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Complex Psychological Comorbidity and Chronic Pain: An Analysis of the Effectiveness and Challenges of Multimodal Pain Management

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Abstract

This study investigates the effectiveness of Multimodal Pain Management (MMST) in patients with complex psychological comorbidity and chronic pain, especially in patients with trauma. Based on expert interviews, it is emphasized that the success of MMST depends heavily on a comprehensive psychological diagnosis to detect and treat potential trauma at an early stage. In addition, it is emphasized that specific treatment approaches, such as longer therapy times and a higher frequency of psychotherapeutic sessions, are required for this patient group. The research draws on various psychological models to represent the interactions between pain and trauma. It highlights the need to identify the factors contributing to maintaining post-traumatic pain. Despite potential limitations, such as limited sample size and lack of control groups, the study highlights the urgent need for further research to develop and optimize effective treatment strategies for this specific patient population.

Keywords: Multimodal pain therapy, psychologically comorbid pain patients

JEL Codes: I10, I18

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1 Introduction

According to the German Society for Pain Medicine, more than 23 million people in Germany in 2020 suffered from chronic pain of varying severity. The trend is rising. 3.4 million were seriously ill (Deutsche Schmerzgesellschaft e.V., 2017, p. 2).
More than 50% of the documented patients requiring treatment suffered from back pain, 16.5% from joint pain, and 9.5% from headaches. 57.8% of the patients state that their performance is significantly impaired (Deutsche Gesellschaft für Schmerzmedizin e.V., 2020, p. 1-18).
This development in society as a whole has economic and health economic implications. The costs of incapacity for work, sick pays, early retirement, etc. greatly strain the German economy (Deutsche Schmerzgesellschaft e.V., 2017, p. 6). According to the German Society for Pain Medicine, 10,000 qualified pain physicians would have to be available to adequately treat people with chronic pain (Deutsche Schmerzgesellschaft e.V., 2017, p. 1–18). The alarming increase in chronic pain patients comes at a time when the resources allocated to treatment are insufficient, therefore it can be summarized that a comprehensive treatment offer is imperative to be able to treat all patients cost-efficient.

1.1 Multimodal pain therapy

The anaesthesiologist John J. Bonica (1917-1994), who founded the International Association for the Study of Pain (IASP), is considered one of the fathers of the multidisciplinary approach to pain therapy. Bonica saw that pain therapies for wounded soldiers of the Second World War were inadequate. In collaboration with neurosurgeon J. D. Loser an anaesthesiologist W. E. Fordyce, he developed the precursors of a first interdisciplinary approach. He quickly realized that the knowledge of a single doctor was not enough to manage the complexity of pain. Bonica realized that the implementation of interprofessional rehabilitation programs, as he required, was associated with considerable logistical and organizational specifications (Gatchel et al., 2014, p. 119–130), which are still a challenge today.
Psychiatrist George L. Engel (1913-1999) took Bonica's approach and developed it further. According to Engel, there is an active interaction between the physiological, psychological and social components (Pauls, 2013, p. 15–20). In the 1970s, he developed a model that later became known as the bio-psycho-social model (Egger, 2015, p. 53–63). Many clinics now refer to this model, such as the UniversitätsSchmerzCentrum Dresden (Schütze et al., 2009, p. 609–617) and the Pain Day Clinic at the Nuremberg Clinic (Söllner und Venkat, 2018, p. 14–20), to name a few.
In the meantime, MMST has become the gold standard in German pain therapy clinics, as a large number of studies, reviews, meta-analyses and other research have proven the success of this program for patients with diagnosis-related somatic diseases, such as chronic back pain (Sabatowski, Kaiser und Scharnagel, 2021, p. 334).
A recent meta-study conducted by Goethe University Frankfurt in 2022 was based on data of 58 randomized controlled trials involving more than 10,000 patients worldwide. The patients suffered from chronic low back pain. An 84% increase in effectiveness in terms of pain relief was achieved through the use of multimodal, individually adapted therapy instead of standard therapies (Fleckenstein et al., 2022, p. 1856–1873).
The effectiveness of MMST was also investigated through a meta-analysis of randomized controlled clinical trials in relation to fibromyalgia syndrome (FMS) (Häuser et al., 2009, p. 222–224). The authors point out limitations: There are no internationally recognised standards regarding the duration of MMST. There is no transferability of the evaluation

results to the total population of FMS patients. No statements can be made regarding the effectiveness for patients with additional mental and psychiatric illnesses. The studies hardly provide any data on socio-economic outcomes (Häuser et al., 2009, p. 222–224).
Sabatowski et al. also point to this problem. The authors describe that multimodal therapy programs are sometimes not applied uniformly in terms of structure and process quality. "... and, in particular, the definition of interdisciplinary multimodal therapy according to the OPS catalogue leaves plenty of room for manoeuvre for programs that do not meet the quality standards that are actually to be demanded, such as those formulated by the German Pain Society, among others." (Sabatowski, Kaiser und Scharnagel, 2021, p. 334)
As a result, there is still a need for discussion with regard to the duration of treatment, treatment methods, treatment intensity and therapy concepts in order to be able to carry out a comparability referring to the effectiveness of MMST in the individual institutions (Sabatowski, Kaiser und Scharnagel, 2021, p. 341, Pfingsten et al., 2019).
In 2018, so-called outcome parameters (COS) were published for the first time by the Ad Hoc Commission of the German Pain Society. They include, among other things, pain medicine, psychotherapy and physiotherapy. According to Sabatowski et al. these are:
"Pain intensity, emotional well-being, health-related quality of life, satisfaction with social role and activities, productivity (home context, working life), frequency of pain,
the patient's presentation of the achievability of the treatment goals and physical activity."
(Sabatowski, Kaiser und Scharnagel, 2021, p. 337)
It remains to be seen to what extent these outcome parameters will be incorporated into future research.
So far, the effectiveness of MMST has been tested mainly in relation to somatic diseases in international and national studies, although there has also been criticism of the methodological explanations (Gaul et al., 2011, p. 475–483); (Häuser et al., 2009, p. 216–224); (Kamper et al., 2014, p. 28–30); (Pöhlmann et al., 2009, p. 40–46; Schütze et al., 2009, p. 609–617); (Dragioti et al., 2018, p. 779–791); (Pfingsten et al., 2019, p. 558–561).
Söllner and Venkat have argued, among other things, that social and psychological variables should be given priority in studies to evaluate the effectiveness and prognosis of multimodal treatment (Söllner and Venkat, 2018, p. 14–20).
There is therefore a considerable need for research on psychological subgroups, regardless of further somatic diagnoses.
The author is currently conducting a quantitative and qualitative secondary analysis of 575 MMST patients with almost 1,000 hospital stays based on five psychological subgroups (see chapter 2.1 Course of scientific work) in order to investigate the effectiveness of multimodal pain therapy also on complex-psychologically comorbid chronic pain patients. This reflects the above-mentioned difficulties in measuring the effectiveness of MMST and comparability. In the present study, twelve experts are interviewed on the topics listed below, whose answers are meticulously and detailed according to the method of qualitative data analysis according to Gläser and Laudel in order to obtain additional well-founded information (Gläser and Laudel, 2010).

1.2 Effectiveness of MMST for complex-psychologically comorbid chronic pain patients with and without trauma

In many multimodal pain treatment centres, chronic pain patients with trauma are treated several times. In many cases, trauma is first diagnosed when a multidisciplinary approach is used to treat the patient's ailments (Söllner and Venkat, 2018, p. 15). The

effects of trauma and other psychological comorbidities have hardly been studied with regard to the effectiveness of MMST compared to patients without trauma.

Traumatized patients reach the limits of their current coping strategies and can quickly become mentally unstable. According to Söllner and Venkat, the therapeutic mindset and approach should focus on stabilizing the patient's psyche and activating him physically and psychologically, avoiding relieving posture as well as social withdrawal and adjusting medication (Söllner and Venkat, 2018, p. 61–62).

Some research shows that chronic pain can be the result of psychological trauma (e.g. PTSD) (Walter et al., 2010, p. 465–471) and it should also be taken into account in the treatment. Subsequently, this also applies to other psychological comorbidities. However, whether these traumas and other psychological comorbidities influence the effectiveness of MMST as a result requires further research.

In addition to the quantitative and qualitative secondary analysis of the patient data, the expert interviews provide further important insights into answering the existing research questions (see chapter 2.2 Research questions) regarding the effectiveness of MMST for different subgroups.

2 Methods

2.1 Course of scientific work

First, a literature review was conducted; from this, research questions with corresponding hypotheses were then formulated. In order to answer the research questions and the hypotheses derived from them, twelve expert interviews were conducted in June 2023, in addition to a qualitative and quantitative evaluation of the secondary data from the Öschelbronn Clinic (Baden-Württemberg). These serve to validate or falsify the research questions complementary to the analysis results of the secondary data of this clinic by descriptive statistical analysis of approval or disagreement in order to avoid statistical spurious correlations.

The main goal of the entire scientific work (planned publication: early 2024) is to assess the efficiency of multimodal pain therapy for complex-psychologically comorbid chronic pain patients, to optimize the efficiency and comparability of MMST as well as to investigate subgroups for the effectiveness of MMST and to develop evidence-based recommendations. In order to contribute to public health, this work provides important foundations for future studies and tries to propose an improved implementation of MMST based on the bio-psycho-social model. Furthermore, recommendations for the treatment of specific subgroups were developed with a view to establishing sustainable therapy programs. The present study is a sub-area of this overall research work, which enables an in-depth examination of the data.

The subgroups studied were determined on the basis of the ICD-10 as follows (Dilling and Freyberger, 2019, p. 119–346):

1. "Group I: Chronic pain disorder with somatic and psychological factors (F45.41) without further F-diagnosis

2. Group II: Chronic pain disorder with somatic and psychological factors (F45.41) and F-diagnosis without PTSD (F43.1)
3. Group III: Chronic pain disorder with somatic and psychological factors (F45.41) and F-diagnosis with PTSD (F43.1)
4. Group IV: Chronic pain disorder with somatic and psychological factors (F45.41) and at least two F-diagnoses without PTSD (F43.1)
5. Group V: Chronic pain disorder with somatic and psychological factors (F45.41) and at least two or more F-diagnoses with PTSD (F43.1)"

2.2 Research Questions

The following research questions were answered by the experts on the basis of statements in order to collect different perspectives and points of view, to examine the causality of the questions at hand and consequently to shed light on them in depth.

Research question 1 (F1): Do chronic pain patients with trauma have a lower treatment success than chronic pain patients without traumatization?

The research question F1 is considered in a more differentiated way by answering the following interview statements:

1. Statement 1: Psychological trauma of the patient complicates the success of MMST treatment.
2. Statement 4: The severity of the trauma has an influence on the success of MMST treatment.
3. Statement 5: The time of traumatization of the pain patient has an influence on the success of the MMST – the earlier, the stronger.
4. Statement 6: Childhood stress and insecure attachment behaviour have a negative effect on the treatment of chronic pain patients with trauma.
5. Statement 8: The investigated subgroups differ in the effectiveness of MMST.
6. Statement 9: Multiple hospital stays of patients with trauma improve the success of treatment.
7. Statement 11: Chronic pain patients with trauma have a lower treatment success than chronic pain patients without traumatization.
8. Statement 15: Concomitant depression has a significant influence on the success of treatment.
9. Statement 16: Stronger fears that occur at the same time have a significant influence on the success of treatment.
10. Statement 17: Concomitant intense stressful situations have a significant influence on the success of treatment.

Research question 2 (F2): Do complex-psychologically (from an additional F-diagnosis) comorbid chronic pain patients with trauma have a lower treatment success in multimodal pain therapy than complex-psychologically comorbid chronic pain patients without traumatization?

The research question F2 is considered in a more differentiated way by answering the following interview statements:

1. Statement 4: The severity of the trauma has an influence on the success of MMST treatment.

2. Statement 5: The time of traumatization of the pain patient has an influence on the success of the MMST – the earlier, the stronger.
3. Statement 6: Childhood stress and insecure attachment behaviour have a negative effect on the treatment of chronic pain patients with trauma.
4. Statement 8: The investigated subgroups differ in the effectiveness of MMST.
5. Statement 12: Complex-psychologically comorbid chronic pain patients with trauma benefit less from MMST than the other subgroups.
6. Statement 13: Complex psychologically comorbid chronic pain patients without trauma benefit more from MMST than the other subgroups with traumatization.
7. Statement 15: Concomitant depression has a significant influence on the success of treatment.
8. Statement 16: Stronger fears that occur at the same time have a significant influence on the success of treatment.
9. Statement 17: Concomitant intense stressful situations have a significant influence on the success of treatment.

Research question 3 (F3): Which components must an optimized multimodal pain therapy contain in order to enable chronic pain patients with traumatization elements and/or complex-psychologically comorbid chronic pain patients with trauma to improve treatment success?

The research question F3 is considered in a more differentiated way by answering the following interview statements:

1. Statement 2: Every MMST should be preceded by an examination of whether there is trauma.
2. Statement 3: MMST should be individually adapted in the case of existing trauma.
3. Statement 7: Addressing trauma early improves the treatment effect in all subgroups with traumatization.
4. Statement 14: In your opinion, do chronic pain patients with trauma and/or complex-psychologically comorbid chronic pain patients with trauma need more tools?

2.3 Expert-Interviews

In order to contribute to the solution of the research questions and to shed more light on the relevant field of action, expert interviews were conducted (Meuser and Nagel, 1991, p. 442–444).

2.4 Selection of interview partners

The interviewees are made up of the following areas:

Medical area

1. Doctor 1: Specialist in internal medicine, senior physician, pain therapist
2. Doctor 2: General practitioner, 13 years of experience as a ward physician in the Department of Pain Therapy
3. Doctor 3: Specialist in orthopaedics, specialising in conservative orthopaedics and pain therapy, additional qualification: special pain therapy, in private practice since 1990
4. Doctor 4: Resident doctor, specialist in anaesthesia and pain medicine, general practitioner, 30 years of professional experience
5. Doctor 5: Senior physician and head of pain therapy at a hospital, 20 years of professional experience, specialist in anaesthesia special pain therapy, palliative medicine, emergency medicine
6. Doctor 6: Medical Director and Chief Physician of a private psychiatric and psychosomatic clinic, Specialist in Psychiatry and Psychotherapy, Specialist in Neurology, Specialist in Public Health, Social Medicine, Addiction Medicine
7. Doctor 7: Specialist in anaesthesia, emergency medicine, palliative medicine, special pain therapy

Psychotherapeutic area

1. Psychotherapist 1: Specialist in general medicine, medical psychotherapist in private practice, 25 years of professional experience as head of psychotherapy in pain therapy and oncology at a hospital
2. Psychotherapist 2: Psychologist M.Sc., psychological psychotherapist in training, in the MMST for two years

Therapeutic area

1. Art therapist: Therapeutic management in the field of pain therapy, among others

Former complex-psychologically comorbid chronic pain patients

1. Patient 1: eleven stays in the MMST
2. Patient 2: two stays in the MMST

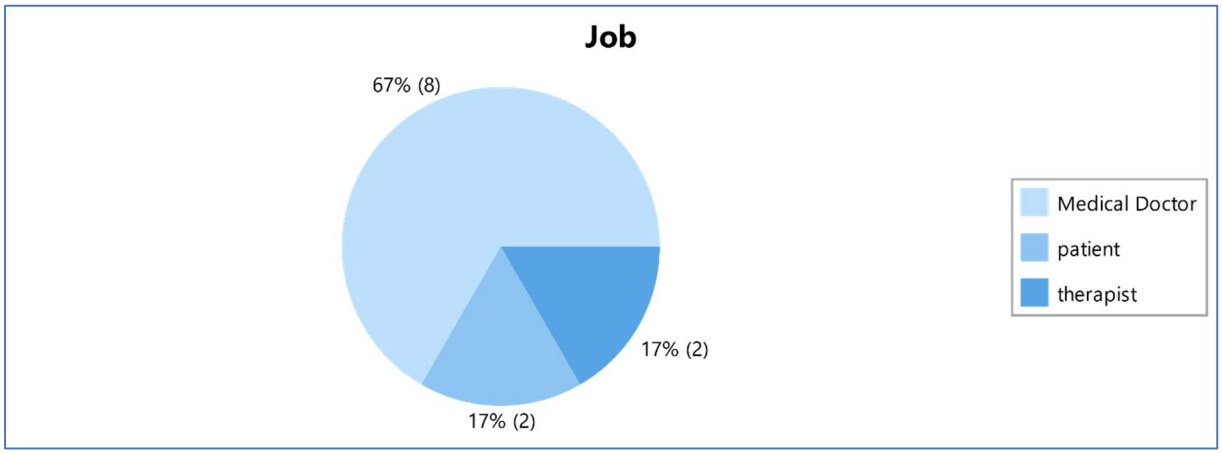

Figure 1: Overview of profession and/or status of experts
Source: own presentation, 2023

2.5 Qualitative and quantitative analysis of primary data: expert interviews

In order to answer the three research questions, semi-standardized expert interviews were conducted. In addition, both open and closed questions were asked to investigate the qualitative content, which were relevant for answering the research questions (Gläser and Laudel, 2010, p. 41–42).

The expert interview includes 18 statements, which the experts were able to answer as follows:

1. Consent (Can you confirm the statement?)
2. Rejection (Do you disagree with this statement?)
3. No statement possible (I can't judge that.)
4. Justification of the answer (Can you justify your answer?)

The experts' responses were recorded and transcribed so that they could be evaluated quantitatively and qualitatively. Subsequently, a list of expert statements was created with the help of the MAXQDA 2023 software and summarized in the form of a report.

The direction of the causal relationship (which of the observed variables are causes, which are effects?) as well as the causal mechanism that exists between cause and effect are not given by an empirical investigation. Gläser and Laudel point out the need to validate qualitative interdependencies through qualitative research. As a result, no causal relationships can be derived from the statistical correlations found in the preliminary study in the strictly scientific sense and the applicability of the results cannot be definitively evaluated (Gläser and Laudel, 2010, p. 26–28). For this reason, additional interviews were conducted with experts and those affected in order to answer the research questions in a well-founded and satisfactory manner and to rule out the possibility that the correlations determined are only coincidental.

2.6 Conducting the expert interviews

The procedure for creating a guideline for the expert interview is based on the chapter "Guideline and Expert Interviews" by Cornelia Helfferich (Baur and Blasius, 2014, p. 559–574) and on the book "Expert Interviews and Qualitative Content Analysis" (Gläser and Laudel, 2010).

The interviews lasted between 14 and 31 minutes.

The interview questions and interview guide can be found in the Harvard Dataverse Public Archives (see Appendix).

2.7 Description of the data collected

Overview of the data

A total of twelve interviews were conducted in German. Five women and five men worked in the field of chronic pain treatment, so that they were able to make an important contribution to solving the research questions. Another two women were complex-psychologically comorbid chronic pain patients with many years of suffering. Seven women and five men were interviewed.

The individual expert descriptions are described in detail in chapter 2.3.1 Expert selection.

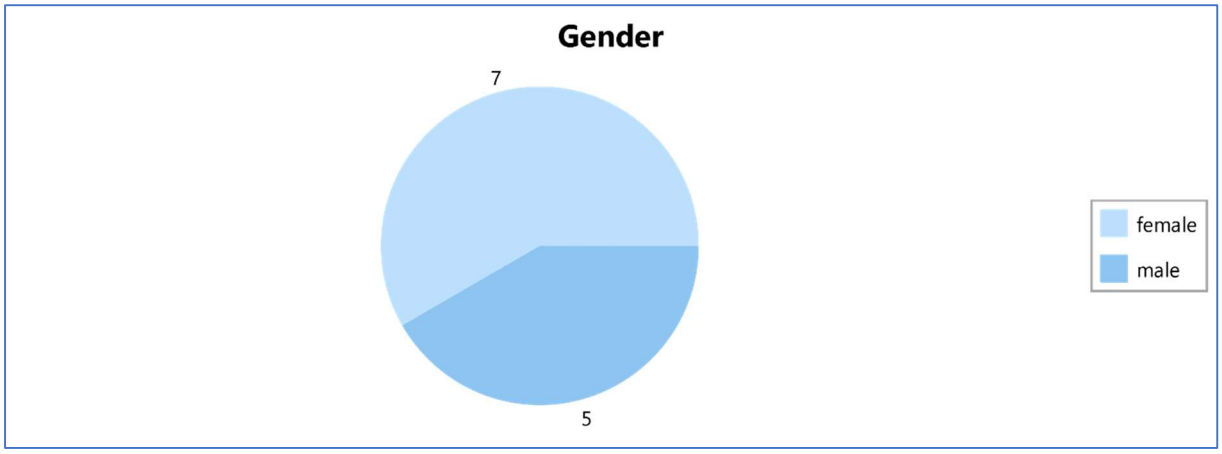

Figure 2: Gender of the subjects
Source: own illustration, 2023

The interviewees were between 33 and 69 years old and all had many years of experience with MMST.

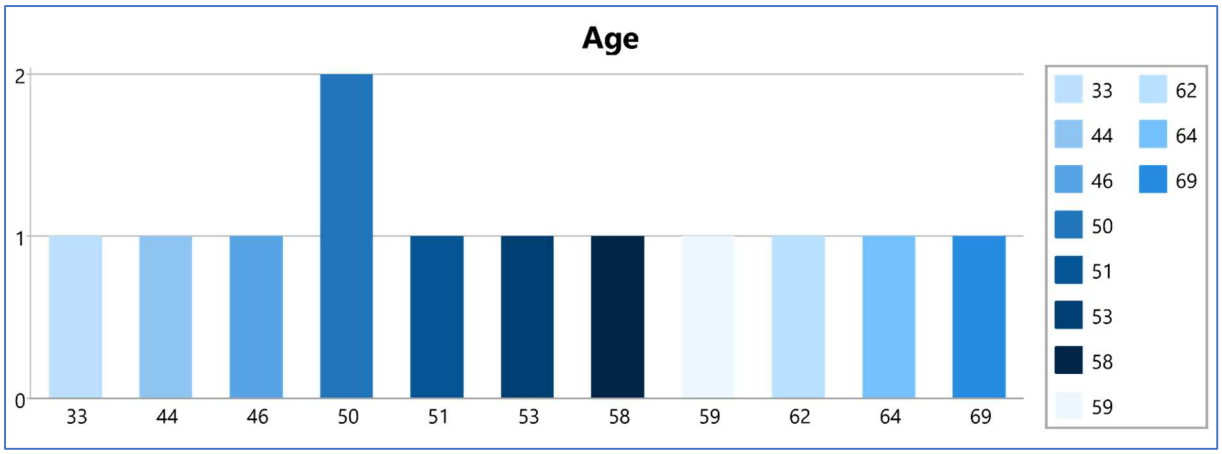

Figure 3: Age structure of the subjects
Source: own illustration, 2023

2.8 Evaluation and results

The responses were evaluated quantitatively by calculating the percentages of agreement, disagreement, and indifference for each acceptance. In addition, the experts' justifications were qualitatively evaluated by conducting a qualitative content analysis using the MAXQDA 2023 software. (Kuckartz and Rädiker, 2022, p. 53–103).

The book "InterViews. Learning the craft of qualitative research interviewing" by p. Brinkmann and p. Kvale provided a detailed explanation of the evaluation of interviews and was also the basis of the methodological approach used (Brinkmann and Kvale, 2015).

3 Results

3.1 Quantitative Analysis

The answers of the interviewees were given within the framework of the given answer options (agreement, rejection, no statement possible). In order to be able to answer the research question 1, "Do chronic pain patients with trauma have a lower treatment success than chronic pain patients without traumatization?", the corresponding statements were quantitatively evaluated (for a description of the statements, see chapter 2.2 Research questions). The evaluation of research question 1 led to the following results:

Table 1: Experts' answers to research question 1

Statements	Number of approval / %	Number of rejection / %	Number of no statement / %
1	12 / 100%	-	-
4	10 / 83,33%	-	2 / 16,67%
5	10 / 83,33%	-	2 / 16,67%
6	10 / 83,33%	-	2 / 16,67%
8	12 / 100%	-	-
9	11 / 91,67%	-	1 / 8,33%
10	8 / 66,66%		4 / 33,33%
11	11 / 91,67%	-	1 / 8,33%
15	11 / 91,67%	-	1 / 8,33%
16	12 / 100%	-	-
17	12 / 100%	-	-

The majority of the answers given confirm research question 1.
As can be seen in Table 1, the statements are confirmed by the vast majority of interviewees. None of the statements are rejected, only seven times statements cannot be confirmed or rejected because the interviewees cannot judge the statement with certainty.
In order to be able to answer the research question 2, "Do complex-psychologically (from an additional F-diagnosis) comorbid chronic pain patients with trauma have a lower treatment success in multimodal pain therapy than complex-psychologically comorbid chronic pain patients without traumatization?", the corresponding statements were quantitatively evaluated (for a description of the statements, see chapter 2.2 Research questions).

Table 2: Experts' answers to research question 2

Statements	Number of approval / %	Number of rejection / %	Number of no statement / %
4	10 / 83,33%	-	2 / 16,67%
5	10 / 83,33%	-	2 / 16,66%
6	10 / 83,33%	-	2 / 16,66%
8	12 / 100%	-	-
10	8 / 66,66%		4 / 33,33%
12	12 / 100%	-	-
13	10 / 83,33%	-	2 / 16,67%
15	11 / 91,67%	-	1 / 8,33%
16	12 / 100%	-	-
17	12 / 100%	-	-

The majority of the answers given confirm the research question 2.
As can be seen in Table 2, the statements are confirmed by the vast majority of interviewees. None of the statements are rejected, only six times statements cannot be confirmed or rejected because the interviewees cannot judge the statement.
In order to be able to answer the research question 3, "Which components must an optimized multimodal pain therapy contain in order to enable chronic pain patients with traumatization elements and/or complex-psychologically comorbid chronic pain patients with trauma to improve treatment success?", corresponding statements were quantitatively evaluated (for a description of the statements, see chapter 2.2 Research questions).

Table 3: Experts' answers to research question 3

Statements	Number of approval / %	Number of rejection / %	Number of no statement / %
2	12 / 100%	-	-
3	12 / 100%	-	-
7	12 / 100%	-	-
14	12 / 100%	-	-

All the answers given confirmed the research question 3.
As can be seen in Table 3, the statements are confirmed by all interviewees. None of the statements are rejected.

3.2 Qualitative analysis

In order to answer research questions 1, 2 and 3, the interviews were qualitatively evaluated. For this purpose, the interviews were coded and qualitatively evaluated with the help of MAXQDA 2023. The respondents' responses to the statements were summarized.

Research Question 1
In order to be able to answer question 1, "Do chronic pain patients with trauma have a lower treatment success than chronic pain patients without traumatization?", the following statements were evaluated:

Statement 1: Psychological trauma of the patient complicates the success of MMST treatment.
Most respondents agree with this statement, as patients with traumatic experiences often have trouble building trust and forming healthy bonds. The experts have found that these patients have an increased sensitivity to pain and defend themselves against psychosomatic connections. In addition, those affected are usually sceptical and resistant to drug treatments. According to the experts, in order to achieve effective and lasting therapeutic results, it is essential to take psychological and social factors into account.

Statement 4: The severity of the trauma has an influence on the success of MMST treatment.
The majority of experts agree that the severity of the trauma has an influence on the success of multimodal pain therapy. Patients with severe trauma often have a persistent chronification, which makes treatment success considerably more difficult. Dissociative behaviours that can be traced back to severe trauma pose a major challenge in MMST. Several experts recommend interval treatments so that a trusting relationship can develop between the patient and the treatment team. The respondents are of the opinion that patients with mild trauma are more likely to achieve a permanent reduction in pain than patients with complex traumatization. One expert is convinced that the structural level of patients with severe trauma is usually much lower than that of people who have not experienced trauma. The severity of the trauma also has an influence on the fears of patients regarding the therapy offers, especially when it comes to whether and how they can get involved. It is believed that traumatization at an early biographical stage of life affects the outcome of treatment.

Statement 5: The time of traumatization of the pain patient has an influence on the success of the MMST – the sooner, the stronger.
The majority of respondents agree that aversive childhood experiences impair the effectiveness of MMST because such experiences cause long-lasting pathways in the brain associated with pain processing and also have a negative effect on the psyche. The chronic pain patients surveyed were unanimous in their opinion that their negative experiences in childhood contributed to their current condition.

Statement 6: Childhood stress and insecure attachment behaviour have a negative effect on the treatment of chronic pain patients with trauma.
The experts assume that traumatic childhood experiences alter the modified cellular and neuroendocrine expression patterns at several levels of pain processing, leading to increased pain perception. Some respondents have found a negative association between treatment outcomes and the severity of childhood trauma, insecure attachment behaviours, and stress. Childhood trauma can lead to chronic pain by increasing sensitivity to pain signals.

Statement 8: The investigated subgroups differ in the effectiveness of MMST.
The experts believe that the effectiveness of MMST varies across the five subgroups with varying degrees of severity of mental illness. The treatment effects differ depending on the severity of the disorders. Patients with trauma or comorbidities are more difficult to

treat. Treatment becomes more difficult the more F-diagnoses and/or traumatization there are. Some respondents noted that MMST could be more successful in patients with numerous F diagnoses and PTSD if treatment was longer, more intense, and more individualized.

Statement 9: Multiple hospital stays of patients with trauma improve the success of treatment.
Experts agree that a patient who has suffered trauma can benefit from multiple hospital stays if a thorough diagnosis is first made, the individual treatment plan is consistently implemented, and the patient is cooperative. The respondents disagree on whether multiple hospital stays generally increase the success of treatment or not. All respondents expressed a desire for a more organized and diagnosis-specific treatment. It emphasizes the importance of clinics that specialize in both trauma and multimodal pain therapy. The experts recommend a combined treatment of psychosomatics and pain medicine to achieve optimal results. This has not yet been implemented in practice in Germany as a result. Psychotherapy and physiotherapy should be continued on an outpatient basis after inpatient MMST in order to optimize the benefit. However, this has its limits, as patients have to put up with long waiting times in outpatient therapy.

Statement 10: The longer it has been since the onset of the pain disorder, the more frequent inpatient stays are. This phenomenon is particularly well known in chronic conditions, as the treatment, but also the management of such diseases, become more and more complex and challenging as the duration of their existence increases. Some of the experts can confirm this, while others cannot make a clear statement on the subject. Nevertheless, there are exceptional cases in which patients can achieve complete freedom from symptoms within a few weeks to months despite long-lasting complaints. Especially in fibromyalgia patients, the diagnosis can become a misleading process that lasts for years, in which traumatization is often identified.

Statement 11: Chronic pain patients with trauma have a lower treatment success than chronic pain patients without traumatization.
The recovery process of traumatized chronic pain patients is subject to a highly complex dynamic process, whereby psychotherapy can make a significant contribution to the success of treatment. The severity of the trauma plays a decisive role in the prognosis - additional therapies during the hospital stay are necessary. The experts have found that this group of patients tends to be more restrained in their expression. Therapists need more time to adequately involve this group in the treatment. They also state that MMST is not optimally implemented in trauma patients.

Statement 15: Concomitant depression has a significant influence on the success of treatment.
The answer to the question was clearly yes, as depression affects mood and increases pain. In general, comorbidities prolong the duration of treatment and complicate it. Because depression is prevalent, it's important to understand how it affects treatment outcomes. In principle, the experts are of the opinion that depression is treatable and that treatment results can be improved by treating it at the same time. It is not clear whether co-occurring depression can be considered a cause or consequence of chronic pain. In any case, there is a connection between the two. Depressed patients are often focused on pain and have increased psycho-social stress, which makes treatment much more difficult. In her opinion, an effective treatment of depression before pain therapy would be ideal.

Statement 16: Stronger fears that occur at the same time have a significant influence on the success of treatment.
Respondents agree that concomitant anxiety can affect treatment outcomes, as they are often associated with avoidance tendencies and impair patient cooperation. The fear of the therapy itself can also be an obstacle. Fears are often linked to trauma and have an additional pain-intensifying effect. Anxiety patients with chronic pain are notoriously harder to treat because they are more likely to refuse medical interventions. Anxiety and chronic pain often occur together.

Statement 17: Concomitant intense stressful situations have a significant influence on the success of treatment.
The answer to the question was a resounding yes. Stressful situations can trigger great inner tension in traumatized pain patients and intensify the pain. The patient's ability to concentrate on the pain process and the corresponding treatment suffers when they are under stress. In addition, the neurotransmitters released under stress increase the sensation of pain. Negative emotions are often misinterpreted as physical pain, as the neural connections between the stress and pain centres can be strengthened by stressful situations. However, new positive learning experiences and close therapeutic support in the clinic can help patients learn to cope better with stressful situations, which in turn has a positive effect on the pain process.

The statements of the experts provided additional important and detailed insights to answer research question 1 and confirmed the suspected connections that chronic pain patients with trauma have a lower treatment success than chronic pain patients without traumatization.

3.3 Research Question 2

In order to be able to answer research question 2, "Do complex-psychologically (from an additional F-diagnosis) comorbid chronic pain patients with trauma have a lower treatment success in multimodal pain therapy than complex-psychologically comorbid chronic pain patients without traumatization?", the following statements were evaluated:

Statement 4: - Already listed on page 12.

Statement 5: - Already listed on page 12.

Statement 6: - Already listed on page 12.

Statement 8: - Already listed on page 12.

Statement 10: - Already listed on page 13

Statement 12: Complex-psychologically comorbid chronic pain patients with trauma benefit less from MMST than the other subgroups.
Multiple diagnoses and entrenched behavioural patterns make treatment more difficult and time-consuming for these patients. Success rates can increase with a sufficient number of individual and group psychotherapies. Patients also benefit from it, but the success is more subtle and takes longer to come. The success rate of treatment is much

lower in patients with complex mental comorbidities. The pain level usually decreases during a stay, but increases again later. The treatment of these people requires empathy, empathy and sustainable, continuous support.

Statement 13: Complex psychologically comorbid chronic pain patients without trauma benefit more from MMST than the other subgroups with traumatization.
Complex psychologically comorbid chronic pain patients without trauma benefit more from the therapy than the other subgroups with traumatization. Traumatization is recognized as a complicating element, but its significance is evaluated differently by respondents. All experts agree that treatment must be adapted to the specific needs of the patient, and that psychotherapy and participation in a pain management group can be very helpful. It was noted by some respondents that both diagnosing trauma and successfully treating patients who are traumatized can be challenging.

Statement 15: - Already listed on page 14.

Statement 16: - Already listed on page 18.

Statement 17: - Already listed on page 18.

3.4 Research question 3

In order to be able to answer research question 3, "Which components must an optimized multimodal pain therapy contain in order to enable chronic pain patients with traumatization elements and/or complex-psychologically comorbid chronic pain patients with traumatization to improve treatment success?", the following statements were evaluated:

Statement 2: Every MMST should be preceded by an examination of whether there is trauma.
Respondents disagree on whether or not a trauma examination is required before starting multimodal pain treatment. Some respondents consider it important to address trauma early, as it can help practitioners better respond to the needs of individual patients. While some argue that this is essential, others stress the importance of a rapid trauma diagnosis to ensure treatment success. All respondents emphasize the need for a comprehensive psychiatric/psychotherapeutic diagnosis in order to recognize potential trauma and to correctly assess the patient's resilience. Above all, the complex psychologically comorbid chronic pain patients surveyed emphasize that traumatization plays a significant role in chronic pain.

Statement 3: MMST should be individually adapted in the case of existing trauma.
All respondents agree that an existing trauma requires individual multimodal pain therapy. The treatment of trauma should therefore be individually adapted. It is recommended to offer more psychotherapeutic conversations or targeted group work so that the patient can better recognize their own patterns and become aware of their own needs. In order to avoid decompensation and flashbacks, some experts emphasize that therapy must be carried out carefully and gently. It is also argued that the pain gives the trauma patient a certain support, which should continue to be guaranteed and by no means omitted.

Statement 7: Addressing trauma early improves the treatment effect in all subgroups with traumatization.
The experts agree that early treatment of trauma improves the treatment effect in all subgroups with traumatization. Understanding the relationship between emotional and somatic distress is an essential aspect of psychoeducation, as trauma is a huge stressor that can lead to chronic pain disorder. In order for chronic pain to develop, it may be preceded by weak or severe traumatization. The treatment of trauma is all the more effective the earlier it is detected. Patients with chronic pain should be screened for trauma before MMST.

Statement 14: In your opinion, do chronic pain patients with trauma and/or complex-psychologically comorbid chronic pain patients with trauma need more tools?
Most professionals recommend closer psychotherapeutic support during and after an inpatient MMST stay. They therefore proposed to at least double the number of psychotherapeutic sessions from a total of two in two weeks (at the Öschelbronn Clinic). I.e., they believe that three to four individual and group sessions per week are optimal.

An expert believes that physiotherapy sessions, including manual treatments, should be used more often in the MMST program to better suit the pain patient.

The healing process, as mentioned in an answer, can also be supported by various tools from the field of exercise therapy (physiotherapy, eurythmy therapy, creative therapies).

Both art and music therapy have been shown to help patients relax, let go of negative thought patterns, and start the healing process. Some professionals have found that MMST patients benefit greatly from artistic therapies.

Some experts argue that a holistic approach must also take into account the mental and spiritual dimension of the patient. For example, one respondent argued that meditation should be included as an additional component of MMST. Another respondent says hypnosis is helpful in motivating patients.

Another expert emphasizes the importance of trauma therapy, as many chronic pain patients suffer from trauma. Many of the patients are traumatized and additionally suffer from several psychiatric illnesses, as a result, more frequent psychotherapy sessions and special support groups are required.

Another expert believes that, in addition to conservative pain treatment, psychosomatic-psychotherapeutic treatment with a trauma-specific orientation is required in most cases. Alternative treatment methods, such as the use of specific wraps and compresses at the Öschelbronn Clinic, additionally support the healing process. The Öschelbronn Clinic has had good experiences with hyperthermia treatment. However, hyperthermia can trigger flashbacks in some patients, especially traumatized or anxious patients. This must be taken into account during treatment.

In addition, in order to increase the effectiveness of MMST, most experts agreed that the duration of treatment should be extended from the current two weeks to three to four weeks. One expert even advocated an eight-week treatment period. Outpatient psychotherapy and physiotherapeutic follow-up care were also favoured by the majority of respondents.

The currently practiced separation of psychosomatics and multimodal pain treatment is a topic that is explicitly addressed by some experts. They believe that the treatment of other mental illnesses should be carried out together with the treatment of chronic pain as part of a hospital stay. However, this is currently not being implemented in practice.

3.5 Summary of analysis results

Research Question 1

90.15% of the experts are of the opinion that chronic pain patients with trauma have a lower treatment success than chronic pain patients without traumatization. 9,85% of respondents did not give a verdict.

The majority of experts agree that the severity of the trauma has an influence on the success of multimodal pain therapy. Patients with severe trauma often have persistent chronification, which makes the success of treatment considerably more difficult. Dissociative behavioural patterns resulting from severe trauma pose a major challenge for MMST. Some experts therefore recommend interval treatments so that a trusting relationship can develop between the patient and the treatment team. The respondents are of the opinion that patients with mild trauma are more likely to achieve a sustainable reduction in pain than patients with complex traumatization.

Traumas can also create fears that can impair the success of treatment.

It is also assumed that trauma at an early biographical stage of life has a negative impact on the outcome of treatment.

Research Question 2

89.17% of the experts are of the opinion that complex-psychologically (from an additional F-diagnosis) comorbid chronic pain patients with traumatization have a lower treatment success in MMST than complex-psychologically comorbid chronic pain patients without traumatization. 10,83% of respondents did not give a verdict.

The experts assume that the success rates of treatment are much lower in patients with complex, co-occurring mental illnesses.

MMST could be more successful in patients with numerous F diagnoses and PTSD if the treatment was longer, more intense, and more individualized.

Some respondents noted a negative association between treatment outcomes and the severity of childhood trauma, insecure attachment behaviours, and stress.

Research Question 3

All experts are convinced (100%) that the use of additional tools in MMST is necessary to increase effectiveness for these psychic subgroups.

All respondents agree that an existing trauma requires individual intensive multimodal pain therapy. They also consider early reappraisal of the trauma to be important in order to improve the success of treatment. All respondents emphasize the need for intensive

psychiatric diagnostics in order to detect possible trauma and to correctly assess the patient's resilience.

Most experts recommend closer psychotherapeutic support during and after an inpatient MMST stay. They propose to increase the number of psychotherapeutic sessions from a total of two in fourteen days to at least double. In addition to conservative pain treatment, psychosomatic-psychotherapeutic treatment with a trauma-specific focus is usually required.

Other important tools proposed are the use of meditation, hypnosis treatment, psychoeducation, intensified physiotherapy, alternative methods of treatment (wraps, compresses), hyperthermia, participation in support groups, etc.

The currently practiced separation of psychosomatic medicine and multimodal pain treatment is considered problematic by some experts. They believe that the treatment of other mental illnesses, along with the treatment of chronic pain, should be done as part of a single hospital stay.

4 Discussion

The analysis of the expert interviews primarily led to additional information regarding the evaluation of the effectiveness of Multimodal Pain Therapy (MMST) and the answers to the research questions. The experts emphasized the need for a differentiated and individualized treatment strategy for patients with chronic pain.

The effectiveness of MMST also depends to a large extent on a comprehensive and appropriate psychological and psychiatric diagnosis. Such diagnostics make it possible to identify and treat possible traumas associated with chronic pain at an early stage. Epidemiological research supports the observation that pain and trauma often occur together, which is also confirmed by the experts interviewed. Both diseases have similar symptoms that are mutually dependent. The Mutual Maintenance Model illustrates these relationships.

Further developed psychological models, such as the Perpetual Avoidance Model according to Liedl and Knaevelsrud as well as the extension of this model by Traue and Riffer, offer additional explanatory approaches for the statements of the experts (Liedl and Knaevelsrud, 2008, p. 644–651; Liedl, 2010; Riffer et al., 2017). These models illustrate the interactions between the two disorders and can illustrate the vicious cycle that complicates the treatment of patients with complex mental comorbidity and chronic pain. These models can be used to identify factors that contribute to the maintenance of post-traumatic pain and must be taken into account in treatment (Liedl and Knaevelsrud, 2008, p. 644–651). The importance of these interactions is explicitly mentioned by the experts.

In addition, the experts point out that patients with complex-psychological comorbidity and chronic pain need additional treatment tools, such as a longer duration of treatment and a higher frequency of psychotherapeutic sessions. They are of the opinion that movement and artistic therapies within the framework of MMST can positively influence the success of treatment, although there are currently no standardized treatment programs for these psychological subgroups and therefore a comparability of the effectiveness of MMST is not possible.

Lukas et al. suggest that compared to acute pain, central neuronal processes and dysfunctional factors play a greater role in the maintenance of chronic pain than organic causes (Lucas, Eich and Tesarz, 2022, p. 291–308). Therefore, it is crucial to first consider psychological influencing factors and to include them more strongly in the MMST. There is still a considerable need for research in this area.

5 Conclusions and limitations

The evaluation of the expert interviews allows the following conclusions:

Complex psychologically comorbid chronic pain patients with trauma belong to the subgroup that benefits least from MMST, as the treatment focus of MMST is often organ-specific. This focus is also reflected in studies on the effectiveness of MMST. The efficacy studies usually refer to chronic back pain, chronic headaches, etc., but not to chronic subgroups.

According to experts, complex psychologically comorbid chronic pain patients with trauma are the most difficult to treat. MMST can become more effective for these patients if intensive diagnostics are carried out with a view to trauma and other concomitant mental disorders and are included in the therapy accordingly.

If there is a mental health diagnosis, adequate tools must be included in the treatment plan. Under this premise, the treatment of organic or physical symptoms would take a back seat.

In the interviews, the experience of the experts has clearly shown that the psychological symptoms or diagnoses with the corresponding symptoms in chronic pain patients should be more in the foreground of the treatment, while the somatic complaints should be treated rather unspecific in the MMST.

In summary, Multimodal Pain Management (MMST) for patients with chronic pain and complex psychological comorbidity is a major professional challenge for the entire team. The analysis of the expert interviews underlines the importance of a differentiated and individual therapy, which includes a comprehensive psychological and psychiatric diagnosis. This is crucial for detecting and treating potential trauma at an early stage, as it is often associated with chronic pain.

The interactions between pain and trauma, as depicted in the psychological models of Liedl and Knaevelsrud and in the extension of Traue and Riffer, provide insights into the complexity of these comorbid disorders and the challenges of treatment. They also highlight the need to identify factors that contribute to the maintenance of post-traumatic pain.

In addition, the experts emphasize that patients with complex psychological comorbidity and chronic pain need additional therapeutic tools. However, there is currently a lack of standardized treatment programs for these specific patient groups, which makes it difficult to compare the effectiveness of MMST.

Research by Lukas et al. (2022) indicates that in chronic pain, central neuronal processes and dysfunctional factors play a greater role than organic disorders. This underlines the need to focus more strongly on psychological influencing factors in MMST.

Overall, these findings underpin the urgent need for further research in this area to develop and optimize effective treatment strategies for patients with complex mental comorbidity and chronic pain.

The study presents a sound methodology with a combination of qualitative and quantitative approaches to data collection and analysis. Nevertheless, there are some possible limitations that need to be considered when interpreting the results:

1. Sample size and selection: The number of interviewees is relatively small (12 experts), which could limit the generalizability of the results. In addition, the experts represent a specific geographical region (Klinik Öschelbronn, Baden-Württemberg), and it is unclear whether the results are transferable to other contexts.
2. Self-reported data: The data is based on expert self-reports and may therefore be influenced by subjective biases and interpretations. Furthermore, the self-selection of the participating experts could lead to a bias effect.
3. Lack of control groups: No control groups were used in the study, which limits the comparison of MMST efficiency between the defined subgroups and other patient groups.
4. Heterogeneity of subgroups: The defined subgroups are based on the ICD-10, but may be heterogeneous with respect to other relevant factors that have not been considered, such as age, gender, duration and severity of pain, extent of psychological comorbidities, and other health conditions.
5. Potential confounding factors: The study does not control for all potential confounding factors that could affect both pain symptoms and mental states. These include socioeconomic factors, lifestyle factors, and other medical conditions.
6. Hypothesis generation: The hypotheses were formulated on the basis of a literature review. While this is a valid approach, there is always the risk that the literature review was not complete and therefore important studies or theoretical approaches were overlooked.
7. Use of software for data analysis: Using software such as MAXQDA 2023 for qualitative data analysis could potentially lead to alienation of researchers from the data and affect the depth of interpretation.
8. Date of data: Data was collected in June 2023. It is therefore possible that current developments in pain therapy and the treatment of mental disorders since and before data collection have not been taken into account.
9. Limited study of causality: The study makes hypotheses about causal relationships, but the methodology does not allow for a definitive determination of causality. The approach of expert interviews can only show associations and correlations, but cannot definitively prove that one variable causes another.

Despite these limitations, the present research represents an important step in the field of research. The results obtained in the study provide valuable insights and can serve as a starting point for future investigations. They allow other researchers to continue and expand this work by considering the limitations of the study and trying to overcome them in their own studies.

Furthermore, it should be emphasized that no study is completely free of limitations. Acknowledging and being aware of these limitations underlines the diligence and integrity of the researchers. The present study also has strengths and weaknesses, which have been disclosed herewith.

This study, despite its limitations, contributes to the expansion of our knowledge and makes a significant contribution to the scientific literature in the field of research under investigation. It is this constant process of learning and improving that makes scientific research so robust and dynamic. Each study, no matter how perfect or flawed it may be, contributes to this process and brings us closer to understanding the complex world we live in.

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Appendix

The following data file can be viewed in the Harvard Dataverse:

- Max QDA project file including expert interview transcripts

The file can be permanently downloaded from the following link:

https://doi.org/10.7910/DVN/O6OROH