Does chronic pain influence our dreams? A dream content analytical approach

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Original studies

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Abstract

Background: To date, the relationship between frequent nightmares, chronic pain, waking-life distress and sleep quality is still unclear. Previous research has shown that chronic pain patients reported more frequent nightmares and critical life events compared to a control group. Moreover, patients reported pain dreams similar to pain in their waking-life, whereas controls reported pain dreams sparsely.
Objective: The aim of this study was to replicate these findings and to analyze the dream content of chronic pain patients in more detail.
Methods: A sample of chronic pain patients and healthy control individuals, matched in age and gender, were recruited. All participants completed psychometric questionnaires and a narrative dream diary for 14 consecutive days.
Results: Nightmare frequency, nightmare distress, pain dreams and distress caused by life events were increased in chronic pain patients compared to the control group. In addition, the patient group reported significantly more negative and aggressive dream contents and physical sensations in their dreams than the controls. These findings replicate continuity between waking-life and dream experiences concerning pain sensation. Distress caused by critical life events also played an important role in negative dream affect and pain perception.

Keywords
Psychological distress · Pain perception · Dream recall frequency · Nightmares · Sleep initiation and maintenance disorders

Introduction

Chronic pain is a common health problem worldwide, estimated to affect 20% of the adult population internationally [12]. A prominent comorbidity of chronic pain is sleep disturbance [22, 27, 30]. It was shown that two-thirds of chronic pain patients reported to be less able to sleep, and, in at least half of chronic pain patients, insomnia symptoms are found [5, 7].

However, as sleep is an essential state for well-being and health in waking-life, sleep deficits can cause various impairments in health, attention, cognition, mood, metabolism, and immune system functioning [8, 9, 26, 28, 32]. Sleep disturbances are associated with increased subjective pain intensity [15], so that, due to the bidirectionality of this relationship [11, 17], there is the probability of the development of a vicious circle between sleep disturbances, increased pain sensitivity, and depression [19].

Although chronic pains and sleep quality have been investigated relatively frequently, associations between chronic pain and dream contents have not been observed yet. For a long time, it was assumed that pain does not occur in dreams because, due to an evolutionary function, the dreamer usually wakes up

shortly before a painful sensation occurs in a dream [1, 29].

A study of Nielsen et al. [21] stated that the five healthy participants in their study each reported at least one pain dream. After somatosensory stimulation (increasing pressure on one leg) during REM sleep, the participants reported more pain dreams. The dream emotions were reported as being strongly negative, and the pain sensation in the dreams was comparable to the induced pressure in waking-life [21]. They were thus able to demonstrate that the sensation of pain can exist in dreams.

In 1998, they conducted a new pain study investigating the frequency and the nature of pain in dreams [33]. Healthy participants completed various questionnaires and recorded their dreams over two weeks in a consecutive dream diary. Almost half of the participants retrospectively reported having at least one dream experience of pain in their life. In addition, 8.6% of the participants ($n = 16$) reported that they experienced pain in 0.59% of all dreams collected in the dream diary (18 dreams).

Schredl et al. [25] conducted a retrospective study on pain dreams and dream emotions including $N = 100$ chronic back pain patients and 270 healthy controls. All participants answered whether they had ever experienced pain sensation in their dreams. Sixteen patients and 23 controls reported pain sensation in their dream reports. In addition, chronic pain patients reported more dreams than healthy controls. The chronic back pain patients reported more pain dreams, more negatively toned dreams, and more dream pain similar to waking-life pain than the control group. Individuals with higher dream recall frequency were more likely to report pain as a dream content. For the patient group, reporting pain dreams was related to poor physical health [25].

Mathes et al. [16] investigated the occurrence of pain in dreams in more detail by having $n = 48$ chronic pain patients (with the diagnosis F.41 according to ICD-10) and $n = 54$ matched healthy controls keep a 28-day dream diary in addition to retrospective questionnaires. The authors found that the average pain intensity and the maximum pain intensity were significantly higher in dreams of chronic pain patients compared to dreams of healthy controls. Moreover, chronic pain patients reported more critical life events than heathy persons. They also found that pain intensity in dreams was significantly related to average pain intensity in waking-life, which suggests that there may be continuity between pain in waking-life and perception in dreams.

To sum up, previous studies have shown that chronic pain is strongly related to poor sleep quality, frequent nightmares, and pain dreams. Nevertheless, there have been methodological limitations in recent pain dream studies. Mathes et al. stated that they did not ask the participants about specific dream contents in their study, more precisely the participants could answer bicategorial items concerning their pain dreams (pain in dream occurred vs. pain in dream did not occur [16]).

To overcome this limitation, we conducted a study in which narrative dream reports were collected from a sample of chronic pain patients and a matched healthy control group.

We assume that in dream reports of chronic pain patients significantly more negative dream emotions, less physical activity, and more frequent body sensations are described compared to healthy controls. To confirm previous findings, we also hypothesize that chronic pain patients will have experienced more stressful life events in the previous year, have increased dream recall frequency (DRF), and score higher in nightmare burden and number of pain dreams during the study than healthy controls.

Methods

Participants

The recruitment of participants took place between June 2022 and January 2023. Recruitment for the patient group took place in the psychotherapeutic practice of Thomas Valentin in Duesseldorf-Oberkassel and the pain unit of St. Marienhospital in Marsberg. The participants of the patient group ($n = 41$; 30 women and 11 men) were all currently undergoing treatment for chronic pain disorder. There were 60 different pain diagnoses according to ICD-10 for $n = 41$ pain patients, with F45.41 (chronic pain disorder with somatic and psychological factors, $n = 31$) being assigned the most. A total of 20 psychological diagnoses according to ICD-10 for $n = 13$ pain were assigned to chronic pain patients, whereas the most common diagnosis was F33 (recurrent depressive episode, $n = 6$).

The mean age and standard deviation (SD) of the clinical sample was 53.34 ± 11.91 years. Healthy control group ($n = 40$; 29 women and 11 men), matched in age and sex, had a mean age and standard deviation of 53.15 ± 11.97 years. There was no significant age difference between the patient and the control group ($t(79) = 0.072$, $p = 0.943$). The control group was recruited in the personal environment of the experimenters. Most participants were employed ($n = 49$) or retired ($n = 25$). Five participants were house spouses, and two were unemployed.

Measurements

Sociodemographic information
In addition to the validated questionnaires and the dream diary, participants were asked about their age, gender, occupational status, education, and sleep disturbances. Pain-related information such as duration of chronic pain and currently ongoing pain treatment was also requested from the chronic pain patients.

Mannheim Dream Questionnaire (MADRE)
To measure retrospective DRF and nightmare frequency, the MADRE was used [24]. Participants could indicate how often they could remember their dreams in the last months on a 7-point Likert scale including 0 (never) to 6 (almost every morning). Nightmare frequency is measured by an 8-point Likert scale from 0 (never) to 7 (several times a week). The Mannheim Dream Questionnaire has shown good psychometric properties (retest reliability of DRF and nightmare frequency: $r = 0.756$ and $r = 0.751$) in a German-speaking sample [24].

Nightmare Distress Questionnaire (NDQ)
The NDQ was used to assess nightmare distress [2]. The scale measures general

nightmare distress (e.g., "Do nightmares interfere with the quality of your sleep?"), impact of nightmares on sleep (e.g., "Are you ever afraid to fall asleep for fear of having a nightmare?"), and impact on day-time reality perceptions (e.g., "Do your nightmares foretell the future?"). It consists of 13 items, most ranging on a 5-point Likert scale from 1 (never/not at all) to 5 (always/a great deal), with higher scores indicate greater distress. The NDQ has proven to be a suitable instrument in the past, with an internal consistency of $\alpha = 0.80$ [3].

Life Event Scale

This scale quantifies the number of critical life events. It is based on the assumption that psychosocial stress contributes to the development of diseases [14]. Participants are asked which of the 43 given common life events have occurred in the last year. Predefined stress intensity points, ranging from 11 to 100 points, are assigned to these events, which are then summed up to a total distress score. According to the authors, a score of 300 or more is considered as cutoff for disability in coping with distress, thus, having an increased probability of developing a disease in the subsequent years [14].

Dream diary

To record the dream content, participants kept a 14-day dream diary, which consisted of two parts. The first part asked about sleep duration and dream recall, with the following answers: 0 (no recall), 1 (yes, I dreamed last night but can't remember), and 2 (yes). If participants recalled at least one dream, they were asked to complete the second part. First, they wrote down the narrative of their dream content. All dream contents of one night were defined as one dream and a maximum of five dream reports had to be written down in order to minimize the perceived pressure on the participants and thus optimize the dream recall frequency. If participants managed to write these five dream reports, only the first part of the dream diary had to be completed for the remaining period. All dreams per participants were aggregated by means. Then, the intensity of positive and negative emotions was recorded on two separate 4-point scales, as following:

0 (no emotions), 1 (mild), 2 (moderate), and 3 (strong emotions). Moreover, participants indicated whether they perceived their dream as a nightmare and rated the overall intensity of the nightmare on an 11-point Likert scale, ranging from 0 (negligible) to 10 (worst imaginable dream). If the participants experienced pain during the dream, they rated if the pain was identical or similar to their chronic pain in waking-life (1 = yes, 0 = no). In addition, the average and highest pain intensity during the dream was assessed on 11-point Likert scales from 0 (no pain) to 10 (worst imaginable pain).

Dream content analysis

The dream content analysis was done with a dream manual, based on Hall & Van de Castle [13]. The number of dream elements such as negative emotions (anger, confusion, apprehension, and sadness), sport (active and passive), fortune and misfortune were counted. If at least one of these dream contents was reported in a dream report, this was coded with "1", if not, it was coded with "0". Moreover, it was coded if the participants mentioned body sensations related to specific body parts: head (1), arms (2), legs (3), torso (4), and back (5). The coding was done blindly, i.e., the rater had no access to the participants' data. The interrater reliability (Cohen's kappa) was between $r = 0.562$ (confusion) and $r = 1.000$ (sadness and sports).

Procedure

After the participants had expressed their interest in the study, they were informed about the procedure and asked to provide written consent. If the participants belonged to the group of chronic pain patients, a pain diagnosis according to ICD-10 [31] was previously made by the practitioners. They were then given a paper and pencil questionnaire pack and a 2-week dream diary, both with a personal identification code and completion instructions. During 14 days, they had to record their sleep and dream recall every morning. The completion of the questionnaire pack could be split over the entire 2 weeks if needed. After these 14 days, the participants returned the dream diary. Participation was completely voluntary, and participants re-

ceived 24 € as compensation. The study was approved and accepted by the Ethics Committee of Heinrich Heine University Duesseldorf (MA01_2022_01).

Analysis

All analyses were conducted using SPSS 25.0 (IBM, Armonk, NY USA). The sample size was calculated using G*Power [10] with $\alpha = 0.05$ and a power of $1 - \beta = 0.85$, yielding a sample size of $N = 82$, to detect medium effect sizes ($d = 0.6$), which we were able to identify in a previous study [16]. Prior to this, the data from the dream content analysis was aggregated by the mean values per participant. In order to investigate between-group effects between the chronic pain patients and the healthy control group in the life event score, in dream recall, nightmare distress, and pain in dreams, t-tests for independent samples were calculated. To compare the retrospective DRF of the Mannheim Dream Questionnaire with the prospective DRF of the dream diary, a Spearman correlation was conducted. In order to analyze the differences in dream contents (negative emotions, sports, and body sensation) between patients and controls, t-tests for independent samples were conducted.

Results

Overall, $N = 532$ dream reports were recorded during the study, of which $n = 287$ dreams were from the patient group (53.95%) and $n = 245$ from the control group (46.05%). Further, $n = 26$ (4.89% in total) dream reports were declared as nightmares by the participants, $n = 19$ by the patient group (73.08%), and $n = 7$ by the control group (26.92%). In addition, pain was reported in $n = 30$ (5.64% in total) dream reports, where $n = 26$ pain dreams were from the patient group (86.67%) and $n = 4$ from control group (13.33%). Further demographic characteristics of the sample are presented in ◻ Table 1.

◻ Table 2 depicts the results of the statistical analyses of between-group differences. With regard to critical life events, retrospective and prospective nightmare frequency, pain dream frequency, and nightmare distress, the chronic pain pa-

Table 1	Demographic and descriptive characteristics of participants		
		Patient group	Control group
		n = 41	n = 40
Demographic characteristics			
Age, years, mean (SD)		53.34 (11.91)	53.15 (11.97)
Female, n (%)		30 (73.17)	29 (72.50)
Education level			
Doctorate, n (%)		–	2 (5.00)
University degree, n (%)		6 (14.63)	8 (20.00)
Apprenticeship, n (%)		25 (60.98)	24 (60.00)
A-levels, n (%)		2 (4.90)	3 (7.50)
Secondary school degree, n (%)		8 (19.51)	3 (7.50)
Employment situation			
Employed, n (%)		18 (43.90)	31 (77.50)
Jobseeking, n (%)		2 (4.90)	–
House spouse, n (%)		4 (9.80)	1 (2.50)
Retired, n (%)		17 (43.90)	8 (20.00)
Ongoing treatments			
Psychotherapy, n (%)		27 (65.90)	–
Pain medication, n (%)		19 (46.30)	–
Physiotherapy, n (%)		22 (53.70)	–
Other treatment, n (%)		7 (17.10)	–
DRF dream recall frequency; *NDQ* Nightmare Distress Questionnaire, *SD* standard deviation			

tients scored significantly higher than the healthy controls. Therefore, no significant difference between the groups could be found in the retrospective or prospective DRF.

Furthermore, significant differences regarding dream contents between the patient group and the control group were found. The patient group mentioned a significantly higher frequency of anger and confusion of the dream-self, whereas the control group never mentioned these dream contents. There was no significant difference between the two groups regarding fortune, misfortune, and sadness. Moreover, the controls did not report that their dream-self was victim of either verbal or physical aggression, whereas this occurred in the patients' dream reports. Interestingly, patients reported significantly more sports themes in their dreams than the controls (◘ Table 3). Finally, there was no significant difference between patients and controls regarding body sensations. Descriptively, arm sensation (n = 2) and back sensation (n = 3) were explicitly mentioned in the patients' dream reports but not in the controls' dream reports.

Discussion

This study broadly confirms previous findings concerning dreams of chronic pain patients. It indicates that chronic pain in waking-life is associated with several dream parameters and critical life events. Therefore, the relationship between chronic pain and dream experience is clearly evident.

Our first hypothesis was confirmed. Chronic pain patients reported more distressing life events than healthy individuals. This could be explained by the allostatic load hypothesis [4, 6], stating that harmful social or economic circumstances can lead to a physiological fight-or-flight response which remains constantly activated. From this point of view, the association between distressing life events and chronic pain should be further investigated. A possible approach here would be intervention studies that therapeutically enhance coping with such life events. Thus, by decreasing the overload caused by these factors, chronic pain symptomatology should also decrease.

Contrary to our expectations, the chronic pain patients did not report a higher dream recall frequency than the control group. This was different in the

study of Mathes et al. [16], where chronic pain patients showed a higher dream recall ability. Interestingly, as in Mathes et al. [16], the chronic pain patients reported significantly more nightmares than the control group in the present study. However, the percentage of dream reports that were nightmares was substantially higher in the 2022 study than in the present study, in particular among chronic pain patients. These differences may be due to the sample: All chronic pain patients were in inpatient treatment. So they may had a different sleep rhythm than usual and may have received different medication than usual. Benzodiazepines repress REM sleep [18], which decreases the dream recall ability.

In accordance with our assumptions, chronic pain patients reported more nightmare distress than healthy controls. The patient group also described more negative dream emotions, where some of them were absent. We do not have an explanation for the absence for them. However, it still remains unclear whether nightmare frequency or nightmare distress has a greater impact on the well-being of chronic pain patients. Furthermore, it should be investigated whether distress caused by pain dreams is comparable to nightmare distress and in which way pain dreams contribute to nightmare distress.

As expected, chronic pain patients reported more dreams containing pain sensation than healthy control participants, which is in line with previous findings concerning chronic pain, and also with the continuity hypothesis [16, 25]. Unexpectedly, physical activity in dreams was mentioned more frequently by the chronic pain patients than by the controls. This could be explained by the continuity to waking-life that chronic pain patients are more aware of their body and their movements, which is also manifested in their dreams. The influence of pain dreams on individuals needs to be further investigated, especially compared to distress caused by nightmares. It is plausible that pain dreams and nightmares could be an additional distress factor for patients with pain and could thus account for poorer sleep and higher pain intensity.

Also, a central question is whether dream content is affected by simultane-

Table 2 Between-group effects

Variables	Patient group	Control group	Df	t	95% CI		p
	M (SD)	M (SD)			UB	LB	
LES	220.78 (135.50)	137.76 (79.41)	79	3.35	132.28	33.73	< 0.001*
Retrospective DRF	3.65 (1.55)	3.30 (1.81)	76.07	0.93	1.10	−0.40	0.178
Prospective DRF	7.00 (4.31)	6.13 (4.26)	78.99	0.92	2.77	−1.02	0.180
Retrospective nightmare frequency	4.22 (2.33)	2.88 (1.59)	79	3.03	2.23	0.46	0.002*
Prospective nightmare frequency	0.59 (0.84)	0.21 (0.48)	64	2.33	0.72	0.55	0.012*
Pain in dreams	0.81 (1.18)	0.11 (0.40)	65	3.31	1.12	0.28	< 0.001*
NDQ total score	31.60 (9.35)	21.00 (3.85)	36	3.90	16.11	5.09	< 0.001*
General distress	12.60 (5.17)	7.23 (2.13)	36	3.57	8.42	2.32	< 0.001*
Impact on sleep	8.64 (3.05)	6.31 (1.70)	36	2.55	4.19	0.47	0.008*
Impact on daily reality perception	9.12 (2.83)	6.46 (1.39)	36	3.18	4.36	0.96	0.002*

*significant at α = 0.05

LES Life Event Score; *DRF* Dream recall frequency; *NDQ* Nightmare Distress Questionnaire, *M* mean, *SD* standard deviation, *95% CI* 95% confidence interval, *UB* upper bound, *LB* lower bound

Table 3 Between-group effects dream content analysis

Variables	Patient group	Control group	Df	t	p
	M (SD)	M (SD)			
Anger	0.09 (0.29)	0.00 (0.00)	78	2.75	0.007*
Confusion	0.20 (0.41)	0.00 (0.00)	78	3.36	< 0.001*
Apprehension	0.34 (0.48)	0.08 (0.29)	25.51	2.61	0.016*
Sadness	0.19 (0.40)	0.08 (0.29)	17.93	1.13	0.274
Fortune	0.04 (0.19)	0.00 (0.00)	89	0.68	0.498
Misfortune	0.16 (0.37)	0.17 (0.39)	89	−0.18	0.986
Body sensations	0.06 (0.25)	0.00 (0.00)	88	0.90	0.372
Physical aggression on DS	0.06 (0.25)	0.00 (0.00)	78	2.30	0.024*
Verbal aggression on DS	0.08 (0.27)	0.00 (0.00)	78	2.53	0.013*
Sport active	0.10 (0.31)	0.00 (0.00)	78	2.97	0.004*
Sport passive	0.10 (0.31)	0.00 (0.00)	78	2.97	0.004*

*significant at α = 0.05

DS dream-self, *M* mean, *SD* standard deviation

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Declarations

ous pain during sleep or by memory of pain experience. It may be an interesting approach for future studies to measure dream experience during different sleep states with both EEG and fMRI.

Concerning the limitations of the study, the 14-day period with the option to report explicit dream content of five dreams proved to be an effective method to gather sufficient dream content to gather sufficient dream content for the analysis of group differences [23]. The relatively old participants recalled various dreams, although DRF was reported to decrease with age [20]. Interestingly, the results are similar to those of Mathes et al. [16], although the method of recording dreams was different. Body sensations were not reported in the control group, whereas they were reported in the patient group.

Another problem in this study is that there were various confounding variables. For testing the group differences in the NDQ measures, nightmare frequency may be a possible confounder. In addition, influences on sleep and sleep quality were not considered, which could be an interesting research topic in the future.

Conclusion

Chronic pain patients seem to be affected by their pain experience in their dreams as well, which in turn can affect their waking-lives. This study supports the understanding of a continuity between waking-life and dreaming, and provides ground for future research regarding psychiatric diseases and critical life events for the chronic cycle of pain and sleeping problems.

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Beeinflussen chronische Schmerzen unsere Träume? Ein analytischer Ansatz für Trauminhalte

Hintergrund: Bislang ist der Zusammenhang zwischen häufigen Albträumen, chronischen Schmerzen, Problemen im Wachleben und der Schlafqualität noch unklar. Frühere Untersuchungen haben gezeigt, dass Patienten mit chronischen Schmerzen im Vergleich zu einer Kontrollgruppe häufiger von Albträumen und kritischen Lebensereignissen berichten. Außerdem berichteten die Patienten über Schmerzträume, die den Schmerzen im Wachleben ähnelten, während die Kontrollgruppe nur spärlich über Schmerzträume berichtete.

Ziel: Ziel der vorliegenden Studie war es, diese Ergebnisse zu reproduzieren und den Trauminhalt von chronischen Schmerzpatienten genauer zu analysieren.

Methode: Zu diesem Zweck wurde eine Stichprobe von chronischen Schmerzpatienten und gesunden Kontrollpersonen rekrutiert, die hinsichtlich Alter und Geschlecht übereinstimmten. Alle Teilnehmer füllten psychometrische Fragebögen und ein narratives Traumtagebuch an 14 aufeinanderfolgenden Tagen aus.

Ergebnisse: Die Häufigkeit von Albträumen, die Alptraumbelastung, Schmerzträume und die Belastung durch Lebensereignisse waren bei chronischen Schmerzpatienten im Vergleich zur Kontrollgruppe erhöht. Darüber hinaus berichtete die Patientengruppe über signifikant mehr negative und aggressive Trauminhalte und körperliche Empfindungen in ihren Träumen als die Kontrollgruppe. Diese Ergebnisse belegen die Kontinuität zwischen Wach- und Traumerfahrungen in Bezug auf Schmerzempfindungen. Auch der durch kritische Lebensereignisse verursachte Stress spielte eine wichtige Rolle für den negativen Traumaffekt und die Schmerzwahrnehmung.

Schlüsselwörter

Psychischer Stress · Schmerzwahrnehmung · Traumerinnerungshäufigkeit · Albtraum · Ein- und Durchschlafstörungen