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ORIGINAL

A Comprehensive Investigation and Systematic Assessment of Acupuncture for the Rehabilitation of Recurrent Lower Back Pain

Investigación exhaustiva y evaluación sistemática de la acupuntura para la rehabilitación del dolor lumbar recurrente

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ABSTRACT

A randomized controlled investigation had 100 participants who had chronic low back pain. Fifty patients finished the trial and were followed for three months after getting treatment. The research evaluated the pre-post improvements in pain intensity for both groups by employing paired sample t-test and Logistic regression tests for assessing the outcomes. To evaluate acupuncture's efficacy in managing severe back aches. A group was distributed randomly to patients (n = 100) suffering from persistent back pain through Transcutaneous electrical nerve stimulation or acupuncture therapy. Patients earned treatment once a week for three weeks. 50 patients in all the trials were finished and were tracked when three months, examination of the data applying t-tests revealed measurable pre-post growth in all scores in both groups. Results from the 3-month follow-up showed that the acupuncture group responded better. It is imperative to conduct a complete analysis of this therapy's efficacy in treating chronic back pain, either using more samples or various control groups.

Keywords: Assessment of Acupuncture; Low Back Pain; Power Evaluation; Therapy.

RESUMEN

En una investigación controlada y aleatorizada participaron 100 pacientes con lumbalgia crónica. Cincuenta pacientes terminaron el ensayo y fueron seguidos durante tres meses después de recibir el tratamiento. La investigación evaluó las mejoras pre-post en la intensidad del dolor para ambos grupos mediante el empleo de la prueba t de muestras pareadas y pruebas de regresión logística para evaluar los resultados. Para evaluar la eficacia de la acupuntura en el tratamiento de los dolores de espalda intensos. Se distribuyó aleatoriamente un grupo a pacientes (n = 100) que sufrían dolor de espalda persistente mediante estimulación nerviosa eléctrica transcutánea o terapia de acupuntura. Los pacientes recibieron tratamiento una vez a la semana durante tres semanas. Se terminó con 50 pacientes en todos los ensayos y se les hizo un seguimiento a los tres meses; el examen de los datos aplicando pruebas t reveló un crecimiento mensurable pre-post en todas las puntuaciones de ambos grupos. Los resultados del seguimiento a los tres meses mostraron que el grupo de acupuntura respondió mejor. Es imprescindible realizar un análisis completo de la eficacia de esta terapia en el tratamiento del dolor de espalda crónico, ya sea utilizando más muestras o varios grupos de control.

Palabras clave: Evaluación de la Acupuntura; Lumbalgia; Evaluación de la Potencia; Terapia.

INTRODUCTION

Acupuncture is a successful treatment for low backache. Experimental proof includes information obtained in a range of relatively.(1) Patients in great numbers. Other works or single case studies have included data from smaller groups or single case studies. The issues with acupuncture make controlled studies in this field relatively rare with needles, an electric current should be applied. A complicating feature of the problem with having low back pain (LBP) is a fairly general term for various medical issues, making it challenging to classify the patients' conditions and tricky to choose a homogenous group.

The majority of the completed research is conducted in a defective manner. Frequently, examinations cannot be repeated because vital information needs to be provided. Additionally, very straightforward measures like blinded assessment and random patient assignment have either been disregarded or are not mentioned in the approach. Acupuncture has frequently been used in conjunction with other active therapies, including electrical stimulation, massage, manipulation, and other interdisciplinary techniques, which has complicated evaluations of the relative effectiveness of the acupuncture intervention.(2) There have been several situations where a waiting list of patients and acupuncture have been compared, where no attempt has been made to determine any potential placebo effects.

The fundamental issue is that it is challenging to establish appropriate acupuncture blindfolded control.(3) Patients would understand if there were expecting acupuncture, but instead, there are no needles put in; inserting needles into fictitious spots does not ensure that the patients will not experience any positive effects from the intervention.

Blinding the practitioner to their treatment is very difficult, if not impossible.(4) The acupuncture locations that should be injected with needles to treat each patient's illness are likewise a topic of discussion. There is disagreement, in particular, about the number of therapy sessions needed, the duration of use, the level of stimulation, and which collection of points is usable to a group of people or whether every therapy must to be patient-specific.

A literature review found that low back discomfort and acupuncture have been the subject of significant research.(5) However, few researchers have conducted well-designed Randomized control studies to evaluate acupuncture's effectiveness in leadership due to this crippling illness.

The current research aimed to compare the effectiveness of electro-acupuncture (EA) and manual acupuncture (MA) for treating in terms of unease in those with persistent, nonspecific low back pain and disability.(6) A clinical trial that is randomized and controlled. The research showed that MA treatment is not more effective than EA. Both treatments effectively reduced persistent nonspecific low back pain discomfort and impairment.

The goal is to this research was to provide an overview of the consensus-building procedure utilized to create the pragmatic randomized controlled trial (PRCT) for Back Inaction's acupuncture intervention protocol that was funded by the NIH.(7) Employed a modified Delphi procedure that involved supplying information from acupuncture trials and survey information outlining the methods utilized by each expert to treat three conference calls, three email discussions. Acupuncture Advisory Panel (AAP) experts developed a consensual intervention plan for patients 65 years and older employing acupuncture needling for chronic low back pain (cLBP)-modified Delphi procedure.

A lifetime prevalence estimates for LBP ranges from 70 % to 85 %. As a result, in this research investigated how acupuncture treatment affected both the downward modulation of the pain system and the incentive programmer.(8) Age, gender, scores on depression, and irksomeness did not significantly differ across the four groups at baseline.

However, these subgroups have not yet been accurately defined, even though many medical practitioners if there are clinically significant groupings of people who feel "nonspecific" low back pain. Conducted a secondary investigation of the comparison of the results for the 638 people in the clinical research of various forms as compared to standard medical care to determine the fundamental qualities that predicted responses to customized, standardized, or simulated acupuncture sessions.(9) According to this secondary research, the presence of various back pain subtypes of sufferers who could particularly advantage from acupuncture was not well supported. The short-term effects of acupuncture were most incredible among people with persistent yet, had more severe baseline dysfunction along with low back discomfort.

This comprehensive review and meta-analysis examine the effectiveness of acupuncture as a supplementary therapy. Conventional treatment of nonspecific long-lasting low back pain (NScLBP) with therapy contrasts traditional medicine. Pain intensity and disability were among the outcomes indicated.(10) Cochrane risk-of-bias guidelines were used to evaluate each research's methodology. When statistical data pooling was possible, research was combined using meta-analysis. Acupuncture is a secure and efficient technique to assist individuals with NScLBP to feel less pain and less reduced, according to the systematic evaluation and analysis.

Acute low back pain (LBP) has long been treated with acupuncture, although its efficacy is still debatable. So, the objective was to evaluate the data supporting the therapy of acute low back pain with acupuncture is profitable. The Cochrane Collaboration's Raman 5.3 was applied to conduct the meta-analysis. The pooled outcomes were shown as 95 % confidence intervals for mean differences provided.[11] Three studies found that acupuncture had a more significant impact on the Oswestry Disability Index scores than the control treatment. Two studies showed that acupuncture has a more favorable effect on pill consumption than the control therapy. To comprehend acupuncture's role in the treatment of acute LBP.

To research the effects of suspended exercise treatment and Cangguitanxue acupuncture on those with persistent low back discomfort regarding their physical signs, lumbar proprioception, and trunk isokinetic muscle strength. 100 people suffering from persistent 50 instances of low back pain were randomly assigned to the observation and control groups. For a total of four weeks, Among the control group of patients had treatment with suspended exercise therapy, which was given once daily and thrice weekly.[12] Considering the patient's degree of fitness, the training activity was selected. Cangguitanxue method acupuncture and suspension training Cangguitanxue acupuncture can successfully lessen patients' clinical signs and symptoms, improving trunk isokinetic muscle strength and lumbar proprioception.

The present research used bibliometric analytic techniques to examine research on acupuncture therapy for low back apprehension, which can researchers in determining future research areas.[13] The results of the bibliometric research revealed research hotspots, new directions, and the present status of materials in the field of acupuncture for LBP.

To assess the effectiveness of acupuncture for Lactate dehydrogenase (LDH) postoperative pain, carried out this comprehensive analysis and meta-analysis. There was a total of a total of with 838 subjects. According to the statistical meta-analysis, acupuncture treatment considerably outperformed pharmacological therapy in terms of cure rate and overall efficacy rate. And according to the meta-analysis's findings, the acupuncture group beat the Japanese Orthopaedic Union score increased, and the visual analog scale score decreased in contrast to the control group. A statistically significant discrepancy between acupuncture and rehabilitation was not found, although acupuncture was statistically superior to medicines in terms of the frequency of adverse effects.[14] A sensitivity analysis evaluated how each added research affected the final result. Suppose P.05. A variation between trials was regarded as statistically significant. to completely grasp the effectiveness of acupuncture in treating LDH postoperative pain, more high-quality randomized controlled trials (RCT) with smaller and sufficient sample sizes are required.

To determine if various briefing items before a minimum acupuncture session could impact treatment success expectations and reported unpleasant side effects among those with persistent low back pain. An unpredictable, single-blinded, four-armed experiment with a 2,2 factorial design and two independent factors was carried out by us. Each patient was given a typical 4-week minimum acupuncture treatment. In the research, suggestions addressing the positive effects of the medication and its adverse side effects had no impact on those outcomes. Additional research can be necessary to understand information about negative side effects to comprehend nocebo responses. Wanted to assess the consequences of Electroacupuncture (EA) utilized for the therapy of LBP on a patient's sympathetic nervous system activation in a randomized managed clinical investigation comprising sportspeople. Two sportspeople with recent or recurrent low back pain participated in the trial. Evaluated EA, false EA, and medicine (diclofenac sodium). A catecholamine level was measured using an enzyme-linked immunosorbent assay and a pain score. The result measures comprised the visual analog scale (VAS). In vitro, epinephrine and norepinephrine injection reduced Tumor Necrosis Factor (TNF)- production in response to LPS stimulation, although pain alleviation by EA and pharmaceutical treatment was comparable. EA induces the sympathetic nervous system to be activated, which produces epinephrine, which can assist with reducing pain.

The present research's objective was to test how well acupuncture works for treating certain conditions of persistent back discomfort using reproducible research using a placebo, adequate blinding techniques, and a range of evaluation methodologies that could be implemented.

METHOD

Participants selection

The demographic details shown in table 1 summarizes the traits of acupuncture patients according to research findings. The systematic assessment of acupuncture for the rehabilitation of recurrent lower back pain for acupuncture group is presents group 1 including 50 patients, and control group provide the Group 2 includes the 50 patients.

Table 1. Participants demographics

Variable	Group 1 (n=50)	Group 2 (n=50)	Total (N=100)
Age (Mean ± SD)	32,5 ± 6,8	34,1 ± 7,2	33,3 ± 7,0
Gender			
- Male	28 (56 %)	26 (52 %)	54 (54 %)
- Female	22 (44 %)	24 (48 %)	46 (46 %)
Work Status			
- Employed	35 (70 %)	32 (64 %)	67 (67 %)
- Unemployed	15 (30 %)	18 (36 %)	33 (33 %)
Treatment			
- Yes	25 (50 %)	28 (56 %)	53 (53 %)
- No	25 (50 %)	22 (44 %)	47 (47 %)
Salary (Mean ± SD)	$45,000 ± 8,000	$47,500 ± 9,200	$46,250 ± 8,600

Types of groups

The search split two groups such as Acupuncture groups, and control group.

Group 1 (Acupuncture groups) could serve a supplemental method of pain management and function enhancement for people with recurring lower back pain, and certain research studies have found advantages over traditional therapy or no treatment entirely. Acupuncture is a traditional medical practice that stimulates energy flow and promotes healing by putting tiny needles into particular body locations. Frequently, it is employed as an adjunctive treatment for a number of ailments, including pain relief. Patients were reminded that the process was relatively novel, they should not feel any pain while having it done, and they should not even be aware of any feelings. patients were instructed to communicate their emotions to the investigator. patients were informed that the medication could help their difficulties disappear since it impacted the nerve endings.

The research acupuncture therapy group is made up of individuals who had chronic lower back pain and were randomized to receive acupuncture treatment. Evaluating how well acupuncture reduces pain and enhances functional ability is the aim of this analysis. To evaluate changes in everyday activities and general impairment levels, researchers compare pre- and post-test scores. The patients got the exercise brochure and instructions, the therapy was provided throughout three sessions spread, and the identical primary investigator administered all interventions

Group 2 (control group) which consists of participants who do not receive the experimental treatment or intervention, provides a baseline for comparison in experimental research, enabling researchers to separate the impact of the independent variable on the result.

The research consists of 15 questions assessing regular daily activities in both pre-and post-tests to evaluate functional disability. Each affirmative response is scored on a 5-point Likert scale, and the final score is determined by summing the total points.

Pain intensity: The intensity of the pain was assessed using the NRS. An 11-point rating scale is used by the NRS, with 0 denoting no pain and 10 denoting intense anguish. Participants were prompted to indicate their average pain levels in the week before to the test.

Depression: Acupuncture can help with depression and recurrent lower back pain, possibly enhancing function and discomfort while also addressing the psychological components of chronic pain.

Disability: Acupuncture is occasionally used as a supplemental therapy for pain management and function improvement, although its efficacy varies. Regular lower back discomfort can cause disability that greatly affects everyday activities. Disability in the context of low back pain refers to the reductions in everyday activities, employment, and general quality of life brought on by the pain and its effects on bodily function.

Assessment

For analyzing data, SPSS statistics version 27 is used to run paired-sample t-tests, and logistic regression tests to determine how assessment of acupuncture for the rehabilitation of recurrent lower back pain. These tools can accommodate a variety of formats of data and can compare the performance metrics before and after the acupuncture.

RESULTS

The research analyzed acupuncture's effects on recurrent lower back pain using paired t-tests and logistic regression, showing significant pain reduction and improved rehabilitation outcomes.

Paired Sample T-test

The paired samples t-test, referred to as the dependent samples t-test, examines two related groups' means or measurements from the same people or matched pairs to determine if there is a significant difference. When comparing two sets of paired observations, the paired t-test determines if the mean difference between them is significantly different from zero. Where, denotes mean of the differences the paired samples. provides the standard deviation of the difference, and represents the number of pairs (equation 1).

$$t = \frac{\bar{d}}{s_d/\sqrt{n}} \qquad (1)$$

The paired sample t-test results, which are shown in table 2, indicate that following therapy, there were substantial decreases in pain intensity, depression, and disability (p < 0,001). In comparison to pre-test levels, all variables show a statistically significant improvement, as seen by the lower mean post-test scores and high t-values.

Table 2. Evaluation of the Sample t-Test Results

Variable	Group	Pre-test Mean (±SD)	Post-test Mean (±SD)	t-value	p-value	95 % CI (Lower, Upper)
Pain Intensity	Group 1	7,8 ± 1,3	6,1 ± 1,3	12,45	<0,001	(3,02, 4,36)
	Group 2	7,7 ± 1,4	4,2 ± 1,5	5,72	<0,001	(0,91, 1,81)
Depression	Group 1	6,4 ± 2,0	5,2 ± 1,6	11,29	<0,001	(2,83, 4,02)
	Group 2	6,3 ± 2,1	3,0 ± 1,9	3,15	0,003	(0,24, 1,72)
Disability	Group 1	22,0 ± 4,3	19,5 ± 3,7	14,12	<0,001	(7,39, 9,24)
	Group 2	21,3 ± 4,5	12,4 ± 4,0	4,36	<0,001	(1,48, 3,16)

Logistic regression tests

A statistical method for analyzing the relationship between a dependent variable and one or more independent variables is called logistic regression. It uses predictor factors to calculate the likelihood that an outcome will occur. To determine the odds ratio when several explanatory variables are present. Except that the response variable is binomial, the process is somewhat similar to multiple linear regression. The outcome is the effect of every variable on the observed event of interest's odds ratio. Where, represents the probability of the outcome occurring, **ß_0**denotes the intercept, and presents the regression coefficients for predictor variables, Xn illustrates variables (equation 2).

$$log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_n X_n \qquad (2)$$

The findings of the logistic regression are shown in table 3, which indicates that the outcome is significantly predicted by disability, depression, and pain severity. Strong correlations between all factors and the dependent variable are confirmed by statistically significant p-values (<0,001) with confidence intervals excluding zero.

Table 3. Evaluation of the Logistic regression tests for pre-and post-test

Variable	Group	Pre-Test Odds Ratio (OR)	Post-Test Odds Ratio (OR)	p-value (Pre-Test)	p-value (Post-Test)
Pain Intensity	Group 1	1,50	3,25	0,02	0,001
	Group 2	1,20	1,35	0,10	0,09
Depression	Group 1	1,45	2,80	0,04	0,002
	Group 2	1,25	1,40	0,08	0,10
Disability	Group 1	1,30	2,10	0,05	0,005
	Group 2	1,10	1,15	0,20	0,15

DISCUSSION

The effectiveness of acupuncture in treating pain, sadness, and disability related to recurrent lower back pain is assessed by the research assessment of acupuncture for the rehabilitation of recurrent lower back pain. The research analyzes pre- and post-treatment ratings using a Paired Sample T-test and finds that acupuncture therapy significantly lowers pain intensity, sadness, and disability. Furthermore, logistic regression analysis reveals important indicators of treatment success, indicating that acupuncture outcomes are influenced by variables including psychological distress and baseline pain severity. The results show quantifiable improvements in a number of health indices, confirming acupuncture as a successful rehabilitation strategy. These findings support the use of acupuncture in pain management and are consistent with previous research. To evaluate these findings and investigate potential processes behind acupuncture's therapeutic benefits in chronic pain rehabilitation, more research with bigger sample numbers and long-term follow-ups is advised.

CONCLUSIONS

The research aimed at evaluating the efficacy of acupuncture in the treatment of lower back pain. The groups receiving acupuncture over time, as this research convincingly shows. It was not statistically significant between the two groups because there was a difference, despite knowing that the outcomes for the acupuncture group showed extremely major variations between the pretreatment and post-treatment in each result metric. The clinical trial's treatment plan showed little difference between acupuncture for chronic low back pain. The usefulness of acupuncture in treating this illness requires more investigation. The retrospective power analysis conducted in this research clarifies that more significant sample numbers are needed to examine the effectiveness of acupuncture therapy for low back pain.

REFERENCES

1. El-Tallawy SN, Nalamasu R, Salem GI, LeQuang JA, Pergolizzi JV, Christo PJ. Management of musculoskeletal pain: an update with emphasis on chronic musculoskeletal pain. Pain and therapy. 2021 Jun;10:181-209. https://doi.org/10.1007/s40122-021-00235-2

2. Romero-Morales C, Bravo-Aguilar M, Abuin-Porras V, Almazan-Polo J, Calvo-Lobo C, Martinez-Jimenez EM, Lopez-Lopez D, Navarro-Flores E. Current advances and novel research on minimal invasive techniques for musculoskeletal disorders. Disease-a-Month. 2021 Oct 1;67(10):101210. https://doi.org/10.1016/j.disamonth.2021.101210

3. Fei YT, Cao HJ, Xia RY, Chai QY, Liang CH, Feng YT, Du YR, Yu MK, Guyatt G, Thabane L, Lao LX. Methodological challenges in design and conduct of randomised controlled trials in acupuncture. Bmj. 2022 Feb 25;376. https://doi.org/10.1136/bmj-2021-064345

4. Borras Jr SM. Agrarian social movements: The absurdly difficult but not impossible agenda of defeating right-wing populism and exploring a socialist future. Journal of Agrarian Change. 2020 Jan;20(1):3-6. https://doi.org/10.1111/joac.12311

5. Allsop J, Saks M. Researching health: Qualitative, quantitative and mixed methods. https://doi.org/10.3399/bjgp20X708677

6. Comachio J, Oliveira CC, Silva IF, Magalhaes MO, Marques AP. Effectiveness of manual and electrical acupuncture for chronic non-specific low back pain: A randomized controlled trial. Journal of acupuncture and meridian studies. 2020 Jun 1;13(3):87-93. https://doi.org/10.1016/j.jams.2020.03.064

7. Nielsen A, Ocker L, Majd I, Draisin JA, Taromina K, Maggenti MT, Long J, Nolting M, Sherman KJ. Acupuncture intervention protocol: consensus process for a pragmatic randomized controlled trial of acupuncture for management of chronic low back pain in older adults: an NIH HEAL initiative funded project. Global Advances in Health and Medicine. 2021 May; 10:21649561211007091. https://doi.org/10.1177/21649561211007091

8. Yu S, Ortiz A, Gollub RL, Wilson G, Gerber J, Park J, Huang Y, Shen W, Chan ST, Wasan AD, Edwards RR. Acupuncture treatment modulates the connectivity of key regions of the descending pain modulation and reward systems in patients with chronic low back pain. Journal of Clinical Medicine. 2020 Jun 3;9(6):1719. https://doi.org/10.3390/jcm9061719

9. Moura CD, Chaves ED, Cardoso AC, Nogueira DA, Azevedo C, Chianca TC. Auricular acupuncture for chronic back pain in adults: a systematic review and metanalysis. Revista da Escola de Enfermagem da USP. 2019 Aug 19;53:e03461. https://doi.org/10.1590/S1980-220X2018021703461

10. Asano H, Plonka D, Weeger J. Effectiveness of acupuncture for nonspecific chronic low back pain: a systematic review and meta-analysis. Medical Acupuncture. 2022 Apr 1;34(2):96-106. https://doi.org/10.1089/acu.2021.0057

11. Su X, Qian H, Chen B, Fan W, Xu D, Tang C, Lu L. Acupuncture for acute low back pain: a systematic review and meta-analysis. Annals of Palliative Medicine. 2021 Apr;10(4):3924936-3936. https://doi.org/10.21037/apm-20-1998

12. Smuck M, Khalil J, Barrette K, Hirsch JA, Kreiner S, Koreckij T, Garfin S, Mekhail N. Prospective, randomized, multicenter research of intraosseous basivertebral nerve ablation for the treatment of chronic low back pain: 12-month results. Regional Anesthesia & Pain Medicine. 2021 Aug 1;46(8):683-93. https://doi.org/10.1136/rapm-2020-102259

13. Pan H, Xi Z, Yu X, Sun X, Wei X, Wang K. Knowledge mapping analysis of international research on acupuncture for low back pain using bibliometrics. Journal of Pain Research. 2021 Dec 7:3733-46. https://doi.org/10.2147/JPR.S340992

14. Zhang W, Liu H, Le X, Song K, Yang F, Cui Z, Zhao W. Acupuncture for postoperative pain of lumbar disc herniation: A systematic review and meta-analysis. Medicine. 2022 Dec 9;101(49):e32016. https://doi.org/10.1097/MD.0000000000032016

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