EFFECTS OF CORE STABILITY EXERCISES AND MUSCLES ENERGY TECHNIQUE ON DEPRESSION, ANXIETY, STRESS STATUS IN FEMALE VOLLEY BALL PLAYERS WITH LOW BACK PAIN- A PILOT STUDY

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ABSTRACT

Lower back pain is a common problem affecting people all over the world. It is something that almost everyone experiences at some point in their lives, and for many, it is not just a one-time thing. Unfortunately, more than half of us will deal with recurring episodes of back pain. In the past few decades, women's volleyball has increased in popularity, and it is now one of the most common sports played among female athletes.

Both Core stability exercise and Muscle Energy techniques are used in treating low back pain. While existing research supports the individual effectiveness of these techniques, no studies have examined their impact on psychological well-being. Therefore, this research aims to determine which technique yields better overall outcomes, including reductions in depression, anxiety, and stress, in female volleyball players experiencing lower back pain.

Methods;

A Pilot study done on 24 female volley ball players aged 20-45, with mechanical lower back pain (due to strain or sprain lasting over three weeks) were recruited from a Greater Noida sports complex[12]. General assessment [name/gender/age], Pre ROM, pre-psychological level on DASS scale & also pre-functional Status on ODI scale of the females will be taken. Subjects were then randomly divided into 2 groups A, B (12 in each group).

Group A (Core Stability Exercises-CSE): Following a 10-minute hot pack application, Group A will perform a 30-minute core stability exercise program, three days a week for four weeks, with 10 repetitions of each exercise. The program includes: single knee-to-chest (10-second hold, alternating legs); bridging (10-second hold); trunk curl-ups (10-second hold); straight leg raises; abdominal bracing; wall squats; and spinal extension (prone on elbows, 10-second hold)[15].

Group B (Muscle Energy Technique - MET): Following a 10-minute hot pack application Group B will receive a 30-minute MET program, three times a week on alternate days for four weeks. The program consists of post-isometric relaxation (PIR) targeting the quadratus lumborum and piriformis muscles and Psoas muscle. For the piriformis, the patient lies supine with the treated leg flexed at the hip and knee, foot resting on the contralateral knee. The outcome measures were Pain recorded through VAS score, Quality of life of back measured through Oswestry Disability Index (ODI), and psychological parameters tested through Depression, Anxiety and Stress scale (DASS score). The data was collected Pre and Post session on 1st day and 28th day after completion of 4 weeks.

RESULTS

Pain-It was found that within the group analysis of the VAS showed significant difference between the pre and the post 4th week intervention data ($p<0.05$) in both the two groups. Between group analysis of VAS scores showed that there is overall improvement in pain by 53% in group A and 48.7 % in Group B proving Core stability exercise to be better than MET.

QOL-It was found that within the group analysis of the ODI showed significant difference between the pre and the post 4th week intervention data ($p<0.05$) in both the groups. Between group comparison showed improvement in ODI scores by 76.65 % in Group A and 28.17 % in group B showing Group a to be more effective.

Psychological parameters-It was found that within the group analysis of the DASS showed significant difference between the pre and the post 4th week intervention data ($p<0.05$) in both the two groups. The between group analysis showed 62 % improvement in DASS scores of Group A in comparison of Only12% improvement in DASS scores in Group B.

CONCLUSION

Thus, the Group A being treated with Core stability exercises (CSE) are more effective in treating low back pain seen in female volley ball players in n comparison with Muscle energy technique (MET).

Key words:

Low back pain, Core stabilization exercise, Muscle Energy Technique, Psychological Parameters.

Lower back pain is a common problem affecting people all over the world. It is something that almost everyone experiences at some point in their lives, and for many, it is not just a one-time thing. Unfortunately, more than half of us will deal with recurring episodes of back pain. In the past few decades, women's volleyball has increased in popularity, and it is now one of the most common sports played among female athletes.[1] Athletes often put their lower backs through a lot of stress with repetitive bending, stretching, and twisting motions. This makes their lumbar spines especially prone to injury. If these injuries are not properly diagnosed and treated, they can become chronic problems, causing significant expense for organizations and long-term health issues for the athletes.[2,3]

Lower back injuries (LBIs) were significantly more common during preseason, occurring almost three times as often as during the regular season. Most of these injuries (85%) happened during practice, compared to only 15% during competitions. Outside hitters and middle blockers were the most frequently affected positions. Nearly 70% of the injuries were new, while about 29% were recurrences of previous problems. The causes were almost evenly split between contact injuries (50%) and overuse injuries (46%), with a small percentage (4%) having unknown causes. Most players (72%) were able to return to play within 24 hours, while others returned within 1-6 days (16%) or 7-12 days (11%). Importantly, no one required surgery.

Core stability exercises have become one of the fitness trends broadly used exercises for low back pain. for low back pain. Benefits of core stabilization have been rooted, from improving athletic performance and preventing injuries, to alleviating low back pain. Lack of sufficient coordination in core musculature can lead to decreased efficiency of movement and compensatory patterns, causing strain and overuse injuries. Training of these muscles typically follows a progression from core stability to core strength to core power exercises. As a foundation core training exercises involve little joint motion & are designed to improve intrinsic stabilization of the Lumbo-pelvic-hip (LPH) complex before core strength or power exercises are considered in a training program.[5]

Fred Mitchell developed the Muscle Energy Technique (MET), which uses isotonic (concentric or eccentric), isometric, or rhythmic pulsating muscle contractions. MET is effective in increasing joint flexibility and range of motion, and it is particularly helpful for patients with back pain. It is used to treat weak muscles and restricted joints, employing muscle effort to mobilize joints and tissues. It can also be used as an evaluation tool to identify range of motion restrictions.[6,7]

Low back pain is the most common musculoskeletal issue encountered by physiotherapists. A recent study indicates that both core stability exercises and muscle energy technique (MET) significantly improve lower back pain. Fahmy et al. (2019) found that a spinal extension exercise program was more effective in improving lumbar range of motion, while muscle energy technique was superior in reducing pain and functional disability in patients with chronic mechanical low back pain.[8]Shivalika et al. (2013) compared core stability exercises (CSE) and muscle energy techniques (MET) for lower back pain (LBP) in 60 subjects divided into three groups. Group A received CSE, Group B received MET, and Group C (control) received conventional physiotherapy. CSE proved most beneficial[9]. Tawrej et al. (2020) concluded that

a single session of muscle energy technique combined with hot pack effectively reduced pain and improved lumbar range of motion in patients with nonspecific low back pain [10]. Nambi et al. (2018) concluded that post-isometric relaxation was more effective than reciprocal inhibition or conventional treatment in reducing pain, improving hip range of motion, and enhancing functional outcomes in individuals with piriformis syndrome [11].

While existing research supports the individual effectiveness of these techniques, no studies have examined their impact on psychological well-being. Therefore, this research aims to determine which technique yields better overall outcomes, including reductions in depression, anxiety, and stress, in female volleyball players experiencing lower back pain.

METHODOLOGY

This pilot study used a pretest-posttest design. 24 female volleyball players[14], aged 20-45, with mechanical lower back pain (due to strain or sprain lasting over three weeks) were recruited from a Greater Noida sports complex[12]. Exclusion criteria included neurological disorders, uncooperativeness, participation in other back-related research, disc issues (PIVD, listhesis), red flag symptoms (cardiovascular disease, diabetes, spinal pathology, fracture), and smoking or alcohol use [13]. Ethical approval of the study was obtained from Institutional Ethical committee of Prakash Institute Ethics Committee (PIPRAMS/IEC/PD/271/2023). General assessment [name/gender/age], Pre ROM, pre-psychological level on DASS scale & also pre-functional Status on ODI scale of the females will be taken. Subjects were then randomly divided into 2 groups A, B (12 in each group). All participants provided written informed consent before participation in the study.

Procedure-

Group A (Core Stability Exercises-CSE): Following a 10-minute hot pack application, Group A will perform a 30-minute core stability exercise program, three days a week for four weeks, with 10 repetitions of each exercise. The program includes: single knee-to-chest (10-second hold, alternating legs); bridging (10-second hold); trunk curl-ups (10-second hold); straight leg raises; abdominal bracing; wall squats; and spinal extension (prone on elbows, 10-second hold)[15].

Group B (Muscle Energy Technique - MET): Following a 10-minute hot pack application Group B will receive a 30-minute MET program, three times a week on alternate days for four weeks. The program consists of post-isometric relaxation (PIR) targeting the quadratus lumborum and piriformis muscles and Psoas muscle. For the piriformis, the patient lies supine with the treated leg flexed at the hip and knee, foot resting on the contralateral knee. The therapist stabilizes the pelvis and resists knee adduction[16]. For the quadratus lumborum, the side-lying patient extends their uppermost arm overhead, grasping the table. During inhalation, the patient performs isometric hip abduction, allowing the leg to hang slightly. During exhalation, the therapist stabilizes the pelvis and gently pulls it away from the ribs, holding the stretch for 30 seconds. Three repetitions of each MET will be performed[17]. For Psoas muscle the patient is prone lying. The therapist bends the knee of patient to 90 degrees, then stabilize the knee of the patient with one hand and the pelvis with the other, the leg is then taken into extension to reach the restrictive barrier. The muscle is then isometrically contracted for 10-15 seconds and then the leg is then moved to reach the other barrier [18].

The outcome measures were Pain recorded through VAS score, Quality of life of back

measured through Oswestry Disability Index (ODI), and psychological parameters tested through Depression, Anxiety and Stress scale (DASS score). The data was collected Pre and Post session on 1st day and 28th day after completion of 4 weeks.

DATA ANALYSIS AND RESULTS

Data analysis will be performed in SPSS software using a master chart of subject data. Mean, standard deviation, and ANOVA will be used to compare pre- and post-intervention values for VAS, ODI and DASS scores across groups A and B.

Initially, 30 subjects were recruited, but 6 were excluded due to not meeting the inclusion criteria, resulting in a final sample size of 24. The treatment effects of groups A and B will be assessed using paired t-tests to compare pre- and post-intervention scores for pain, quality of life through ODI and depression, anxiety, stress, scores. Statistical significance will be defined as $p \leq 0.05$. ANOVA will be used to compare post-intervention values across the two groups.

RESULTS

A total of 30 female volley ball players were recruited out of which 6 dropped out and 24 players were selected based on inclusion and exclusion criteria. Their baseline characteristics of demographics and Pe test values are represented in the table below:

Table 1.1: BASELINE CHARACTERISTICS OF STUDY

BASELINE CHARACTERISTICS OF STUDY	
Total No. Of Individuals	24
Gender	Female
Mean Age (Years)	35.176 (SD- 1.902166)
Mean Height (Metres)	1.771 (SD- 0.122497)
Mean Weight (Kgs)	55.787 (SD- 9.573859)
Mean BMI(Kgs/M^2)	24.743 (SD- 2.112217)
Mean value of VAS score	8.125 (SD-3.718)
Mean value of ODI SCORE	23.562 (SD- 3.758)
MEAN VALUE OF DASS SCORE	18.4375 (SD-4.7324236)

The subjects were then matched and distributed in two groups Group A and Group B. Pretest and posttest scores of VAS, ODI and DASS were noted.

IMPROVEMENT IN VAS SCORES

Table 1.2 Within the Group Comparison Of VAS

Table SOURCE OF VARIATION		Sum of Squares	df	Mean Square	F	Sig.
	Within Group A (CSE)	34.188	45	0.76	2.612	0
	Within Group B (MET)	128.797	45	2.862	18.072	0

It was found out that in the table above that within the group analysis of the VAS showed significant difference between the pre and the post 4th week intervention data ($p<0.05$) in both the two groups. The calculated t-value is 18.072. Therefore, when compared with t table the calculated t- value is greater than the critical value. Hence there is significant improvement in in the VAS with the intervention.

Table 1.3 Comparison of pre & posttest readings of VAS in group A and B

GROUPS (VAS)	PRE-MEAN ± SD	POST MEAN ± SD	T test
A (CSE)	8.125	3.813	18.61243
B (MET)	9.782	4.937	1.0716972

In this above table the mean VAS for group A pretest and posttest are 8.125 and 3.8125, group B are 9.7825 and 4.9375. The standard deviation for group A pretest and posttest is 3.718 and 1.973, group B are 3.543 and 2.982. Hence there is significant improvement in VAS pain scale in group A as compare to B with the intervention.

IMPROVEMENT IN QUALITY OF LIFE THROUGH ODI SCORES

Table 1.4 WITHIN THE GROUPS COMPARISION OF ODI

Table SOURCE OF VARIATION		Sum of Squares	df	Mean Square	F	Sig.
	Within Group A (CSE)	683.875	45	15.197	1.958	0

	Within Group B (MET)	695.813	45	15.463	122.625	0

It was found out that in the table above that within the group analysis of the ODI showed significant difference between the pre and the post 4th week intervention data ($p<0.05$) in both the groups. The calculated t-value is 122.072. Therefore, when compared with t table the calculated t- value is greater than the critical value. Hence there is significant improvement in in the ODI with the intervention.

Table 1.5 Between group Comparison of pre & posttest readings of ODI

GROUPS (ODI)	PRE MEAN ± SD	POST MEAN ± SD	T test
A (CSE)	26.5625	6.201367	122.3424638
B (MET)	28.9375	20.78179	11.0944058

In above table and graph it is shown that the comparison of pre and post ODI t value in group A is greater than the group B but, t value of group B is greater than the critical value. Hence both group A & B has significant improvement in ODI.

IMPROVEMENT IN DASS SCORE

Table 1.6 WITHIN THE GROUP COMPARISION OF DEPRESSION

Source of Variation		Sum of Squares	df	Mean Square	F	Sig.
	Within Group A (CSE)	709.688	45	15.771	1.547	0.224
	Within Group B (MET)	505.313	45	11.229	48.891	0.00

It was found out that in the table that within the group analysis of the DEPRESSION showed significant difference between the pre and the post 4th week intervention data ($p<0.05$) in both the two groups. The calculated t-value is 48.891. Therefore, when compared with t table the calculated t- value is greater than the critical value. Hence there is significant improvement in the DASS score with the intervention.

Table 1.7 Comparison of pre & post test readings of Depression in group A and B

GROUPS (DEPRESSION)	PRE MEAN ± SD	POST MEAN ± SD	T test

A (CSE)	22.475	8.526	48.89053803
B (MET)	19.685	17.287	1.546895641

In above table and graph it is shown that the comparison of pre and post-DASS SCORE t value in group A is greater than the group B. Hence group A has significant improvement in psychological parameters

DISCUSSION

Our aim of doing this study was to find the effect among core stability exercises and muscles energy technique in pain, depression, anxiety, stress status & quality of life in females with chronic low back pain. Results of mean score on DASS scale showed the significant improvement after 4 weeks intervention of training session in depression, anxiety, and stress level. The mean depression for group A pretest and posttest is 18.43 and 7.062, group B are 16.875 and 17.5625. The standard deviation for group A pretest and posttest is 4.732 and 1.526, group B are 3.685 and 4.257. Hence there is significant improvement in depression in group A as compare to B with the intervention after 4 weeks of core stability treatment protocol with ‘t’value of 48.89 and p value of 0.000 which shows the significant differences in both the two groups which is supported by study by Sethi Vanshika et.al (2012) in her research have concluded that the Patients were given core stability training of 4 weeks duration.

The improvements in the outcome measure likely resulted from restored control of the core muscles (lumbar multifidus and transversus abdominis). This reduced reliance on superficial muscles (rectus abdominis, external and internal obliques), which otherwise overcompensate to stabilize the spine and increase lumbar muscle activity. Exercise program can be carried out safely in players with chronic low back pain & by their level of depression, anxiety & stress can be decreased by short duration exercises.

Reduced pain-related disability led to better sleep and improved psychological well-being. It has also been shown that co-contraction of local muscles like the transversus abdominis and lumbar multifidus effectively stabilizes the lumbar spine's motion segments, especially in the neutral zone. This creates a stable foundation for the global (superficial) muscles to function safely [19]

This study found stabilization exercises effective in reducing short-term pain-related disability,a result that contrasts with Koumantakis et al. [20]. Their study reported greater short-term reductions in pain and disability with general exercise compared to stabilization-focused exercise

This study's findings align with several previous studies. Akodu et al. [21] also found stabilization exercises effective for managing pain and functional disability in patients with non-specific chronic low back pain (NSCLBP). Similarly, Shakeri et al. [22] showed that

lumbar stabilization exercises improved pain and disability in women with menstrual low back pain. Furthermore, the results support Nava-Bringas et al. [23], who reported reduced pain and faster functional improvement following adherence to a lumbar stabilization exercise program in patients with chronic low back pain (CLBP)

Antunes et al. [24] found a high prevalence of depression among chronic low back pain (CLBP) patients in their cross-sectional study. They also concluded that this depression is linked to poorer quality of life. We saw a real improvement in sleep quality for people with chronic lower back pain in our study. This likely happened because their pain and disability decreased. It is a vicious cycle: pain often makes it hard to sleep, and when we do not sleep well, our pain can feel worse and become harder to manage [25]. When sleep suffers, it can leave us feeling exhausted, sleepy during the day, and down in the dumps. This can create a cascade of problems, from fuzzy memory and trouble at work to just feeling stressed out all the time and a lower quality of life overall. And, of course, it can make the pain even more intense [26]. Sleep problems are also often connected to anxiety, and some research even suggests that poor sleep might be a warning sign for developing anxiety disorders [27]. Interestingly, while anxiety and depression might trigger sleep problems in younger women, it seems like sleep and anxiety can influence each other in both men and older women [28], which is what we also observed in our study group of older men and women. Another study, by Lee and colleagues [29], also found that people who felt like they were not sleeping well were more prone to developing moderate to severe depression.

CONCLUSION

Our research shows that stabilization exercises can make a real difference for volley ball players struggling with chronic lower back pain. They can help lessen the pain and how much it interferes with daily life, improve sleep quality, and even lift their spirits by easing feelings of depression and anxiety. This means that when doctors and therapists are working with patients who have this kind of back pain, it is crucial to look at the whole picture, not just the pain itself, but also how well they are sleeping, their mood, and how much the pain is limiting them. And, of course, using ways to measure these things helps make sure the treatment is working. The study had the limitation of having a small sample size, long term effects were not observed and MET required trained professional for application of technique. All these limitations can be taken care of in future studies for better application of results.

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