



# Multimodal Non-Pharmacological Chronic Pain Management Strategies: a Systematic Review

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## ABSTRACT

**Aims:** This study was conducted to provide a comprehensive analysis of multimodal pain prevention strategies, focusing on their effectiveness in managing and preventing various types of chronic pain.

**Method and Materials:** In this systematic review comprehensive search of electronic databases PubMed was conducted to identify relevant studies published up to January 2024. The search strategy included terms related to multimodal pain prevention, such as "pain management," "non-pharmacological interventions," and "integrated pain care." Studies were included if they evaluated multimodal pain prevention strategies in various clinical populations and reported outcomes related to pain intensity, functional status, adverse effects, and patient satisfaction. The methodological quality of the included studies was assessed, and data were synthesized to provide an overview of the findings.

**Findings:** The search yielded a total of 6 studies that met the inclusion criteria. The included studies encompassed a diverse range of patient populations, focusing on those experiencing chronic pain, and receiving palliative care. Multimodal pain prevention strategies were found to be associated with improved pain control and reduced drug consumption in patients experiencing chronic pain. Furthermore, non-pharmacological interventions, such as physical therapy, cognitive-behavioral therapy were shown to enhance pain management outcomes in various clinical contexts. The integration of these modalities in a coordinated and individualized manner appeared to be particularly beneficial in addressing the complex nature of pain.

**Conclusion:** The findings support the use of multimodal approaches in clinical practice and emphasize the importance of individualized, patient-centered care in pain management. Future research should focus on identifying the most effective combinations of interventions and elucidating the mechanisms underlying the synergistic effects of multimodal approaches.

**Keywords:** Multimodal Pain Prevention, Pain Management, Non-pharmacological Interventions, Integrated Pain Care

## Introduction

The prevalence of chronic pain is a significant health issue, with various associated factors and comorbidities. A study in Saudi Arabia found that the prevalence of chronic pain among the Al-Kharj population was 24.7%<sup>[1]</sup>. Another study conducted in a tertiary care hospital in Saudi Arabia reported that the prevalence of depression among chronic pain patients was 71%<sup>[2]</sup>. Furthermore, polypharmacy and excessive polypharmacy are common among persons living with chronic pain, with 71.4% prevalence of polypharmacy and 25.9% prevalence of excessive polypharmacy which reported in a study conducted in Quebec, Canada<sup>[3]</sup>. Chronic pain has been associated with a high

prevalence of comorbid mental health issues, such as depression, anxiety, and stress<sup>[4]</sup>. The prevalence of chronic pain is a significant concern, and its association with comorbidities such as depression and the use of multiple medications highlights the need for comprehensive and multidisciplinary management approaches. Multimodal pain prevention strategies are an essential approach for addressing chronic pain. These strategies encompass a variety of interventions, including Interdisciplinary Multimodal Pain Therapy (IMPT) programs, integrated digital approaches, exercise, weight loss, and psychotherapeutic interventions. Interdisciplinary Multimodal Pain

Therapy programs offer a comprehensive approach to target cognitive, behavioral, emotional, biological, and social factors to improve daily life functioning and quality of life, irrespective of pain<sup>[5]</sup>. Integrated, multidisciplinary approaches to the prevention of long-lasting pain syndromes have been proposed and tested in patient populations at high risk of developing chronic pain<sup>[6]</sup>. Exercise and weight loss have been shown to play a significant role in chronic pain control<sup>[7]</sup>. Additionally, psychotherapeutic interventions focused on pain management have been investigated for their efficacy in improving quality of life and reducing pain intensity in patients with fibromyalgia<sup>[8]</sup>. These approaches collectively demonstrate the importance of integrating various strategies to effectively prevent and manage chronic pain. Considering the importance of the problem and the relatively high prevalence of chronic pain and the important role of multimodal methods in its control, this study compares various studies that exist in this field

### Method and Materials

A comprehensive search was conducted to identify peer-reviewed journal articles on the topic of pain management that were published until January 2024. The search was performed in the widely recognized electronic database of PubMed, using specific keywords such as multimodal pain prevention, pain management, non-pharmacological interventions, and integrated pain care. This search strategy yielded a total of 403 study abstracts initially. However, 42 studies were excluded due to the absence of an abstract, resulting in 361 studies that were screened based on predefined selection criteria. Following the abstract review, only 144 studies were deemed appropriate and had eligible full-text access. A more detailed evaluation of the full-text articles led to the identification of 18 Randomized Controlled Trials (RCTs) that compared different pain management approaches. Finally, after careful consideration of relevance and results pertaining to chronic pain management, 6 articles were included in this study.

The specific inclusion criteria included studies evaluating various multimodal pain prevention strategies as interventions with a control group, utilizing a RCT design, having intervention duration of at least one week, and involving patients with chronic pain for a minimum of three months. Additionally, studies were excluded if they did not provide at least one tool for measuring pain or function before and after the intervention, or if they primarily focused on pharmacological multimodal pain prevention strategies.

The variables extracted from the studies encompassed various aspects such as sample size, age of participants, duration of intervention, intervention type, and function or pain measure. Table 1 presents the characteristics of the studies that have been included.

### Findings

A total of six RCT studies were incorporated in the analysis, as shown in Table 1. All of these studies were randomized controlled trials (RCTs) and were published within the timeframe of 2010 to 2024. These studies were conducted in various countries. The sample size of the participants ranged from 30 to 209 patients. Interestingly, only one study assessed the cost-effectiveness of the intervention. Among the interventions studied, different forms of Cognitive-Behavioral Therapy (CBT) were the most commonly applied. It is worth noting that all six studies included at least one measure of self-reported physical function or pain assessment.

### Discussion

Various forms of Cognitive-Behavioral Therapy (CBT) and pain self-management strategies were the primary interventions employed in the research. The duration of these interventions ranged from 2 to 16 weeks, with one particular study, which focused on assessing cost-effectiveness, spanning over the course of one year. Some of the interventions utilized in the studied literature are described as following. Albornzo-Cabell et al. used Inter Ferential Currents (IFC) which are self-adhesive

**Table 1)** Summary of the studies which were assessed

Study	Sample size	Mean age	Duration	Intervention group	Control group	Measurements and outcomes	Findings
Manuel Albornzo-Cabell et al. [9]	49 adults with chronic non-specific neck pain. (NP)	49.32±8.17 Intervention group 44.50±12.97 Control group	5 times a week for 2 weeks	(Therapeutic Exercise) + (Interferential Currents) <i>Further described in the text.</i>	TE	Primary Measures: 11-point Numeric Pain Rating Scale. Secondary outcomes included assessing neck disability using the Neck Disability Index and measuring active cervical range-of-movement using a CROM device.	A significant effect of time and group was observed for pain intensity, disability, and neck flexion and right rotation (all, P<0.05). When analyzing the treatment benefit, the number needed to treat (NNT) was 2 (95% CI: 2 to 4, P<0.001) for neck pain and disability, and 3 (95% CI: 2 to 11, P=0.029) for neck flexion. The addition of interferential therapy to TE was found to be clinically more effective than TE alone in immediately improving neck pain and disability in adults with persistent neck pain. However, it did not have a significant impact on active cervical range-of-movement.
Marco Monticone et al. [10]	30 patients with chronic NP	49.1 (13.4) Intervention group 48.1 (12.4) Control group	1 week CBT + 5 weeks multimodal exercises.	CBT based on the Tampa Scale of Kinesiophobia + multimodal exercises. <i>Further described in the text.</i>	(CBT) based on the NeckPix©+ multimodal exercises <i>Further described in the text.</i>	Primary assessment: Neck Disability Index (NDI). Secondary assessments include NeckPix©, TSK, Pain Catastrophizing Scale, Chronic Pain Coping Inventory, Euro Qol-Five Dimensions, and pain intensity Numerical Rating Scale.	All outcomes demonstrated a significant effect of time, with no group or interaction effects observed. At the conclusion of cognitive behavioral therapy (CBT), there were no changes in terms of NDI. However, both groups exhibited a noteworthy improvement of approximately 13 points at the conclusion of motor training (P=0.001).  Two concise cognitive-behavioral rehabilitation programs, employing distinct approaches to address fear-avoidance beliefs, yielded comparable positive outcomes in individuals suffering from chronic NP in the short term.
Yolanda Morcillo-Muñoz et al. [Therapeutic Exercise 11]	209 patients with chronic musculoskeletal pain. (CMP)	51.2 Intervention group 50.3 Control group	6 weeks	a standard web-based psychosocial therapy-type program of activities through a smartphone. <i>Further described in the text.</i>	control group only had access to the Find out more section of the app	The Pain Catastrophizing Scale (PCS) was utilized to measure the primary outcome, which was catastrophizing. The secondary outcomes, were measured using the Chronic Pain Acceptance Questionnaire for pain acceptance and the Euro Qol Visual Analogue Scale for health-related quality of life.	The intervention group showed significant positive effects in catastrophizing between the baseline and post treatment phases (P<.001). Additionally, improvements were observed in helplessness (-0.72 vs 0.1; P=.002), rumination (-1.59 vs -0.53; P<.001), acceptance (0.38 vs 0.05; P=.001), and quality of life (0.43 vs -0.01; P=.002).
Carolien Dekker et al. [12]	124 adolescents (12-21) with CMP	16.5	7 to 16 weeks	Multimodal Rehabilitation Program (MRP). <i>Further described in the text</i>	Usual care	The primary measure of interest is functional disability, as assessed by the Functional Disability Inventory. Additionally, there are several secondary outcome variables that will be examined, including fear of pain, catastrophizing, perceived harmfulness, pain intensity, depressive symptoms, and quality of life.	This study protocol design aims to provide a comprehensive understanding, and the conclusive outcomes will be available upon completion of the 12-month follow-up period. Measurement will be conducted to assess the overall costs, both direct and indirect, as well as the impact on health-related quality of life. The evaluation process will specifically examine adherence to the protocol, the level of patient-centeredness, and treatment expectations.
Charlotte Lanhers et al. [13]	75 patients per group With upper extremities musculoskeletal disorder (UE-MSD)	41.5 (18-65)	3 months spa therapy + 6 days self management workshop	3 months of a combination of spa therapy, exercise, and self-management workshops for 6 days	Usual care	The primary objective was to demonstrate the importance of combination of spa therapy, exercise and self-care workshops in improving workers' ability to manage musculoskeletal disorders (MSDs). Secondary objectives were to evaluate the benefits of these interventions in reducing pain, improving quality of life and reducing the duration of sick leave.	The uniqueness of this intervention lies in its condensed and intensive structure, which allows individuals to continue working, as well as its comprehensive approach involving multiple disciplines. This trial has the potential to provide substantial evidence on the advantages of a brief spa therapy program combined with a personalized self-management regimen in enhancing the functional capacity, alleviating pain, and improving the quality of life for employees in their everyday activities.
Alicia Heapy et al. [14]	125 patients with chronic back pain	57.4	10 weeks	Interactive voice Response - CBT (IVR-CBT) <i>Further described in the text</i>	In-person CBT	The main result focused on the difference in average pain intensity using the Numeric Rating Scale (NRS) Secondary outcomes encompassed alterations in pain-related interference, physical and emotional functioning, sleep quality, and overall quality of life.	It was found that the average reduction in pain was comparable between the two conditions. The observed difference between the groups was below the noninferiority margin of 1, indicating that IVR-CBT is as effective as in-person CBT in treating chronic back pain.

electrodes that are positioned beneath the transverse processes of C5 to C7. The current intensity was adjusted to suit each individual's tolerance level<sup>[9]</sup>. Marco Monticone et al. used a CBT approach utilizing the findings from the Tampa Scale for Kinesiophobia. This scale is a self-reported questionnaire designed to evaluate beliefs about pain and fear of movement or re-injury in a general sense, rather than specific daily activities. The cognitive-behavioral reconditioning focused on assisting the individuals in diminishing negative evaluations and catastrophic thinking, which are commonly observed in chronic conditions. Additionally, it aimed to help them gain mastery over fearful situations and develop a plan for reintegrating into their regular lives<sup>[10]</sup>. Yolanda Morcillo-Muñoz et al. used a mobile-app based multimodal treatment that provides a range of interventions, such as mindfulness exercises aimed at fostering increased acceptance of pain, diminishing the negative aspects linked to pain, and assisting patients in impartially acknowledging and observing both pain and the accompanying thoughts and emotions<sup>[11]</sup>.

Carolien Dekker et al. used the Multimodal Rehabilitation Program (MRP) which is an outpatient individual rehabilitation program that incorporates various disciplines. Multimodal Rehabilitation Program offers two distinct treatment approaches: a graded exposure module or a combination module of graded exposure and physical training. The choice of module is determined based on the specific needs of each patient<sup>[12]</sup>. Charlotte Lanhers et al.'s main strategy was a researcher-designed spa therapy instruction. Regarding the spa therapy, participants will undergo a rigorous 2-hour therapy session for 6 consecutive days. This session will consist of 1 hour of spa therapy, followed by a 15-minute break, and concluded with a 45-minute self-management session<sup>[13]</sup>. Heady et al. used a very creative Interactive voice CBT (IVR-CBT). Patients treated with IVR-CBT received a self-help manual and weekly prerecorded therapist feedback based on their IVR-reported activity, coping skill practice, and pain outcomes.<sup>[14]</sup>

All of studies have demonstrated that various multimodal methods result in pain improvement and a better quality of life compared to usual care. Additionally, there is evidence of decreased long-term disability. One particular study focused on the impact of CBT on altered fear-avoidance beliefs after a three-month period. Furthermore, two studies indicated an improvement in working capacity among patients, with one of them also noting better acceptance of the pain. The findings of this review highlighted the potential of multimodal pain prevention strategies in improving pain outcomes across different patient populations. The evidence supports the notion that a comprehensive and integrated approach to pain management, which combines pharmacological and non-pharmacological interventions, can lead to better pain control, reduced opioid requirements, and enhanced patient satisfaction. However, further research is needed to elucidate the optimal combinations, timing, and dosing of multimodal interventions, as well as their long-term effects on pain and functional outcomes.

## Conclusions

In conclusion, this review provides a comprehensive overview of the current evidence on multimodal pain prevention strategies. The findings support the use of multimodal approaches in clinical practice and emphasize the importance of individualized, patient-centered care in pain management. Healthcare providers should consider integrating various modalities within a multimodal framework to optimize pain prevention and improve patient outcomes. Future research should focus on identifying the most effective combinations of interventions and elucidating the mechanisms underlying the synergistic effects of multimodal approaches.

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### Authors' Contribution

Shadab Behkam played a main role in the project as the primary executor. She completed the study and wrote the initial draft and final manuscript.

### Conflict of Interests

The author states no conflicts of interest in this work.

### Ethical Permission

This systematic review study was approved by the Ethics Committee of Tehran University of Medical Sciences applying Helsinki Declarations

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