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Original Research Article

Effectiveness of Core Stability Exercises on Firm Surface (Mat) and Labile Surface (Swiss Ball) in Managing Pain and Disability in Patients with Mechanical Low Back Pain

Manmeet Kour[1], Shyamal Koley[2]

[1]Post-Graduate Student, [2]Professor and Head,
Department of Physiotherapy, Guru Nanak Dev University, Amritsar - 143005, Punjab, India

Corresponding Author: Shyamal Koley

ABSTRACT

Introduction: Low back pain is a major public health problem all over the world. Many different therapeutic interventions are used in the management of low back pain. In the present study, four weeks interventions with core strengthening exercises were given to patients with mechanical low back pain on two different surfaces, such as, on Swiss ball and on floor mat.

Method: A total of 63 purposively selected confirmed cases of mechanical low back pain aged 25-55 years were considered for the present study. The samples were collected from the Government Medical College, Jammu, Jammu & Kashmir, India. The subjects were divided into two groups for intervention. Group A consisted of 31 subjects who were to perform the core strengthening exercises on Swiss ball for four weeks. Group B consisted of 32 subjects who were to perform the core strengthening exercises on floor mat also for 4 weeks.

Results: Statistically significant differences ($p<0.013$-0.001) were found in age, ODI score (after treatment) and VAS (after treatment) between the patients treated with Swiss ball and floor mat. Though patients treated with Swiss ball had the decrement of 77.07% in ODI score as compared to 74.76% on floor mat exercises and the decrement of 58.82% in VAS score in patient treated with Swiss ball as compared to the decrement of 46.38% in patient treated with floor mat.

Conclusion: It might be concluded from the present study that, both the surfaces, such as Swiss ball and floor mat were proven equally effective for care strengthening exercises in patients with mechanical low back pain, though Swiss ball surface was proven to be more effective.

Key Words: Mechanical low back pain. Swiss ball surface. Floor mat surface. Core stability exercises.

INTRODUCTION

Low back pain (LBP) is a major public health problem all over the world. It affects 60% to 80% population of US adults at some time during their lives, and upto 50% have pain within a given year. [1-8] In India, occurrence of LBP is also alarming; nearly 60% of the people have significant back pain at some time or the other in lives. [9,10] Mechanical low back ache is described as a musculoskeletal pain, which varies with physical activities and not involving root compression or serious spinal diseases.

Core stability is a description of the muscular control required around the lumbar spine to maintain functional stability. [11] It has become a major trend in rehabilitation in low back pain. The term has been used to connote lumbar stabilization, motor control training, and other regimens.

The use of labile (Swiss ball) surface underneath the subject for stability training

of the injured low back is becoming more popular. [12] The first use of the gym ball was by Swiss therapists to help improve balance and equilibrium in children with cerebral palsy. [13,14] There has been a considerable increase in the use of the Swiss ball as an exercise tool in the last several years. [15-19] The use of floor mat exercises on the patients with low back pain is also a common practice.

Very few references are available on the effectiveness of core stability exercises on floor mat and Swiss ball in managing pain and disability in patients with mechanical low back pain: Thus, the present study was planned.

MATERIALS AND METHODS

Subjects

The present cross-sectional study was based on purposively selected 63 confirmed cases of mechanical low back pain aged 25-55 years. The samples were collected from the Government Medical College, Jammu, Jammu & Kashmir, India. The subjects were divided into two groups for intervention. Group A consisted of 31 subjects (20 females and 11 males) who were to perform exercises on labile surface (Swiss ball) for four weeks. Group B consisted of 32 subjects (19 females and 13 males) who were to perform exercises on firm surface (floor mat) for 4 weeks. The study was approved by the Institutional ethics committee.

Anthropometric Measurements

Three anthropometric variables, such as, height, weight and BMI were taken on each subject using the techniques provided by Lohman et al. [20] and were measured in triplicate with the median value used as the criterion.

The height was recorded during inspiration using a stadiometer (Holtain Ltd., Crymych, Dyfed, UK) to the nearest 0.1 cm. Weight was measured by digital standing scales (Model DS-410, Seiko, Tokyo, Japan) to the nearest 0.1 kg. BMI was then calculated using the formula weight (kg)/height^2 (m)^2.

Interventions

Both groups had to perform 5 types of core stability exercises for 10 repetitions from 1st week to 4th week. The repetition was increased by 50% of 1st week performance. In 4th week, exercises were continued with addition of 10 second holding time. So far surfaces were concerned, patients of Group A were treated on Swiss ball and the patients of Group B were treated on floor mat. Patients in both the groups were assessed for pain on Visual Analog Scale (VAS) and disability on ODI questionnaire on 1st day and end of 4th week.

Statistical Analysis

Standard descriptive statistics (mean ± standard deviation) were determined for directly measured and derived variables. Student's t-test was used for the comparison of various variables between patients treated with exercises on Swiss ball and floor mat. Data were analyzed using SPSS (Statistical Package for Social Science) version 20.0. A 5% level of probability was used to indicate statistical significance.

RESULTS

Table 1 showed the descriptive statistics of selected variables in patients treated with Swiss ball and floor mat exercises. Statistically significant differences ($p<0.013$-0.001) were found in age, ODI score (after treatment) and VAS (after treatment) between the two sets of data.

The descriptive statistics of selected variables in male and female patients treated with Swiss ball were shown in table 2. Statistically significant differences ($p<0.040$) were found only in height between the male and female patients treated with Swiss ball.

Table 3 showed the descriptive statistics of selected variables in male and female patients treated with floor mat exercises. Statistically significant differences ($p<0.004$) were found, once again, only in height between the male and female patients treated with floor mat.

Table 1: Descriptive statistics of selected variables in patients treated with Swiss ball and floor mat exercises

Variables	SWBE (n =31)		FME (n =32)		t-value	p-value
	Mean	SD	Mean	SD		
Age (years)	30.04	6.42	36.95	11.38	2.592	**<0.013**
HT (cm)	158.46	13.03	163.00	9.29	1.390	0.171
WT (kg)	58.92	11.49	63.71	11.10	1.469	0.149
BMI (kg/m^2)	22.84	3.28	24.31	3.97	1.403	0.167
ODISBT (%)	23.42	2.39	25.50	5.05	1.827	0.074
ODISAT (%)	3.37	1.93	10.50	5.51	4.301	**<0.001**
VASBT	4.12	0.74	4.42	0.71	1.368	0.173
VASAT	1.04	0.20	2.37	0.57	10.693	**<0.001**

SWB = Swiss ball exercises, FME = floor mat exercises, HT = height, WT = weight, BMI = body mass index, ODISBT = ODI score before treatment, ODISAT = ODI score after treatment, VASBT = VAS before treatment, VASAT = VAS after treatment.

Table 2: Descriptive statistics of selected variables in male and female patients treated with Swiss ball

Variables	Male patients (n =11)		Female patients (n =20)		t-value	p-value
	Mean	SD	Mean	SD		
Age (years)	29.00	4.08	30.47	7.23	0.502	0.621
HT (cm)	166.86	9.94	155.00	12.79	2.186	**<0.040**
WT (kg)	64.28	14.49	56.70	9.66	1.509	0.146
BMI (kg/m^2)	22.97	4.15	22.78	3.00	0.126	0.901
ODISBT (%)	22.86	1.57	23.65	2.67	0.727	0.475
ODISAT (%)	5.57	1.81	5.29	2.02	0.314	0.757
VASBT	4.43	0.79	4.00	0.71	1.308	0.204
VASAT	1.00	0.00	1.06	0.24	0.633	0.533

Table 3: Descriptive statistics of selected variables in male and female patients treated with floor mat exercises

Variables	Male patients (n =13)		Female patients (n =19)		t-value	p-value
	Mean	SD	Mean	SD		
Age (years)	43.10	10.07	32.57	10.46	2.468	**<0.022**
HT (cm)	169.10	9.79	158.64	6.11	3.226	**<0.004**
WT (kg)	68.70	9.12	60.14	11.30	1.976	0.061
BMI (kg/m^2)	24.08	3.07	24.48	4.61	0.237	0.815
ODISBT (%)	24.80	5.01	26.43	5.98	0.702	0.490
ODISAT (%)	11.40	5.50	13.86	4.67	1.180	0.250
VASBT	4.50	0.71	4.36	0.74	0.473	0.641
VASAT	2.40	0.70	2.36	0.50	0.176	0.862

DISCUSSION

Low back pain is a widespread complication. [1-8] Many different therapeutic interventions are used in the management of low back pain. For clinicians, researchers and policymakers, it is important to be able to determine the most successful treatment. In the present study, four weeks interventions with core stability exercises were given to all the patients with mechanical low back pain on two different surfaces, such as, on Swiss ball and on floor mat. Statistically significant differences were found between Swiss ball and floor mat exercises in ODI-after treatment and VAS-after treatment (table 1). When comparison was made between ODI before and after treatment, highly significant differences ($t=43.499$; $p<0.001$) were found, showing the disability decrement of 77.07% in patient treated with Swiss ball. Whereas, highly significant differences ($t=18.406$; $p<0.001$) also were found between ODI before and after treatment, showing the disability decrement of 74.76% in patients treated with floor mat. So far VAS score was concerned, highly significant differences ($t=21.059$; $p<0.001$) were found between VAS before and after treatment, showing the decrement of pain 58.82% in patients treated with Swiss ball and highly significant differences ($t=18.185$; $p<0.001$) also between VAS before and after treatment, showing the decrement of pain 46.38% in patients treated with floor mat. Therefore, both the surfaces, such as Swiss ball and floor mat were proven equally effective for core stability exercises in patients with mechanical low back pain, though Swiss ball surface took the upper hand (due to their greater decrement percentage both in pain and disability). When comparisons were made among the male and female patients treated with Swiss ball and floor mat separately, no significant differences were found between before and after ODI or VAS. The findings of the present study supported the findings of

earlier studies. [15-19]

Performing core stability exercises on labile surfaces appears to increase abdominal muscle activity. This increase in muscle activity is probably due to the increased requirement to enhance spine stability and whole-body stability to reduce the threat of falling off the labile surface. Moreover, in order to enhance the stability, it appears that the motor control system selected to increase external oblique muscle activity more than the other abdominal muscles. The use of labile surfaces appears to increase muscle activity levels and co-activation. [21]

The limitations of the present study were small sample size and the data exclusively from Jammu and Kashmir State of India. More extensive study is required to validate the data.

CONCLUSION

It might be concluded from the present study that, both the surfaces, such as Swiss ball and floor mat were proven equally effective for core stability exercises in patients with mechanical low back pain, Swiss ball surface was more effective.

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