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To Compare The Effect Of Proprioceptive Neuromuscular Facilitation Program Versus Core Stabilization Exercises For Decreasing Pain And Improving Functions In Patients With Low Back Pain

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Abstract: *Low back pain has been a matter of concern, affecting up to 90% of population at some point in their lifetime, up to 50% have more than one episode. People of all age group can be affected by this menace irrespective to their gender and quality of life. It has become one of the leading causes for the visit to physician thus also puts a heavy burden on the currency of the country. Physiotherapy is the most widely used form of treatment adopted for gaining relief from low back pain. The exercises include stretching, strengthening, range of motion exercises, McKenzie therapy and core stability exercises other techniques like Proprioceptive neuromuscular facilitation program etc. It has been concluded in various studies core stability exercises and Proprioceptive neuromuscular facilitation are beneficial in low back pain patients but comparison of their effect needs to be established to provide early and better relief from the disability. Therefore objective of the study was to compare the effect of Proprioceptive neuromuscular facilitation program and Core stabilization exercises on low back pain patients. 40 subjects aged 30 – 50 years with low back pain for more than 4 weeks were made part of the study based on inclusion and exclusion criteria and were then divided into two groups named A, B. Group A received Proprioceptive neuromuscular facilitation and group B received Core stabilization exercises and hot pack given initially for 10-15 minutes to the lower back. The exercise program was given for 4 weeks with a total of 24 sessions and progression of the activity was made within the tolerance of the patient. Pre and post treatment readings were taken of pain, Oswestry Disability Questionnaire and Functional Reach Test. Results were analyzed using paired, unpaired t- test. Results showed that there is significant effect on pain, Oswestry Disability Questionnaire and Functional Reach Test in the two groups but group A was clinically more significant than groups B. The study concluded that patients with low back pain are benefitted more by Proprioceptive neuromuscular facilitation program. So, Proprioceptive neuromuscular facilitation program should be practiced more.*

Keywords: *Low Back Pain, Core Stabilization Exercises, Proprioceptive Neuromuscular Facilitation.*

I. Introduction

Pain in the lower back has been a matter of concern, affecting up to 90% of population at some point in their lifetime, up to 50% have more than one episode (William and Shiel, 2012). People of all ages can be affected by this menace irrespective to their gender and quality of life (Harreby et al, 1995). Back pain experienced was found to be 28% in men and 33% in women (Heistaro et al 2007). It has been found that annual expenditure on the low back pain range from $30-70 billion (Driscoll, 2011). It is determined that the risk of back pain is twice as high once a history of the condition has been established (Hestbaek 2003). Population is facing number of obstacles in their daily life. Pain and muscle weakness are the most common obstacles in carrying out activities of daily living. The main causative factor that can cause back pain is poor posture while sitting, standing and lifting heavy weights. Other factors that can cause low back pain include spinal disorders and systemic diseases. (Cox and Trierk 1987).

Physiotherapy is the most widely used form of treatment adopted for gaining relief from low back pain. It is used in both modes, as single line of treatment including exercises or in a form of combination with electrotherapy modalities like short wave diathermy, interferential therapy etc. The exercises include stretching, strengthening, range of motion exercises, McKenzie therapy, core stability exercises and Proprioceptive neuromuscular facilitation program (Kumar, 2011). In order to improve low back pain there needs to be enough strength in abdominal and trunk muscles and the pelvic floor therefore strengthening exercises play an important role (Ferreira et al, 2006). Core stability exercises have become one of the fitness trend broadly used exercises for low back pain. Benefits of core stabilization have been rooted, from improving athletic performance and

preventing injuries, to alleviating low back pain (Hodges, 1996). Lack of sufficient coordination in core musculature can lead to decreased efficiency of movement and compensatory patterns, causing strain and overuse injuries. There is ample evidence that individuals with low back pain and sacroiliac pain lack proper recruitment of core muscles and exhibit core weakness. There is also evidence of increased fatigue, decreased cross section, and fatty infiltration of paraspinal muscles in patients with chronic low back pain. Patients with back pain also seem to over-activate superficial global muscles whereas control and activation of the deep spinal muscles is impaired. Thus core stability exercises have strong theoretical basis for prevention of different musculoskeletal conditions and the treatment of spinal disorders (McGill, 2001). Muscles are made up of fibers that stretch and contract in order to do something. Like many components of the body, muscles have a built in safe-guard called a myotatic stretch reflex that will signal muscle to contract if it senses that it is being overstretched. There is another safe guard in tendons called a golgi tendon organ which signals the muscles to relax when your tendons are stretched to far. Proprioceptive Neuromuscular Facilitation (PNF) utilizes both of these sensory responses in it's approach to improving flexibility, range of motion and even strength. There are several different exercises that are used during PNF. Common exercises may include different exercises Contract-Relax with Agonist Contract, Hold Relax, Rhythmic Initiation and Rhythmic Stabilization, combination of isotonic exercises. It has been concluded in various studies that both Core stabilization exercises and Proprioceptive neuromuscular facilitation program are beneficial in low back pain patients. Comparison of their effect needs to be established to provide early and better relief from the disability.

Need of the study

Low back pain is the common disability for people and hinders their functional ability. Proprioceptive neuromuscular facilitation program and Core stabilization exercises showed marked improvement. There is a need to compare both the treatment regime in order to provide better results in less time.

Aim of the study

To compare the effect of Proprioceptive neuromuscular facilitation and Core stabilization exercises in low back pain patients.

Objectives of the study

To evaluate the effectiveness of proprioceptive neuromuscular facilitation and core stability exercises on disability. To evaluate the effectiveness of proprioceptive neuromuscular facilitation and core stability exercises on pain.

Hypothesis

Null hypothesis There will be no significant difference in the effect of Proprioceptive neuromuscular facilitation and Core stabilization exercises in patients with low back pain. **Alternate hypothesis** There will be significant difference in the effect of Proprioceptive neuromuscular facilitation and Core stabilization exercises in patients with low back pain.

II. Materials and methods

Muthukrishnan, Shenoy and Sandhu. 2010 did study to examine the differential effect of core stability exercise training and conventional physiotherapy regime on altered postural control parameters in patients with chronic low back pain (CLBP). As heterogeneity in CLBP population moderates the effect of intervention on outcomes, in this study, interventions approaches were used based on sub-groups of CLBP. On the basis of the study they concluded that core stability exercise group provide better result.

Kofotolis and Kellis (2006) did a study to examine the effects of two 4- week proprioceptive neuromuscular facilitation (PNF) programs on trunk muscle endurance, flexibility and functional performance in women with chronic low back pain (CLBP). Eighty-six women (40.2±11.9 [$\bar{X}$±SD] years of age) who had complaints of CLBP were randomly assigned to 3 groups: rhythmic stabilization training, combination of isotonic exercises, and control. Subjects trained with each program for 4 weeks with the aim of improving trunk stability and strength. Static and dynamic trunk muscle endurance and lumbar mobility were measured before, at the end of, and 4 and 8 weeks after training. Disability and back pain intensity also were measured with the

Oswestry Index. Multivariate analysis of variance indicated that both training groups demonstrated significant improvements in lumbar mobility (8.6%–24.1%), static and dynamic muscle endurance (23.6%–81%), and Oswestry Index (29.3%–31.8%) measurements. Static and dynamic PNF programs may be appropriate for improving short-term trunk muscle endurance and trunk mobility in people with CLBP.

Study Design: Experimental study design comparative in nature

Research setting: Orthopaedics department and Physiotherapy department of Gian Sagar Medical College and Hospital. Out patient department of Gian Sagar College of Physiotherapy, Ram Nagar, Rajpura, District Patiala.
Study duration: 6 months
Population Sample: 40 patients
Sampling technique: Random Sampling Technique
Inclusion criteria: Duration of pain for more than 4 weeks, Age: 30-50 years**,** Both males and females**,** Patient on same medications for low back pain**,** Pain during or after activity
Exclusion criteria: Pregnancy, History of vertebral fracture during last 1 year, Neurological disorders, Uncooperative patient, Presence of any cardiovascular disease, Participating in another research study involving low back pain, Recent trauma

Procedure:

40 patient were made part of the study based on the inclusion and exclusion criteria. After taking consent, these patients were randomly divided into two groups i.e Group A and Group B 20 in each group. In Group A Proprioceptive neuromuscular facilitation are given. The treatment to this group of patients includes Combination of Isotonic Exercises (COI) and Rythmic Stabilization Technique (RST), Kofotolis and Kellis 2006 and Hot pack given initially for 10–15 minutes, Kumar 2011 to the low back. The Combination of Isotonic Exercises program consists of alternating concentric and eccentric contractions of agonists without relaxation resisted active concentric contraction for 5 seconds (trunk flexion), resisted eccentric contraction for 5 seconds (trunk flexion), and resisted maintained contraction for 5 seconds (trunk flexion-extension). Three sets of 15 repetitions at maximal resistance were performed. The RST program consisted of alternating trunk flexion-extension isometric contractions against resistance for 10 seconds, with no motion intended. Subjects performed 3 sets of 15 repetitions at maximal resistance provided by the same physical therapist. Rest intervals of 30 seconds and 60 seconds were provided after the completion of 15 repetitions for each pattern and between sets, respectively. Group B Core stabilization exercises are given. . The treatment to this group of patients includes Cat – camel exercise, Curl up exercise and Bridging (Joshua 2012)
(10 repetitions,10 sec duration) Apparao et al 2012
The exercise programme is given for 4 weeks i.e 6 sessions/week. During this period with consultation of treating Physician, patients will be given same medications for low back pain.
Dependent Variables: Visual analogue scale (Polly et al 2001), Modified Oswestry disability questionnaire (Fairbank and Davis 1980), Forward reach test (Duncan et al 1990).
Independent variables: Proprioceptive neuromuscular facilitation and Core stabilization exercises.
Outcome measures:
Visual analogue scale- Visual Analogue Scale is a pain rating scale on which the patient is asked to rate his or her pain from 0 (no pain) to 10 (most severe pain imaginable). The line is 10 cms in length on which patients mark is measured from the left (no Pain) end of the scale and is recorded in centimeters. VAS has advantages over other methods in terms of feasibility and reliability.
Modified oswestry low back pain disability questionnaire- This questionnaire has been designed to give information as to how your back pain has affected your ability to manage in everyday life and consists of 10 items addressing different aspects of function, each scored from 0 to 5, with higher values representing greater disability. The total score is multiplied by 2 and expressed as a percentage. This test is highly reliable.

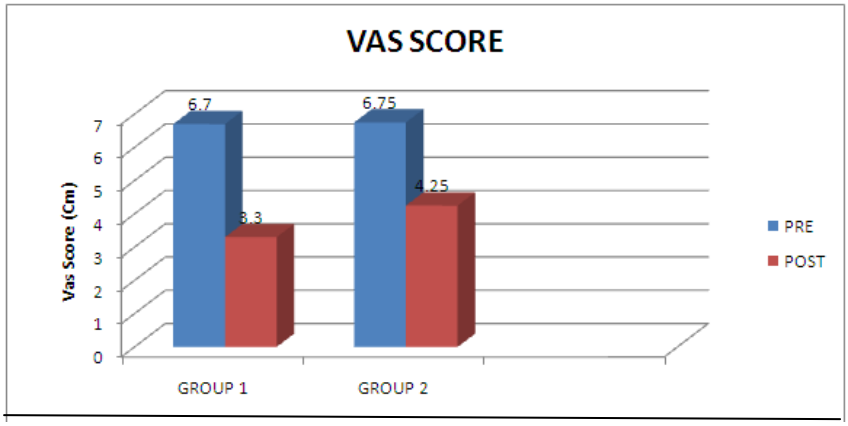
III. Data analysis

Results were analysed by paired, unpaired t- test. Paired t- test was applied between pre and post values of VAS, ODQ and FRT of group A. Paired t- test was applied between pre and post values VAS, ODQ and FRT of group B. Unpaired t- test was applied to the difference of pre and post values of group A with difference of pre and post values of group B.

Table 1.1 Mean and standard deviation of pre-treatment, post-treatment of VAS score of the groups.

GROUPS	PRE		POST	
	Mean ± SD	SE	Mean ± SD	SE
A	6.7 ± 1.97	0.44	3.3 ± 2.00	0.44
B	6.5 ± 1.91	0.42	4.25 ± 1.83	0.40

The main score of VAS for pre and post treatment for group A was 6.7 ± 1.97 and 3.3 ± 2.00 respectively. The main score of VAS for pre and post treatment for group B are 6.5 ± 1.91 and 4.25 ± 1.83 respectively.

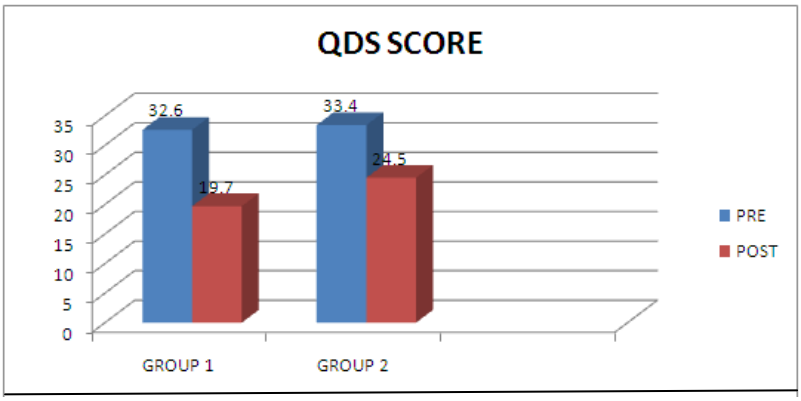


Graph 1 Graph represent mean of VAS at Pre, Post interval for the subjects of Group A and Group B

Table 1.2 Mean and standard deviation of pre-treatment, post-treatment of ODQ score of the groups.

GROUPS	PRE		POST	
	Mean ± SD	SE	Mean ± SD	SE
A	32.6 ± 10.5	2.34	19.7 ± 8.23	1.84
B	33.4 ± 9.52	2.12	24.5 ± 10.7	2.39

The main score of ODQ for pre and post treatment for group A was 32.6 ± 10.5 and 19.7 ± 8.23 respectively. The main score of ODQ for pre and post treatment for group B are 33.4 ± 9.52 and 24.5 ± 10.7 respectively.



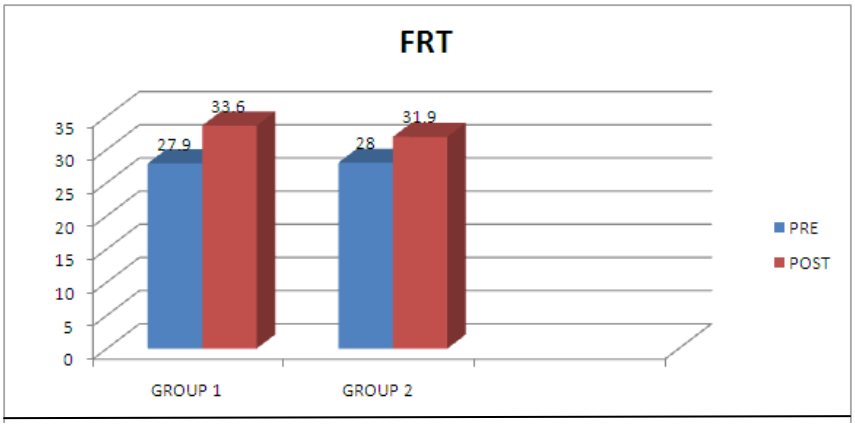
Graph 1.2 Graph represent mean of ODQ at Pre, Post interval for the subjects of Group A and Group B

Table 1.3 Mean and standard deviation

GROUPS	PRE		POST	
	Mean ± SD	SE	Mean ± SD	SE
A	27.9 ± 1.13	0.25	33.6 ± 1.82	0.40
B	28.0 ± 1.28	0.28	31.9 ± 3.39	0.75

of pre-treatment, post-treatment of FRT score of the groups.

The main score of FRT for pre and post treatment for group A was 27.9 ± 1.13 and 33.6 ± 1.82 respectively. The main score of FRT for pre and post treatment for group B are 28.0 ± 1.28 and 31.9 ± 3.39 respectively.



Graph 1.3 Graph represent mean of FRT at Pre, Post interval for the subjects of Group A and Group B

Table 1.4 T- value by paired t- test for comparing within the groups (at 5% LOS)

OUTCOME MEASURES	GROUP A	GROUP B	SIGNIFICANT/NON SIGNIFICANT LOS(at 5%) t-table = 1.72
VAS	18.52	9.04	Significant
ODQ	9.53	6.71	Significant
FRT	17.6	7.38	Significant

Paired t sample test was applied to examine the changes in dependent variables from base-line to after completion of intervention in each group (Table 1.4). Level of significance was defined at $p \leq 0.05$ and confidence interval of 95 % was taken.
The t-test value of VAS for group A is 18.52, for group B is 9.04. On comparison the results in two groups showed significant difference ($p \leq 0.05$).
The t-test value of ODQ for group A is 9.53, for group B is 6.71. On comparison the results in two groups showed significant difference ($p \leq 0.05$).
The t-test value of FRT for group A is 17.6, group B is 7.38. On comparison the results in two groups showed significant differences ($p \leq 0.05$),

Table 1.5 T- value by Un-paired t-test for comparisons between the groups (at 5% LOS)

OUTCOME MEASURES	Between Gp A&B	SIGNIFICANT/NON SIGNIFICANT LOS(at 5%) t-table = 1.68
VAS	2.37	Significant
ODQ	1.99	Significant
FRT	2.36	Significant

The unpaired t-test was used for between group analyses for all the outcome measures (Table 1.7). Level of significance was defined at $p \leq 0.05$ and confidence interval of 95 % was taken.
On comparison the results of VAS in the group A and B showed significant difference ($p \leq 0.05$). The t-test value of VAS for group A and group B is 2.37.
On comparison the results of ODQ in the group A and B showed significant difference ($p \leq 0.05$). The t-test value of ODQ for group A and group B is 1.99.
On comparison the results of FRT in the group A and B showed significant difference ($p \leq 0.05$). The t-test value of FRT for group A and group B is 2.36.

Statistical Analysis of the data proves that all the groups are singnificant . Graphical representation shows that Group A is significantaly better than Group B.

IV. Discussion

Low back pain is an important public health, social and economic problem. It is a disorder with much possible aetiology, occurring in different groups, and also a common health condition in working population In India, occurrence of low back pain is also alarming, nearly 60 per cent of the people in India have significant back pain at some time or the other in lives. Approximately 35% people suffer from chronic back pain, which significantly hampers their day-to-day routine (Suryapani, 1996). Pain is the most common symptom which

contribute to significant decline in physical abilities including walking, standing, sitting, lifting etc. VAS scale in used to measure the pain intensity of the patients with low back pain. There was statistically significant difference ($p \leq 0.05$) in VAS score readings of the 2 groups when analysed using paired t-test but clinically

It was found that group A, which received Proprioceptive neuromuscular facilitation showed better results than group B which received Core stabilization. The results of the study is in compliance with a done by Tanvi et al (2013) did a study to examine the effect of Proprioceptive Neuromuscular Facilitation Program on Muscle Endurance, Strength, Pain, and Functional Performance in Women with Post-Partum Lumbo-Pelvic Pain. A total of 28 females were taken on the basis of inclusion (7SI joint test) and exclusion criteria and divided into two groups via convenient sampling. Group A (n=14) received set of lumbo-pelvic stabilization exercises after IRR and Group B (n=13) received proprioceptive neuromuscular facilitation techniques (rthymic stabilization and combination of isotonics) after IRR for four weeks. All the outcome variables i.e. trunk flexors and extensors static and dynamic endurance, pain and quality of life were measured at 0 (pre-test), 2^{nd} and 4^{th} week. Paired t-test indicated that Group A (Lumbo-pelvic stabilization group) demonstrated significant improvements in static and dynamic muscle endurance, pain and Quebec back pain disability scale measurements. However Group B (proprioceptive neuromuscular facilitation group) also shows improvement on the measure of functional ability and pain from baseline. With in group analysis was done found to be significantly different. The results of the study suggest that both the groups show improvement but lumbo-pelvic stabilization exercises are beneficial for improving trunk muscle endurance, pain and functional ability in women with post partum lumbo-pelvic pain. The findings of pain management with Proprioceptive neuromuscular facilitation in the present study was further supported by George, K.U and N.P (2013) conducted a study to compare the effectiveness of combination of trunk Proprioceptive neuromuscular facilitation training and conventional strengthening exercises with conventional strengthening exercises alone in the management of mechanical low back pain. The findings suggest that trunk neuromuscular facilitation training along with conventional strengthening exercises in subjects with mechanical low back pain induces a greater improvement on pain and functional disability as compared to conventional strengthening exercises alone. The findings of pain management with stabilization exercises in the present study was further supported by Franca et al in 2010 who did a study on the efficacy of two exercises programme , segmental stabilization and strengthening of abdominal and trunk muscles with chronic low back pain. Improvement in all variables was superior in the segmental stabilization group opposed to the strengthening.

The results of Oswestry disability questionnaire (ODQ) when analyzed with paired t-test showed significant difference ($p \leq 0.05$) in all the 2 groups but clinically it was found that group A, which received Proprioceptive neuromuscular facilitation and conventional exercises showed better results than group B which received Core stabilization. Kumar, Zutshi and Narang (2011) did a study to examine the efficacy of trunk proprioceptive neuromuscular facilitation (PNF) training on chronic low back pain (CLBP). The results of the study suggest that the PNF programs are appropriate for improving trunk muscle endurance, trunk mobility, pain and functional ability in people with CLBP. The study further supported the present study done by

Aggarwal in 2010 on the effects of lumbar stabilization exercises as home programme in treatment of young women with non specific low back pain. In experimental group where lumbar stabilization exercises along with back care and ergonomic advice is given is more effective to decrease pain and disability than in control group in which only back care and ergonomic advice is given as a home programme.

V. Conclusion

The conclusion of the present study is that the patients of low back pain within the age group of 30-50 years are benefited more by Proprioceptive neuromuscular facilitation program rather by Core stabilization exercises.

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