

Effectiveness of Plank Exercise in Low Back Pain

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Abstract: A total of 30 subjects were recruited in the study including both genders (male and female) who was suffering from low back pain for more than 2 weeks, the participants attended 2 sessions, during session 1, was and quality of life i.e., pre reading were taken and the participant were introduced with the 5 plank activities to ensure that they could perform all activities using a proper posture or form and instructed to do all the plank exercises at home for three weeks, second session after 3 weeks was and quality of life i.e., post reading is taken to find out the effectiveness of plank exercise in low back pain. The Result showed significant effect of plank exercise in low back pain based on the effective treatment given to subjects. The plank exercise strengthens the core, enables proper musculature and brings significant changes in proper alignment and posture along with strength to bring down pain, improve quality of life.

Keywords: low back pain, plank exercise, plank exercise in low back pain, posture correction exercise

1. Introduction

Low back pain is described as some sort of discomfort or uneasiness in back that could cause a) pain; b) muscle tension; or c) stiffness in the local area which can be radiating or non-radiating into the lower limb present along with radiating into the lower limbs or without radiating. In maximum patients where no medical diagnosis can be made of patients with chief complaint of back pain it is referred as “nonspecific” type of low back pain. The signs & symptoms of ‘nonspecific’ low back pain might be related to strain which may be mechanical in nature like strenuous sports activities or psychological and social stressors like job dissatisfaction although it can develop spontaneously as suggested by Vanrhijn, in 2009.^[1] Lower back pain is menace of the today’s world influencing about 80% of the population is affected from LBP at least once or twice in their life span^[2] “It is a twentieth century health care enigma” according to Sieben et al 2004.

The leading causes of LBP include attaining or having incorrect postures while sitting, standing and lifting of heavy weights. Low back pain is one of the common concerns of the entire world. It affects almost ninety percent of the population around the globe at any point during their lifetime although more than half of the population have more than one episode of pain according to William and Shiel, 2012^[4]

The general classification of LBA depends on their aetiology which are: 1) Mechanical; 2) rheumatic; 3) infectious; 4) tumor and; 5) psychological etc.

Many researches have reported that in individuals having weak core muscles leads to strain on structures of spine especially lumbar gradually leading to Low back pain. There have been enough evidences bolstering fact that in patients with weak core muscle are suffering with low back pain as suggested by Akuthota, et al 2004.^[3]

The core muscles are the major important group of muscles responsible for maintaining stability of vertebral column. Grossly they can be divided into 2 groups

Deep core muscles – 1st group of muscles which are primary stabilizing muscles. Muscles which are included in this are transverse abdominals, lumbar multifidus, internal oblique muscle and quadratus lumborum. The muscle lumbar multifidus is attached directly to every lumbar vertebra.^[5]

Shallow core muscles or global core muscles- The 2nd group of muscle. Consists of global a stabilizing muscle which includes muscles like rectus abdominis, internal and external oblique mus., erector spinae, quad. Lumborum, they are indirectly attached to vertebrae instead linked to the pelvis to the thoracic ribs or lower limb joints therefore enhancing the spinal control.^[9]

In treatment of low back pain and for improving mobility strengthening of core muscles is an important factors. One more reason of chronic LBP is the poor strength as well as motor control of the deep core trunk muscles. The plank exercises and core stability exercise is described as one of the most factor to reestablishing the capability of neuromuscular system and to maintain and increase the strength and guard the vertebrae from injurious strains as suggested by Jin Lee, et al in 2016^[6] The plank (also known as front hold, or modified bridging exercise, or abdominal bridge) is an isometric exercise which strengthen the core that involves maintaining a position similar to a push-up for the maximum possible time. There are various form of plank exercises which are practiced; Plank (prone bridging on elbows), side plank, Quadruped Opposite Arm/Leg; in a quadruped position (on all fours)^[6]

Treatment options along with the plank exercise in low back pain; therapies such as spinal mobilization and superficial heat are the most strongly supported evidence based and the other treatment option available in physiotherapy includes cryotherapy, thermotherapy, massage therapy, spinal traction, TENS, Ultrasound, and LASER. Medication which are used in the management of

low back pain are , steroids, opioids, NSAID, and muscle relaxant.

Kim, et al (2018) completed an examination on the effectiveness of Hollowing and Bracing methodologies. In this 38 adult women were allotted into two group, and the two group practice the intervention for 12 back to back weeks and found that lumbar stabilization exercise is helpful to increase the trunk strength and decrease the low back ache in adult women^[11]

Joaquin et al (2017) did a study on ‘‘Trunk muscle activity during different variations of the supine plank exercise’’. In this twenty university students took part in this cross-sectional investigation and found that, there is no differences between exercises were found UP ABS, LOW ABS and OBLIQ muscle activity. The unilateral suspended supine plank provided the highest lumbar activity) while the bilateral stable supine plank provided the lowest activity.^[12]

Calatayudet al (2017) did a study on ‘‘ Progression of Core Stability Exercises Based on the Extent of Muscle Activity’’. The point of this cross-sectional investigation was to assess an variety of isometric plank works out. Twenty college students performed the accompanying eight unique variations of plank exercise in random order and with 1-min rest intervals. The suspended prone plank and the suspended roll-out plank gave the best outside slanted movement, in spite of the fact that not essentially not quite the same as the suspended horizontal plank^[13]

Lee et al (2016) finished an investigation on comparison of three diverse surface plank exercises on focus muscles activity. And found that the plank practice reinforce the center muscles effectively, and muscle action is related to the stance of the activity and the area of the muscle. These outcomes propose that plank practices enhance muscle exercises. Also, plank activities can be associated with general medical care^[6]

Alfuth, et al (2016) did a study on Chronic low back pain; comparison of mobilization and core stability exercises. The point of this prospective randomized clinical pilot ponder was to look at the viability of activation and center security practices as to objective and subjective result measures in patients with LBP Concerning their everyday grievances, patients with LBP can be dealt with utilizing institutionalized assembly practices notwithstanding center strength works out.^[15]

Frymoyer, et al (2011) did a study on Risk factors in low-back pain. An epidemiological survey. A study was done on 1221 men between the ages of eighteen and fifty-five years Each patient finished a survey concerning any history of low-back pain, Patients with direct low-back pain were all the more regularly joggers and cross country skiers when contrasted and the asymptomatic men and the men with extreme low back pain.^[17]

Akuthota, et al (2004) did a study on core strengthening The investigator did this study to understand the concept of core strengthening and low back pain rehabilitation. core strengthening has turned into a major pattern in recovery.

Core strengthening has a hypothetical premise in treatment and counteractive action of different musculoskeletal conditions. Other than examines in the treatment of LBP, explore is extremely deficient. With the headway in the information of motor learning hypotheses and life systems, core-stability programs show up on the cusp of imaginative new research.^[3]

2. Methodology

Study type: interventional study

Source of Collection of Data: Data was collected from DELHI, NCR regions.

Sample Size: 30 subjects,

Material used:

- Data collection sheet.
- Consent form.
- Stopwatch.
- Mat
- Inch Tape.

Outcome Measures; Pain

Visual analogue scale (VAS) will be used to assess pain. 10-point scale which ranging from 0- 10. It is used to measure the intensity of pain. Where, 0 score is no pain and 10 score is the highest pain intensity.

Quality of life

Oswestry disability index will be used to test the functional outcome for low back pain. The scale consists of 10 sections. The patient is supposed to mark one option in each section. In each section minimum score is 0 and maximum score is 5. Score is calculated out of 50 in percentage form which is then interpreted.

Selection Criteria:

a) Inclusion Criteria:

- Subject with Low back pain (mechanical pain)
- Age – 18 to 30
- Gender- male/ female
- Low back pain more than 2 weeks

b) Exclusion Criteria

- History of Abdominal surgeries
- History of spinal surgeries
- Hip knee dysfunction
- Pregnancy
- Any systemic disease such as arthritis, TB, liver, kidney failure.
- Any recent fractures in hand and legs

Sampling: convenient sampling

Dependent variable: Visual analogue scale (VAS), Quality of life scale (Oswestry low back pain disability questionnaire)

Independent variable: plank Exercises.

Procedure

30 subjects were recruited in the study who were suffering from low back pain for more than 2 weeks.

Based on the inclusion and exclusion criteria, after taking written informed consent forms the participants attended 2 sessions, during session 1, vas and quality of life i.e., pre reading were taken and the participant were introduced with the 5 plank activities to ensure that they could perform all activities using a proper posture or form and instructed to do all the plank exercises at home for three weeks, after 3 weeks vas and quality of life i.e., post reading is taken to find out the effectiveness of plank exercise in low back pain

The exercise protocols are as follow;

Table 1

Plank (prone on elbows)	30 seconds hold	1min rest	2 sets
Side plank (right side)	30 seconds hold	1min rest	2sets
Side plank (left side)	20 seconds hold	1min rest	2sets
Quadruped Opposite Arm/Leg (right)	20 seconds hold	1min rest	2sets
Quadruped Opposite Arm/Leg (left)	30 seconds hold	1min rest	2sets

Plank (prone bridging on elbows) ; In this position Both forearms kept up contact with the ground while the hands made clench hands and the elbows kept up a separation of 30 cm separated, protraction of the scapula's and keep up 90-degree points at the lower legs. The abdomen was contracted utilizing the stomach attracting move strategy; the shoulders height and hips starting from the earliest stage keep at 25 cm. side plank; sideling with your elbow underneath you; ascend so the body is resting one lower arm/elbow and foot on same side.

Quadruped Opposite Arm/Leg; in a quadruped position (on each of the fours), with knees bowed to 90 degrees and hands on the tangle, head straight, and Tighten the hamstrings, glutes, and low back and lifting to rectify the leg and inverse arm.^[6]

Data analysis

		MEAN±SD	T value	P value
VAS	pre readings	5.06±1.04	12.1018	≤0.05
	post reading	2±0.90		
QOL	pre readings	31.13±10.32	8.25659	≤0.05
	post reading	12.5±6.79		

The data was analysed using a SPSS Software to find out the effectiveness of plank exercise in low back pain in general population. The VAS was analysed using paired sample t test and independent sample t test. The level of significance chosen was p≤0.05.

Paired sample t test was applied to compare the characteristics of pre and post value of VAS and QUALITY OF LIFE i.e. within the groups. The level of significance chosen was p≤0.05.

Independent sample t test was applied to compare the characteristics of pre and post of VAS and QUALITY OF LIFE i.e. between the groups. The level of significance chosen was p≤0.05.

3. Result

Baseline characteristics-

Table 1: Characteristics of the participants

	Mean±sd	Variance
Age (years)	21.4±2.62	6.86
Weight (kg)	66.76±15.67	245.63
Height (cm)	169.77±10.15	103.16

Table 2

Thirty subjects were included in the study. 18 of them were males and 12 were females. The mean age of the participants was 21.4±2.62years.

The mean weight of the participants was 66.76±15.67kg.

The mean height of the participants was 169.77±10.15cm.

Effect of Intervention

Table 3

This table represents the mean and standard deviation along with t value within the group itself based on the reading of VAS and QUALITY OF LIFE.

*significant results obtained at p≤0.05

Table 3 demonstrates that there was a difference between pre and post reading of VAS and QUALITY OF LIFE respectively (p≤0.05). This shows that the intervention was effective within group of analysis.

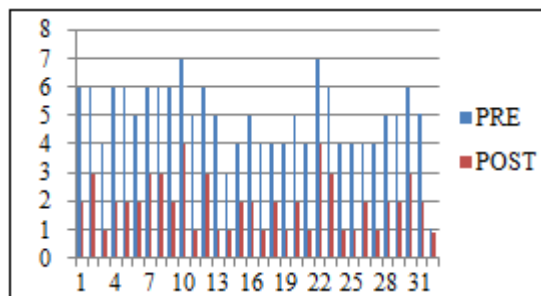


Figure 1: Pre and post vas

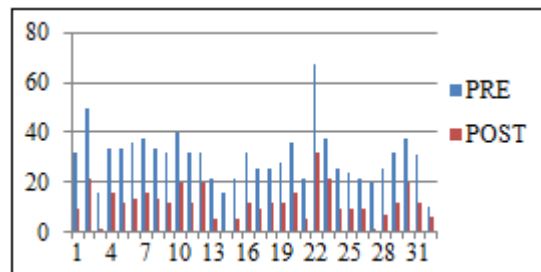


Figure 2: Pre and post quality of life

4. Discussion

The present study was conducted to find out the effectiveness of plank exercise in low back pain. In this study 30 subjects received 5 different type of plank exercises.

The age group of the participants included in the study is 18 to 30 years. Combination of assessment of pain by VAS scale and quality of life through modified Oswestry scale has been done via standard procedures. The visual analogue scale (VAS) is a psychometric pain response scale, commonly used in Questionnaire/ Studies and General assessment. It is the most common pain scale used in recent times and a point scale which tries to measure pain from 0 i.e. no pain to 10 i.e. worst imaginable pain for current situation.

The Oswestry disability is a list got from Oswestry low back pain questionnaires by FB JC, Couper J, Davier JB and is utilized by clinicians and scientists for estimating disability and evaluating quality of life of person with bring down back pain. The questionnaire comprise of 10 questions with respect to intensity of pain, ability to lift, to care for own self, ability to walk, to sit, and stand social life, ability to walk, to sit, and standard social life, sleep and ability to travel. Each question is followed by 6 statement portraying diverse conceivable situations in the subject's life. The subject is requested to check which proclamation intently takes after their circumstance and tick it out. Each inquiry has a score of 0 to 5 with first being 0 demonstrating minimum measure of disability and last being 5 showing most serious disability. The score are then computed to discover the measure of disability with 0 being no disability and 100 being most extreme disability.

In the present study the mean value of VAS and Quality of life before the treatment was given came out to be 5.06 and 31.13 respectively whereas the mean value of VAS and Quality of life after the treatment came out to be 2 and 12.5 respectively with a t value of 12.108 and p value is <0.05 which is suggestive of significant result.

This is because the hypothesis behind the practice of plank exercise which act as Strengthening the core muscles such as transverses abdominis, multifidus, diaphragm and pelvic floor muscles by effectively co-contracting these muscles in performing exercises can also be one of the reasons for reduction in pain and improvement in disability. Core exercises have become very popular in rehabilitation programs combining with sports medicine and are backed up by many studies. One of them is Punjabi's well known model of the spine stability system that has 3 subsystems naming the passive subsystem (bones, ligaments and joint capsule), the active subsystem (muscles and tendon) and the neural subsystem (CNS and PNS). According to him these systems works fifth level: (1) Heading 5 together and provide stabilization controlling spinal movements. Thereby supporting the effectiveness of core stability exercise as they help in improving motor and sensory components which promote spinal stability.

This study support to the study done by Minseock et al (2018) on Effect of Endurance Training of Trunk Extensor Muscles on Pain and Endurance in Patients with Sub Acute Nonspecific Low Back ache which suggests that there is improve trunk strength, decrease in low back disability, and decrease in pain experience by the subject when given the plank exercises. Thus, decreasing the VAS and Quality of Life value.^[1]

This study contrasts the study done by Joaquin et al (2017) on "Trunk muscle activity during different variations of the supine plank exercise". And found that, there is No differences between exercises were found UP ABS, LOW ABS and OBLIQ muscle activity. which suggests that there is no significant decrease in the pain level by performing plank exercise^[12]

The present study shows significant effect of plank exercise in low back pain based on the effective treatment given to subjects. The plank exercise strengthens the core, enables proper musculature and brings significant changes in proper alignment and posture along with strength to bring down pain, improve quality of life. In the present study, the pre reading of quality of life is moderate disability which after the treatment given to the subjects came down to mild disability and the pre reading of vas is moderate pain which after the treatment came down to mild pain. This study suggests that significant result were found. So we claim that plank exercises are effective in the treatment of LOW BACK PAIN.

5. Limitations

The only limitation present in the following study –

- 1) Small sample size;
- 2) Short treatment time with no follow up to know the long lasting effects.
- 3) Age limit can be increased.

6. Future Scope for the Study

This study can be extensively used in near future by co-operating large sample size with long follow ups and better instrumentations in use

7. Conclusion

This study, which was conducted on 30 patients including both gender with back pain more than 2 weeks. Manage through 5 different types of plank exercises training. The plank training is useful in enhancing the quality of life and reducing pain in low back pain.

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