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Short-term effect of acupuncture dry needle in treatment of chronic mechanical low back pain: a randomized controlled clinical trial

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Abstract. – OBJECTIVE: In today's industrialized world, between sixty and ninety percent of the working-age population experiences low back discomfort. Chronic mechanical low back pain (CMLBP), the most common ailment among working-age people in contemporary industrial society, causes a major economic burden due to the widespread use of medical services and the absence of work. For those suffering from persistent mechanical low back pain, this experiment aimed to assess the efficacy of using acupuncture dry needles in the short term.

PATIENTS AND METHODS: Our research included 30 individuals with nonspecific low back pain; their ages varied from 20 to 45. The participants were divided into two parallel groups using a random process: 15 individuals in group A had acupuncture treatment with a dry needle placed to specified locations on their backs, whereas 15 individuals in group B participated in muscle strengthening and stretching exercises. Both before and after therapy, researchers examined the lumbar range of motion (ROM) in four directions: flexion, extension, bilateral side bending, as well as pain intensity and functional impairment.

RESULTS: We examined the data for normality and covariance homogeneity using the Shapiro-Wilk and Box's tests, respectively. The variables of interest that were investigated were compared across various test groups and measurement periods using a 2x2 mixed design-multivariate analysis of variance (MANOVA). We used a significance threshold of 0.05. When comparing the two groups after treatment, it was found that the flexion and extension range of motion increased significantly ($p<0.05$), while the pain intensity, bending to the right and left, and functional impairment decreased significantly ($p<0.05$). The results of multiple pairwise comparisons showed a noteworthy difference in pain severity, functional debility, and back ROM between the two groups before and after treatment ($p<0.05$), with group A showing an advantage over group B after treatment.

CONCLUSIONS: Based on the study results, dry needle acupuncture may be a beneficial modality in treating chronic mechanical low back pain by relieving pain intensity, improving functional debility, and improving ROM.

ClinicalTrials.gov: NCT06140264.

Key Words:
CMLBP, Acupuncture dry needle, Mobility, Disability.

Introduction

There are significant social and economic ramifications associated with low back pain, which

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is also the most often recounted kind of musculoskeletal disorder. The point prevalence of low back pain (LBP) varies between 33% and 65%; one-year estimates vary from 65% to 84%; and lifetime estimates are at 84%. These ranges demonstrate significant disparities across researchers[1]. A large number of instances of chronic mechanical low back pain (CMLBP) go undiagnosed, despite being a leading source of disability and sickness among working-age adults[2].

Pain and impaired physical performance are hallmarks of low back pain, which may have an impact on mental health, raise the likelihood of comorbidities, and ultimately increase the chance of death from any cause[3]. There are obviously a lot of things that might trigger back pain. Accidents, trauma-induced injuries, trigger points (TrPs), and a lack of physical activity are all factors that can lead to back pain. Being overweight or obese also puts additional strain on the spine. Bad posture and improper body mechanics at work are other common causes[4].

Squeezing a hyperirritable area inside a tight band of skeletal muscle may lead to aches and pains, including cramps, stiffness, and discomfort. The clinical features of TrPs determine whether they are active or latent. Resting discomfort is a symptom of an activated trigger point. Its denoted aching outline is comparable to the patient's aching complaint[5], and it is painful to touch. This misdirected pain is experienced far from the actual location of the trigger point. Spreading or radiating is a common way to describe the agony[6].

The radiated pain is a key indicator of a trigger point. It distinguishes between trigger points and sensitive points, the latter only painful when palpated[7]. Although latent trigger points do not often produce discomfort on their own, they may limit the range of motion or even induce muscular weakening[8].

The pressure put directly over a latent trigger point may be the only way for a patient suffering from musculoskeletal limits or faulty to experience the pain it causes. By depriving the muscle tissue of oxygen and nutrients and causing an accumulation of metabolites that cannot be removed, TrPs restrict muscular action and decrease circulation. These waste products could both stimulate and harm the pain nerve endings. Reduced nutrition delivery to muscles causes inflammation and spasms[9,10].

A variety of methods exist for the elimination of myofascial trigger points, including injections, stretching and spraying, pressure release, massage, exercise, dry needling (acupuncture), and medical agents. The treatment of myofascial trigger points (MTrPs) has also made use of needle-based treatments. Two examples are trigger point injections and acupuncture point stimulation. Interestingly, it has been shown that direct needling exerts an effect apart from the injected TrPs substance[11,12]. Immediate relief from local, referred, and generalized pain, improved range of motion, and normalized muscle activation patterns are all advantages of dry needling[13].

Up to now, no research has examined the short-term effects of dry-needle acupuncture on lumbar range of motion (flexion, extension, right- and left-side bending), pain intensity, or functional impairment, and research has focused on mechanical low back pain patients. As a result, the purpose of this research is to find out how well acupuncture with a dry needle works in the short term for those with persistent mechanical low back pain. The purpose of this research was to determine the efficacy of using a dry acupuncture needle as a short-term remedy for individuals suffering from persistent mechanical low back pain.

Patients and Methods

Patients

The research included 30 male and female patients aged 20-45. Group A: Fifteen patients underwent back muscular stretching and strengthening exercises after having dry acupuncture needles placed on specific trigger points in the piriformis, gluteus medius, quadrates lumborum, and iliocostalis lumborum muscles. To ascertain their eligibility for the study, 15 patients from Group B who were simply given back strengthening and stretching activities were evaluated (Figure 1).

Participants' ages had to fall within the specified range of 20-45 to be included in this research[14]. A visual analogue scale (VAS) ranging from 0 (no pain) to 100 (the greatest agony conceivable) measuring between 30 and 70 millimeters in length is required. There must be a minimum of four muscles with MTrPs on each side. The patients' medical records indicate a previous occurrence of myofascial pain syndrome in the lower back. Some individuals who were ineligible for the study had a history of back surgery, neurological impairments, existing symptoms in

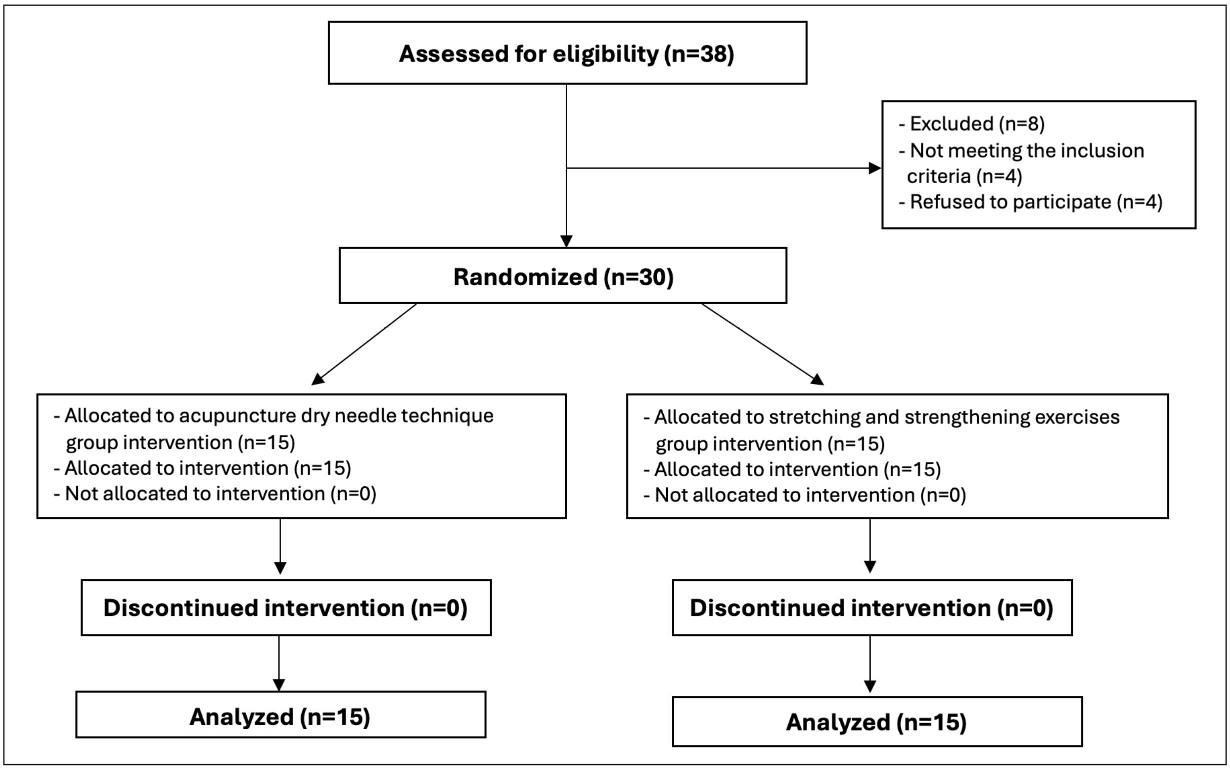

Figure 1. Participants flow diagram.

the lower limbs, reduced activity tolerance due to cardiopulmonary disease, rheumatologic conditions, polyarticular osteoarthritis, rheumatoid arthritis, advanced lumbar degenerative disease, or were undergoing concurrent medication or physical therapy that could potentially influence the study outcomes.

Study Design

This research followed the standard protocol for randomized controlled trials. The Department of Physical Therapy at Prince Sattam bin Abdulaziz University gave the ethical approval (number: RHPT/022/035). The study was registered in ClinicalTrials.gov (ID: NCT06140264). The study adhered to the standards laid forth in the Helsinki Declaration. Every patient included in this study signed an informed consent form.

Allocation and Randomization

To ensure that the treatment groups had equal representation at the end of each block, participants were randomly assigned using the randomly permuted block approach once all baseline requirements were met. The participants were separated into blocks using software that generates random numbers.

Instrumentations

Assessment instrumentations

Both before and after the intervention, patients underwent evaluations. The following elements were part of the evaluation processes.

Pain assessment

The visual analog scale (VAS) was utilized for the assessment of pain. The VAS employs a 10-centimeter line with 0 (no pain) and 10 (worst pain) to enable continuous data processing. Individuals experiencing discomfort were asked to indicate their degree by placing a mark along the line[15].

Functional disability

The Oswestry Disability Questionnaire was used to evaluate the functional impairment of every patient. This tool is legitimate and dependable. There are ten multiple-choice questions on back pain, and the patient has to choose the phrase that best describes his discomfort from a list of six. A higher score indicated severe discomfort. Minimal impairment ranges from 0 to 20%, while moderate ranges from 20% to 40%. The severity levels range from 40% to 60%; however, disabling scores range between 60% and 80%. Health conditions confine individuals with scores ranging from 80% to 100% to their beds[16].

Lumbar Range of Motion

Extension and flexion

The new method replaces it with the Schober flexion technique, which studies by William et al[17] have shown to be a valid and reliable method to evaluate the lumbar flexion range of motion. After the patient stood up, the examiner used the thumb to find the posterior superior iliac spine. Therefore, the examiner drew an ink mark horizontally from the midline of the lumbar spine to those spines. To measure the distance between the two markings on the skin, another mark was created 15 cm above the first mark using ink. Subsequently, the therapist instructed the patient to fully stretch the lumbar area by leaning forward, and then proceeded to evaluate the distance between the two skin markings[17].

The next step for the patients was to fully extend their backs, and then the length between the upper and lower skin markings was determined in a direct line. The differences between marks were used to quantify the degree of extended lumbar region. The range of motion (ROM) for lumbar extension was determined by taking the mean of three consecutive tests.

Lateral flexion

Following the research of Ponte et al[18], it was found that the maximum comfortable lateral flexion was defined as the space between the floor and the index fingertip. The participant was instructed to fully bend laterally extended feasible. Each side underwent this test three times in a row, and the average result was the lateral flexion ROM.

Interventional Modalities

Acupuncture-like needle (long somatic needle)

The therapy instrument utilized is a long somatic needle with a diameter of 0.30 mm and a length of 50 or 70 mm.

Procedures

Prior to and after treatment, patients had evaluations as follows.

Diagnosis of Myofascial Pain Syndrome (MPS)

A comprehensive medical history, in addition to a clinical evaluation, is required for the diagnosis of MPS. The patient's medical history provides valuable information about the sites of pain and may be used to identify potential causes of MPS. During the clinical examination, we focused on the muscles that have trigger points that might radiate pain to specific locations. Flat or pincer palpation was used to seek for tense bands in the muscles. The hardest and most sensitive location, known as the trigger point, was located by sliding fingers along the tight band. The patient was instructed to inform the healthcare provider of any sensitivity or discomfort experienced at the location where manual compression was applied to the TrPs. Additionally, the patient was asked to indicate if the discomfort resembled their usual pain. After applying pressure to the trigger point for 5 to 10 sec, the participant was instructed to report any pain or sensations emanating from the lumbar area.

Interventional Procedures

Acupuncture dry needle (Group A)

First, a tight band inside the belly of the muscle in the lumbar area was palpated to locate the trigger points. The targeted muscles are the piriformis, gluteus medius, quadratus lumborum, and iliocostalis lumborum. The patients had a two-week period of observation.

Myofascial acupuncture dry needle technique

Before the patient was given dry needling, the method was explained to them. Prior to, during, and after DN therapy, the patient should receive information about the theory and logic of the procedure, as well as specifics regarding the needle type, safety measures to take, potential adverse effects, and anticipated results. Everyone should be made aware of the potential discomfort and fear of needles that might accompany DN. The pain caused by DN may be distinguished from other unpleasant stimuli and even appreciated by patients after their conditioned pain-control system is activated, according to research[19].

An endogenous pain-inhibiting pathway may be activated by this realization, which blocks early nociceptive processing. Patients can often manage the pain of DN within this larger framework, reducing the likelihood of windup or more sensitization[20]. The therapist ought to check the muscle being treated for a tight crew and locate a hyper-irritable region inside the crew to validate that the patient is suffering from TrPs. Then, they may proceed with DN methods to treat the patient.

The solid filiform needles inserted into a tube are the standard tool for dry needling. According to the training, direction, and position of the muscle, the non-needling hand is used to hold the filiform needles in its tube, while the other hand uses a pincer grasp or flat palpation to press against the suspicious region. Loosening the needle from the tube is done delicately using the needling hand. To insert the needle into the skin, one must tap or flick the tip of the needle. To do deep DN, one must first feel resistance and then elicit a local twitch response (LTR) by guiding the needle toward the TrP. In order to have the desired therapeutic impact, it is believed that eliciting an LTR is crucial[21].

After inserting the needle deeply enough to reach the tight band region, it is brought back to the subcutaneous tissue layer, keeping it in place under the skin. After that, it is kept in the TrPs for seven to ten minutes[22]. Typically, it is possible to elicit a great deal of LTRs. If the occurrence or disappearance of LTRs, resistance to palpation of the underlying tissue, or patient pain from continual needling at that particular area significantly decreases or disappears, the DN procedure may be halted. To minimize swelling and discomfort after needle removal, apply pressure (hemostasis) immediately to the skin over the site of injection by alcoholized swabs. The next step is to palpate the muscle once again to check for TrPs and tense bands[23].

Treated Muscles

Iliocostalis lumborum MS

Using flat palpation, identify the trigger points (TrPs) while in a lateral position. The procedure involves inserting a 5-centimeter needle at a right angle to the skin's surface and guiding it downward and toward the midline for approximately 300 units, just above the TrPs, while carefully avoiding lung infiltration.

Quadraus lumborum MS

The patient should be positioned on their side with their arms extended to raise their rib cage and their legs bent at the knees to lower their iliac crest. A cushion or bolster should be placed under the side that is not being treated to provide more room to feel for trigger points. The procedure involves inserting a 7-centimeter-long needle immediately below the 12^{th} rib and ahead of the paraspinal muscular masses. The needle is then angled matching to the back's planes, in the frontal planes, and is directed towards the transverse processes of L2 and L3.

Gluteus medius MS

Internally, the individual is in a prone position. The length of the needle used was 5 cm. Along the iliac crest's outline, needles are inserted using flat palpation that is perpendicular to the muscle. A deep incision into the subcutaneous tissues is necessary to shorten the space between the skin and the muscular tissues. The periosteum is a frequent site of needle contact. Safety measures: The sciatic nerve should not be needled. Beneath the medius and minimums are deep roots of the gluteal nerve and veins should not be needed. The depth it can reach depends on the amount of fat present.

Piriformis MS

On the inside, the patient is laying down. At S2, S3, and S4, locate the sacral and greater trochanter bone markers. A 5-centimeter-long needle was put into the palpable TrPs taut band, which was located slightly medial to the sacrum at the trochanter, perpendicular to the muscle surface. The needle was advanced from the sciatic groove towards the pubical symphysis. The sciatic nerve should not be needled.

Group B protocol

There were fifteen participants in group B. Over the course of four weeks, they participated in twelve sessions of back strengthening and stretching exercises, including active back extension and gentle hamstring, calf, and back stretching at the end of each set. There were three sets of each exercise, with a 6-second pause in between.

Statistical Analysis

For this study, we used SPSS version 23 for Windows (IBM Corp., Armonk, NY, USA) to conduct all statistical analyses. This study considered two distinct variables. The first component was the test group, which consisted of two levels: Groups A and B. The second component was the duration of training, which consisted of two levels: before and after. Also included in this evaluation were six dependent variables: functional impairment, range of motion, extension, pain intensity, and the capacity to bend to the right and left. Data for all dependent variables was found to have a normally distributed distribution, according to the Shapiro-Wilk test ($p>0.05$). The boxplot and Mahalanobis distance tests also confirmed this, with no outliers in either the univariate or multivariate categories ($p>0.05$). The scatterplot and multicollinearity tests also came up empty. Both Levene's test of homogeneity of variances and Box's M test indicated that the variances and covariances were very similar ($p>0.05$). Consequently, the relevant variables that were examined across several groups and training durations were compared using a 2×2 mixed design multivariate analysis of variance (MANOVA). An initial alpha level of 0.05 was used to perform the MANOVAs.

Results

Two separate factors were considered in this analysis. There were two distinct variables; the first was the test group, which consisted of two levels: Groups A and B. The second was the time spent training, a two-level topic component (both before and after). Also included in this evaluation were six dependent variables: functional impairment, range of motion, extension, pain intensity, and the capacity to bend to the right and left. Data for all dependent variables was found to have a normally distributed distribution, according to the Shapiro-Wilk test ($p>0.05$). The boxplot and Mahalanobis distance tests also confirmed this, with no outliers in the univariate or multivariate categories ($p>0.05$). The scatterplot and multicollinearity tests also came up empty. Both Levene's test of homogeneity of variances and Box's M test indicated that the variances and covariances were very similar ($p>0.05$). Consequently, the relevant variables that were examined across several groups and training durations were compared using a 2×2 mixed design MANOVA. An initial alpha level of 0.05 was used to perform the MANOVAs.

Mixed-design statistics refers to the use of statistical methods that include both within-group and between-group factors in the analysis. A total of thirty patients were equally divided into two groups and then submitted to MANOVA analysis. Effects among subjects ($F=34.15$, $p<0.0001$, Partial Eta Squared=0.887), effects within treatment time ($F=19.14$, $p<0.0001$, Partial Eta Squared=0.788), and belongings across subjects ($F=18.12$, $p<0.0001$, Partial Eta Squared=0.779) were all found to be statistically significant. Descriptive statistics and results of post hoc tests (multiple pairwise comparisons) for all dependent variables are shown in Table I. Similarly, in both groups, the results of the multiple pairwise comparison tests showed that the extension and flexion ROM increased significantly ($p<0.05$), and the pain intensity, lateral flexion, and functional debility decreased significantly ($p<0.05$) after treatment compared to before. When comparing group A with group B, numerous pairwise comparisons showed that the range of flexion and extension was significantly higher ($p<0.05$), pain intensity was significantly lower ($p<0.05$) and bending to the right and left was significantly reduced. These differences were related to between-subject effects. While the functional impairment scores of the two groups did not vary significantly ($p>0.05$) before or after intervention.

Discussion

Patients suffering from persistent mechanical low back pain were shown to have less pain, functional impairment, and improved range of motion after receiving acupuncture dry needle therapy, according to this study's findings.

Both groups' pain levels, functional disabilities, and range of motion in the back improved significantly after therapy compared to before. This confirms what previous research has shown[24] about the benefits of dry needle for myofascial pain syndrome patients. When it comes to managing myofascial pain, it was proposed that DN subsequent to active muscle elongation is superior to alone muscle elongation or receiving no therapy at all. When paired with paraspinal needling, Ga and Choi[25] found that DN of TrPs significantly reduced pain in older individuals.

The following four comparisons were examined by Teasdale[26] in a systematic study of DN in athletes: DN compared to four other treatments: 1) no therapy or placebo, 2) conventional medicine, 3) traditional acupuncture, and 4) wet needling. It was concluded that DN had greater positive effects on athletes than sham

Table I. Analysis of the dependent variables in both the experimental and control groups, both before and after the study period, using descriptive and inferential statistics.

		Group (A) (n=15)	Group (B) (n=15)	*p*-value*
Pain severity	Pre training	6.13±1.12	6.73±0.45	0.066^{NS}
	Post training	3.36±1.90	5.42±0.28	0.001^{S}
	% of change	45.18↓↓	19.46↓↓	
	p*-value*	0.001^{S}	0.001^{S}	
Range of flexion	Pre training	3.7±0.56	3.75±0.38	0.764^{NS}
	Post training	6.76±0.94	4.81±0.27	0.001^{S}
	% of change	82.7↑↑	28.26↑↑	
	p*-value*	0.001^{S}	0.013^{S}	
Range of extension	Pre training	1.52±.24	1.47±0.18	0.563^{NS}
	Post training	2.32±.41	1.9±0.12	0.001^{S}
	% of change	52.63↑↑	29.25↑↑	
	p*-value*	0.001^{S}	0.001^{S}	
Range of right-side bending	Pre training	48.59±3.65	48.6±3.76	0.992^{NS}
	Post training	44.57±4.78	26.1±2	0.001^{S}
	% of change	8.27↓↓	46.29↓↓	
	p*-value*	0.001^{S}	0.001^{S}	
Range of left side bending	Pre training	49.22±3.18	49.22±3.13	0.991^{NS}
	Post training	45.05±4.81	26.78±1.45	0.001^{S}
	% of change	8.47↓↓	45.59↓↓	
	p*-value*	0.001^{S}	0.001^{S}	
Functional disability	Pre training	47.33±4.16	47.73±2.78	0.76^{NS}
	Post training	30.73±7.83	34.13±1.4	0.109^{NS}
	% of change	35.07↓↓	28.49↓↓	
	p*-value*	0.0001^{S}	0.0001^{S}	

*Inter-group comparison; **Intra-group comparison of the results pre- and post-training; $^{NS}p>0.05$=non-significant; $^{S}p<0.05$=significant; *p*=probability; ↓↓ = decrease; ↑↑= increase.

acupuncture or no therapy at all and that there were no adverse events[26]. A comparison of dry needling to the conventional treatment found no statistically significant improvement. Nevertheless, it was discovered that dry needling had a statistically significant advantage over traditional acupuncture. Dry needle has been demonstrated to alleviate pain, improve life quality, and expand ROM beyond what conventional acupuncture can do[26]. When used in conjunction with other non-invasive therapies like stretching and exercise therapy, this treatment has the potential to greatly enhance pain relief, athletic performance, and overall quality of life for athletes[26].

According to Hu et al[27] dry needling did not provide any statistically significant improvement over usual treatment. In contrast to conventional acupuncture, dry needling (DN) had a more substantial impact in reducing pain intensity and functional impairment at the post-intervention level. When it came to reducing the severity of pain and functional handicap after an intervention, DN was more effective than fake needling. The outcomes of the included trials were also inconsistent; thus, it was unclear whether DN was more effective than trigger point injection, laser, or conventional physical therapy or if it was just as effective[27].

Several processes have been proposed in the literature, including mechanical, neurophysiologic, and chemical impacts, as explanations for the therapeutic benefits of DN. The reduced sarcomeres and constricted cytoskeletal components inside the TrP may get a mechanical localized stretch from DN. By decreasing the degree of overlap between the actin and myosin filaments, the sarcomere could return to its resting length[28,29]. According to neurophysiological theories, DN may reduce pain by stimulating A-delta nerve fibers, which might trigger the enkephalinergic inhibitory dorsal horn interneurons[30-32].

Previous research demonstrated that the immediate correction of elevated substance P, GGRP, bradykinin levels, and other substances at TrP by inducing LTR after DN is a chemical effect of DN[31]. It is possible that DN affects microcirculation. Multiple studies have shown that stimulating a location by inserting a needle into it increases blood flow to the skin and muscles[32-35].

Conclusions

According to current evidence, people suffering from chronic mechanical low back pain may find relief from their pain, functional debility, and increased ROM with the use of acupuncture dry needles. Future research could explore comparative effectiveness by evaluating acupuncture dry needles against other conventional treatments for chronic mechanical low back pain. This approach would help establish the relative efficacy and potential advantages of acupuncture in comparison to existing therapeutic modalities.

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Ethics Approval
Research involving human subjects was conducted in accordance with the principles outlined in the Helsinki Declaration. The Prince Sattam bin Abdulaziz University localized Ethics Committee approved this study with the number RHPT/022/035.

Trial Registration
This study was registered at ClinicalTrials.gov (ID: NCT06140264).

Conflicts of Interest
The authors declare no conflicts of interest.

Informed Consent
Every participant was informed about the research purpose and signed a consent form.

Data Availability
The authors declare that all relevant data supporting the findings of this study are available within the article.

Authors' Contributions
The study's conception and design were contributed to by SMA, AFE, AS, ARA, WE, WKA, and GMK. In accordance with the treatment plan, the various treatments were administered with the assistance of SMA, AFE, AS, ARA, and GMK. Participation in the data-collecting process included SMA, AFE, AS, ARA, and GMK. AFE, WE, and WKA aided in the analysis and interpretation of the data. Data interpretation, statistical analysis, writing, and editing were all areas in which all authors participated. All authors reviewed and accepted the final paper.

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References

1) Elshiwi AM, Mohammed AM, Al shahrani BA, Al-Khathami SA, Koura GM. Influence of electromagnetic field therapy versus acupuncture dry needle in treatment of nonspecific low back pain patients: randomized clinical trial. JPSP 2022; 6: 3014-3031.
2) Endean A, Palmar K, Coggon D. Potential of MRI findings to reline case definition for mechanical low back pain in epidemiological studies. A systemic review. Spine 2011; 36: 160-169.
3) Koes BW, van Tulder MW, Thomas S. Diagnosis and treatment of low back pain. BMJ 2006; 332: 1430-1434.
4) Fryomer JW, Selby DK. Segmental instability. Rational for treatment. Spine 1993; 39: 9-13.
5) Han SC, Harrison P. Myofascial pain syndrome and trigger point management. Reg Anesth 1997; 22: 89-101.
6) Mense S, Schmit RF. Muscle pain. Which receptors are responsible for the transmission of noxious stimuli? In: Rose FC, ed. Physiological aspects of clinical neurology. Oxford: Blackwell Scientific Publications 1997; 265-278.
7) Hopwood MB, Abram SE. Factors associated with failure of trigger point injections. Clin J Pain 1994; 10: 227-234.
8) Ling FW, Slocumb JC. Use of trigger point injections in chronic pelvic pain. Obstet Gynecol Clin North Am 1993; 20: 809-815.

9) Fricton JR, Kroening R, Haley D, Siegert R. Myofascial pain syndrome of the head and neck a review of clinical characteristics of 164 patients. Oral Surg Oral Med Oral Pathol 1985; 60: 615-623.
10) Simons DG. Understanding effective treatment of myofascial trigger points. J Bodyw Mov Ther 2002; 6: 81-88.
11) Raj PP, Paradise LA. Myofascial pain syndrome and its treatment in low back pain. Semin Pain Med 2004; 2: 167-174.
12) Hong CZ. Lidocaine injection versus dry needling to myofascial trigger point. The importance of the local twitch response. Am J Phys Med Rehabil 1994; 73: 256-263.
13) Fernandez-Carnero J, La Touche R, Ortega-Santiago, Galan-del-Rio F, Pesquera J, Ge HY. Short-term effects of dry needling of active myofascial trigger points in the masseter muscle in patients with temporomandibular disorders. J Orofac Pain 2010; 24: 106-112.
14) Ceccherelli F, Rigoni MT, Gagliardi G, Ruzzante L. Comparison of superficial and deep acupuncture in the treatment of lumbar myofascial pain: A double-blind randomized controlled study. Clin J Pain 2002; 18: 149-153.
15) Shipton EA. Book Review: Pain medicine - A comprehensive review - 2nd Edition. Anaesth Intensive Care 2003; 31: 705-706.
16) Bank JCT, Pynsent PB. The Oswestry disability index. Spine 2000; 25: 2946-2953.
17) William R, Binkley J, Bloch R, Goldsmith CH, Minuk T. Reliability of the modified schober and double inclinometer methods of measuring lumber flexion and extension. Phys Ther 1993; 73: 26-37.
18) Ponte DJ, Jensen GJ, Kent BE. A preliminary report on the use of the McKenzie protocol versus Williams protocol in the treatment of low back pain. J Orthop Sports Phys Ther 1984; 6: 130-139.
19) Cagnie B, Dewitte V, Barbe T, Timmermans F, Delrue N, Meeus M. Physiologic effects of dry needling. Curr Pain Headache Rep 2013; 17: 348.
20) Legrain V, Iannetti GD, Plaghki L, Mouraux A. The pain matrix reloaded: a salience detection system for the body. Prog Neurobiol 2011; 93: 111-124.
21) Tekin L, Akarsu S, Durmus O. The effect of dry needling in the treatment of myofascial pain syndrome: a randomized double blinded placebo-controlled trial. Clin Rheumatol 2013; 32: 309-315.
22) Barbero M, Schneebeli A, Koetsier E, Maino P. Myofascial pain syndrome and trigger points: evaluation and treatment in patients with musculoskeletal pain. Curr Opin Support Palliat Care 2019; 13: 270-276.
23) APTA. Description of dry needling in clinical practice: An educational resource paper 2013: 1-7. Available at: https://www.myopainseminars.com/wp-content/uploads/2022/02/DryNeedling_ClinicalPracticeEducationalResourcePaper1.pdf.
24) Edwards J, Knowles N. Superficial dry needling and active stretching in the treatment of myofascial pain a randomized controlled trial. Acupuncture Med 2003; 21: 80-86.
25) Ga H, Choi JH. Dry needling of trigger points with and without paraspinal needling in myofascial pain syndromes in elderly patients. J Altern Compl Med 2007; 13: 617-624.
26) Teasdale T. Safety, Effectiveness and Impact of Dry Needling Trigger Points in Athletes - a Systematic Review. Ottawa, 2009. Available at: https://api.semanticscholar.org/CorpusID:52200124.
27) Kietrys DM, Palombaro KM, Azzaretto E, Hubler R, Schaller B, Schlussel JM, Tucker M. Effectiveness of dry needling for upper-quarter myofascial pain: a systematic review and meta-analysis. J Orthop Sports Phys Ther 2013; 43: 620-634.
28) Hu HT, Gao H, Ma RJ, Zhao XF, Tian HF, Li L. Is dry needling effective for low back pain? A systematic review and PRISMA-compliant meta-analysis. Medicine (Baltimore) 2018; 97: e11225.
29) Dommerholt J. Dry needling in orthopedic physical therapy practice. Orthopaed Pract 2004; 16: 15-20.
30) Rickards LD. Therapeutic needling in osteopathic practice: an evidence-informed perspective. Int J Osteopathic Med 2009; 12: 2-13.
31) Shah JP. Integrating Dry Needling with New Concepts of Myofascial Pain, Muscle Physiology, and Sensitization. In: Audette JF, Bailey A, editors. Integr Pain Med 2008; 107-121.
32) Cagnie B, Barbe T, De Ridder E, Van Oosterwijck J, Cools A, Danneels L. The influence of dry needling of the trapezius muscle on muscle blood flow and oxygenation. J Manipulative Physiol Ther 2012; 35: 685-691.
33) Kostopoulos D, Nelson AJ, Ingber RS, Larkin RW. Re-education of spontaneous electrical activity and pain perception of trigger points in the upper trapezius muscle through trigger point compression and passive stretching. J Musculoskelet Pain 2008; 16: 226-278.
34) Nambi G, Alrawaili SM. An additional effect of electro-acupuncture on unspecified chronic low back pain among university employees in Al-kharj, Saudi Arabia: a randomized controlled study. Acupunct Electrother Res 2023; 48: 185-197.
35) Nambi G, Abdelbasset WK, Elsayed SH, Verma A, Abase SA, Inbasekaran D, Abdelaziz MA. Role of electro acupuncture therapy on temporomandibular joint pain with orofacial myalgia following post healed unilateral cervicofacial burn. Acupunct Electrother Res 2021; 46: 123-134.