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Effectiveness of Core Stabilization Exercises on Floor and Swiss Ball on Pain, Disability and Range Of Motion in Non-Specific Low Back Pain Patients: A Randomized Control Trial

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Abstract
Aim of Study*: The aim of the study was to conduct a randomized control trial to compare the effectiveness of core stabilization exercises on floor and Swiss ball on pain, disability and range of motion in non-specific low back pain patients.* ***Methodology****: 30 subjects were included in the study as per inclusion and exclusion criteria. A written informed consent was signed by the subjects in their own language. The subjects were divided into two groups by using random number table. Group (A) Experimental Group (N=15) received treatment with exercises on Swiss ball and Group (B) Control Group (N=15) received treatment with exercises on floor. Exercise program lasted for 6 weeks. Patients were assessed by Visual Analog Scale (VAS), Modified Oswestry Low Back Pain Disability Questionnaire (MOLBPDQ) and Modified Schober Test (MST).* ***Result****: The result showed that there was significant (p<0.001) improvement in VAS, MOLBPDQ and MST in both groups A & B after 6 weeks of the treatment. But when compared between group A & B; group A showed significant (p<0.001) improvement in VAS, MOLBPDQ and MST Flexion as compared to group B.* ***Conclusion****: The Swiss ball exercises showed statistically significant improvement in reducing pain, disability and increasing range of motion as compared to the floor exercises. Thus, Swiss ball exercises were more effective as compared to the floor exercises.*

Keywords*: Non-specific LBP, Swiss ball exercises, Floor exercises.*

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I. Introduction

Non-specific low back pain has become a major public health problem worldwide. Men and women are equally affected. It occurs most often between ages 30 and 50. The prevalence of non-specific low back pain in Indian population has been found to range from 6.2% to 92% and found to increase with age and to be more common among females[1].

Non-specific low back pain is defined as low back pain not attributable to a recognizable, known specific pathology (e.g., infection, tumour, osteoporosis, fracture, structural deformity, inflammatory disorder, radicular syndrome, or cauda equina syndrome). Non-specific LBP is usually classified according to the duration as acute (less than 6 weeks), sub acute (between 6 weeks and 3 months) or chronic LBP (longer than 3 months)[2].

The management of LBP comprises with range of different interventional strategies, including drug therapy and nonmedical interventions. Physical therapy includes exercises and pain relieving modalities[3]. Short wave diathermy, interferential currents and transcutaneous electrical nerve stimulation have been known to reduce muscle spasm and blocking pain[4]. There are various forms of exercise that can be prescribed based on different schools of thought. This includes intensive dynamic back extensor exercises[5], motor control exercises[6], yoga[7], aerobic exercises[8]. The exercises include stretching, strengthening, range of motion exercises, McKenzie therapy, core stability exercises and proprioceptive neuromuscular facilitation program[9].

Research guidelines recommend core stabilization exercise as a commonly used treatment strategy for low back pain[10,11]. Core stability exercises in low back pain rehabilitation have become popular due to observed changes in abdominal muscle activation patterns in the presence of low back pain[12,13]. Core stability exercises facilitate co-contraction between abdominals and back extensors to maintain the spinal stability so as to transfer the loads equally and to make the patient functionally active[14] .

The use of Swiss ball training for core muscle development has been popular for several years[15]. Most researchers who studied the use of Swiss ball exercises quantified abdominal muscle activity during the crunch, push-up, and bench press exercises, and typically investigated the recruitment patterns of only 1 or 2 muscles[16,17,18]. Numerous other Swiss ball exercises are used in training and rehabilitation to enhance core

development and stability. The purpose of this study to test the effectiveness of core stabilization exercises on floor and Swiss ball on pain, disability and range of motion in non-specific low back pain.

II. Methodology:

Study was approved by Research and Ethical committee of University College of Physiotherapy (UCOP), Faridkot. 35 patients were screened, 5 were excluded (2 did not meet the inclusion criteria & 3 declined to participate). The inclusion criteria included 1. Both males and females 2. Age group of 20-45 years 3. Patients with diagnosed non-specific low back pain > 3 months 4. Patients with minimum to moderate disability on ODI (upto 40%) 5. Patients with VAS grade of 5 and below. 6. Patients willing to participate in the study and Exclusion Criteria was 1. Any previous or current experience in core strengthening. 2. Subjects who are on regular fitness program. 3. Past history of fracture (spine, rib) or injury and abdominal and spinal surgery. 4. Spondylolisthesis, Spondylolysis, Ankylosing spondylosis and Osteoarthritis 5. Neurological disorder (CVA, Parkinson's disease). 6. Acute infection or acute systemic disorder and metabolic or vascular disorders. 7. Non-cooperative and psychiatric subjects. 8. Pregnancy.

The patients were divided into two groups, Group A (n=15) and Group B (n=15) based on randomization. Informed consent was signed by the patients. Randomization was done by random number table. They were evaluated for pain, disability and range of motion by using Visual Analog Scale (VAS), Modified Oswestry Low Back Pain Disability Questionnarie (MOLBPDQ) and Modified Schober Test (MST) respectively. The patients were assessed before, at the end of 3 week and at the end of 6 week after the treatment protocol to see the efficacy of two different protocols.

Procedure: The study was conducted for six days weekly for 6 weeks. Patients in both Groups A and B received Hot Moist Pack (India Medico Instruments Co., New Delhi, India) was applied for the duration of 15 min on low back region followed by interferential current (IFT) for 20 min . Four pole channels (5 cm×10 cm) were positioned with carrier frequency 4,000 Hz, with modulated frequency amplitude (MFA) of 20 Hz, ΔMFA of 10 Hz and intensity was increased as per the tolerance of the subject[19]. In 1& 2 week exercise protocol was curls up and bridging (10 repetitions of each exercise) for Group A (on Swiss ball) and Group B (on floor). In 3& 4 week, curls up with rotation and bridging with one leg raise for Group A and B (12 repetitions with 5 sec. hold of each exercise). In 5& 6 week, side plank for Group A and B (15 repetitions with 8 sec. hold of the exercise).

Data Analysis: For data analysis, unpaired t-test was applied to analyze the characteristics of the subject using SPSS 20.0. In order to compare the VAS, MOLBPDQ and MST Flexion of each group at 0 week, 3rd week and 6th week, the level of statistical significance was set as 0.05 for all analyses.

III. Results

The comparison of VAS, MOLBPDQ and MST Flexion scores of Group A and Group B was made using the unpaired t- test. On comparison of the mean difference of both groups, the mean difference of VAS scores between Group A and B at 0 week was 5.73 and 6.0, at 3rd week was 4.60 and 5.4 and at 6th week was 3.33 and 4.4 respectively.

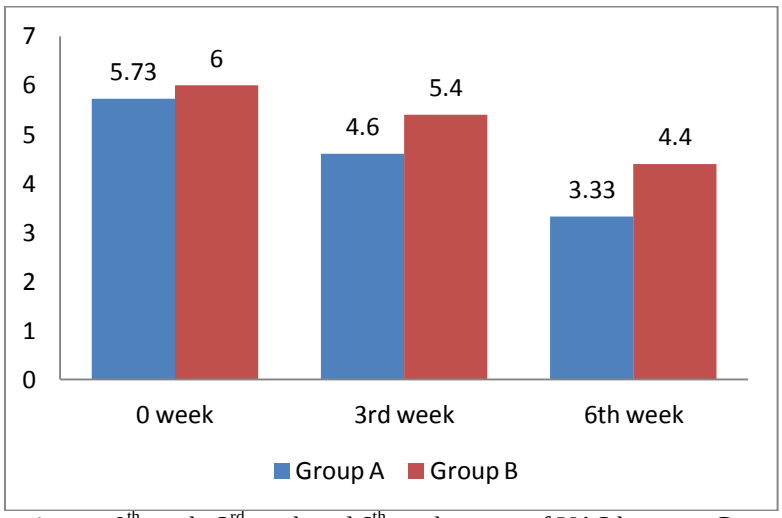

Figure-1.1: Comparison at 0th week, 3rd week and 6th week scores of VAS between Group A and Group B.

The mean difference of MOLBPDQ scores between Group A and B at 0 week was 24.733 and 23.0, at 3rd week was 15.067 and 19.133 and at 6th week was 8.267 and 14.133 respectively.

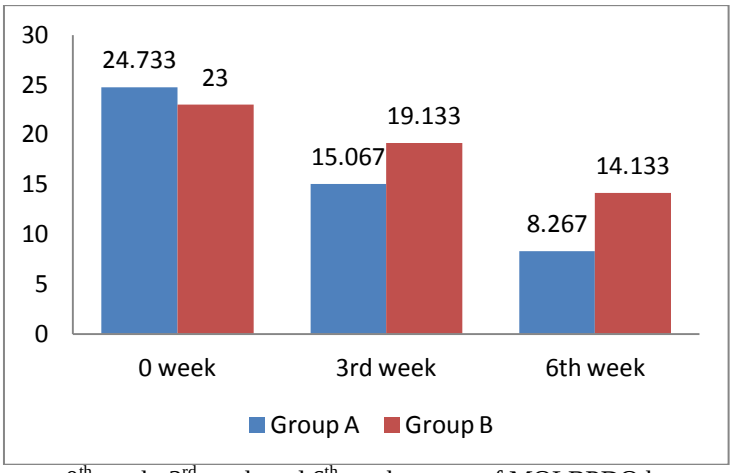

Figure-1.2: Comparison at 0th week, 3rd week and 6th week scores of MOLBPDQ between Group A and Group B.

The mean difference of MST Flexion scores between Group A and B at 0 week was 3.8 and 4.133, at 3rd week was 5.6 and 4.8 and at 6th week was 6.93 and 5.6 respectively.

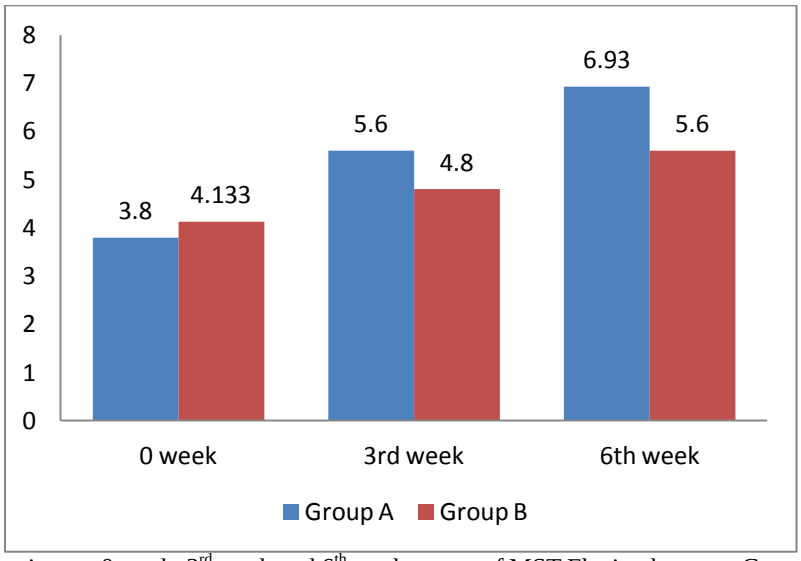

Figure-1.3: Comparison at 0 week, 3rd week and 6th week scores of MST Flexion between Group A and Group B.

There was a significant statistical difference in the effectiveness of both groups since the mean difference in the VAS, MOLBPDQ and MST Flexion scores was significant with p-Value of 0.001* (<0.05). Hence, Group A showed highly significant difference values in reducing pain, disability and increasing ROM as compared to the Group B.

IV. Discussion:

Results of the present study concluded that both the exercises on Swiss ball and floor were effective in reducing pain, improving disability and increasing ROM in patients with non-specific LBP. However, statistically it was concluded that Swiss ball exercises are better than floor exercises. There was statistically significant in reducing pain, improving disability and increasing ROM for Group A that was treated by exercises on Swiss ball as compared to those who received exercises on floor for Group B. There was a significant improvement in Swiss ball group as compared to floor, which may be due to the following reasons- Reduction in contact area, Increase in perturbations, control of centre of gravity within the limited base of support. Rajan Balakrishnan1 et al[20]., (2016) studied the comparison of Swiss ball and floor exercise in subjects with non-specific LBP. The group A subjects were allowed to perform core stability exercises on Swiss ball and group B performed same exercises on floor. At the end of 4 weeks of core stability exercise program, there was a significant change in VAS and ODI score in core stability exercise on Swiss ball between pre and post. There was a significant improvement in Swiss ball group compared to floor. The result of this study is relevant to the

present study which showed significant decrease in pain and improve in disability with the use of Swiss ball exercise. Raj Kiran.Tiku, Bhumika.Kaul[21] (2016) studied the comparison of Swiss ball and floor exercise in subjects with non-specific LBP. Comparison of pre and post VAS scores within two group showed that in both the groups there was significant improvement between pre and post mean scores. There was a significant improvement in Swiss ball group compared to floor. The result of this study is relevant to the present study which showed significant decrease in pain and improve in disability with the use of Swiss ball exercise. Alisha Murtaza Khokhawala, Reshma Gaurav[22] (2019) The primary goal of this study was to study the effects of Swiss ball exercises in comparison to floor exercises in patients with mechanical low back pain. The subjects of 64 Group A were taught floor exercises, and that of Group B were taught Swiss ball exercises. After statistical analysis, it showed that both groups are capable of reducing mechanical low back pain, but the Swiss ball exercises showed greater capability in reducing mechanical low back pain. This difference may be due to a reduction in contact area, control of the center of gravity.

V. Conclusion:

This study concluded that both Swiss ball exercises and Floor exercises are effective in reducing pain, decreased disability and increased range of motion. However, reduction in pain, decreased in disability and increased in range of motion is more after the treatment of sixth weeks in subjects who received Swiss ball as compared to the subjects who received Floor exercises. The limitation of the study was that the sample size for the study was small, study period was less and there was no longer follow up. Future scope of the study will be that studies can be done on large sample size and can include different outcome measures. Further studies should also include long term follow up. EMG biofeedback can be used for quantifying muscle activity.

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