Effects of Swiss ball exercise and Pilates exercise on core muscle strengthening in college cricketers

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ABSTRACT

Introduction and Aim: Cricket is one of the most popular game in India played by men and women of all ages. Core stability is defined as the ability to control the position and movement of the trunk over the pelvis to allow optimum production, transfer and control of force and movement to the terminal segment. Major muscles involved are pelvic floor muscles, Transverse abdominis, multifidus, internal and external obliques, and rectus abdominis. Core is used to stabilize the thorax and the pelvis during dynamic movement. The study helps to compare the effectiveness of Swiss ball exercise and Pilates exercise on gaining core muscle strength. The aim of the study is to compare the effect of Swiss ball exercise and Pilates exercise on core muscle strengthening in college cricketers.

Materials and Methods: The design of the study is comparative type. The study was carried out in faculty of Physiotherapy, Dr.M.G.R. Educational and Research Institute. The study sample of 30 male college cricketers between the age group of 18 to 25 years are included in the study. Individuals with associated neuromuscular conditions, any injuries to lower limbs and any spinal injuries have been excluded in the study. Swiss ball and Pilates mat are the materials used. Sphygmomanometer is the outcome measure.30 male individuals between the age group of 18 to 25 years were divided into two groups, group A and group B. Individuals in the group A (n=15) received the Swiss ball exercise and group B (n=15) received Pilates exercise for 4 session/ week for 6 weeks.

Results: On comparing the mean values of group A and group B on double leg lowering test (DLLT), it shows significant decrease in the post test mean values but (group B- Pilates exercise) shows (30.60) which has the lower mean value is more effective than (group A- Swiss ball exercise) (46.80) at $P \leq 0.001$. Hence, null hypothesis is rejected.

Conclusion: The study concluded that both the group was effective but while comparing Pilates exercise showed the potential treatment option than swiss ball exercise. Hence, Pilates exercise was effective on core muscle strengthening in college cricketers.

Keywords: Swiss ball; Pilates mat; core muscle; sphygmomanometer.

INTRODUCTION

Cricket is one of the most famous games in India played by men and women of all age. The increased physical demands on the players may increase the risk of injuries. This is because the demands on the body from playing cricket are most often varied as players are required to bat, bowl and field various time throughout the game. Cricketers must have potential strength of core muscle; a core is the essential structure between upper limbs and lower limbs. Therefore, it is essential to prevent low back injuries and lower limb injury in cricketers (1).

Shoulder depression and horizontal flexion strength for the desired limb and quadriceps power in the un-desired limb are commonly related to back injuries. Bowlers who rotated the trunk to re-align the shoulders by more than 40 degree to a more side-on position between back foot impact and front foot impact in the delivery stride were prone to sustain back injuries (2).

Anatomically, the sites of injuries in cricketers are estimated in number of studies. Cricketers are more prone to back and trunk injuries by 14-18%. The frequency of lower limb injuries varies from 25% to 30% has been reported (3). The major causes of injuries were found to bowling 12.5% male college bowlers and 8.7% of cricket player. Major muscles included are pelvic floor muscle, transverse abdominis, multifidus, internal & external obliques and rectus abdominis. Core is used to stabilize the thorax and the pelvic during dynamic movement. Core stability is defined as the ability to control the position and movement of the trunk over pelvis to allow correct production transfer and control of force and motion to the terminal segment in integrated coordinated athletic activities (1). Core Stability Exercise (CSE) with the Abdominal Drawing in Maneuver (ADIM) technique has been found to mainly activate the deep abdominal muscle with minimal (or) marginal activity of the superficial muscle (3).

Core muscle strength is important to avoid the risk of injuries in cricketers (1).Stability is attained through the co-activation of trunk muscle through Swiss ball as an exercise tool in many studies (4).Swiss ball exercise enhance the core stability for efficient conditioning and rehabilitation of the athletes (5).The Swiss ball is an extremely popular apparatus used for core stability training in populations as varied as spinal disorders to cricketers. The majority of the research work done on abdominal muscle exercise were comparing them with traditional mat exercises, and the benefits of Swiss ball exercise appear to have been applied to whole body exercise equally (1). The Swiss ball is used by trainers in fitness programs and by therapist for injury rehabilitation and prevention (6). This is due to an understanding of spinal stabilization and the role of that it plays in back pain (7). Swiss ball is a type of therapeutic tool, which is used to improve the muscle tone, balance, control, structure and coordination of the movement achieving a greater activation of musculature. Pilates is a physical fitness system and alleviate problems. It was developed in the early 20th century by Joseph Pilates. Pilates improves flexibility and strength, develops control and endurance in the entire body. It works on alignment, breathing, and developing a strong core, and improving coordination and balance. The core consisting of the muscle of the abdomen, low back and hip is often called the 'power-house' and plays a important role in maintaining the stability (7).

MATERIALS AND METHODS

This experimental study was conducted at the Faculty of Physiotherapy (A.C.S. Medical College and Hospital) for 30 subjects selected using convenient sampling method. This study was conducted for about 6 weeks. Pre and post-tests were done using sphygmomanometer. The inclusion criterion includes male college cricketers with core muscle weakness between the age group of 18 to 25. The study excluded subjects with neuromuscular condition, any spinal injury, injuries on lower limb, musculoskeletal injury.

Procedure

30 subjects with age group between 18 to 25 years were selected who fulfilled the inclusion criteria. The subjects were divided into two groups, group A and B each with 15 subjects. The methodology was explained to subjects and informed consent was obtained. The exercise protocol was explained and a demo was given to the subjects. Group A subjects will receive the Swiss ball exercise and group B will receive Pilates exercise. The duration of this exercise will be for 6 weeks, 30 minutes per day, 4 days per week. Pre-test was taken by using sphygmomanometer and goniometer. Pre-test and post-test were evaluated by statistical tools.

Group A: dolphin plank

Place your elbows on the top of a Swiss ball in prone position with legs extended. Keep back straight and hold this position for 5 to 10 seconds. Repeat it for 10 times.

Bridge

Lie on your back with your legs resting on a top of the ball Tighten your abdominal muscle. Raise your hip and buttocks off the floor into a bridge (A) hold for 3 deep breaths this works your core muscles and the muscles along your back side the gluteus muscle and hamstrings as they contract to keep you in place Return to the start position. Moreover, repeat for 10 times.

Plank

Ask the patient to lie on the swiss ball in prone position lean forward until you touch the floor with your hands with elbow extended and both the legs on the top of the ball. Move your hands forward away from the ball until the ball reach your upper thighs, tighten your abdominal muscles. Move your hands backward. Repeat for 10 times

Stability ball crunch

Lie on the back, with knee flexed feet on floor hip width apart, and hands behind ears. Slowly start with upper body upward raising shoulders off ball and tucking chin to chest. Maintain the position for 5-10 seconds. Repeat it for 10 times.

Group B: Pilates exercise

Hundreds

Lie face up, bring knee in towards chest lift head, neck and shoulders off mat, and stretch hands by sides with palm facing floor. Pump arms up and down while breathing in and out through the nose for five counts each. Hold the position and continue for 10 beats. Repeat for 10 times.

Single leg stretches

Lie in supine position on mat with knees drawn towards chest, shins parallel to floor in table-top position. At the same time extend left leg straight to a 45-degree angle and drawn right knee towards chest. Patient will maintain the upper body lift throughout the exercise. In addition, it will support the abdominals. Repeat for 10 times

Double leg stretches

Lie face up on mat. Raise the head, neck and shoulders and bring knees to chest arms hugging shins. Inhale and straighten leg to a 45-degree angle while at the same time extending arms along ears. Keep shoulders off the mat and maintain breathing. Maintain the position for 5 to 10 second. And repeat for 10 times.

Double straight leg stretches

Lie in supine position on mat with hands supporting back of neck and knees bend towards chest. Exhale bringing upper torso off mat and extending legs towards ceiling. Maintain the legs to a 45-degree angle for 3 counts then lift again for 1 count remain in the position to maintain this core strength torso position throughout the exercise. Repeat the exercise 10 times.

Table 1: Comparison of double leg lowering test (DLLT) values between group A and group B in pre- and post-test

#DLLT	#Group A		#Group B		t - Test	Df	Significance
	Mean	S.D.	Mean	S.D.			
Pre- Test	63.40	14.30	60.60	12.00	.581	28	.566*
Post- Test	46.80	18.78	30.60	8.31	3.05	28	.000***

#Group A: Swiss ball exercises, # Group B: Pilates exercises (*- P > 0.05) (***- P ≤ 0.001)

The above table reveals the mean, standard deviation (S.D.), t-test, degree of freedom(df) and p-value of the double leg lowering test between (group A) and (group B) in pre-test and post-test weeks. The above table reveals that there is no significant difference in pre-test values of the double leg lowering test between group A and group B (*P > 0.05). The above table explains that there is statistically highly significant difference in post-test values of the double leg lowering test between group A and group B (***- P ≤ 0.001).Both the groups show significant decrease in the post test mean values but (group B) which has the lower mean value is more effective than group A.

Table 2: Comparison of double leg lowering test (DLLT) values within group A and group B between pre and post-test values

#test	Pre-test		Post-test		t - Test	Significance
	Mean	S.D.	Mean	S.D.		
Group A	63.40	14.30	46.80	18.78	7.80	.000***
Group B	60.60	12.00	30.60	8.31	16.82	.000***

#Group A: Swiss ball exercises; # Group B: Pilates exercises. (***- P ≤ 0.001)

The above table reveals the mean, standard deviation (S.D.), t-value and p-value of the double leg lowering test values between pre-test and post-test within group A and group B.

Based on the double leg lowering test values, it shows that there is a statistically highly significant difference between the pre-test and post-test values within group A and group B (***- P ≤ 0.001).

RESULTS

On comparing the mean values of group A and group B on double leg lowering test ,according to table 1 it shows significant decrease in the post-test mean values but (group B - Pilates exercise) shows (30.60) which has the lower mean value is more effective than (group A: Swiss ball exercises; 46.80) at P ≤ 0.001. Hence, null hypothesis is rejected. On comparing pre-test and post-test within group A and group B on double leg lowering test according to table 2 shows highly significant difference in mean values at P ≤ 0.00. Hence, group B is more effective than group A.

DISCUSSION

The purpose of the study was to investigate the effects of Swiss ball exercise and Pilates exercise in core muscle strength in college cricketers for 6 weeks with 4 sessions per week. This study revealed the core muscle strengthening and core muscle stability.

In table 1, both the groups showed significant difference, but group B which has lower mean value is more effective than group A. This table shows that statistically significant difference in post-test values of the double leg lowering test between group A and B (p<0.001). In table 2, based on the double leg lowering test values, it shows that there is a statistically highly significant difference between the pre-test and post-test values with group A and group B (P<0.001). According to the data analysis a significant difference was found between the pre and post-test values of DLLT shows highly significant mean value at P<0.001.

Previous studies by Sai Sudha *et al.,* concluded that although the study showed beneficial result in both the groups, the results reflected that Swiss ball group better improvement of core muscle strength than the floor exercise group (1). The result of the present study shows that subjects in Pilates group show a significant improvement in core muscle strength.

Raghav *et al.,* showed that with the six weeks protocol there was significant difference between post treatment values of VAS score, ODI score, DAET score and DEET score taken on 42nd day (8). Bhem *et al.,* showed that exercises performed on unstable (Swiss ball) surface stressed the musculature and activated the proprioception activity and gain the stability (9). A study by Cosiolima *et al.,* showed the effects of physioball and conventional floor exercises on early phase adaptation in back and abdominals core stability and balance in women for 5 weeks and the physioball group was found to give significantly greater mean change in EMG flexion and extension

activity and greater balance score (10). Drake *et al.*, in a study on 8 subjects came with a result that the use of an exercise ball will always create a greater challenge for the musculoskeletal system which does not support the present study (11). In young, healthy population, there does not appear to be any training advantages to perform exercises on a ball versus mat. However, in a rehabilitation scenario, these exercises performed on a ball could reduce low back pain loading and hence reduced the potential for injury. Christopher *et al.*, showed that the effects of a Pilates exercise program on core strength in females found no difference between the groups (12). Gracia *et al.*, studied the effect of curl up exercise on stable and unstable surface. They found that performing curl ups on unstable surfaces changes both the level of muscle activity and the way that the muscle co activates stabilize the spine and the whole body (13)Srivastav *et al.*, compared the core muscle activity on Swiss ball and on mat exercise found that for the transverse abdominis, the activation on the unstable surface was greater as compared to the stable surface (5). As per Kloubec *et al.*, the Pilates method using functional exercise improve the muscular strength and endurance (14).

Dorado *et al.*, have shown that the volume of obliquus and transversus abdominis muscles especially rectus abdominis muscles have increased after Pilates exercise (15). Freeman *et al.*, showed that an 8 weeks' Pilates based core stability program improved balance and mobility in patients with MS who had EDSS score (16). Johnson *et al.*, have also shown that dynamic balance was improved in healthy adults after five weeks Pilates training (17). Amorim *et al.*, have shown that Pilates exercise provided in addition to dance training increased upper and lower extremity muscle strength of University dance student (18).

CONCLUSION

The present study concluded that the Pilates exercise is effective in strengthening the core muscle. On comparing the pre and post mean values of double leg lowering test of group B shows highly significant difference when compared to group A. Hence, this study suggests that Pilates exercise is more effective than Swiss ball exercise.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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