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Non-Pharmacological Interventions for Chronic Pain Management: A Narrative Review

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Abstract— Background: Chronic pain is a pervasive and debilitating condition affecting millions globally, leading to significant distress, disability, and economic burden. Characterized by persistent or recurring pain lasting beyond three months, it profoundly impacts quality of life, mental health, and socioeconomic well-being.

Objectives: This comprehensive review critically evaluates the efficacy and safety of various non-pharmacological interventions for chronic pain management.

Methods: A systematic search was conducted across PubMed, Scopus, CINAHL, and Web of Science databases for studies published in English between 2000 and 2024. Keywords related to chronic pain and non-pharmacological interventions were identified, including physical therapies, psychological therapies, and complementary and integrative medicine (CIM) modalities. Study selection focused on randomized controlled trials, controlled clinical trials, systematic reviews, cohort studies, and case-control studies involving adults with chronic pain.

Results: Physical therapies, such as manual therapy, exercise therapy, and therapeutic modalities, demonstrate benefits in improving physical function and reducing chronic pain. Psychological therapies, including cognitive behavioural therapy (CBT), mindfulness-based stress reduction (MBSR), and acceptance and commitment therapy (ACT), are crucial for addressing the psychological and emotional dimensions of chronic pain. CIM modalities such as yoga, Tai Chi, acupuncture, and massage therapy offer complementary approaches. The strength of evidence varies across interventions, with CBT and exercise therapy supported by robust evidence, while other modalities require further investigation.

Conclusions: This review underscores the importance of a multimodal approach to chronic pain management, integrating physical, psychological, and CIM therapies.

Index terms— Chronic pain; Cognitive Behavioural Therapy; Mindfulness-based Stress Reduction; Non-pharmacological Interventions; Occupational Therapy; Physical Therapy; Psychological Therapies.

I. INTRODUCTION

Chronic pain is a pervasive and debilitating state that affects millions of people globally, causing significant distress, disability, and economic burden. Characterized by persistent and recurring pain lasting beyond three months, it can profoundly impact an individual's quality of life, mental health, and socioeconomic well-being [1]. The prevalence of chronic pain varies widely, with estimates suggesting that it affects approximately 30% of the global population. Another report estimates that more than 100 million adults are affected by chronic pain, resulting in substantial economic and healthcare burdens [2].

The complex aetiology of chronic pain involves multiple factors, including biological, psychological, and social components. Biological causes include tissue damage, inflammation, and genetic predisposition. Moreover, multiple types of injury or infection can lead to the activation of nociceptors [3]. Additionally, chronic pain can be caused by underlying medical conditions, such as arthritis, fibromyalgia, or neuropathic pain [4].

Traditionally, the management of chronic pain has relied heavily on pharmacological interventions—primarily opioid analgesics. While these medications can offer temporary pain relief, they are associated with significant risks, including addiction, dependence, respiratory depression, and gastrointestinal complications. Prolonged opioid use can also lead to tolerance and even paradoxical increases in pain sensitivity, known as opioid-induced hyperalgesia [5].

Recognizing the limitations and potential risks associated with pharmacological approaches, there has been a growing emphasis on non-pharmacological interventions to manage chronic pain. These encompass a diverse range of approaches, each targeting different aspects of the pain experience and aiming to improve overall function and well-being.

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Therapies, such as physical therapy and occupational therapy, employ a variety of techniques, including manual therapy, therapeutic exercises, and modalities such as transcutaneous electrical nerve stimulation (TENS), to improve physical function, reduce pain, and enhance movement patterns [6]. Psychological therapies, such as cognitive behavioural therapy (CBT) and mindfulness-based stress reduction (MBSR), focus on addressing the psychological and emotional aspects of chronic pain. These therapies help individuals identify and modify maladaptive thoughts and behaviours, develop coping strategies, manage pain-related anxiety and depression, and improve their overall well-being [7].

Complementary and integrative medicine (CIM) modalities, including yoga, Tai Chi, acupuncture, and massage therapy, offer a holistic approach to pain management. These practices can help reduce stress, improve sleep quality, enhance flexibility, and promote overall physical and mental well-being [8].

This comprehensive review aims to critically evaluate the efficacy and safety of various non-pharmacological interventions for chronic pain management. By synthesizing the available evidence from rigorous clinical trials, meta-analyses, and systematic reviews, it will provide clinicians, researchers, and sufferers of chronic pain with valuable insights into the most effective and evidence-based approaches to manage this complex condition.

II. METHODS

A systematic search strategy was employed to identify relevant studies published in peer-reviewed journals. The search encompassed a broad range of databases, including PubMed, Scopus, CINAHL, and Web of Science.

Keywords related to both chronic pain and non-pharmacological interventions were meticulously selected and combined using Boolean operators (AND, OR, NOT) to refine the search results. These keywords included, but were not limited to: "chronic pain," "pain management", "non-pharmacological", "physical therapy", "occupational therapy", "exercise therapy", "cognitive behavioral therapy", "mindfulness", "yoga", "Tai Chi", "acupuncture", "massage", "manual therapy", "spinal manipulation", and "mind-body therapies". The search was limited to studies published in English within the previous 25 years (2000-2024) to ensure

the inclusion of the most recent and relevant evidence.

Inclusion criteria for the studies were as follows:

Study design: Randomized controlled trials (RCTs), controlled clinical trials, systematic reviews, cohort studies, and case-control studies were considered.

Population: Studies involving adult participants with chronic pain conditions were included.

Interventions: Studies were eligible if they investigated non-pharmacological interventions for chronic pain management, including physical therapies, psychological therapies, and complementary and integrative medicine modalities.

Outcomes: Studies that reported on relevant outcomes, such as pain intensity, interference with daily activities, effect on quality of life, and adverse events, were included.

Exclusion criteria:

Study design: Case reports, case series, and animal studies were excluded.

Population: Studies involving populations with acute pain were excluded.

Interventions: Studies investigating pharmacological interventions or surgical procedures were excluded.

Outcomes: Studies that did not report on relevant clinical outcomes were excluded.

The extracted data were narratively synthesized to provide a comprehensive overview of the effectiveness and safety of various non-pharmacological interventions for chronic pain management. This rigorous methodology ensured the inclusion of high-quality evidence and provided a robust foundation for this narrative review.

III. RESULTS

The focus of this narrative review was the efficacy and safety of various non-pharmacological interventions for chronic pain management. The examined interventions, categorized as physical therapies, occupational therapy, psychological therapies, or complementary and integrative medical practices (CIM), are discussed below.

1. Physical Therapies

Physical therapies can be broadly categorized into manual therapy, exercise therapy, and therapeutic modalities [9].

1.1 Manual Therapy

Common manual therapy techniques involve joint mobilization and manipulation, whereby precisely calibrated biomechanical forces are judiciously applied to articular structures. The objective of such interventions

is to optimize arthrokinematic integrity and modulate afferent nociceptive pathways. Joint mobilization, often using graded oscillatory movements or sustained articular glides, aims to restore accessory joint motion and mitigate capsular restrictions. Conversely, manipulative interventions, typified by high-velocity, low-amplitude thrusts (HVLAT), such as those employed in spinal manipulative therapy, are posited to elicit neurophysiological responses, including segmental reflex inhibition and descending pain modulation, thereby attenuating allogenetic signalling [10].

Soft tissue mobilization (STM) involves manual modalities targeting myofascial, tendinous, and ligamentous structures to mitigate aberrant myofascial hypertonicity, deactivate trigger points, and enhance tissue compliance. Techniques include myofascial release, trigger point deactivation, and deep tissue effleurage. Specialized methods such as strain-counterstrain (SCS) attenuate proprioceptive input and myospasm via passive positioning, while muscle energy techniques (METs) leverage volitional contraction to restore arthrokinematic freedom. The empirical evidence for the efficacy of manual therapy is heterogeneous. While spinal manipulative therapy (SMT) shows utility for specific lumbago presentations, the evidentiary basis for many techniques within the broader category of soft tissue mobilization (STM)—such as myofascial release and muscle energy techniques—remains less conclusive [11].

1.2 Exercise Therapy

Diversified exercise modalities encompassing aerobic conditioning (e.g., ambulation, aquatic ergometry, cycling) contribute to enhanced cardiorespiratory fitness and systemic antinociception; resistance training, meticulously targeting specific myoskeletal units, augments muscular strength and joint stability; flexibility regimens, including static and dynamic stretching and range-of-motion protocols, optimize articular excursion and mitigate myofascial rigidity; and functional movement patterns, mirroring activities of daily living, enhance overall functional capacity. Robust empirical evidence substantiates the therapeutic efficacy of exercise therapy across a spectrum of chronic pain phenotypes. For instance, meta-analyses and systematic reviews consistently demonstrate significant improvements in pain intensity, physical function, and health-related quality of life in conditions such as chronic low back pain, fibromyalgia, and knee osteoarthritis. The mechanisms posited include modulation of central sensitization, activation of endogenous opioid systems, reduction of systemic inflammatory markers, and promotion of beneficial neuroplastic changes within pain processing networks. The prescription of exercise must be individualized, considering principles of progressive overload, specificity, and patient-specific pain neurophysiology, to optimize therapeutic outcomes [12,13].

1.3 Therapeutic Modalities

Therapeutic modalities employed in pain management include transcutaneous electrical nerve stimulation (TENS) for nociceptive modulation, therapeutic ultrasound for thermal and non-thermal cellular effects, superficial thermotherapy (e.g., moist heat, cryotherapy) for local perfusion and metabolic alteration, and low-level laser therapy (LLLT) for photobiomodulation. Empirical evidence varies regarding their efficacy; TENS may offer transient antinociception, but evidence remains less robust for the sustained utility of modalities such as therapeutic ultrasound in chronic pain management [14].

Important Considerations for Physical Therapy:

Optimal physical therapy regimens require meticulous individualization, considering the patient's unique pathophysiological profile, specific chronic pain phenotype, and extant biomechanical constraints. The synergistic integration of diverse physical therapeutic techniques, such as manual therapy, exercise prescription, and various electro-physical modalities, is often demonstrably more effective than monotherapy. Psychoeducation, encompassing didactic instruction on pain neurobiology and the implementation of self-effective pain management strategies, constitutes an indispensable facet of comprehensive physical therapy. Furthermore, exercise programs must be entailed progressive overload, with incremental titration of load and complexity contingent on the patient's evolving physiological adaptation and functional restoration [15].

2. Occupational Therapy

Occupational therapy (OT) for chronic pain primarily involves meticulous activity analysis and modification to identify pain exacerbators and formulate adaptive task execution strategies, thereby mitigating biomechanical strain. Occupational therapists also prescribe and train patients in assistive technology and adaptive equipment to facilitate independent performance of instrumental activities of daily living (IADLs) with reduced discomfort. Energy conservation techniques, encompassing activity pacing and strategic rest, are imparted to optimize functional endurance and preclude pain exacerbations [16]. Furthermore, OT incorporates joint protection principles and comprehensive pain management psychoeducation, providing an advanced understanding of pain neuroscience, cognitive/behavioral coping mechanisms, and self-management paradigms.

Although the empirical efficacy of OT demonstrates variability based on intervention and pain phenotype [16,17], it remains a valuable component of a multidisciplinary pain management approach.

3. Psychological Therapies

Several psychological therapies have demonstrated significant therapeutic efficacy in the management of chronic pain, notably those encompassing cognitive behavioural therapy (CBT), mindfulness-based stress reduction (MBSR), and acceptance and commitment therapy (ACT) [18].

3.1 Cognitive Behavioural Therapy (CBT)

Cognitive behavioural therapy (CBT) for chronic pain typically involves cognitive restructuring, which facilitates the identification and challenge of maladaptive cognitions, such as pain-related catastrophizing or beliefs in functional incapacitation. This process aims to foster cognitive reappraisal and the development of more adaptive schemas. Autonomic regulation strategies, including diaphragmatic breathing, progressive neuromuscular relaxation, and guided affective imagery, are frequently employed to attenuate somatic hyperarousal and mitigate pain-related anxiety. Behavioural activation constitutes another pivotal component, encouraging patients to incrementally augment participation in value-concordant and reinforcing activities, even in the presence of persistent pain, thereby countering activity avoidance and ameliorating affective dysregulation. Finally, adaptive pain self-management strategies are imparted to modulate acute pain exacerbations, encompassing activity pacing, cognitive distraction techniques, and continued autonomic regulation exercises. CBT has been extensively investigated and is an established first-line psychological intervention for chronic pain [19]. Meta-analyses, notably by Hofmann et al., have demonstrated its robust efficacy in attenuating pain perception, enhancing functional restoration, and ameliorating psychological morbidity across heterogeneous chronic pain phenotypes. Furthermore, empirical data indicate the particular utility of CBT for individuals with distinct chronic pain etiologies [20].

3.2 Mindfulness-Based Stress Reduction (MBSR)

Mindfulness-based stress reduction (MBSR) for chronic pain typically involves contemplative practices such as body scan meditation, seated mindful-

ness, and ambulatory meditation. Informal integration of mindfulness into daily activities, such as mindful eating and walking, is also cultivated. The incorporation of hatha yoga and somatic awareness exercises is common, aiming to enhance interceptive awareness and reduce musculoskeletal tension. MBSR has demonstrated efficacy in attenuating pain perception, improving affective states, and fostering pain acceptance in individuals with chronic pain, and there is robust evidence for its capacity to reduce pain catastrophizing and enhance health-related quality of life in specific chronic pain conditions. Comprehensive reviews conclude that MBSR may serve as a valuable adjunct to existing pain management paradigms [21].

3.3 Acceptance and Commitment Therapy (ACT)

Acceptance and commitment therapy (ACT) aims to address chronic pain through psychological acceptance, which involves the volitional embrace of internal experiences, including persistent pain, without judgment or experiential avoidance. Cognitive diffusion, a core process, involves disengaging from the literal content of unhelpful thoughts about pain, recognizing them as transient mental phenomena rather than objective truths. Values clarification, the explicit articulation of deeply held personal principles, guides therapeutic direction. Finally, committed action entails engaging in behaviours aligned with these identified values, even in the presence of discomfort, thereby fostering psychological flexibility and functional engagement. ACT has demonstrated efficacy in enhancing functional capacity and health-related quality of life in individuals with chronic pain, even in the absence of significant changes in pain intensity. Studies have indicated the effectiveness of ACT in improving psychological flexibility and reducing pain interference, as well as its particular utility for chronic pain patients grappling with pain-related anxiety [22].

4. Complementary and Integrative Medicine (CIM)

CIM modalities generally emphasize a holistic approach to health and well-being, addressing the interconnectedness of mind, body, and spirit. Several CIM modalities have gained recognition for their potential role in chronic pain management, including yoga, Tai Chi, acupuncture, and massage therapy [23].

4.1 Yoga

Yoga, a multifaceted mind-body intervention, can enhance musculoskeletal flexibility, augment muscular strength, improve postural stability, and cultivate interoceptive awareness. Its therapeutic efficacy for various chronic pain pathologies has been explored by a substantial body of empirical investigations. Research consistently suggests that structured yoga protocols may confer significant benefits in attenuating pain and improving functional capacity in individuals afflicted with chronic low back pain. Further studies have highlighted the benefits of yoga in other chronic pain conditions, such as osteoarthritis and fibromyalgia, demonstrating positive outcomes in terms of pain reduction and health-related quality of life [24,25].

4.2 Tai Chi

Tai Chi, frequently described as "meditation in motion", is a low-impact mind-body exercise that can significantly enhance proprioceptive balance, musculoskeletal flexibility, and neuromuscular coordination. Empirical investigations have explored its therapeutic potential in chronic pain management, with emerging research suggesting its potential to reduce pain and improve functional outcomes in chronic pain conditions such as osteoarthritis and fibromyalgia. Further studies have highlighted the effects of Tai Chi on other chronic pain phenotypes, demonstrating positive outcomes with regard to pain reduction, ameliorated affective states, and improved health-related quality of life. However, additional rigorous research is warranted to corroborate these preliminary findings and to delineate optimal Tai Chi protocols for diverse chronic pain aetiologies [26].

4.3 Acupuncture

Acupuncture is claimed to confer therapeutic effects through the modulation of endogenous energy flow (Qi) and the promotion of endogenous opioid peptide release, thereby inducing systemic antinociception. This ancient therapeutic modality has been subjected to rigorous empirical scrutiny regarding its role in chronic pain management, and select investigations have indicated that it may be effective in lowering pain intensity and improving functional status in patients with chronic pain conditions such as intractable lumbago, cervicgia, and osteoarthritic arthralgia. Nevertheless, the aggregate evidence base for the effectiveness of acupuncture in chronic pain remains heterogeneous, necessitating more rigorous methodological designs to definitively confirm these observations and

to determine the precise neurophysiological mechanisms underpinning its therapeutic actions [27].

4.4 Massage Therapy

Various manual therapeutic techniques, including Swedish massage, deep tissue manipulation, and myofascial release, are employed within the domain of massage therapy. This modality has been rigorously investigated for its potential benefits in chronic pain management. Empirical evidence suggests that massage therapy may be effective in attenuating pain and enhancing functional parameters in individuals with conditions such as chronic low back pain, cervicgia, and fibromyalgia. Furthermore, studies have explored the effects of massage therapy on other chronic pain phenotypes, finding positive outcomes in pain reduction, ameliorated affective states, and reduced anxiety levels [28].

IV. DISCUSSION

The findings of this narrative review highlight the multifaceted nature of non-pharmacological interventions in the management of chronic pain, demonstrating varying degrees of evidence for their efficacy across diverse conditions. The synthesized literature underscores the potential for these therapies to significantly impact pain intensity, functional capacity, and quality of life, alongside their generally favourable safety profiles.

Physical therapies, particularly exercise therapy, are supported by robust evidence for their role in improving physical function and mitigating pain. The consistent findings across studies emphasize the importance of tailored exercise programs that address individual needs and limitations. Manual therapy, while showing promise for specific conditions such as chronic low back pain with techniques such as spinal manipulation, has more varied evidence for its broader application. Therapeutic modalities may offer short-term relief, but for long-term chronic pain management, often lack the strong evidence base such as that observed for exercise or manual therapy. The literature suggests that physical therapy programs are most effective when carefully tailored to the individual's specific needs, limitations, and pain condition. Furthermore, combining different physical therapy techniques, such as manual therapy, exercise therapy, and modalities, may yield superior outcomes compared with monotherapy. Patient education is consistently highlighted as an essential component,

empowering patients with knowledge about their condition, the benefits of engagement, and self-management strategies. Progressive advancement of exercise programs is also critical as patient tolerance and function improve [15].

Psychological therapies, notably cognitive behavioural therapy (CBT), emerge as critically important in addressing the complex psychological and emotional dimensions of chronic pain. The effectiveness of CBT in reducing pain intensity, improving function, and decreasing psychological distress is well-established across various chronic pain conditions. Mindfulness-based stress reduction (MBSR) and acceptance and commitment therapy (ACT) also demonstrate considerable promise in fostering pain acceptance, enhancing psychological flexibility, and improving quality of life, even if direct pain reduction is not always the primary outcome. These therapies underscore the crucial link between mental well-being and the experience of chronic pain.

Complementary and integrative medicine (CIM) modalities present a holistic approach, with varying strengths of evidence. Yoga and Tai Chi show moderate evidence for reducing pain, improving function, and enhancing quality of life, often attributed to their integration of physical movement, breathing, and mindfulness. Acupuncture shows mixed results, with some evidence for specific pain conditions, but a need for more rigorous research to elucidate its mechanisms and broader effectiveness. Similarly, massage therapy offers moderate evidence for reducing pain and muscle tension, often contributing to overall relaxation. The diverse mechanisms of these CIM therapies suggest their value as adjunctive treatments within a broader pain management strategy.

A significant consensus exists regarding the paramount importance of a multimodal approach to chronic pain management, advocating for the integration of physical, psychological, and, where appropriate, CIM therapies. Exercise therapy and CBT are widely recognized as foundational components of effective chronic pain management strategies. There is also increasing recognition of the valuable role of mindfulness-based approaches, such as MBSR, in cultivating improved pain coping mechanisms and acceptance among individuals with chronic pain [29,30]. However, areas of ongoing disagreement or uncertainty persist. These in-

clude determining the optimal specific interventions, such as identifying the most effective types of exercise for distinct pain conditions, establishing the long-term effectiveness of certain manual therapy techniques, and fully elucidating the precise mechanisms by which CIM modalities exert their therapeutic effects.

V. STUDY LIMITATIONS

This review is subject to several limitations that warrant acknowledgment. First, its scope was limited to studies published in English within the past 25 years (2000-2024); this methodological choice may have inadvertently excluded some relevant research published in other languages or prior to this time-frame. Furthermore, while a comprehensive search strategy covered multiple databases, publication bias remains a potential concern, as studies with negative or inconclusive results may be less likely to be published, potentially overestimating the effectiveness of some interventions. The narrative synthesis approach, while providing a broad overview of the literature, does not offer the same level of statistical rigor as a meta-analysis; it was therefore not possible to quantitatively assess the overall effect sizes of the different interventions.

There was some variability in the quality of the included studies. While it was attempted to include only high-quality studies, some may have had methodological limitations, such as small sample sizes, lack of blinding, or unclear allocation concealment, which could have influenced their results. The heterogeneity of study populations, encompassing variations in the type of chronic pain, duration of pain, and comorbidities, presented challenges in directly comparing and synthesizing findings across studies. Furthermore, the review focused primarily on the effectiveness of non-pharmacological interventions and did not extensively address the cost-effectiveness or implementation challenges associated with these interventions. Finally, the search and selection process, while systematic, is inherently subject to the subjective judgment of the reviewers, and some relevant studies may have been inadvertently overlooked.

VI. CONCLUSION

This narrative review provides a comprehensive overview of the current evidence for non-pharmacological interventions in the management of

chronic pain. Physical therapies, including manual therapy and exercise therapy, are pivotal in improving physical function and reducing pain, while psychological therapies, particularly CBT, are indispensable for addressing the psychological and emotional aspects of chronic pain. CIM modalities, such as yoga and Tai Chi, offer promising complementary approaches. While the strength of evidence varies between different interventions, a multimodal approach integrating physical, psychological, and CIM therapies is often recommended for optimal chronic pain management.

List of Abbreviations:

ACT: Acceptance and commitment therapy
 CBT: Cognitive behavioral therapy
 CIM: Complementary and Integrative Medicine
 MBSR: Mindfulness-based stress reduction
 OT: Occupational therapy
 RCT: Randomized controlled trial
 TENS: Transcutaneous electrical nerve stimulation

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