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To Determine the Effect of Sound Wave Frequency (Tuning Fork) Alongwith Exercise in Population with Non- Specific Low Back Pain

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ABSTRACT

Background: Low Back Pain (LBP) is most frequent musculoskeletal disorder worldwide, most of the general population will experience an episode during their lifespan with high reoccurrence rate. Non-specific LBP refers to pain without a clear medical cause—conditions like tumors, infections, or nerve root compression are absent. It significantly affects the physical activity, quality of life and ADL resulting in psychosocial, behavioral, nutritional and emotional challenges. It is suggestive that the electrotherapy, exercise therapy is helpful in case of 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. Previous or existing study shown electrotherapeutic sound wave frequency modalities and exercise therapy have beneficiary effect. 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 a alternate way of using sound wave to treat chronic non specific low back pain with combination of exercise therapy.

Methods: The study design was a comparative study comparing effects of exercises only and sound wave frequency (tuning forks) with exercises in patients with low back pain population. A total of 60 participants meeting the inclusion criteria were randomly divided into two equal groups (n=30 each). The study duration was 4 weeks, with sessions lasting 45 minutes at PMCH Udaipur.

Results: A statistically significant reduction in pain was observed for Group B (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). Group A mean of 62.6 with a standard deviation of ±8.99. The MODQ score after treatment (mean 50.53, standard deviation 9.80) showed that patients experienced a significant drop in disability. All the results together prove that combined exercise and tuning fork therapy is more effective at reducing pain and disability compared to conventional exercise used by itself.

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.

The spine is a marvel of biomechanics, comprising both passive and active elements. While muscles and nerves enable movement, the passive structures—bones, ligaments, and discs—provide stability, define the range of motion, and safeguard the spinal cord. Due to their continuous exposure to stress, these passive structures are vulnerable to degeneration, which may result in discomfort and impaired function.[3]

Non-specific LBP refers to pain without a clear medical cause—conditions like tumors, infections, or nerve root compression are absent. Pain sources may include muscles, ligaments, discs, and fascia, but pinpointing the exact structure is often challenging.[5] 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].

It is suggestive that the electrotherapy, exercise therapy is helpful in case of 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. In this study we are administrating a different technique using sound wave through a tool known as tuning fork.

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 healing works through the interconnected principles of resonance, entrainment, and intention, harnessing the profound healing potential of the human voice. These altered states play a crucial role in healing by quieting the analytical mind and allowing us to access more balanced, integrated states of being. Research suggests that ancient civilizations understood this therapeutic power of sound.

Tuning forks offer a refined form of sound therapy, delivering precise vibrations to the body. When activated, they can be applied around the head or directly on bones to promote resonance and balance. They stimulate tissues, enhance fluid circulation, and may improve mobility. Like acupuncture but without needles, tuning fork therapy releases tension and supports emotional balance. Most therapists agree that the tuning forks can induce a state of deep relaxation, increase energy flow throughout the body, provide mental clarity, relieve stress and anxiety, clear blockages, and bring the nervous system and other systems within the body in balance[5,6,7].

Previous research and trails show positive result to support exercise to compare to usual care for acute or subacute pain in general with varying in result because severe low back pain decrease muscle strength, endurance, mobility co-ordination, and limiting ADL. Therapeutic exercises are the first line treatment of management of nonspecific chronic low back pain because it is associated with pain relief as compared to exercise [12,13]

The optimal dose of physical activity prescribe 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[16]. 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[17].

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 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[8] and 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[9].

2. METHODOLOGY

Study design: A randomized control trial. Clearly state the patients of the study, which is to compare the effects of sound wave frequency (tuning forks) in population with low back pain.

Sampling design: Sampling technique used (random sampling). Explain the inclusion criteria, such as non specific 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, pin 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 60 patients, divided equally into two groups:

Group A: Exercise

Group B: Sound wave frequency alongwith exercise

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 & TABLES

Table Error! No text of specified style in document.**.1 Group Statistics**

Group	N	Mean	Std. Deviation	Std. Error Mean
Group A	120	6.28	0.85	0.078
Group B	120	5.35	1.01	0.092

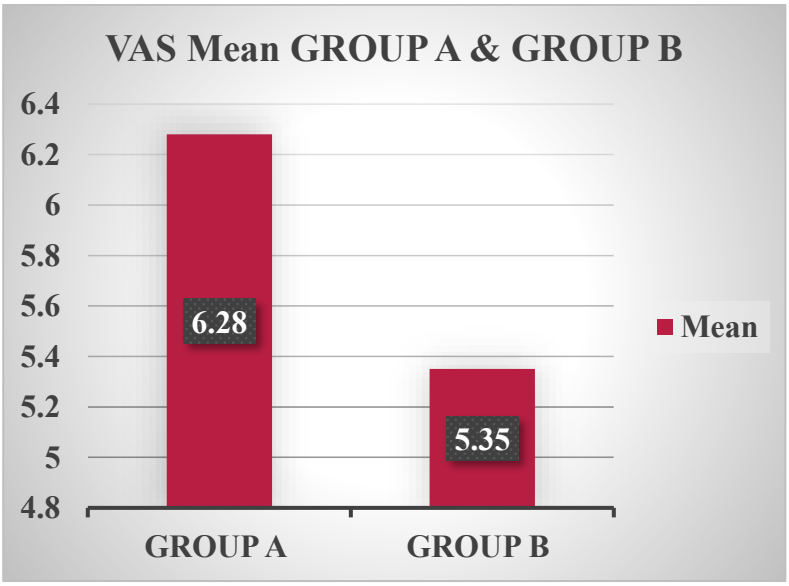

Figure Error! No text of specified style in document.**.1 Exhibiting VAS Score Comparison of Group A and Group B**

Table 1.1 shows that Group A reported an average VAS score of 6.28 with a standard deviation of 0.85, while Group B had a mean score of 5.35 and a standard deviation of 1.01, which means people in Group B said they had less pain. The result of the t-test showed that the groups were significantly different ($t = -6.59$, $df = 238$, $p < 0.001$), and the groups' means differed by -0.93. Therefore, we can see that Group B managed to reduce pain more effectively than Group A.

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

Group	N	Mean	Std. Deviation	Std. Error Mean
Group A	120	50.53	9.8	0.89
Group B	120	31.3	9.47	0.86

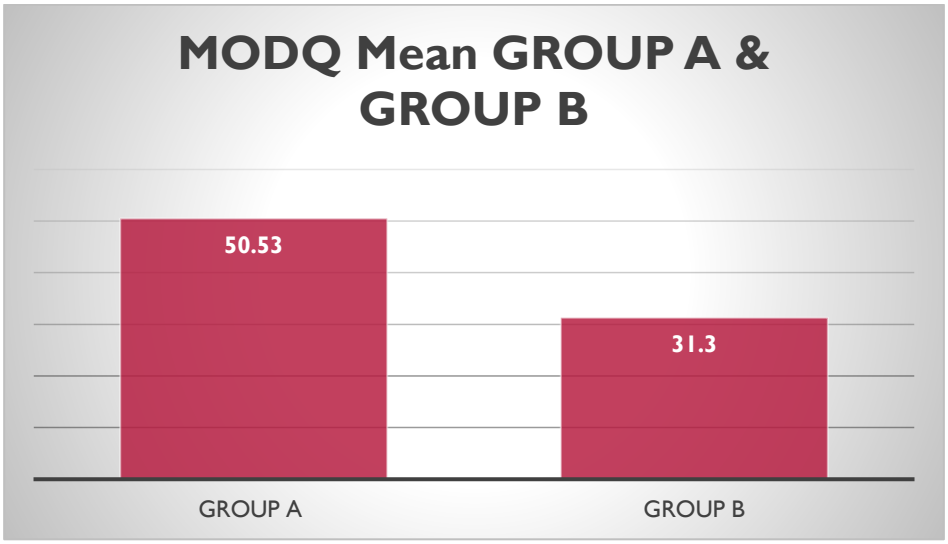

Figure Error! No text of specified style in document.**.7.2 Exhibiting MODQ Score Comparison of Group A and Group B**

Table 1.2 that Group B had a higher mean for functional improvement than Group A. The finding from the independent t-test was that there was a significant difference in the groups ($t = 18.03$, $p < 0.001$) with a mean difference of 19.23. This points to Group B's combined treatment resulting in less disability than Group A.

Group B demonstrated significantly greater improvement in VAS and MODQ scores. Sound wave frequency (tuning forks) combined with physiotherapy yielded superior outcomes versus physiotherapy alone.

4. DISCUSSION

This study includes 60 subjects divided into two groups -: Group A and Group B of age 18-55 as per the inclusion criteria. Study involves procedure i.e. conventional exercise therapy and conventional exercise therapy with sound waves targeting with a tool called tuning fork. A specified and scientifically provened tailored programme of conventional exercise are introduced with both the groups. The aims of the study to observe the efficacy of tuning fork or sound wave with conventional exercise to improve the symptoms of lower back pain and disability associated with chronic LBP. As we see the high prevalence of chronic lower back pain in all the age group (young, middle, old age).

In this study above mentioned divided participants or subjects treated with conventional therapy 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 with both group A and group B 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 in group B shows more significant changes. Group B result were found better than group A result as data analysis showed For Group A, the average VAS score was 6.28 (±0.85 on the standard deviation), meaning that pain was moderate overall. Compared to Group A, Group B experienced a greater effect from the intervention, as the mean VAS score for them was 5.35 (±1.01). On average, Group B had a decrease of nearly one point in pain intensity as compared to Group A. It was proven that the extra pain relief from tuning fork therapy was highly substantial ($t = -6.59$, degrees of freedom = 238, $p < 0.001$) since traditional exercise alone did not perform as well.

At the same time, the functional outcomes determined by MODQ showed that Group B performed better. The average

MODQ score in Group A was 50.53 (With (+/-) 9.80) and suggested a moderate level of disability. Those in Group B generally performed much better and had lower disability than participants in Group A, with an average MODQ score of 31.3 (±9.47). The mean difference between groups was 19.23 and was found with precision, confirming the clinical value of combining treatments. Another independent t-test ($t = 18.03$) suggested that the improvement in functional status seen in Group B was of much greater significance than that observed in Group A ($df = 238$, $p < 0.001$). So the study rejects null hypothesis and accepts research hypotheses which states that combined exercise and tuning fork therapy is more effective at reducing pain and disability compared to conventional exercise used by itself. The big decline in both VAS and MODQ scores among patients in Group B suggests that tuning fork therapy may speed up rehabilitation outcomes and lead to better quality of life.

5. CONCLUSION

This study investigates the effect of a different interventions i.e use of sound waves with tuning fork. Sound waves have been used since ages for diagnostic, treatment and healing purposes. Sound wave has shown promisingly profound effect on humans and other species also. In the new era of technology, we are able to segregate the frequency of sound waves for different perspectives. 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.

Result of the study shows significant difference in the mean of difference of score of group A and group B. The difference for GROUP B was more significant than GROUP A. Result showed group B data were found better than group A; result as data analysis showed For Group A, the average VAS score was 6.28 (±0.85 on the standard deviation), meaning that pain was moderate overall. Compared to Group A, Group B experienced a greater effect from the intervention, as the mean VAS score for them was 5.35 (±1.01). On average, Group B had a decrease of nearly one point in pain intensity as compared to Group A, At the same time, the functional outcomes determined by MODQ showed that Group B performed better. The average MODQ score in Group A was 50.53 (With (+/-) 9.80) and suggested a moderate level of disability. Those in Group B generally performed much better and had lower disability than participants in Group A, with an average MODQ score of 31.3 (±9.47). The mean difference between groups was 19.23 and was found with precision, confirming the clinical value of combining treatments. The present study showed that the use of sound wave frequency using tuning forks, in combination with a tailored exercise regimen, is effective in reducing both pain and functional disability in patients with nonspecific low back pain.

The result of the study can be applied clinically to assist healthcare worker professionals to manage chronic low back pain better. Additional study with large number of sample size with more significant inclusion and exclusion criteria are needed the to validate the results.

6. LIMITATIONS AND RECOMMENDATION

Limitations-

1. The sample size of 60 participants may not be representative of the broader population.
2. Short intervention period.
3. No long term follow ups was conducted to assess the durability of therapeutic benefits.

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.

Different condition may be selected.

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