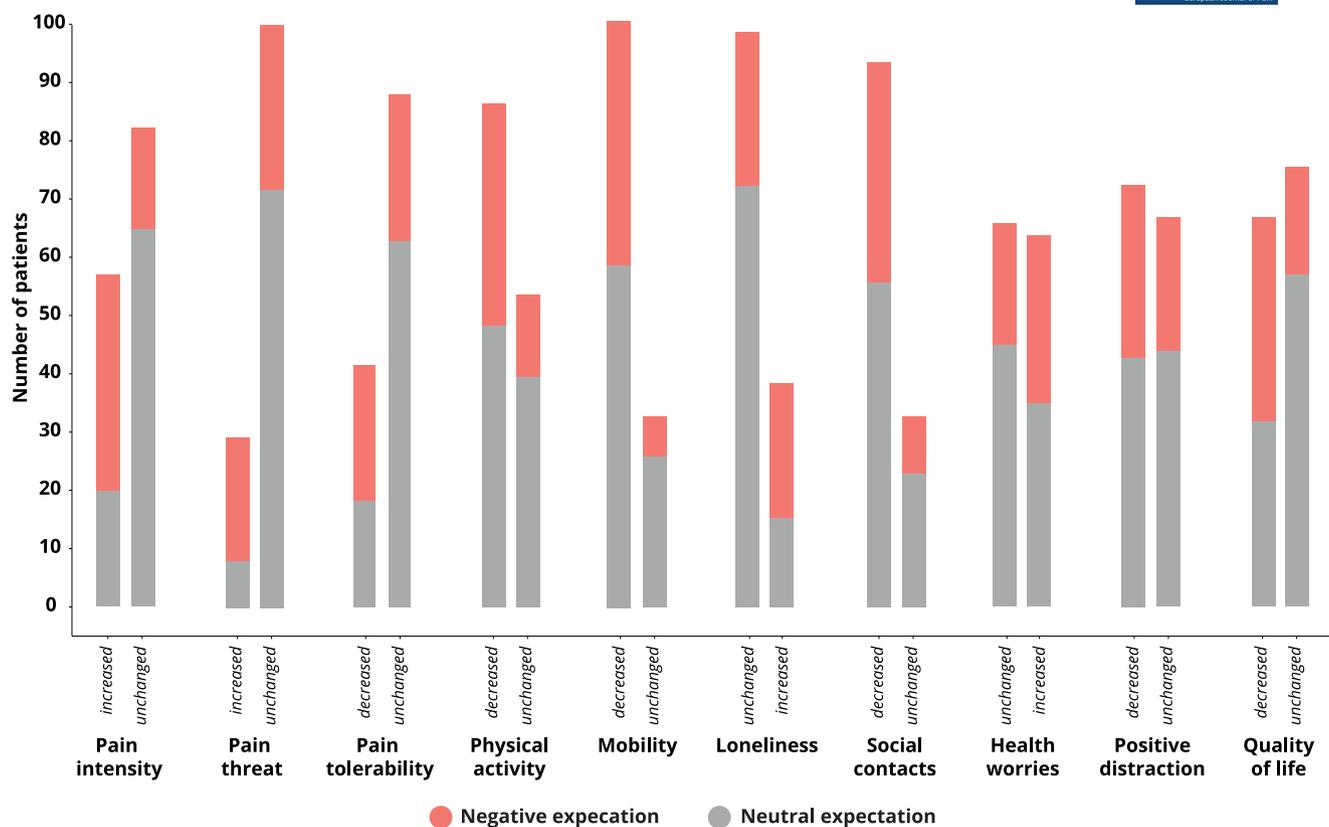


FIGURE 5 Pain expectations across different aspects of pain and life changes. Distribution of patients with negative and neutral pain expectations across negative or no changes in pain and life aspects at interview 1. Negative pain expectations were significantly related ($p < 0.05$, chi-squared tests) to negative changes in all three aspects of pain and to loneliness and quality of life

($r = 0.167$, $p = 0.048$) and disability ($r = 0.306$, $p < 0.001$). Internal LOC scores correlated neither with pain intensity ($r = -0.13$, $p = 0.12$) nor with disability ($r = -0.151$, $p = 0.074$). At Interview 2, external LOC scores correlated again positively with pain intensity ($r = 0.198$, $p = 0.019$) and disability ($r = 0.334$, $p < 0.001$). Moreover, there was a significant negative correlation between internal LOC and pain intensity ($r = -0.189$, $p = 0.025$) and between internal LOC and disability ($r = -0.219$, $p = 0.009$).

4 | DISCUSSION

This study examined the perceived impact of the COVID-19 pandemic on patients with chronic pain during April to May and during August to December 2020. A large portion of patients were negatively affected in various aspects of their daily life and more than one third reported a worsening of pain symptoms due to the pandemic. The exploratory analysis identified some of the factors that might be related to the observed pain worsening. Reductions in quality of life and increases in health-related worries were more common among patients whose pain increased. Moreover, patients who expected pain worsening at the first interview were more likely to report pain increases a

few months later, and negative expectations were related to greater pain severity and a greater psychological impact of the pandemic. Finally, pain worsening was associated with a lower internal and a higher external LOC.

4.1 | General impact of the pandemic

Patients with chronic pain experienced various restrictions due to the pandemic. The most common negative consequences were a reduction of mobility, social contacts, and physical activity, followed by fewer possibilities for distraction, reduced quality of life, and increases in general health worries and loneliness. On average, patients reported moderate levels of COVID-19 related thoughts, stress, everyday life changes, and reductions in coping possibilities. Comparable effects (e.g., subjectively increased stress and anxiety) have been observed among the general public (Bauerle et al., 2020; Cullen et al., 2020; Vindegaard & Benros, 2020). Since this study did not aim for a direct comparison between patients and the general population, we did not include a healthy control group. Yet, an online survey conducted during the lockdown in the UK suggests that people with pain suffered more adverse psychological consequences than pain-free individuals (Fallon

et al., 2021). At the second interview, we observed a similar, albeit slightly weaker, pattern of restrictions, suggesting that the observed impact was not just a temporary reaction to the new circumstances at the beginning of the pandemic.

4.2 | Perceived impact on chronic pain symptoms

About one third of the patients reported a worsening of their pain symptoms at both interviews. Comparable studies found that between 25% (Mun et al., 2021) and 65% (Hruschak et al., 2021) of patients with chronic pain reported a symptom worsening due to the pandemic. These observations highlight the role of psycho-sociological factors in chronic pain and emphasize the importance of closely monitoring people with pain during times of global crisis.

To gain more insights into possible pain-aggravating factors, we performed an exploratory analysis comparing patients whose pain worsened with those whose pain did not change. Patients who reported a pain worsening indicated higher pain intensities and disabilities than those whose pain did not change. They were more affected by the consequences of the pandemic as they reported more limitations in the use of coping strategies and more COVID-19-related thoughts, stress, and life changes. They were also more likely to report reductions in physical activity and quality of life and increases in general health worries and loneliness. Thus, at both interview time-points, patients were more likely to report a pain worsening if they suffered from greater pain severity and/or more negative consequences of the pandemic. This is in line with other studies reporting greater increases in pain among patients who experienced greater disruptions in their mood and sleep quality (Mun et al., 2021) and higher decreases in physical activity (Fallon et al., 2021) due to the pandemic. Contrary to other findings, we did not observe a greater likelihood of pain worsening for women (Hruschak et al., 2021).

4.3 | Negative expectations

Since expectations can shape both the perception of pain itself and the effectiveness of pain treatments, we explored possible differences between patients who expected a pain worsening and those who expected no change. Our finding that patients who, at the first interview, expected their pain/treatment to worsen were more likely to also report a worsening of their pain/treatment at the second interview aligns with the notion of expectation being a predictor of subsequent pain and treatment outcomes (Bingel, 2020; Cormier et al., 2016; Schmidt et al., 2021). Interestingly,

patients with negative expectations also differed from those with neutral expectations in several other ways: they scored higher on pain intensity and disability, were more stressed by the pandemic, and experienced more limitations in their coping possibilities. Moreover, they were more likely to report an increase in loneliness and a decreased quality of life. Thus, negative pain expectations seem to be related to greater disease severity and to a higher burden of the pandemic. Although the observational nature of our study does not allow for any inferences about the causal direction of these effects, experimental studies have shown that negative pain expectations can increase pain sensitivity (Bingel, 2020; Bingel et al., 2011; Schmid et al., 2015). Conversely, positive treatment expectations are associated with greater prophylactic treatment effects in chronic migraine patients (Schmidt et al., 2021). Therefore, it is conceivable that negative expectations lead to an aggravation of pain symptoms. However, since negative expectations were related to greater pain already at the first interview, it also seems plausible that the greater suffering led to more negative expectations. To better understand the mutual interactions between pain expectations and pain experience, it will be necessary to examine how interindividual differences in expectations arise. On the one hand, negative expectations might develop as a consequence of negative treatment experiences, for example, due to previously failed or insufficient treatment attempts. These expectations would most likely be specific to pain/treatment effects, scale with the number of failed treatment attempts, and be relatively transient (i.e., they could be altered by positive experiences). On the other hand, negative expectations could be part of a more deeply rooted personality trait, thereby expressing a more general pessimistic outlook on life. In this case, negative expectations would generalize to other areas of life and would be relatively stable as they might reinforce themselves via self-fulfilling prophecies.

4.4 | Locus of control

One such personality trait that reflects people's general expectations about life outcomes is the LOC. We observed a positive correlation between external LOC and both pain intensity and disability, supporting previous findings about possible health drawbacks of an external LOC (Pastor et al., 1993; Scharff et al., 1995). The corresponding opposite pattern, i.e., a negative correlation between an internal LOC and pain and disability, was only present at Interview 2, suggesting a somewhat less prominent or stable association. A higher internal LOC has previously been associated with desirable outcomes such as less pain and disability (Conant, 1998; Trafimow & Trafimow, 1998) and better quality of life (Cheng & Leung, 2000; Zaharoff, 2005) and coping strategies

(Härkäpää, 1991; Turk et al., 1995). In addition to replicating these earlier findings, we found the same association between LOC and pain worsening, i.e., patients whose pain increased due to the pandemic had a higher external and a lower internal LOC than patients whose pain did not change. Moreover, patients with negative expectations had a higher external LOC than those with neutral expectations. Thus, patients' anticipated pain worsening might have been, at least partially, the result of their general control beliefs. However, since stress e.g., about finances or health, can shift control beliefs to become more external (Nowicki et al., 2018), one should, once again, assume a certain degree of mutual interaction between personality traits, expectations, and pain. Nevertheless, it seems plausible that in the face of a global pandemic, a tendency to attribute the control over one's life to external factors can give rise to negative expectations. Another psychological risk factor for increased pain during the pandemic is pain catastrophizing (Fallon et al., 2021; Hruschak et al., 2021). Since pain catastrophizing includes a component of helplessness, these results point in a similar direction i.e., that the perceived inability to improve one's condition further aggravates chronic pain. Thus, to estimate a patient's risk of pain worsening during the pandemic, it is necessary to take the direct consequences of the pandemic (e.g., reduced physical activity), psychological reactions (e.g., expectations about future pain), personality traits (e.g., LOC), disease severity, as well as the interactions between these factors into account.

5 | LIMITATIONS

Several limitations should be considered when interpreting these results. The timeframe of the second interview was relatively broad (August – November 2020) and the COVID-19 incidence rates and corresponding lockdown measures were much more variable during this period than during the time of the first interview (April – May 2020). While incidence rates were relatively low in Germany between August and October 2020, incidence rates and government restrictions increased again in November 2020, leading to a heterogeneous situation throughout the second interview phase. The wider timeframe for the second interview was necessary because patients were more difficult to reach and to schedule appointments with during these months. The second interview should thus not be considered as a “post-COVID-19” measurement but should rather give an impression of the stability of the effects observed in the first interview, when the pandemic situation was still very new and unfamiliar. Finally, since our patients all received specialized pain treatment, our results might not be generalizable to the large number of people with pain who do not have access to adequate pain treatment, whose pain worsening rates might be even higher.

6 | CONCLUSION

Our findings emphasize the role of psychosocial factors in chronic pain. In times of crisis, those patients who already carry a high burden either in terms of pain symptoms or due to the impact of the crisis on other aspects of their life are at greater risk of further pain deterioration. For clinicians, this implies that increased awareness is necessary to identify patients at risk of further symptom worsening and to flexibly adjust treatment plans if necessary. Additional psychological interventions, even if “only” in the form of digital applications or online consultations, might be advised for patients with unfavourable psychological attitudes such as negative expectations or a highly external LOC.

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CONFLICT OF INTEREST

There are no relevant conflicts of interest for any of the authors.

AUTHOR CONTRIBUTIONS

DM, LB, JF, HS and UB conceptualized and designed the study. LS collected the data. DM and JK-B analysed the data. DM drafted the manuscript. All authors discussed the results, critically revised the article and approved the final version.

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