Original Article

Scapular and Pelvic PNF Pattern for Female Physical Education Students with Low Back Pain

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Abstract

Background: - Physical education students are at greater risk of low back pain due to physical activity that put a lot of stress on the lumbar spine, such as gymnastics, wrestling, rowing, diving, and football. PNF training is one of the interventions that are less investigated in the management of LBP.

Purpose: - The purpose of this study was to determine whether exercises using proprioceptive neuromuscular facilitation (PNF) scapular and pelvic patterns might decrease the pain index and increase the lumbar flexibility of female physical education students with low back pain.

Subjects & Methods: - A total of 40 female undergraduates with low back pain who meets the inclusion and exclusion criteria are recruited for the study.

Methodology: - 20 were allotted to Experimental group who received scapular and pelvic pattern of PNF along with conventional strengthening exercises and another 20 was allotted to Control group who received conventional strengthening exercises alone.

Outcome Measures: - Numerical Pain Rating Scale (NPRS), Modified-Modified Schober Scale (MMST) and Oswestry Disability Questionnaire (ODI).

Results: - results showed that both the groups improved almost equally in lumbar flexion and extension ranges but the improvement was considerably significant on NPRS and Modified Oswestry Disability Index was found to be significantly effective in experimental group which was $p<0.001$.

Conclusion: - This study showed that PNF can be used to improve pain index rating and lumbar flexibility. The findings indicate that the experimental group experienced greater improvement than the control group by participating in the PNF lumbar stabilization.

Keywords: *- PNF, Physical education, NPRS, ODI, MMST, Lumber stabilization*

Introduction

Low back pain is a very common health problem worldwide and a major cause of disability - affecting performance at work and general well-being. Low back pain is classified as acute, sub-acute, or chronic according to the duration of symptoms[7]. The 'low back' was defined as the area on the posterior aspect of the body from the lower margin of the 12th ribs to the lower gluteal folds[9] Chronic low back pain is normally consistent back pain experienced for more than 12 weeks[16]. More than 80% of the world population experiences low back pain at least once, and 15% of that 80% suffer from chronic low back pain due to unrecovered symptoms[8]. Though several risk factors have been identified (including occupational posture, depressive moods, obesity, body height and age. The lifetime prevalence of non-specific (common) low back pain is estimated at 60% to 70% in industrialized countries. LBP prevalence in young undergraduates (< 30 years) approximating 30–40%, with up to60% of LBP events in this age group result from work-related injuries[9].

Although back pain is not the most common injury, it is one of the most challenging for the sports physician to diagnose and treat. Factors predisposing the young athlete to back injury include the growth sport, abrupt increases in training intensity or frequency, improper technique, unsuitable sports equipment, and leg-length inequality. Poor strength of the back extensor and abdominal musculature, and inflexibility of the lumbar spine, hamstrings and hip flexor muscles may contribute to chronic low back pain. Excessive lifting and twisting may produce sprains and strains, the most common cause of low back pain in adolescents. The relationship between sports and LBP in adolescents appears to be curvilinear, and all levels of physical activity are associated with an increased risk of LBP in adolescents and special risks are posed by activities that put a lot of stress on the lumbar spine , such as gymnastics, wrestling, rowing, diving, and football[10-13].The biggest problem of low back pain is lumbar instability[14]. Unbalanced mobilization order among stability muscles and mobility muscles, as well as muscle length, causes low back pain[15].

For patients with low back pain, deep muscle exercise is required to counteract muscle atrophy and damage to the deep muscles[16]. It was found that patients with low back pain experienced a mobilization delay in their deep muscles, which generates activation and contraction before the movement of the limbs[17].

For lumbar region stability, strengthening and co-contraction of the multifidus and transverse abdominis (TA), which are deep stability muscles, and the erector spinae (ES) and abdominal muscles, which are superficial stabilizer muscles, are required.[18]

In recent years, the trunk stability approach has been widely used as a method of spine treatment, and many efforts have been made to objectively prove the effect. Among the exercises for trunk muscle activity of patients with low back pain, the effect of ball exercise has been reported to comprehensively improve muscle strength, endurance, and flexibility, as well as strengthen body reflexes, sense of balance and proprioception[19]. In addition, Stanton et al.[20] reported that the Swiss ball exercise is an effective stability exercise for trunk core muscles.

PNF has been recommended for sensory-motor control training, as well as for stimulating lumbar muscle proprioception[21]. Proprioceptive neuromuscular facilitation is a concept of treatment whose underlying philosophy is that all human beings, including those with disabilities, have untapped existing potential (Kabat 1950)[1]. PNF involves stretching, resisted movement, traction and approximation to ameliorate muscle decline, disharmony, atrophy and joint movement limitations. Recently, it has been used in orthopaedic diseases of bones and joints (like lower back, neck and shoulder pain), sports related trauma. The scapular muscles control or influence the function of the cervical and thoracic spine. Proper function of the upper extremities and trunk requires both motion and stability of the scapula. Pelvic motion and stability are required for proper function of the trunk and the lower extremities. Anterior depression and posterior elevation of scapula helps in activating trapezius, levator scapulae, rhomboids, serratus anterior, pectoralis minor and major, whereas anterior elevation and posterior depression of pelvic helps in activation of internal and external oblique abdominal muscles, contralateral internal and external oblique abdominal muscles[2].

Previous studies recommended PNF, which may stimulate the proprioceptive senses of the lumbar region muscles and is useful for training sensory-motor regulation and balance[22]. When PNF exercises are performed correctly, the client will eventually adapt them into their everyday movements, thereby altered postures and habits putting chronic strain on the muscles, causing soreness, stress and eventually leading to injury will be corrected[23].

Methodology and Findings

Source of data

YMCA College of Physical Education, Nrapathunga road, Bangalore, India.

Method of collection of data:

Population : Female Collegiate students

Sampling : Convenience sampling

Sample size : 40

Type of study : Pre- post experimental study

Duration of study : 6 months

Inclusion criteria:

- Subjects with LBP
- Age 18 - 30 year
- Undergraduate female students of sports and physical education institute are included in this study

Exclusion criteria:

- Acute traumatic injuries of vertebrae, pelvic and scapula
- Rotator cuff tear
- Shoulder complex fractures
- Neurological disorder
- Vertebral fixation
- Surgery of spine, pelvic and shoulder

Materials Required

- Pen
- Paper
- Couch
- Inch-tape

Data Interpretation

Table-1: Range, mean and SD of age of the female undergraduate students of sports and physical education.

Sno	Variable	Group-A		Group-B		Unpaired t-test
		Range	Mean ± SD	Range	Mean ± SD	
1	Age in years	18-27	22.05±3.06	18-28	22.30±2.77	t=0.270, p=0.788, NS

NS-Not significant. i.e.>0.05.

The table 1 presents the outcomes of age in years of female undergraduate students of sports and physical education. In group-A the subjects were ranging within the age of18-27 years with mean 22.05 and SD of 3.06. In group-B the subjects were ranging within the age of 18-28 years with mean 22.30 and SD of 2.77. The unpaired t-test was carried to compare the means, which was found to be not significant at 5% level (i.e., p>0.05). It revealed that the baseline characteristic of age was similar in both the groups.

Table-2: Range, mean and SD of outcome measures in group-A (control).

Sno	Outcome measures	Group-A(Control)				Paired t- test/ Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	NPRS	5.50-8.25	6.73±0.77	2.25-500	3.81±0.760	z=3.923*	p=0.001

***Cont...* Table-2: Range, mean and SD of outcome measures in group-A (control).**

2	ODI	22-40	30.00±6.42	14-22	18.50±1.05	z=3.628*	p=0.001
3	Flexion	5.20-6.40	5.74±0.37	5.5-6.5	6.00±0.35	t=9.133*	p=0.001
4	Extension	2-3.50	2.70±0.43	2.4-3.6	2.91±0.38	t=2.633*	p=0.0 16

Note: * denotes –Significant (p<0.05). z- Wilcoxon test, t-paired t-test

The above table-2 shows the outcomes in group-A (control). In pre-test numerical pain rating scale score was ranging 5.50 to 8.25 with mean 6.73 and SD of 0.77 but in post-test, it was ranging within 2.25-5.00 with mean 3.81 and SD 0.76. The non -parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant at

p=0.001 (p<0.05). On other hand regarding the outcome measure of Oswestry Disability Index (ODI) was ranging within 722-40 with mean 30.00 and SD 0.37 in pre-test. But, in post-test it was ranged within 5.5-6.5 with mean 6.00 and SD 0.35. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant at p=0.001 (p<0.05).

In pre-test, the flexion ranging from 5.20-6.40 with mean 5.74 and SD of 0.37 but in post-test, flexion was ranging within 5.5-6.5 with mean 6.00and SD of 0.35. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be significant at p=0.001 (p<0.05). On other hand regarding the outcome measure of extension was from 2-3.5 with men 2.70 and SD of 0.43 but, in post-test it was ranging within 2.4-3.6 with mean 2.91 and SD 0.38. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be significant at p=0.001 (p<0.05).

It evidenced that the subjects in control group administered with conventional treatment strengthening exercise reduced the pain, disability and increased the flexion and extension.

Table-3: Range, mean and SD of outcome measures in group-B (Experimental).

Sno	Outcome measures	Group-B(Experimental)				Paired t- test/ Wilcoxon test	p-value
		Pre test		Post test			
		Range	Mean ±SD	Range	Mean ±SD		
1	NPRS	3.5-6.25	4.87±0.90	1-3	2.11±0.58	z=3.927*	P<0.001
2	ODI	24-40	31.90±5.56	10-18	12.70±2.36	z=3.928*	P<0.001
3	Flexion	5.20-6.40	5.69±0.41	5.5-6.8	6.08±0.34	t=5.940*	P<0.001
4	Extension	2.20-3.40	2.67±0.23	2.4-3.5	2.93±0.29	t=6.504*	P<0.001

Note: * denotes –Significant (p<0.05). z- Wilcoxon test, t-paired t-test

The above table-2 shows the pre and post-test outcomes in group-B (experimental). In pre-test numerical pain rating scale score was ranging 3.5-6.25 with mean 4.87 and SD of 0.90but in post-test, it was ranging within 1-3 with mean 2.11 and SD 0.58. The non -parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant at p=0.001 (p<0.05). On other hand regarding the outcome measure of Oswestry Disability Index (ODI) was ranging within 24-40 with mean 31.90 and SD 5.56 in pre-test. But, in post-test it was ranged within10-18with mean 6.08 and SD 0.34. The non-parametric test for comparison of dependent outcomes, the Wilcoxon test was carried out and it was found to be significant at p=0.001 (p<0.05).

In pre-test, the flexion ranging from 5.20-6.40 with mean 5.69and SD of 0.41 but in post-test, flexion was ranging within 5.5-6.8 with mean 6.08 and SD of 0.34. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be significant at p=0.001 (p<0.05). On other hand regarding the outcome measure of extension was from2.20-3.40 with men 2.67and SD of 0.23 but, in post-test it was ranging within 2.4-3.5with mean 2.93 and SD 0.29. The parametric test for comparison of dependent outcomes, the paired t-test was carried out and it was found to be significant at p=0.001 (p<0.05).

It evidenced that the subjects in experimental group administered with scapular and pelvic PNF with conventional treatment significantly reduced the pain, disability and increased the flexion and extension

Table-4: Comparison of pre and post-test outcome measures in between the groups

Sl.no	Outcome measures	Pre-test		Post-test	
		Group-A	Group-B	Group-A	Group-B
		Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
1	NPRS	6.73±0.77	4.87±0.90	3.81±0.760	2.11±0.58
2	ODI	30.00±6.42	31.90±5.56	18.50±1.05	12.70±2.36
3	Flexion	5.74±0.37	5.69±0.41	6.00±0.35	6.08±0.34
4	Extension	2.70±0.43	2.67±0.23	2.91±0.38	2.93±0.29
Between group comparison Unpaired t-test		· NPRS z=1.401, p>0.05 NS · ODI: z=1.027, p>0.05, NS · flexion: t=0.401, p>0.05, NS · Extension: t=0.318, p>0.05, NS		· NPRS: t=5.074, p<0.001 S · ODI: t=4.660, p<0.001, S · Flexion: z=0.715, p>0.05, NS · Extension: z=0.133, p>0.05, NS	

S-denotes significant (p<0.05); NS – not significant (p>0.05)

The above table-4 presents the outcomes of between group comparisons of outcome measures in between the two groups. The outcome measures were more or similar in pre-test in both groups. The post test scores of numerical pain rating scale sores and Oswestry Disability index were comparably less in experimental group than control group but in case of post-test flexion and extension in experimental group were not significantly different.

Result

It evidenced that though both experimental and control group were individually effective in reducing the pain, disability and improving the function of flexibility and extension, the experimental group is better than control group.

Conclusion

Objective of the study was to find out the efficacy of scapular and pelvic PNF pattern on low back pain and flexibility among female undergraduate students of sports and physical education institutes. This study showed that PNF can be used to improve pain index rating and lumbar flexibility. The findings indicate that the experimental group experienced greater improvement than the control group by participating in the PNF lumbar stabilization. Hence, the alternate hypothesis is accepted, and null hypothesis is rejected. Both the techniques are almost equal in their clinical effectiveness for improving lumber flexibility and that either of the techniques may be used in clinical practice for improving lumber flexibility.

Ethical Clearance : - **Taken from The Oxford College of Physiotherapy**

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Conflict of Interest – Nil

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