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A STUDY TO COMPARE THE EFFICACY OF ULTRASONIC PULSED WAVE & ISOTONIC EXERCISE VS CONTINUOUS WAVE ALONG WITH ISOMETRIC BACK EXERCISE PROGRAM ON WORK RELATED SUB-ACUTE LUMBOSACRAL PAIN IN INDIAN HOUSE WIVES

Dr.Ashish Yadav[1*], Dr.Sudhansu Bhusan Mangaraj[2]
[1*,2] PhD, Physiotherapy Dept. ANS hospital, Jaipur, Rajasthan

***Corresponding Author:** drbutu@gmail.com
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ABSTRACT

Background: Subacute lumbosacral pain is becoming one of the leading causes of disability among adults worldwide. Therapeutic ultrasonic is one of the most often utilized electro-physical modalities in clinical settings and is often used by physiatrists to treat LBP. Likewise, isometric and isotonic back protocols are nearly more effective ways to strengthen the hip and back muscles.

Objective: to observe the benefits of isotonic or isometric protocols combined with various modalities of US treatment for individuals with subacute lumbosacral pain, particularly in Indian housewives.

Methodology: The Division of Physical Medicine & Rehabilitation at ANS Hospital conducted this randomized control experiment from September 2025 to November 2025. The research cohort included of female patients aged 25 to 55 who diagnosed with sub-acute LBP while they were in the hospital. Sixty-six individuals with sub-acute LBP who met the selection parameters were included in the research population. They were separated into two groups, designated Group A and Group B. There were 33 patients in each group. Twenty-two patients i.e 11 from each group were lost over follow-up. 44 patients' worth of data were used for the final study. In contrast, patients in group A received pulsed US along with isotonic protocols, patients in group B received constant US with isometric exercise, and ADL instructions permitted to both groups.

Conclusion: Isometric and isotonic protocols, together with US therapy, are important in the treatment of subacute lumbosacral pain. At the end of the trial, Group-A made a substantial improvement over Group-B.

Keywords: sub-acute lumbosacral pain, US therapy, isometric exercise, isotonic exercise, VAS, ODI.

Introduction

In the lumbar and buttock regions, lumbosacral pain is characterized as an unpleasant feeling that arises from neurons within or adjacent to the spinal canal that are damaged or irritated by one or more disease processes. This has an effect on the gap between the lower rib cage and the gluteal folds. A definitive diagnosis cannot be made based on anatomical or physiological dysfunction for the majority of patients with lumbosacral pain. Chronic, non-specific A three-month or longer period of activity-limiting low back discomfort (without pain radiating to either lower leg) is referred to as lumbosacral pain(1,2,3). Approximately 80% of people will experience lumbosacral pain at a certain point in their lives, which can be brought on by a lot of physical labor, lifting, extreme sports, bending, and twisting. Global population-based studies have shown that prevalence varies greatly, with women experiencing a range of 10% to 25% and men experiencing a range of

10% to 27% [4,5]. Non-specific lumbosacral pain history includes lifting and/or twisting while lifting heavy objects, using a vibrating machine, extended sitting, falling, coughing, sneezing, and straining [6,7]. We regularly encounter chronic low back discomfort in our daily work. Although low back discomfort is widespread even in those without these risk factors, obesity, poor conditioning, bending and twisting, heavy lifting, and physical vibration are risk factors (8).

Lumbosacral pain in Indian house wives: Low back discomfort is common among Indian housewives for a variety of physical, ergonomic, lifestyle, and psychological reasons. The impact of motion on the lower back is increased by most household tasks that require continuous or unnatural positions, such as bending forward for extended periods of time while preparing food on low platforms, squatting or sitting cross-legged while washing clothes or utensils, sweeping and mopping with repetitive spinal flexion and rotation, and lifting water buckets, gas cylinders, and grocery bags. The home's ergonomics are poor, inadequate physical fitness, Postpartum problems, several pregnancies can occasionally occur, inadequacies in nutrition, psychological strain, absence of exercise to prevent pain. One of the physical modalities that is frequently used to treat soft tissue injuries is therapeutic ultrasonic (US). Evidence supporting the clinical use of curative US in LBP patients is scant. The most crucial scientific tool for attempting to establish therapy success is a randomized clinical trial (9). For LBP, therapeutic ultrasonic (US) is a popular noninvasive therapy option. One common deep heat treatment for LBP is US, which operates at a frequency of 1-3 MHz. Therapeutic US delivers ultrasonic energy to deep tissues, causing mechanical and thermal consequences. By altering conduction velocity, reducing muscular spasm, and increasing collagen tissue elasticity and local blood flow, the enhanced movement of molecules produced by acoustic waves raises tissue warmth and reduces pain. (10). Additionally, by promoting cell membrane movement, vascular wall permeability, and soft tissue regeneration, ultrasonic pulsing waves produce non-thermal effects including acoustic cavitation and microbubbles that can help to reduce pain. Because of these factors, therapeutic US was reported to be beneficial for improving lumbar range of motion, pain reduction, and functional improvement in patients with LBP (11). Protocols that are isometric are static in nature, meaning that muscles contract and generate force without causing a noticeable change in muscle length or joint motion (15,16). Isometric exercise entails holding still for long stretches of time. Deep, slow-twitch postural muscles are the major focus of these workouts since they are in charge of holding the body opposing gravity and preserving proper posture. Back discomfort and bad posture are caused by these muscles' propensity to shrink over time. These muscles, which are found in the body's core, include the diaphragm, multifidus, paraspinal muscles, and transversus abdominis (12, 13). An workout that is dynamic and involves the motion of joints and ejection of certain parts of the body is called an isotonic exercise. Dynamic motions used in these protocols, known as concentric and eccentric contractions, cause the muscles used in the exercise to stretch and shorten. On the other hand, phasic muscles—large, fast-twitch muscles found on the body's surface—are the main muscles used in isotonic workouts. However, these muscles are susceptible to exhaustion and weakness. Phasic muscles encompass the gluteal muscles, rectus abdominis, latissimus dorsi, and erector spinae (14).

Objectives:

Comparing the effects of two distinct intervention techniques on pain and impairment in individuals with LBP—pulsed ultrasonic with isotonic exercise (Group-A) and continuous ultrasonic wave treatment with isometric exercise (Group-B)—was the primary research goal. Furthermore, the study sought to evaluate the efficacy of the Gp-A and Gp-B approaches in these individuals when compared to the same factors. The study's central premise is that Gp-A techniques are superior to Gp-B interventions in terms of lowering pain and impairment in LBP patients. According to the second hypothesis, these two approaches' effects on pain and functional status are not significantly different.

Methods:

Study design: Between May and November 2025, a randomized controlled experiment was carried out at the ANS Hospital's rehabilitation department in Jaipur, Rajasthan. On May 1, 2023, the trial protocol was retroactively registered despite an omission mistake.

Participants: 44 people in the research had their lumbosacral pain assessed by a physician who then recommended exercise treatment. Two groups of patients, each with an equal number of participants (n = 22), were formed. Only women between the ages of 25 and 55 were included in the groups. Patients were assigned

to their respective groups using a straightforward randomization technique to guarantee equity. The "Research Randomizer" was used for allocation, and each participant chose a sealed envelope. By ensuring anonymity and a distinct selection cycle, this method avoided favoritism in the selection process.

Intervention: Every member of group A received a 40-day ultrasonic wave therapy intervention together with a therapeutic isotonic exercise regimen. Similarly, members of group B received ongoing US therapy along with an isometric exercise program. A five-minute warm-up, twenty minutes of the primary workout, and ten minutes of ultrasonic wave persuasion were all included in each session, which lasted between thirty-five and forty minutes. Education was given to both groups. Each patient got a presentation that explained proper posture and ways to prevent lumbosacral pain in order to support the treatments. To guarantee proper execution of the protocols and the use of the ultrasonic device, an instructional session was held at the initial appointment with the assistance of a skilled physical therapist. Abdominal hollowing, straight leg lift from prone, superman, the teaser, curl up, side bridge, and supine extension bridge are among the seven protocols in the regimen. An ultrasonic device was used to treat the US group; the frequency was set to 1 MHz, and the power output was set to 1.5 W/cm in continuous mode and 1:4 in pulsed mode.

Outcome measures: The visual analog scale (VAS) was used to measure the participants' level of pain. They were told to use tick marks on a 10-cm straight line to represent their level of pain. A grade of 0 to 10 was assigned to the criteria, where 0 meant "no pain" and 10 meant "the worst possible pain." The VAS evaluation tool has strong inter-rater reliability. Patients' degree of impairment was evaluated using the Oswestry impairment Index (ODI). Ten questions make up this assessment, which assesses several facets of everyday living, such as the degree of discomfort, personal hygiene, lifting, walking, sitting, standing, sleeping, sexual activity, dating, and travel. Each question has six potential responses, and the points range from 0 (best performance) to 5 (worst performance). A higher score on the ODI reflects more severe disability (18). Both pain and disability were evaluated before and after 4 weeks.

Statistical analysis: The statistical analyses were performed with JASP for Windows (Version 16.0). In the table and text, the data are displayed as mean ± SD. The data was examined for an average distribution. At the significance threshold of $P < 0.05$, the t-test is employed to determine group differences. The Oswestry impairment Index, which measures impairment level, also revealed significant variations between the two groups ($P < 0.05$).

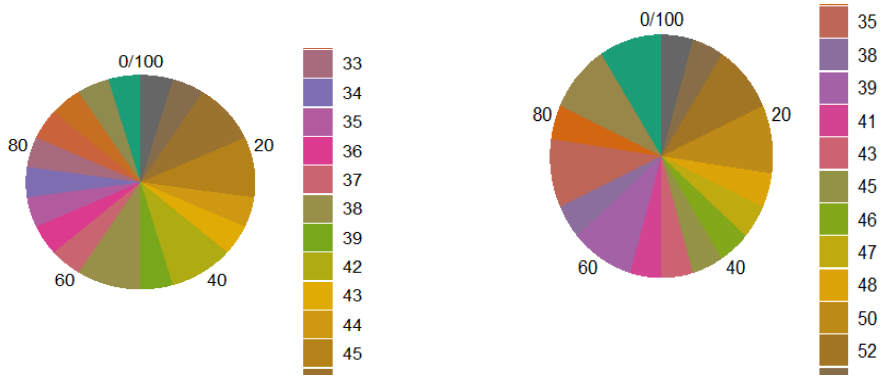
Results:

Descriptive Statistics

	age(A)	age(B)
Valid	22	22
Missing	0	0
Mean	39.091	41.364
Std. Error of Mean	1.598	1.938
Std. Deviation	7.495	9.090
Variance	56.182	82.623
Minimum	25.000	26.000
Maximum	54.000	54.000

Pie charts

age(A) age(B)



Descriptive Statistics

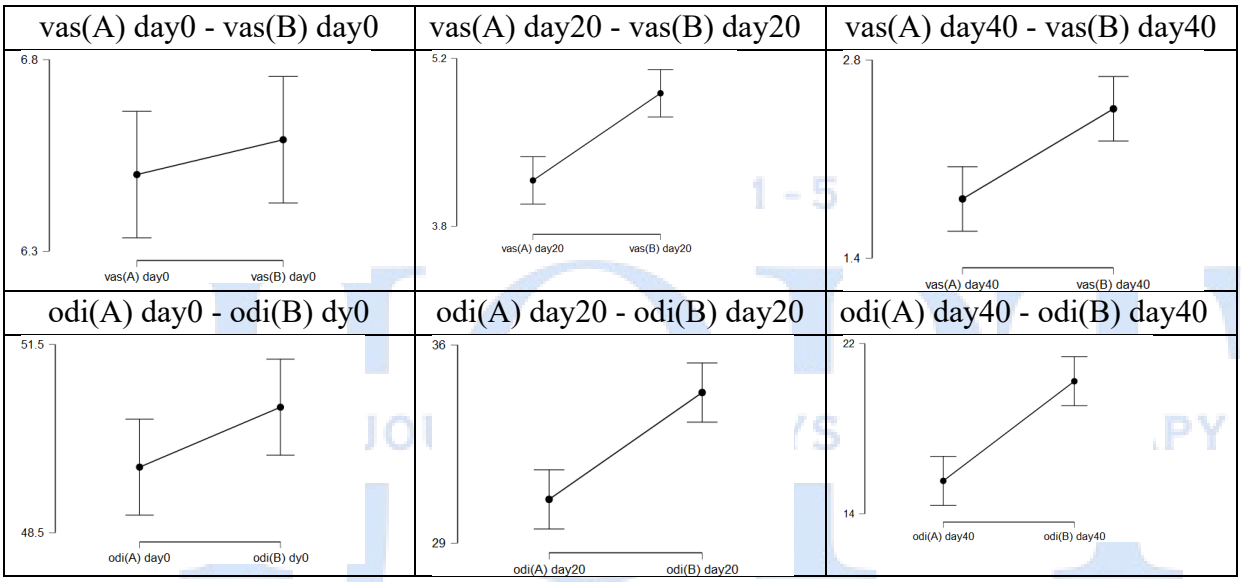
	vas(A) day0	vas(A) day20	vas(A) day40	odi(A) day0	odi(A) day20	odi(A) day40	vas(B) day0	vas(B) day20	vas(B) day40	odi(B) dy0	odi(B) day20	odi(B) day40
Valid	22	22	22	22	22	22	22	22	22	22	22	22
Missing	0	0	0	0	0	0	0	0	0	0	0	0
Mean	6.500	4.182	1.818	49.54	30.54	15.55	6.591	4.909	2.455	50.50	34.38	20.27
Std. Error of Mean	0.205	0.156	0.125	0.598	0.735	0.584	0.204	0.196	0.143	0.599	0.757	0.912
Std. Deviation	0.964	0.733	0.588	2.807	3.447	2.738	0.959	0.921	0.671	2.807	3.551	4.275
Variance	0.929	0.537	0.346	7.879	11.89	7.498	0.920	0.848	0.450	7.881	12.68	18.29
Range	3.000	2.000	2.000	9.000	12.00	9.000	3.000	3.000	2.000	10.00	11.00	14.00
Minimum	5.000	3.000	1.000	45.00	25.00	12.00	5.000	3.000	1.000	45.00	28.00	13.00
Maximum	8.000	5.000	3.000	54.00	37.00	21.00	8.000	6.000	3.000	55.00	39.00	27.00

Paired Samples T-Test

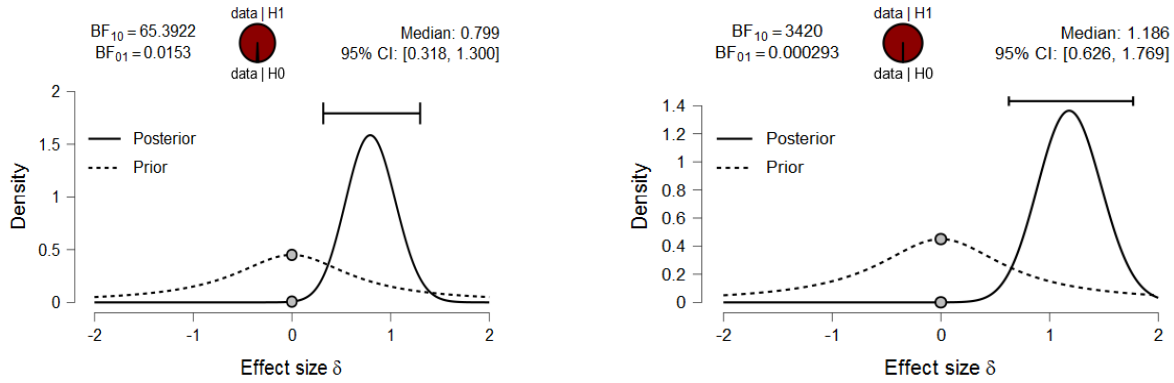
						95% CI for Cohen's d	
Measure 1	Measure 2	t	df	p	Cohen's d	Lower	Upper
vas(A) day0	- vas(A) day20	22.808	21	2.670e -16	4.863	3.339	6.375
vas(A) day20	- vas(A) day40	22.517	21	3.462e -16	4.801	3.295	6.295
odi(A) day0	- odi(A) day20	40.839	21	1.705e -21	8.707	6.057	11.269
odi(A) day20	- odi(A) day40	22.249	21	4.409e -16	4.743	3.254	6.222
vas(B) day0	- vas(B) day20	16.547	21	1.598e -13	3.528	2.383	4.660
vas(B) day20	- vas(B) day40	19.323	21	7.457e -15	4.120	2.809	5.419
odi(B) dy0	- odi(B) day20	29.686	21	1.238e -18	6.329	4.380	8.213
odi(B) day20	- odi(B) day40	24.421	21	6.685e -17	5.206	3.584	6.819

Paired Samples T-Test

Measure 1		Measure 2	t	df	p
vas(A) day0	-	vas(B) day0	0.810	21	0.427
vas(A) day20	-	vas(B) day20	5.405	21	0.084
vas(A) day40	-	vas(B) day40	4.107	21	0.003
odi(A) day0	-	odi(B) dy0	1.835	21	0.081
odi(A) day20	-	odi(B) day20	5.303	21	0.0001
odi(A) day40	-	odi(B) day40	5.984	21	0.0001



Prior and Posterior



Discussion: The results demonstrated the importance of the aforementioned interventions for the treatment of backache; the analysis p value during and after the procedure shows the differences, for example, p=0.0001 at day 40 on the functional status assessment with ODI outcomes and p=0.003 at day 40 on the rating of pain with VAS outcomes. Physical therapy, especially US therapy (UST), and medication have been shown to be beneficial supplements to an active exercise and education program that supports functional rehabilitation. Because continuous US delivers waves continuously, it can have thermal effects such as enhanced circulation

and tissue extensibility, which can cause reactive back tissues to overheat. Pulsed US reduces heat by stopping transmission while maximizing non-thermal benefits including constant cavitation, a gentle massage action that reduces inflammation and muscle spasms. For phases of acute or aggressive lumbosacral pain, pulsed US's decreased heat buildup is perfect because it enhances segmental comfort and motor control, two crucial components of physiotherapy treatments. While targeted rehabilitation may benefit from pulsed US, overall Cochrane evidence suggests that US is not well supported generally. Isotonic protocols are great for building muscle hypertrophy, power, and overall strength through gradual loading with weights. Simulating everyday activities also helps them transition more effectively to functional duties. In the absence of varied holds, isometric protocols limit range-specific improvements in strength and stability, but they do improve posture and power at certain joint angles. Isotonic workouts restore dynamic control, which enhances circulation, bone density, mobility, and calorie burn—all of which aid in the recovery from conditions like lumbosacral pain. In early rehabilitation, isometrics are useful for painless stability or injury prevention, but they are less beneficial for tolerance or sport-specific performance.

Outcome	Pulsed US + Isotonic	Continuous US + Isometric
Pain reduction	Moderate–High	High (short-term)
Inflammation control	Excellent	Limited
Muscle spasm relief	Moderate	Excellent
Lumbar ROM	Significantly improved	Mild improvement
Functional ability	Better improvement	Moderate improvement
Long-term benefit	Superior	Limited without progression

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Conclusion: Pulsed US is more effective than continuous US in treating lumbosacral pain because it effectively controls inflammation, reduces nociceptor sensitivity, enhances tissue healing, and allows for early functional training without the risk of thermal aggravation. For lumbosacral pain, isotonic exercise is better than isometric training because it enhances range of motion, promotes neuromuscular control, and provides a stronger long-term functional recovery.

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