



# Exploring Acupuncture and Its Effects on Chronic Headache and Musculoskeletal Pain: A Comprehensive Narrative Review

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## ABSTRACT

**Aims:** The objective of this review is to conduct a thorough analysis of the utilization of acupuncture as a non-pharmacological method for managing pain, with a specific focus on its effectiveness in addressing chronic musculoskeletal pain and headaches.

**Method and Materials:** A comprehensive search was conducted on electronic databases such as PubMed and Google Scholar to identify relevant studies published until January 2024. The search employed keywords such as "acupuncture," "acupuncture mechanism," "headache," "musculoskeletal pain," and "pain management." Studies were included if they assessed the use of acupuncture in different clinical populations and reported outcomes related to pain intensity, functional status, and cost-effectiveness. Ultimately, a total of 6 articles were selected for the final analysis.

**Findings:** The studies included in this review encompassed a diverse range of patient populations, specifically focusing on individuals who received acupuncture treatment. The findings indicated that acupuncture was associated with improved pain control and reduced reliance on medication among patients suffering from chronic musculoskeletal pain and headaches. Additionally, one study demonstrated the long-term cost-effectiveness of utilizing acupuncture in this manner.

**Conclusion:** The results of this review provide support for the implementation of acupuncture as part of non-pharmacological approaches in clinical settings. Future research should concentrate on identifying the most effective combinations of acupuncture and standard care, as well as elucidating the mechanisms that underlie the synergistic effects of this treatment modality.

**Keywords:** Acupuncture, Acupuncture Mechanism, Headache, Musculoskeletal Pain, Pain Management

## Introduction

Acupuncture is a form of traditional Chinese medicine that involves the insertion of thin needles into specific points of the body [1]. The mechanism of action of acupuncture is not fully understood, but it is believed to involve the stimulation of nerves, muscles, and connective tissue, resulting in the release of endorphins and other neurotransmitters that help to reduce pain and inflammation. The possible mechanisms of action include opioid-induced analgesia, activation of glial cells, and the expression of Brain-Derived Neurotrophic Factor (BDNF) [2]. Acupuncture has been shown to alleviate central sensitization, which is associated with the development of hyperalgesia and allodynia. It enhances the descending inhibitory effect and modulates

the feeling of pain, thereby modifying central sensitization [3]. Additionally, acupuncture can activate the endogenous opioid, adrenergic, 5-hydroxytryptamine, and N-methyl-D-aspartic acid pathways, which are involved in pain modulation [3]. Furthermore, a PET-CT study demonstrated that acupuncture can lead to increased cerebral metabolism in areas of the brain associated with pain processing, and reduced metabolism in areas associated with pain perception, suggesting a specific cerebral response to acupuncture stimulation [4]. These mechanisms contribute to the analgesic effects of acupuncture, making it a potential treatment for chronic pain conditions.

There are several different types of acupuncture, each type has its unique characteristics and may be used to address different

Health concerns. Traditional Chinese Acupuncture [5], Electro acupuncture [6], Auricular Acupuncture [7], Japanese Acupuncture [8], etc., are some examples of different types of acupuncture that are widely used in different countries.

Acupuncture is generally considered safe when performed by a licensed and trained practitioner [1]. According to Leung et al, the observed harmful complications included bleeding and injury to the tissues and organs at the puncture sites. Adverse effects encompassed symptoms such as fainting and other systemic disruptions that were challenging to comprehend. A comprehensive investigation conducted by proficient acupuncturists at a reputable research institution, involving 2000 acupuncture procedures, revealed that complications were absent, and adverse events were rare. [9]

Acupuncture has been used to treat both visceral and somatic chronic pain conditions. In regards to visceral pain, acupuncture has been proven to be effective in pain associated with irritable bowel syndrome [10], pain in pediatric patients with sickle cell disease [11], cancer pain [12], tension-type headache [13], and myofascial pain syndrome [14], PCO [15], dysmenorrhea [16] and, fibromyalgia [17]. Regarding chronic somatic pain, acupuncture has been proven to be effective in knee osteoarthritis, chronic low back pain, and chronic neck pain [1, 18, 19, 20]. Acupuncture has also been shown to have positive effects on systemic blood flow, regulation of circadian rhythm, temperature, and nocturnal melatonin secretion, as well as improvements in spastic hypertonia and motor function [1]. Acupuncture has also been applied to various psychosomatic diseases such as anxiety, depression, and sleep disturbances [1].

The prevalence of chronic headaches and musculoskeletal pain is a significant public health concern, impacting individuals' daily lives. Several studies provide insights into the prevalence and impact of these conditions. The prevalence of chronic idiopathic musculoskeletal pain and headache among adolescents was studied in a population-based Norwegian study. The study found that pain at least once a week during the last three months

was reported by 44% of adolescents, with the prevalence of headache at least once a week during the last three months at 22% and musculoskeletal pain at 33% [21].

A study on gender differences in chronic musculoskeletal pain found that chronic pain not only affects daily functioning but also disrupts the quality of life, with women reporting lower quality of life compared to men [22]. Another study investigated the impact of chronic tension-type headaches on the functionality of deep cervical muscles, highlighting the correlation between anatomical, functional, and psychological variables in patients with this type of headache [23]. Additionally, a study on demographic and clinical factors associated with psychological well-being in people with chronic, non-specific musculoskeletal pain found that depression was significantly related to psychological well-being, contrary to pain and limitations in daily life [24].

In summary, the prevalence of chronic idiopathic musculoskeletal pain and headache is significant, with a notable impact on daily life, including quality of life and psychological well-being. Further research and comprehensive approaches to non-pharmacological management, such as acupuncture, are essential to address these challenges. The focus of our search in this article has been more on the effects of acupuncture on musculoskeletal pain and chronic headaches, therefore, some examples of the effects noted in the literature review are given below. Acupuncture has been studied for its effects on chronic musculoskeletal pain. A pilot study found that acupuncture produces holistic reductions in chronic musculoskeletal pain, with interactions between pain, fatigue, emotional, physical function, and social domains [25]. Additionally, a study examined the effectiveness of acupuncture for chronic musculoskeletal pain in cancer survivors, showing a reduction in pain severity [26]. Furthermore, a systematic review compared the effects of local and distant acupuncture point stimulation for chronic musculoskeletal pain, finding that both types of stimulation were effective in pain reduction [27]. Another

study evaluated the efficacy of transcranial direct current stimulation in reducing chronic musculoskeletal pain in older individuals, showing a reduction in pain intensity [28]. These studies provide insights into the potential effectiveness of acupuncture for chronic musculoskeletal pain.

Acupuncture is an effective treatment for chronic headaches, including tension-type headaches and migraine. A study found that acupuncture can be at least as effective as prophylactic drugs for migraine and elicits very few side effects [29]. Another study found that both acupuncture and medical training therapy significantly reduced depression and anxiety, and improved quality of life in patients with frequent tension-type headaches [30]. Acupuncture has also been shown to alleviate acute and chronic pain, including tension-type headaches and migraines [31]. Additionally, a study found that the combination of acupuncture and medical training therapy significantly reduced mean pain intensity compared to usual care in patients with tension-type headaches [32]. Due to the importance of the issue, a comprehensive study on the effect of

acupuncture on headache and musculoskeletal conditions and the results is presented below.

Method and Materials

A comprehensive search was conducted on PUBMED and Google Scholar to gather all relevant studies on acupuncture and its effects on chronic musculoskeletal pain and headaches. Studies published electronically until the end of January 2024 were considered. The search utilized keywords such as "acupuncture," "acupuncture mechanism", "headache," "musculoskeletal pain," and "pain management." Initially, a total of 178 articles were identified, including 19 clinical trials. After removing duplicates, study protocols, and irrelevant studies, a more detailed analysis of the abstracts resulted in the inclusion of 6 clinical trials in the study focusing on the effects of acupuncture on chronic musculoskeletal pain and chronic headache.

Findings

The studies assessed in this review are shown in Tables 1 and 2.

Table 1) Summary of the studies addressing chronic musculoskeletal pain

Study	Sample size	Mean age	Duration	Interventi on group	Contro l group	Measurements And outcomes	Findings
Zhang Lele et al. [33]	90 patients with knee osteoarthritis	55.2±6.0	over 2 weeks	electroacupuncture (EA) alone and EA plus the usual care group	usual care	Pain VAS (Visual Analogue Scale) to measure pain levels, WOMAC (Western Ontario and McMaster Universities Osteoarthritis) scale to assess pain, stiffness, and physical function, AQoL-SF36 (Assessment of Quality of Life instrument version of the 36-item Short Form Health Survey) to measure health-related quality of life across various domains.	The results showed that acupuncture or EA combined with usual care was more effective at reducing pain and improving function than usual care alone, though there was no significant difference between the acupuncture and EA groups. EA combined with usual care seemed to improve some quality of life domains more than the other treatments. The study concludes that acupuncture or EA combined with usual medical care is effective for treating knee osteoarthritis.
Luo Yong et al. [34]	152 patients with CLBP	39±9 (HEA) 36±10 (SA) 37±9 (UC)	7 weeks overall	hand-ear acupuncture, standard acupuncture	usual care	Outcomes were measured using the Roland-Morris Disability Questionnaire to assess back dysfunction and the Visual Analogue Scale to assess pain severity at baseline and 2 and 6 months post-treatment	Both acupuncture treatments significantly improved outcomes compared to usual care. Hand-ear acupuncture showed greater improvements in function, pain, and overall efficacy than standard acupuncture, with effects persisting longer. The study suggests that hand-ear acupuncture may be more effective for treating CLBP than standard acupuncture.
Caroline de Castro Moura et al. [35]	110 with back musculoskeletal disorders	47.51±13.89 (treatment) 51.03±14.90 (placebo) 46.19±15.73 (Control)	Five AA sessions, which occurred Once a week for one and a half months	auricular acupuncture	Treatment, placebo	The evaluation of outcomes was done using the Brief Pain Inventory to assess pain intensity and a digital algometer to measure the pain threshold before and after the treatment, as well as after a 15-day follow-up period.	The results of the study, which included a sample size of 110 individuals, showed a decrease in pain intensity in both the treatment and placebo groups when comparing the initial and final evaluations. Additionally, the treatment group exhibited a decrease in pain intensity when comparing the initial and follow-up evaluations. The impact of pain on daily activities also decreased over time in both the treatment and placebo groups. At the final evaluation, the treatment group had a lower impact of pain compared to the other groups.

**Table 2)** Summary of the studies addressing chronic headaches.

Study	Sample size	Mean age	Duration	Intervention group	Control group	Measurements And outcomes	Findings
Joerg Schiller et al. [32]	95 adult patients with tension-type headaches	38.7 (13.3)	6 weeks of treatment with 12 interventions	acupuncture , medical training, a combination of acupuncture and medical training	usual care	The main outcome measures included pain intensity (average, maximum, and minimum), headache frequency, responder rate (defined as a 50% reduction in frequency), duration of headache episodes, and use of headache medication.	The combination of acupuncture and medical training therapy resulted in a significant reduction in mean pain intensity compared to usual care. Similar reductions were observed for maximum pain intensity and minimum pain intensity. At 3 months, the majority of patients in all groups experienced a reduction of at least 50% in headache frequency. At 6 months, significantly higher responder rates were observed in all intervention groups.
Joerg Schiller et al. [30]	96 adults with frequent episodic or chronic tension-type headache	38.7 (13.3)	6 weeks of treatment with 12 interventions	acupuncture , medical training, a combination of acupuncture and medical training	usual care	The study assessed depression, anxiety, and health-related quality of life as secondary outcome measures at various time points. The Patient Health Questionnaire-9 (PHQ-9) and the Generalized Anxiety Disorder-7 (GAD-7) were employed as components within the Patient Health Questionnaire-9 (PHQ-9) to consistently evaluate symptoms of depression and anxiety.	The results showed that both acupuncture and the combination of acupuncture and medical training therapy significantly reduced depression scores compared to medical training therapy alone or usual care alone. Similar results were observed for anxiety scores.
AJ Vickers et al. [36]	401 patients with chronic headache disorder s, primarily migraine	46.3 (10.4)	3 months	12 acupuncture treatments over 3 months	usual care	The main outcome measures included the assessment of headache scores, Short Form 36 (SF-36) health status, and medication usage at baseline, 3 months, and 12 months. The utilization of resources was assessed every 3 months, and the incremental cost per quality-adjusted life-year (QALY) gained was also determined.	The results indicated that at the 12-month mark, the acupuncture group had lower headache scores compared to the control group, with an adjusted mean difference of 4.6. Patients in the acupuncture group experienced the equivalent of 22 fewer headache days per year. SF-36 data favored acupuncture, particularly in physical role functioning, energy levels, and overall health improvement. In comparison to the control group, patients randomized to acupuncture treatment exhibited a 15% reduction in medication usage, made 25% fewer visits to general practitioners, and took 15% fewer sick days. However, the total costs incurred during the one-year study period were higher for the acupuncture group due to the costs associated with acupuncture practitioners. The mean health gain from acupuncture over the trial year was estimated to be 0.021 QALYs, resulting in a base-case cost of £9180 per QALY gained. This finding remained robust even when subjected to a sensitivity analysis. The cost per QALY decreased significantly when considering long-term analysis.

**Discussion**

Acupuncture is effective for the treatment of chronic pain, including musculoskeletal, headache, and osteoarthritis pain [37]. Acupuncture has shown promise as a treatment for chronic pain, demonstrating lasting effects, although its suitability for all individuals remains uncertain. Additional research is needed to assess its effectiveness across different conditions and to elucidate the precise mechanisms by which it alleviates

pain. [38]. This study examined the impact of acupuncture on pain levels, medication use, and cost-effectiveness. Most studies used Traditional Chinese Acupuncture, which showed positive effects on reducing pain and analgesic consumption. However, there were conflicting results on the duration of pain relief. While some studies reported long-term reduction, others only showed short-term relief. Long-term effects were not evaluated. The study suggests inconclusive evidence of

acupuncture's long-term efficacy for pain reduction. Only one study assessed cost-effectiveness, and further research is needed. Nonetheless, acupuncture seems to be a cost-effective treatment for chronic headaches. [38]The limitations of this article include the diverse designs and measurement methods used in acupuncture studies, as well as variations in sample sizes and populations studied.

## Conclusion

The results of this study support the fact that while acupuncture shows potential as a valuable treatment for chronic pain, further investigation is necessary to gain a comprehensive understanding of its effectiveness, the underlying mechanisms by which it operates, and the cost-effectiveness of applying it for both patients and society.

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## Conflict of Interest

The author states no conflicts of interest in this work.

## Author Contribution

ShB is the primary executor of this project. Recently, she completed her MD degree from Tehran University of Medical Science.

## Ethical Approval

This study protocol was approved by the Ethics Committee of Tehran University of Medical Sciences, applying the Helsinki Declaration.

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