

Influence Of Electromagnetic Field Therapy Versus Acupuncture Dry Needle In Treatment Of Nonspecific Low Back Pain Patients: Randomized Clinical Trial

Ahmed Mohamed Fathi Elshawi ^{1*}, Amr Moustafa Yehia Mohammed ²
Bashayer Aydah Abdullah Al shahrani ³, Sami Ali Abdullah Al-Khathami ³ and
Ghada Mohamed Rashad Koura ^{4,5}

¹ PhD of physical therapy, Faculty of physical therapy, Cairo University, Egypt, Consultant of physical therapy, head of department of physical therapy in Saudi German hospital, Aseer, Saudi Arabia.

² Lecturer in department of musculoskeletal disorders and its surgery, faculty of physical therapy, 6 October university, Giza, Egypt.

³ Physiotherapy specialists, collage of applied medical sciences, king Khalid University, physiotherapist in Saudi German hospital, Aseer, Saudi Arabia.

⁴ Assistant professor in department of medical rehabilitation, faculty of applied medical sciences, KKU, Saudi Arabia.

⁵ Assistant professor in department of physical therapy for musculoskeletal disorders and its surgery, faculty of physical therapy, Cairo University, Egypt.

*Corresponding Author:

Ahmed Mohamed Fathi Elshawi, E-mail: asd2511978@gmail.com

Abstract

Background: low back pain affects about 60% to 90% of the working-age population in modern industrial society. Non-specific low back pain is mechanical low back pain of musculoskeletal origin in which symptoms vary with physical activities.

Objective of the study: to examine the electromagnetic field therapy versus acupuncture dry needle in treatment of nonspecific low back pain patients. **Subjects and Methods:** Thirty patients were assigned randomly in to 2 groups. Subjects in the first group (A) (n=15) with main age of 36.73(2.52) received magnetic field therapy and traditional physical therapy program (Infrared radiation, ultrasonic, stretching and strengthening exercises for back muscles), and the second group (B) (n = 15) with main age of 37.27(2.52) received acupuncture dry needle over trigger points of back muscles followed by stretching exercise. The following parameters including pain severity, functional disability and lumbar range of motion (flexion, extension, right side bending and left side bending) were measured before and after treatment.

Results: Concerning to the within subject effect, the multiple pairwise comparison tests was used to compare between pre and post treatment in both groups, and it revealed that there was significant increase ($p < 0.05$) in Range of flexion and extension and significant reduction ($p < 0.05$) in pain severity, right and left side bending and functional disability at both groups post- treatment. Regarding between subject effects multiple pairwise comparisons revealed that there was no significant difference between both groups pre- treatment and post- treatment in pain severity, Range of flexion, Extension and in functional disability while there was significant reduction ($p < 0.05$) in range right and left side bending at post- treatment in favor to group A compared to group B. **Conclusion:** on the basis of the present date, it is possible to conclude that both electromagnetic field therapy and acupuncture dry needle were effective in

reducing pain severity and functional disability and improve range of motion in patients with nonspecific low back pain.

Key words: electromagnetic field, acupuncture dry needle, non-specific low back pain.

INTRODUCTION

Low back pain (LBP) is attributed to physical and psychosocial

factors, including lifestyle factors, depression, and obesity.[1]

Low back pain is the most frequent self-reported type of musculoskeletal pain, it is often recurrent and has important socioeconomic consequences

Estimating the prevalence of LBP vary considerably between studies and reach 33% for point prevalence, 65% for one-year prevalence, and 84% for lifetime prevalence.[2]

From a global standpoint, the age standardized global prevalence of low back pain in 2019 was 70 per 1000 population. [3]

LBP is typified by pain and reduced physical functioning, often affecting mental health, and increasing risks for comorbidities and all cause mortality.[4] cases of mechanical LBP, repeated trauma to or overuse of the spine, intervertebral disks, and surrounding tissues, This causes disk herniation, vertebral compression fractures, lumbar spondylosis, spondylolisthesis, and lumbosacral muscle strain[5], and also Biomechanical risk factors for causing LBP include inappropriate posture of the lower back, heavy lifting, repetitive work, and whole-body vibrations from agricultural machinery, Psychological factors, in turn, include stress, anxiety, and depression[6]

Nonspecific low back pain is often further subdivided based on duration of symptoms to acute (pain lasting less than 6 weeks), sub-acute (6 to 12 weeks), or chronic (more than 12 weeks). [7]

However, in about 90–95% of the cases the cause of the pain cannot be identified, and these patients are classified as having nonspecific LBP. [8]

Non-specific low back pain (NSLBP) is defined by the absence of a known pathoanatomical cause for the pain.[1] it is most common type of back pain to occur and accounts for 85% of all back pain causes[9].

The low back pain has become one of the greatest public health problems worldwide [10], the diagnostic label of non-specific low back pain implies no known pathoanatomical cause. Triage aims to exclude those cases in which the pain arises from either problems beyond the lumbar spine eg, (leaking aortic aneurysm); specific disorders affecting the lumbar spine (eg, epidural abscess, compression fracture, spondyloarthropathy, malignancy, cauda equina syndrome); or radicular pain, radiculopathy, or spinal canal stenosis[11]. Evaluation and treatment of low back pain all still insufficient. Patients still have some degree of disability and pain even after rehabilitation. [12]

Electromagnetic fields (EMFs) tool up a non-invasive, safe, and easy method to treat pain with respect to musculoskeletal diseases. The destination of this systematic review was to describe the use of electromagnetic therapy in the rehabilitation field by investigating the efficacy in acute and chronic pain in the musculoskeletal disorders. [13]

In addition The use of electromagnetic fields (EMFs) and in particular of the magneto-therapy has had a notable increase

in the last decade in rehabilitation treatment and provides a non- invasive, safe, and plain method to directly treat the site of injury, the source of pain and inflammation, and other types of disease. [14][15]

Magnetic field therapy was applied to promote bone healing, treat osteoarthritis and inflammatory diseases of the musculoskeletal system, relieve pain, enhance healing of ulcers and reduce spasticity. [16] In addition Magnetic field, were applied to improvement pain, functional disability, and lumbar ROM in patients with non-specific low back pain than Conventional physical therapy alone. [17]

Dry needling is defined by the American Physical Therapy Association (APTA) as a: skilled intervention that uses a thin filiform needle to penetrate the skin and stimulate underlying myofascial trigger points, connective tissues and muscular for the management of neuromusculoskeletal pain and movement impairments. [18]

A trigger point (TrP) is a hyper irritable spot in a taut band of skeletal muscle that is painful on stretch, compression, overload or contraction of the tissue which usually responds with pain referred that is perceived distant from the spot [19].

Depending on their clinical characteristics, the trigger points are classified as active or latent. active MTrPs when they produce spontaneous pain and, when palpated, reproduce a patient's familiar pain. Latent MTrPs do not produce spontaneous pain and are only painful upon palpation. [20]

Trigger point dry needling (TPDN) interventions have begun to be utilized by physical therapists to manage musculoskeletal conditions, TPDN uses an acupuncture like needle to target myofascial trigger points (MTrPs).MTrPs are definition as areas of hardness and tautness in muscles that contain hyperalgesic zones. [21]

Dry needling as a skilled intervention using a thin filiform needle to penetrate the skin that stimulates myofascial TrPs, muscles, and connective tissue for the treatment of musculoskeletal pain disorders. [22]

Dry needling is typically used to treat soft tissues, such as muscles, fascia, scar tissue, ligaments, tendons, peripheral nerves and neurovascular bundles involved in a variety of neuromusculoskeletal pain syndromes. [23]

Until now, no research has compared the effects of electromagnetic field therapy versus acupuncture dry needle in treatment of nonspecific low back pain patients. As a result, this study will be carried out to identify which of the two therapy regimens is more effective in terms of treatment.

Aim of the work:

The aim of the study was designed to examine the electromagnetic field therapy versus acupuncture dry needle in treatment of nonspecific low back pain patients.

Subjects and Methods

Study Design:

The study was designed as an experimental randomized clinical trial. The study was evaluated and approved by the ethical committee of Faculty Physical Therapy, Cairo University, Egypt, (Approval number: P.T.REC/012/004029). The Helsinki Declaration Criteria for human research were followed in this study. A written informed consent was obtained from each patient.

Subjects:

Forty patients diagnosed clinically with non-specific low back pain were examined for eligibility in the study (Figure: 1)

Assessed for eligibility (n=40)

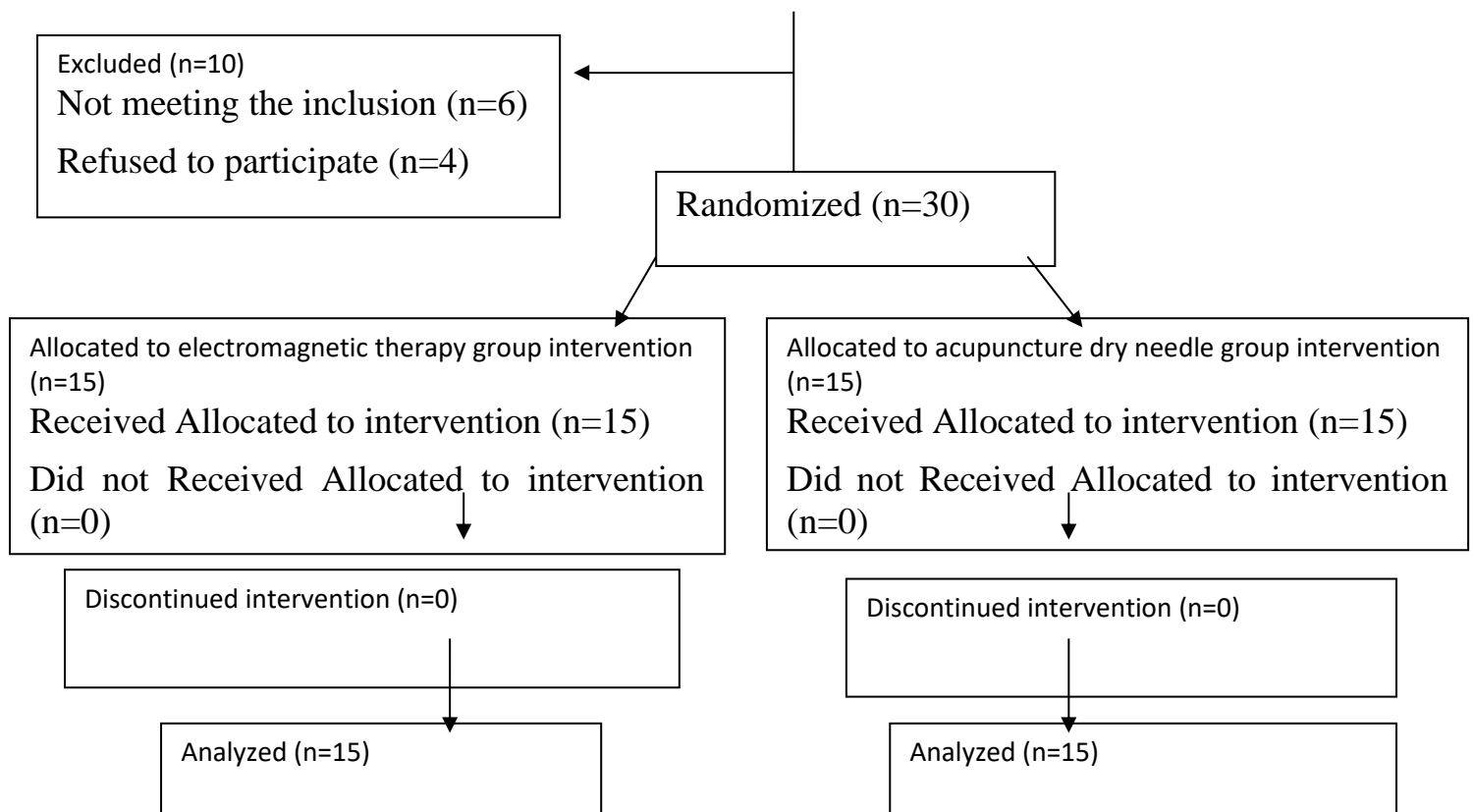


Figure (1): Participant flow diagram

Inclusion Criteria:

- Patients (office worker) had low back pain for 3 months ago.
- Patients with active trigger points in lower back muscles.
- Ranged of the patient age from 20 to 40 years.

Exclusion Criteria:

- Pregnant and lactating women.
- History of previous back surgery.
- Vertebral compression fracture.
- Neurological deficit.
- Current lower extremity symptoms.
- Cardiopulmonary disease with decreased activity tolerance.

The experiment continued with 30 patients (21 female and 9 male), their age ranges from 20 to 40 years signed an informed consent. The subjects were assigned randomly (one by one for each group) into: group (A) 15 patients received (magnetic field and traditional physical therapy program infrared, ultrasonic, stretching exercises and strengthening exercises for back muscles) for 12 sessions over four weeks period, group (B) 15 patients received acupuncture dry needle over trigger points of back muscles followed by stretching exercise program only for 4 sessions over two weeks period.

Instrumentations:

Instrumentations used for evaluation: We should assess the patient just before and just after the treatment sessions. The

procedures of assessment included the following items.

1- Pain assessment:

One of the most important things is measurement of pain. Visual analog scale (VAS): Visual analog scale tool was used for subjective assessment of pain, where subject documents their level of pain on a straight line of 10 to 15 cm length.

Extreme end points of this line corresponds to “no pain at all” and “pain as bad as it could be”. Subject was explained about the line and meaning of end points and asked to mark on the line with pencil or pen. Subject gave rating of their own perception of pain without any input from others. [24]

2- Functional disability:

Functional disability of each patient was assessed by The ODI is a ‘gold standard’ self-administered questionnaire for assessing low back functional disability .It contains ten sections involving pain intensity, social and sex life, and different personal activities. Each section has 6 possible answers to be marked on a zero to five scales. The maximum scores indicate a maximum level of functional disability. The total score is fifty, usually represented as a percentage. A single agreed-upon minimal clinically important difference (MCID) score has not been recognized yet for the Oswestry disability index. The MCID of ODI varies, such as 17 points, 10 points, six and five point change. The Urdu version of the ODI (ODI-U) was used, with good to moderate validity and excellent reliability in patients with lumbar radiculopathy. The MDC of approximately six points has been reported on a zero–fifty scale for lumbar radiculopathy patients the level of disability was considered as a secondary outcome. [25]

3- ROM assessment:

Assessment of lumbar flexion and extension:

Modified Modified Schober Test (MMST) is one of the known methods for measuring lumbar range of motion because of its simplicity, its high co-relation with flexion measurements of lumbar spine obtained through radiograph. Along with these qualities, it gives accurate measurements, can be used everywhere and materials used are affordable and easily available. This method is reliable, valid and convenient for both therapist and patient it does not need any landmarks or fixation because it is easy to palpate. [26]

a- Measurement of Lumbar Flexion:

The patients were instructed to remove their shoes and disrobe, exposing their back from gluteal fold to mid-thoracic spine with left and right PSIS fully exposed. The patients were asked to stand erect, with their eyes directed horizontally, arms at their sides, and feet placed on a paper footprint that was secured to the floor (the heels of the footprint was about fifteen cm apart). This position helped the patients to stabilize the pelvis, aided them in maintaining their balance and helped us mark a midline point on sacrum (inferior mark). Then the final mark (superior mark) was marked on the lumbar spine fifteen cm above the midline sacral mark (inferior mark). The therapist aligned the tape measure between two skin marks with zero at inferior mark and fifteen cm at superior skin mark. The measuring tape was kept firmly against the patients skin while the patients were asked to bend forward with the instruction “Bend forward as far as you can while keeping the knee straight”.

The measuring tape was maintained against the volunteer’s back during the movement but was allowed to unwind to accommodate motion. [27][28][29][30]

b- Measurement of Lumbar Extension:

The same landmarks and processes described for the flexion technique were used for measuring lumbar extension. With the patients in the erect standing position, with their eyes directed horizontally, arms at their sides, and feet placed on paper footprint, the therapist lined up the measuring tape between the markings. While holding the tape measure placed firmly against the patient skin, the therapist gave instruction: "Place the palms of your hands on your buttock and bend backward as far as you can". When the patients bent backward into full lumbar extension, the new distance between the superior and inferior skin markings was measured using the tape and the change in the distance between the marks was used to indicate the amount of range of motion of lumbar extension. After measuring lumbar extension, instruction given to patients was: "You can come back to comfortable standing position". At the end of data collection, all skin marks were removed with alcohol

For each of the spinal motion measured, the end of the range of motion (ROM) was defined by instructing the patients to report that they cannot move any further. At the end of flexion range of motion, the distance between the two marks was noted. The range of motion was the difference between fifteen cm and length measured at the end of motion. After each measurement, instruction given to patients was: "you can come back to a comfortable standing position. [28][29]

c- Lateral flexion:

Finger to floor: Lateral flexion distance: Have the patients stand with their feet shoulder-width apart and arms at their side. If the patient pant hyperextends or flexes their knees, cue them to keep the knees in neutral. Ask the patients to bend maximally and laterally to the right. Measure the distance between the patients right fully extended middle finger and the floor. Hold

the tape measure next to the right foot and directly under the right middle finger. Repeat these proceedings on the left for left-side bending, the patients should not be bending forward or backward while performing lateral movement. Include that the contralateral foot does not lift and that the ipsilateral leg does not bend during lateral movement. [31]

Instrumentation used for treatment:

1- ASA Magnetic field (Automatic PMT Quattro pro):

ASA magnetic field is a device for magneto therapy, its model is (Automatic PMT Quattro pro) and its serial number is (00001543). And consists of an appliance, motorized bed and solenoids. The appliance must be connected to electrical mains supplying $230v \pm 10\%$ at a frequency of 50 or 60 Hz with earth connection. The spatial lay and intensity out of the generated magnetic field depend on the type of solenoid used.

2- Infrared radiation:

Infrared has been used as a form of heat for many purposes. Its model is 4004/2N. The device has a voltage 203v, power of 400w, and frequency of 50/60Hz. Infrared is sometimes chosen as a form of heat prior to, mobilization, traction, stretching, massage and exercise therapy.

3- Ultrasonic device:

Ultrasonic device Phyaction 190 serial number 2745, 230V, 300 mA / 50 – 60Hz, Pus: 8w. It is used for pain relief and break down of adhesions in the case of LBP.

4- Acupuncture like needle (Long somatic needle):

Long Somatic Needles 0.30mm in diameter, 50 and 70mm long used as a treatment tool.

Procedures:

Patients were assessment before and after the treatment sessions; The Assessment procedures include the following:

Diagnosis of MPS:

- Diagnosis of MPS requires both proper history taking and clinical examination; the history identifies the areas affected by pain and help in finding the predisposing factors that led to MPS.

Treatment procedure:

-In clinical examination muscles whose trigger points can refer pain to the affected areas were examined.

-Muscles were palpated searching for taut bands, using either flat palpation or pincer palpation.

-Fingers were moved along the taut band to find the hardest and most tender spot (the trigger point).

-Trps were compressed manually and the patient was asked if the spot is tender or painful, and if so did the pain resemble his usual pain.

-Trps was compressed for 5–10 seconds and the patient was asked if there is pain or some sensation away from the trigger point (referred pain).

Group A:

This group was consisted of 15 patients. They had received:

- Infrared radiation for 20 minutes/session at distance of 60 cm from lumbar region, while patients in prone lying position for 12 session 3/week every other day for one month. [32]

- Ultra sonic: for 5 minutes, 1Hz, continuous mode of application 1.5w/cm2. [33]
- Mild stretching exercises for 30 seconds for hamstring, calf muscles, and back muscles from long setting. [34]
- Strengthening exercises for back muscles (bridging and active back extension). [35] Each exercise was down 3 times at session with hold for 6 seconds.
- Pulsed Electromagnetic Field, frequency 10 Hz, intensity of 20 gauss and duration of 15min. [36] While patients in prone lying position expose lumbar to (PEMF), 3 sessions per week every other day for one month

Group B:

This group was consisted of 15 patients. They had received acupuncture dry needle.

Treatment procedure for group B (acupuncture dry needle):

First of all, detect the trigger points by palpating a taut band within the muscle belly at the lumbar region. The muscles that have been treated iliocostalis lumborum, quadratus lumborum, gluteus medius and piriformis muscles. The patients received 2 sessions per week for 2 weeks.

Myofascial acupuncture dry needle technique:

Myoficial TrP is a hyper-irritable point within a taut band of skeletal muscle that is painful on compression, stretch, overload, or contraction of the tissue which usually responds with a referred pain that is perceived distant from the point. [37]

A myofascial TrP that causes a clinical pain complaint, It is always tender, weakens the muscle, prevents full lengthening of the muscle, refers a patient recognized pain on direct compression, mediates a local twitch

response of muscle fibers when stimulated. [38]

An explanation of the procedure to the patient was performed prior to the application of dry needling. The patient should be educated on DN rationale and theory, what to expect during and after the treatment, possible side effects, and expected outcomes, type of needle used, precautions, possible fear of needling and pain associated with DN must be addressed. When providing dry needling to patients Adept palpation skills are used to identify a trigger point. A flat or pincer grip is used to identify the problematic area with the palpating hand, The needling hand places the needle and guide tube at the site, The needle is tapped into the epidermal layer of the skin and the guide tube is discarded, The control hand is used to insert the needle perpendicular to the muscle superficially to the subcutaneous tissue (deep) into the muscle to penetrate the trigger point. This is known as superficial (SDN), or deep dry needling (DDN/TrP-DN) respectively. The needle can be left in situ for a short period of time (up to 20 minutes) and out of the muscle, causing a twitch response from the trigger point, During a pistoning technique, once the acetylcholine (motor neurone, para sympathetic system) is depleted at the end plate, the twitching will stop and the needle is removed and discarded appropriately in a sharps container. [37]

Dry needling is usually performed with a filiform needle to penetrate the skin and or underlying tissues to affect change in body structures and functions for the evaluation and management of neuromusculoskeletal condition, movement impairments, disability and pain. [39]

Muscles treated by acupuncture dry needle:

1-Iliocostalis lumborum:

From side lying position identify the trigger point via flat palpation. A needle with 5cm

length was inserted slightly superior to the TrP. Perpendicular to the skin, and directed inferomedially for about 300. Precautions: Avoid penetration of the lung.

2-Quadratus lumborum:

While the patient was in a side lying position, place the patient's arm in extension to elevate the rib cage; leg is in extension and adduction to drop the iliac crest lower, and use a pillow under the non-treated side to open up a wider space where Trp can be easier identified. A needle with 7cm length is inserted just caudal to the 12th rib and anterior to the paraspinal muscle mass; it is directed parallel to the plane of the back (in the longitudinal plane) toward the L2 and L3 transverse processes.

3-Gluteus medius:

The patient is in a side-lying position. A needle of 5cm in length was used along the contour of the iliac crest. The muscle is needled perpendicularly with flat palpation. The Strong dropping of the subcutaneous tissue is required to minimize the distance from the skin to the muscle. It is common if the needle contacts the periosteum. **Precautions:** Avoid needling the nerves (sciatica- superior gluteal) and deep branch of the superior gluteal vessels. The amount of adipose tissue determines the depth of penetration.

4- Piriformis:

The patient is in side lying position. Distinguishes the bony landmarks of the greater trochanter and the sacrum at S2, S3 and S4. A needle 5cm length was inserted perpendicular to the muscle surface at the trochanter or just medial to the sacrum from the sciatic notch toward the pubic symphysis directly into the TrP taut band identified by palpation.

Precautions: Avoid needling the sciatic nerve

Statistical Analysis

The Statistical Package for Social Science (SPSS) software version 23 for Windows was used for all statistical analyses. Covariance homogeneity and data normality are tested using the Box's test and the Shapiro-Wilk test, respectively. 2x 2 mixed design MANOVA was used to compare the tested variables of interest in different test groups and measurement times. The alpha level was set at 0.05.

Results

Mixed design MANOVA revealed that there were significant within- subject effect and treatment*time effect ($F = 224.929$, $p = 0.0001$, Partial Eta Squared=0.983) ($F = 80.283$, $p = 0.0001^*$, Partial Eta Squared=0.954) respectively. Also, there was significant between- subject effect ($F = 27.429$, $p = 0.0001^*$, Partial Eta Squared=0.877). The descriptive statistics

of within and between groups differences at 95 % CI for the effects of interventions for all dependent variables were presented in table (1). Concerning to the within subject effect, the multiple pairwise comparison tests was used to compare between pre and post treatment in both groups, and it revealed that there was significant increase ($p < 0.05$) in Range of flexion and extension and significant reduction ($p < 0.05$) in pain severity, right and left side bending and functional disability at both groups post-treatment. Regarding between subject effects multiple pairwise comparisons revealed that there was no significant difference between both groups pre-treatment and post- treatment in pain severity, Range of flexion, Extension and in functional disability while there was significant reduction ($p < 0.05$) in range right and left side bending at post-treatment in favor to group A compared to group B.

Table (1): Descriptive and Inferential Statistics of the Dependent Variables in the Experimental and Control Groups Pre and Post the Study Period.

		Group (A) (n = 15)	Group (B) (n = 15)	P value*
Pain Severity	Pre training	6.06 ± 1.22	6.13 ± 1.12	0.878 ^{NS}
	Post training	3.43 ± 0.53	3.36 ± 1.90	0.899 ^{NS}
	% of change	43.39 ↓↓	45.18 ↓↓	
	P value**	0.001 ^S	0.001 ^S	
Range of Flexion	Pre training	3.7 ± 0.56	3.7 ± 0.56	1.00 ^{NS}
	Post training	6.56 ± 0.69	6.76 ± 0.94	0.514 ^{NS}
	% of change	77.29 ↑↑	82.7 ↑↑	
	P value**	0.001 ^S	0.001 ^S	
Range of Extension	Pre training	1.54 ± 0.24	0.24 ± 1.52	^{NS} 8250.
	Post training	2.44 ± 0.25	41 ± 0.2.32	^{NS} 3270.
	% of change	58.44 ↑↑	52.63 ↑↑	
	P value**	0.001 ^S	^S 0010.	
Range of Right side Bending	Pre training	48.6 ± 3.72	48.59 ± 3.65	0.992 ^{NS}
	Post training	19.45 ± 1.15	44.57 ± 4.78	0.001 ^S
	% of change	59.97 ↓↓	8.27 ↓↓	
	P value**	0.001 ^S	0.001 ^S	

Range of Left side bending	Pre training	49.21 ± 3.15	49.22 ± 3.18	0.991 ^{NS}
	Post training	19.32 ± 0.9	45.05 ± 4.81	0.001 ^S
	% of change	60.73 ↓↓	8.47 ↓↓	
	P value**	0.001 ^S	0.001 ^S	
Functional Disability	Pre training	47.13 ± 4.15	47.33 ± 4.16	0.896 ^{NS}
	Post training	27.66 ± 2.09	30.73 ± 7.83	0.154 ^{NS}
	% of change	41.13 ↓↓	35.07 ↓↓	
	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.

DISCUSSION

Non-specific low back pain is one of the most common causes of inappropriate back function. Magnetic therapy has been reported to be effective in the treatment of patients with back pain. This study was conducted to examine the effects of pulsed electromagnetic field (Frequency of 10Hz, intensity of 20 Gauss and duration for 15 minutes precession, three sessions per week for successive 12 weeks) on improvement of pain, functional disability and back range of motion in non-specific low back pain patients.

All patients in both groups had symptoms of low back pain. This agrees with **Amorim et al., (2019)** who reported that, some postures that people adopt in the occupational setting, such as carrying, lifting heavy weight while inclined, or adopting awkward postures (e.g. bending, twisting, squatting, and kneeling) are associated with a higher prevalence of recurrent symptoms of LBP. [40]

Activities of daily living (ADL) are various functional activities that may range from basic ones, such as bending or walking to more complex activities (also called instrumental activities of daily living), such as cooking, bathing or getting dressed, in other words activities which enable independent living. This agrees with **Edemekong et al., (2019)**. [41]

Electromagnetic field therapy group (GI):

To examine the analgesic effects of (EMF), comparison between pre and post results of pain assessment using visual analogue scale for the patients in the experimental group. Randomized Controlled Trial (RCT) study was conducted to investigate the effects of pulsed electromagnetic field therapy in patients with chronic nonspecific low back pain. The findings of the current study is improved pain intensity, disability and lumbar range of motion. These results come in agreement with **Elshawi et al., (2019)** [42]. The analgesic effect of pulsed electromagnetic field therapy could be attributed to one of the following mechanisms: First, the physiologic mechanism of pain relief due to application of PEMF therapy decreased pain, disability and increased lumbar spine mobility possibly by motivation of inhibitory sensory neurons and/or by local interference of the electrochemical changes thereby inhibiting pain signals to some extent. [17]

On the basis of them randomized controlled trial concluded, by adding pulsed electromagnetic field to conventional physical therapy protocol it resulted in superior clinical improvement in pain, functional disability, and lumbar range of movement) ROM (in patients with non-specific low back pain. [42]

Second, the molecular mechanism of the effect of magnetic field may involve PEMF (low frequency) has also been linked to cell membrane adenosine receptor expression. (Cadossi and colleagues) have reported that PEMF exposure results in increased expression of the A2A and A3A adenosine receptors in a variety of cells and tissues. Activation of these receptors by endogenous adenosine is associated with reductions in prostaglandins and inflammatory cytokines, again consistent with the published clinical findings of reduced inflammation and pain. [43]

Third, evidence exists that For targeted PEMF, upregulation of nitric oxide production been found to reduce inflammatory gene expression in immune cells, reduce programmed cell death, and promote dilation of blood vessels and enhanced circulation, This results are consistent with reductions in pain, swelling, and inflammation that have been observed clinically. [44]

To examine the effect of the (PEMF) on reducing functional disability, comparison between pre and post results of functional disability using Oswestry disability questionnaire for the patients of experimental group there was significant decrease in functional disability at the end of the treatment, These results are consistent with **C Luigi et al., (2020)[45]** and **Markov M et al., (2017)[46]** Who said the PEMFS can reduce inflammation, pain, edema, and complete tissue regeneration, including neovascularization and remodeling of the extracellular matrix up to complete restoration of the injured tissue, PEMFs can penetrate completely through all types of tissues, from the skin to bone, and are capable of inducing tissue and cellular responses, including transcriptional activation. The improvement in functional ability for patients in this study could be attributed to the positive anti-inflammatory and analgesic effect of magnetic field which

lead to decrease pain and inflammation and improve back functions. [47] Concerning lumbar range of motion, there was significant increase at lumbar (flexion, extension, RT side bending and Lt side bending) after treatment at patients by magnetic field. These results come in agreement with **Elshawi et al., (2019)[42]** on the basis of their randomized controlled trial concluded, by adding pulsed electromagnetic field to conventional physical therapy protocol it resulted in superior clinical improvement in pain, functional disability, and lumbar range of movement (ROM) in patients with non-specific low back pain.

The study outcome also showed improved Related Quality of Life (HRQOL) scores, overall indicating PEMF therapy to be efficient in treatment of non-specific LBP and related disabilities. [17]

The main finding of all study above is that PEMF therapy seems to reduce the pain intensity and enhance better functionality in individuals with low back pain. When used alone, the PEMF seem to have great effect in decrease the pain intensity in low back patients, independently of the low back pain condition. However, when added to other standard active safe tool for conservatively treat the low back pain. Furthermore, it has a high potential of compliance due to its high tolerance and low risk of side effects. Several studies have been demonstrating the PEMF effectiveness in reducing the disability related to the low back pain. [48]

Acupuncture dry needle group (G2):

Acupuncture dry needle technique was effective in reducing pain severity and functional disability and improves range of motion in patients with nonspecific low back pain. This finding is in accordance with other studies showing the effects of DN in patients with myofascial pain syndrome. Stretching exercises, as many studies have supported, is a beneficial

intervention to treat chronic myofascial pain syndrome. [49] Stretching cervical muscles for 30 s was optimal in achieving stretching benefits and reducing the negative effects of MP on the contiguous nerve roots and central nervous system.

[50]

Dry needling of trigger points with paraspinal needling resulted in slightly more continuous subjective pain reduction than dry needling of TrPs only and showed significant improvements on the geriatric depression scale. [51]

In a systematic review focused on DN in athletes. Investigated four comparisons: 1) DN vs. placebo treatment, 2) DN vs. standard care; 3) DN vs. standard acupuncture; and 4) DN vs. wet needling. She conclude that dry needling, compared to acupuncture or placebo needling, is more effective in relieving post-treatment pain and disability in low back pain.

Hu, H.T.et al., (2018) [52] She also noted no statistically significant benefit with dry needling comparison to standard care. However, when comparing dry needling to standard acupuncture, effect of DN on alleviating pain intensity and functional disability at post intervention was more significant than acupuncture. And DN had more significant effect than sham needling on alleviating post intervention pain intensity, post intervention functional disability. In addition, when compared DN with trigger point injection or laser or standard physical therapy, it remained uncertain whether DN was superior to these other treatments or had equal efficacy because results of the included studies were mixed.

Most recently, **Rainey (2013) [53]** described the case of a female 30-year old on active military duty who injured her low back while weight lifting. She was diagnosed with a lumbar segmental instability with right hip.

Investigators have attributed the therapeutic effects of dry needling to various mechanisms, such as mechanical, neurophysiologic and chemical effects. [54]

Twenty new articles involving dry needling had been indexed in PubMed by April 2015. Almost all of them have reported that dry needling is effective for specific types of musculoskeletal pain. [55]

From a mechanical viewpoint, it has been suggested that the increase in muscle blood flow and oxygenation observed after TrP-DN would support a reduction of sarcomere contracture. [56]

It is thought that DN mechanically provides a localized stretch to the shortened sarcomeres and contracted cytoskeletal structures within the Myofascial trigger point this would allow the sarcomere to resume its resting length by decrease the degree of overlap between actin and myosin filaments. [57]

From a mechanical viewpoint, it has been suggested that TrP-DN is able to disrupt the dysfunctional end plates, to increase of sarcomere length, and to reduce the overlapping between actin and myosin filaments. [58]

From a neurophysiological viewpoint, Trigger point -Dry needling may reduce both peripheral and central sensitization by removing the source of peripheral nociception (TrP area), by modulating spinal dorsal horn activity, and by activating central inhibitory pain pathways Activation of the descending inhibitory systems, which blocks noxious stimulus from pain neural pathways that connect the CNS and spinal cord. [59]

For the chemical effect of DN, Chemical, Cellular Stimulus The needle depolarizes and neutralizes abnormal chemicals at motor end plates, resulting in improved symptom. [60]

Peripheral activation of A δ - and C-fibre nociceptors is modulated by a number of sensitizing and algogenic agents, such as

substance P (SP), bradykinin, histamine, calcitonin gene-related peptide (CGRP), prostaglandins, interleukin-1 β (IL1 β), tumor necrosis factor (TNF), and nerve growth factor (NGF). All of these can be released following cellular damage, The local release of some of these chemicals (SP, histamine) causes inflammation and vasodilation, contributing to the “protective” function of pain, The perception and endogenous modulation of pain Scientific. [61]

DN may influence the microcirculation. Different studies have demonstrated that needling may increase muscle blood flow and oxygenation. Several mechanisms have been suggested to explain the local muscle response of blood flow in needle stimulation. [56]

Conclusion

On the basis of the present data, it is possible to conclude that both electromagnetic field therapy and acupuncture dry needle were effective in reducing pain severity and functional disability and improve range of motion in patients with nonspecific low back pain.

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Ethics Statement:

The study was designed as an experimental randomized clinical trial. The study was examined and approved by the ethical committee of Faculty Physical Therapy, Cairo University, Egypt, (approval number: P.T.REC/012/004029). The Helsinki Declaration Criteria for human research were followed in this study. A written informed consent was obtained from each patient.

Authors Contributions:

AMF, AMY and GMR took part in the concept and design of the study. AMF and AMY contributed to applying each treatment according to the treatment schedule. BAA and SAA participated in acquisition of data. GMR contributed to Data analysis and interpretation. All authors collaborated on the study's statistical analysis, interpretation of the data, writing, and editing.

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Conflict of interest:

Authors state no conflict of interest.

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