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To Assess the Effect of Exercise Combined with Sound Wave Frequency (Tuning Fork) On Pain and Disabiity in Population with Low Back Pain: An Experimental Study

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ABSTRACT

Background: Low back pain (LBP) is one of the most widespread public and occupational health issues, posing significant professional, economic, and social challenges. An estimated 84% of people will experience LBP at some point in their lives, with a high likelihood of recurrence[(1,2)].

Since non-specific LBP lacks an identifiable pathoanatomical cause, targeted interventions become difficult, making long-term management challenging. Chronic pain can lead to emotional distress, anxiety, and depression, often compounding the physical symptoms. Psychosocial factors—such as fear-avoidance, coping strategies, and social support—play a significant role in how LBP is perceived and managed[(1,2)]. Traditional physiotherapy approaches often offer short term relief, prompting the need for integrative approach that provided sustained pain relief and well-being. This study is necessary not only to offer evidence-based directions for the clinicians, physiotherapists but also to define the most effective treatment scheme. This study investigates the combined effect of tuning fork therapy and structured exercise protocol in individuals with chronic nonspecific LBP, using VAS and MODQ as primary outcome measures. The goal is to evaluate whether integrating sound wave frequency using tuning forks with conventional physiotherapy can produce superior clinical outcomes.

Objective: To examine and measure the quantitative and qualitative relation between specific exercise with sound wave frequency using tuning fork having effect on pain and disability in low back pain.

Methodology: A total of 30 participants meeting the inclusion criteria were enrolled and provided with a specific exercise program along with sound wave frequency using tuning forks.

Pre and post intervention outcomes were assessed using the Visual Analog Scale (VAS) and Modified Oswestry Low Back pain disability Questionnaire for disability (MODQ).

Results: A statistically significant reduction in pain was observed. (VAS mean pre 7.43 and a low standard deviation of ±0.82; VAS mean post 3.27 and its standard deviation rose to ±1.14). Functional outcomes also demonstrated marked improvement (MODQ mean pre 59.67 and standard deviation was ±10.92; MODQ mean post 31.3 and the standard deviation was ±9.47).

Conclusion: The present study showed that the sound wave using tuning fork with exercises has the advantage of reducing pain and effective in reducing the disability. The result of the study can be applied clinically to assist healthcare worker professionals to manage chronic low back pain better.

Keywords: *Low back pain, sound wave frequency, tuning forks, VAS, MODQ,*

1. INTRODUCTION

Low back pain is most frequent musculoskeletal disorder worldwide, most of the general population will experience an episode during their lifespan with high reoccurrence rate. It significantly affects the physical activity, quality of life and ADL resulting in psychosocial, behavioral, nutritional and emotional challenges. Chronic LBP, especially of nonspecific origin, continues to challenge clinicians due to its complex etiology involving biomechanical, neurological, and psychosocial components.

The spine is a complex biomechanical structure which comprises both active and passive structures that enables an erect posture and withstand loading during daily activities. The active structures controls movement and the passive structures of the spine provide stability, limit and define range of motion and safeguard the neural structures in the spinal canal. Due to their continuous exposure to stress, these passive structures are vulnerable to degeneration, which may result in discomfort and impaired function.[3]

Low back pain (LBP) is one of the most widespread public and occupational health issues, posing significant professional, economic, and social challenges. An estimated 84% of people will experience LBP at some point in their lives, with a high likelihood of recurrence [1,2]. LBP is especially prevalent in middle-aged and older adults and can significantly impact both physical and mental health. It is categorized by duration: acute (<4 weeks), subacute (4–12 weeks), and chronic (>12 weeks). LBP may be "specific" or "non-specific".[6]

Conventional physiotherapy typically includes interventions like electrotherapy, stretching, strengthening exercises, and posture correction. Although these modalities are effective in providing short-term relief, recurrence of pain is common, and many patients do not experience sustained functional recovery[3,6]. The electrotherapy and exercise therapy are useful in patients with low back pain. In electro therapeutic modalities various sound frequency modalities are used such as ultrasound, shock wave therapy etc. to treat low back pain. Conservative management of LBP commonly involves electrotherapy and exercise. Treatments often include stretching glutes and lower back muscles, core strengthening, ergonomic advice, and functional training[7,8]. Electrotherapy techniques, such as ultrasound and shockwave therapy, use sound waves to produce therapeutic effects by improving circulation, reducing inflammation, and promoting healing.

Sound healing involves the intentional use of sound frequencies to support the body and mind in achieving balance and wellness[4]. Sound healing is among the oldest therapeutic practices known to humanity. Today, there's growing recognition of its profound potential. As Einstein suggested over a century ago, matter itself is energy at a frequency perceptible to our senses—suggesting sound may influence our physiology at a fundamental level[5]. Sound is considered the most fundamental form of vibrational energy, serving as the origin of all other types of vibrations. It influences both our conscious and unconscious states, often triggering emotional reactions. Sound plays a regulatory role in our physical and emotional well-being.

In this study we are administrating a different technique using sound wave through a tool known as tuning fork with some therapeutic exercise to observe the effect of sound waves in order to find an alternate way of using sound wave to treat chronic non specific low back pain with combination of exercise therapy. Tuning forks are exquisitely and finely tuned to carry sound frequencies to activate healing mechanisms in the human body. Some tuning forks are designed to be struck, or activated, then passed in and around the auric field and particularly either side of the head to balance brain hemispheres. Using this interval alone, in thirty seconds (the time it takes to stretch a muscle) you can achieve the same state of deep relaxation that might take thirty minutes to reach with meditation. Resonance is easily observed when a 'C' tuning fork is struck and brought near to another 'C' tuning fork. The second tuning fork will start to resonate together with the first tuning fork. It is because of the first tuning fork has transmit some of its energy to the second one. If the stem of the struck tuning fork is placed on a metal, glass or wooden object, this object will begin to vibrate.[11,12]

However minimal or no clear evidence of other modalities or tools (such as tuning forks) producing different type or different frequency sound wave have the specific effects with or without exercise protocol on non specific low back pain.

The optimal dose of physical activity prescribed in clinical setting classify into lowest effective dose and moderate to highest effective dose; the lowest effective dose- minimum amount of physical activity is provide benefit (15 min a day), moderate to high effective dose – increasing in the minimum effective level (>15min) i.e. 30minutes a day or 75 minutes a week exercises appears to be associated increased health benefits[9]. Study suggests 2-4weeks programme of exercises with training frequency of 3-5 times per week and training duration of 20-30 minutes per session causes the highest effect of both in pain and disability[10].

This experimental study focuses on the clinical outcomes of combining exercise with sound wave frequency using tuning forks in individual experiencing chronic low back pain. The focus was on evaluating improvements in pain and functional ability using validated outcome measures to assess the potential of an integrative, non-invasive treatment paradigm. Thus, the present or mentioned observational research is needed to examine and measure the quantitative and qualitative relation between specific exercise with tuning fork sound having effects on pain and disability in low back pain.

In this research or article, we use to major clinically sound outcome measure i.e. the visual analog scale (VAS) is used to assess the subjective pain in patient with low back pain before and after the exercise intervention. The VAS is a very frequent and widely used method for quantifying pain because the scoring on vas is easy reliable and valid in clinical setting. On the VAS 0 represents no pain and 10 represents extreme pain[13]. According to Begum and Hossain, the VAS is especially valid in low back pain populations due to its responsiveness and clarity in measuring pain fluctuations. The Modified Oswestry Low Back pain disability Questionnaire (MODQ) is well defined condition specific outcome measure that helps to quantify disability in patient with low back pain. The modified ODQ consists of 10 items each scored from 0 to 5. A higher score reflects higher disability. It is also highly acceptable as far as the results to be a valid and highly reliable disability assessment[14]. Baradaran et al. (2016) affirm its reliability and internal consistency, making it an excellent tool for measuring disability levels pre- and post-intervention in LBP patients.

2. METHODOLOGY

Study design: An experimental study. Clearly state the patients of the study, which is to compare the effects of sound wave frequency (tuning forks) along with exercises in population with low back pain.

Sampling design: Sampling technique used (convenient sampling). Explain the inclusion criteria, such as nonspecific low back pain population aged 18-55 male and female. Define exclusion criteria, such as patients with upper and middle back pain, lumbar vertebrae fractures, pain radiating to limbs.

After obtaining ethical approval dated 23/02/2024 PMU/PMCH/IEC/2025/280. All participants completed information and consent form at recruitment.

Sample size: The sample participants size is 30 patients

Study sitting: single session 45-60 minutes for alternative days

Duration of study: 3 days per week for 4 weeks

Study Centre: PMCH Udaipur.

3. RESULTS AND TABLES

Table Error! No text of specified style in document.**.1 Exhibiting Descriptive Statistics for VAS Score Week wise**

Time Point	N	Min	Max	Mean	Std. Deviation	F	Sig.
Pre	**30**	**6**	**9**	**7.43**	**0.82**	**126.12**	**0**
Post	**30**	**1**	**5**	**3.27**	**1.14**		
Overall	**60**	**1**	**9**	**5.35**	**2.12**		

Figure Error! No text of specified style in document.**.1 Exhibiting VAS Score Week wise**

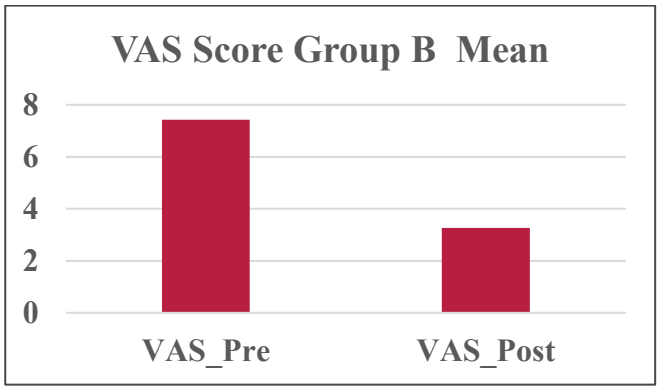

Figure Error! No text of specified style in document.**.1 Exhibiting VAS Score Week wise for Group B**

Table 1.1 below for the VAS scores by week for. Patients showed a major reduction in pain, from having a VAS score of 7.43 to 3.27 post-treatment. Scores became much more similar, a sign that patients were getting better treatments and results.

The ANOVA analysis shows that there is a very significant difference in the treatment effect over time (F = 126.12, p = 0.000). People gave an average score of 5.35 when the studies were conducted at the different times.

The chart in Figure 1.5 makes it clear that the pain has reduced a lot after taking the treatment.

Table Error! No text of specified style in document.**.2**

Exhibiting Descriptive Statistics for MODQ Score Week wise

TIME POINT	N	MIN	MAX	MEAN	STD. DEVIATION	F	SIG.
Pre	30	40	83	59.67	10.92	115.34	0
Post	30	11	51	31.3	9.47		
Overall	60	11	83	45.48	16.47		

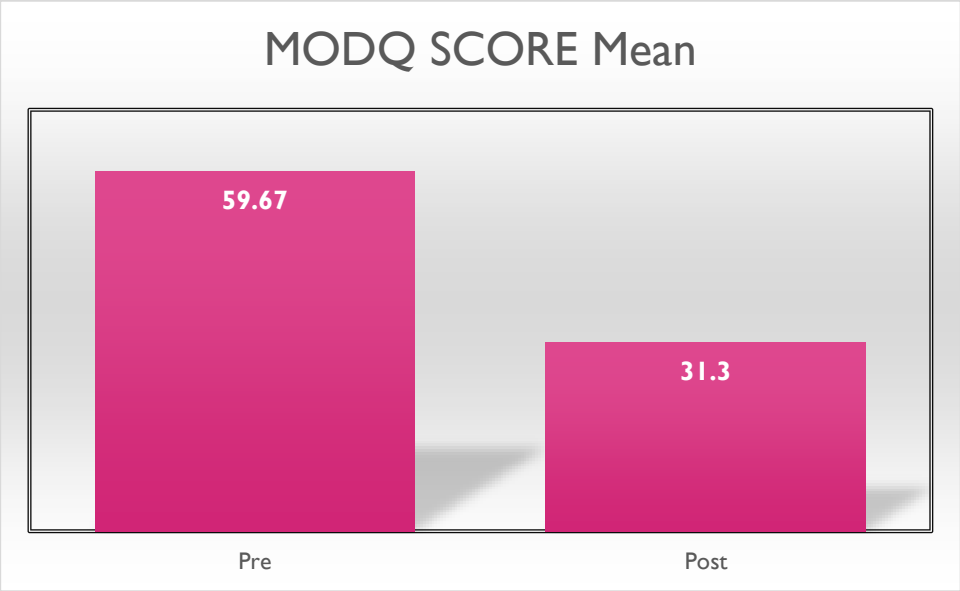

Figure Error! No text of specified style in document.**.2 Exhibiting MODQ Score Week wise**

Table 1.2 shows the weekly scores for the MODQ test. The mean MODQ score dropped a lot, going from 59.67 before treatment to 31.3 after, which means the participant was able to do more activities on their own much better. The score range also got smaller, showing that the patients improved more after having treatment. The ANOVA results show a big difference between the success rates over time (F = 115.34, p = 0.001), which shows that the intervention did make a clear change for the better. The overall mean MODQ score was 45.48 at both the first and second times it was checked.

Figure 1.2 shows clearly that participants (the conventional exercises with tuning fork) saw a big drop in their disability scores after getting treatment from before to after treatment.

4. DISCUSSION

In this study and tuning fork with conventional therapy for 4 weeks followed by measuring the pain and disability component on VAS and MODQ on week 0 (day 1) and week 4; chronic back pain was evaluated. A written consent was taken from subjects from outpatient setting who fulfilled the inclusion criteria. At the end of 4-week treatment programme showed improvement in lower back pain. Based on results study supports research hypothesis that there was a significant

improvement in pain and disability component. Patient participated showed more significant changes. Participants experienced a greater effect from the intervention, as the mean VAS score for them was 5.35 (±1.01). It was proven that the extra pain relief from tuning fork therapy was highly substantial ($t = -6.59$, degrees of freedom = 238, $p < 0.001$).

Participants generally performed much better and had lower disability with an average MODQ score of 31.3 (±9.47). So, the study rejects null hypothesis and accepts research hypotheses which states that there is a significant association between application of sound wave frequency using tuning forks and reduction in pain and functional outcome in patients with chronic low pain.

The big decline in both VAS and MODQ scores among patients suggests that tuning fork therapy may speed up rehabilitation outcomes and lead to better quality of life.

5. CONCUSION

It states in movement science world some sound waves modalities already have been practicing since long for healing purposes and pain management. In the field of physiotherapy, the sound waves is used with the help of electrotherapeutic modalities (ultrasound and shockwave therapy), very few recommendations are published for the use of tuning fork. In this study we introduced the sound waves with use of tuning fork and a scientific tailored exercise programme to observe the combined effect of both.

Participants experienced a greater effect from the intervention, as the mean VAS score for them was 5.35 (±1.01) and the functional outcomes determined by MODQ performed better with an average MODQ score of 31.3 (±9.47).

The present study showed that the sound wave using tuning fork with exercises has the advantage of reducing pain and effective in reducing the disability. This integrated approach not only addresses the physiological aspects of LBP but also enhances therapeutic outcomes through neuromuscular facilitation and patient engagement. Given its ease of application, cost-effectiveness, and non-invasiveness, tuning fork therapy may serve as a beneficial adjunct to routine physiotherapy interventions.

Further large-scale studies are warranted to validate these findings with significant inclusion and exclusion criteria and support its broader adoption in clinical practice. The result of the study can be applied clinically to assist healthcare worker professionals to manage chronic low back pain better. This study will provide new insights about sound wave using tuning forks and effects with or without exercise on low back ache.

6. LIMITATIONS AND RECOMMENDATION

Limitations-

1. Small sample size
2. Short intervention period
3. Absence of control group

Recommendation-

1. Recommendation for further enhancement

A wide range of participants with different age groups must be taken into considerations

Large group of participant and increased time duration is advised

2. For getting better understanding and better result a long term follow up program is needed.
3. Explore frequency specific effects to better understand the therapeutic potential of tuning fork therapy.
4. In-cooperate randomized controlled trials.

Different condition may be selected.

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