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Effects of core strength training in unprofessional cricketers

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Abstract
Background: Improving core Stability will provide a more secure foundation, which will allow for greater force production in the upper and lower extremities.
Objectives: To evaluate the effect of core strength training in unprofessional cricketers in age group of 18-30 years. This Population was taken from students of Dr. Ulhas Patil College of Physiotherapy who played unprofessional Cricket in the last 6 weeks for 2 hours on alternate days and did recreational activities like stretches, chess, table tennis, etc on the next day as they experienced Delayed Onset of Muscle Soreness the next day.
Methods: A sample size of 37 subjects of both genders were taken in this study for a duration of 6 weeks. The subjects included those who had been playing cricket since the last six months. Their core strength was measured before and after performing four different forms of exercises.
Result: It was observed that there was substantial variation in their core strength before and after the exercises. Paired T-Test revealed highly significant value; 'P <0.0001'. Hence a conclusion can be arrived at that core stability exercises are significantly effective in improving core strength in unprofessional cricketers.
Conclusion: We concluded from this study Core stability exercise plays an important role in improving the core muscles strength in unprofessional cricketers.

Keywords: (C.S.T: - Core Strength Training, Core stability exercises, Sorensen endurance test, Sit-Up-Test, Pelvic Bridging, Curls-Up, Spinal Extension, Side Push-ups (Both Sides)

Introduction

In sports performance, core strength is very important for improving body balance and postural control in movements such as squatting and non- contact sport. The core helps to maintain postural alignment and dynamic postural balance during functional activities, helping to avoid a variety of distortion patterns. CST (Core Strength Training) focuses on the strength and conditioning of the local and global core muscles that work together to stabilize the spine. Basically, CST involves training the deep muscles of the core (BergmarkA 1989). The core muscles, including the Transverse Abdominus, Rectus Abdominus, Multifidus, External & Internal Oblique, Diaphragm, and Pelvic floor muscles, are thought to contribute to spinal stability (Malatova R, Rokytova J, Stumbauer J 2013). Reports have shown that the transversus abdominis contracts initially to contribute to rigidity in the face of forward propulsion during upper extremity activities and standing tasks involving sudden perturbations. (Allison GT, Morris SL, Lay B; 2008). Other trunk muscles (i.e., the multifidus, diaphragm, and pelvic floor) are thought to perform functions similar to the transversus abdominis. These core muscles contract first to increase core stability during extremity exercise and are thought to help prevent sports injuries (Bergmark A 1989). Abdominal muscle strength exercises in experimental subjects have been reported to increase lumbar spine stability. (Allison GT, Morris SL, Lay B 2008). There was a classification made of the lumbosacral spine which was local and global muscles. Therefore, it was stated that the global muscles cause the movement of the spine, while the local muscles work in the segmental stabilization system (Bergmark A 1989).

The definition of trunk stability is the ability to control the position and movement of the trunk on the pelvis and leg to allow optimal production, transfer and control of force and movement in the terminal segment in the integrated activity of the kinetic chain. (Putnam CA; 1993).

The core muscles, like the muscles of the trunk and pelvis, are responsible for maintaining the stability of the spine and pelvis thus contributing to the generation and transfer of energy from large to small parts of the body during many sports activities**.** (Wilson JD, Christopher PD, Davis JM; 2005). The core of the body is generally considered to be the torso. (Karageanes S.J Ed; 2005). The spine is an important part of the kinematic chain, transferring force from the lower limbs to the upper limbs and also functions as a force generator capable of accelerating the arm (Young J.L, Herring S.A, Press J.M & Casazza B.A; 1996). Core stability is the basis for explosive movements and control (agility, balance and coordination), essential qualities in cricket. It is the ability of your trunk to support the efforts and forces of your arms and legs. This allows your muscles and joints to function in their safest, strongest and most efficient positions. Core stability allows you to hit the ball with the bat harder and smoother, to swing the ball better while bowling and enhance the agility in fielding by improving your ability to control arm and leg movements. Core stability is the watchword in cricket fitness as the "core" is the origin of movement and the foundation of confident and dynamic cricket. It allows central control of the body and allows you to generate power by maximizing the effectiveness of your muscular effects. The Benefits of developing Core Stability in terms of cricket are that you become more stable while batting, have better control while bowling, and become stronger in your ability to catch and throw the ball. **(**Mr Arijit Putatunda, Dr Subirdebnath, Prof. M.S Chundawat; 2018). Core strength training is practiced by professionals to enhance core stability and increase core muscle strength, enhance athletic performance, and prevent the risk of injury.

A variety of isometric load-bearing capacity tests, such as the Abdominal Fatigue Test, The Beiring-Sorensen Test, The Lateral Plank Bridge & The Squat, are used as tools to measure trunk stabilization without the use of sophisticated instruments. The McGill test proposed a clinical test of specific trunk flexors, extensors, and lateral flexors to identify specific lumbar stabilizers and ways to recruit and measure deficits in endurance. By combining these tests in a testing protocol, specific deficits can be assessed objectively and functionally since lumbopelvic hip stability involves the synchronization of all trunk muscles (Alexis O, Sharon O, Charles LL; 2005), (McGill SM, Childs A, Liebenson C; 1999).

Need of Study

The need of study of core stability training is to achieve significant strength, endurance, and recruitment patterns which will prevent injuries in unprofessional cricketers. Improving core Stability will provide a more secure foundation, which will allow for greater force production in the upper and lower extremities.

Aim

To find out the effect of core strength training in unprofessional cricketers in age group of 18-30 years.

Objectives

To evaluate the effect of core strength training in unprofessional cricketers in age group of 18-30 years by doing certain tests and exercises.

Hypothesis

1. Alternative hypothesis

There will be statistically significant effect of core strength in unprofessional cricketers in age group of 18-30 years.

2. Null hypothesis

There will not be statistically significant effect of core strength in unprofessional cricketers in age group of 18-30 years.

Material and Methodology

Materials

1. Pen
2. Paper
3. Mat
4. Stop watch

Methodology

1. **Study Design:** Pre-Post Cross sectional study
2. **Sample Size:**

$$\mathbf{N = Z_1^2 S^2 / D^2}$$

where,
M = guess of population means = 24.7
S = standard deviation = 2.77
Z_1 = Associated with confidence =1.96
1 alpha = Set level of confidence (value <1.0) = 0.95
D = absolute precision = $\pm$ 0.9
N = 37
Minimum sample size for the study will be 32.

1. **Study Population:** 18 years to 30 years.
2. **Study Duration:** 6 weeks.
3. **Sample Method:** convenient sampling.
4. **Study Setting:** Jalgaon.
5. **Criteria of Selection:** unprofessional cricketers**.**

Inclusion criteria

- Subjects with informed consent.
- Both male and female between age group 18 to 30 years.
- The subject included who have been playing cricket last six months.

Exclusion Criteria

- Any Musculoskeletal injuries.
- Cardiopulmonary or Neurological disorders which may not permit.
- The player to perform the running tests, any recent surgery, recent fractures, Posterior Intervertebral Disc Prolapse, were excluded from this study.

Outcome Measures

1. Sorensen Endurance Test

This Test was performed on subjects in the prone position and the upper body beyond the anterior iliac spine (ASIS) suspended over the edge of the couch with the pelvis, knees and hips fixed to the ASIS. The upper limbs are held along the chest, with the hands resting on the opposite shoulders.

Failure occurs when the upper body drops below the horizontal position.

2. Sit- Up- Test

Lie on your back with your knees bent at 90 degrees. Place your feet about 30 cm apart and your hands at the sides of your head. The Physiotherapist should hold your feet on the ground and shout "GO" when the timer starts. Sit up, touch your knees with your elbows and return to the floor. This is 1 rep. Do as many as you can in 1 minute**.**

Procedure

- The ethical clearance was taken from ethical committee prior for the commencement of the study.
- Subjects were taken according to the inclusion and exclusion criteria.
- Prior to starting the study, the procedure was explained and a written consent form was taken from the subjects.
- 37 subjects were taken.
- They were explained about the study and given information about how it would benefit them.
- Initially, the demographic data that was Name, Age, and Gender of the subject will be assessed.
- Then pre-test assessment was taken using 1) Sorensen test, 2) sit up test and grading was done.
- Post-test assessment was taken using 1) Sorensen test, 2) sit up test.
- A Pre and Post Interventional study were undertaken, participants were included by convenient sampling based on inclusion and exclusion criteria as mentioned earlier.
- A brief demographic data of all subjects was obtained
- The purpose and procedure of the study was explained to the subjects
- The subjects were assessed by basic Assessment format which includes 5 days in a week for 6 consecutive weeks initially 2 weeks only 5 repetitions after 2nd week 10 repetitions. After every completing every exercise in each session the resting time was 10 seconds. They were told to cool down for 2 minutes after all the 4 exercises.
- After giving core stability training there was an improvement of core strength in unprofessional cricketers
- Precautions taken during exercises were as follows:
  - Subjects was asking to wear appropriate clothing.
  - Exercises was avoided when the subject felt ill such as fever, etc.
  - Exercises was asked to stop immediately if the subject felt dizzy.

Intervention

1. Side Push up Intervention (Both Sides)

This exercise activates and strengthens the Transvers abdominis, and oblique Muscles.

Procedure: The Subject performing this intervention lies supine with the hands supporting the lumbar region. Do not flatten the back to the floor. One leg is bent with the Knee flexed to 90°. Do not flex the cervical Spine. Leave the elbows on the floor while elevating the head and shoulders a short distance off the floor.

2. Curl Up Intervention

This exercise activates & strengthens the Rectus Abdominis, External Oblique, Internal Oblique, and Transvers Abdominis Muscles.

Procedure: The Subject performing this intervention lies supine with the hands supporting the lumbar region. Do not flatten the back to the floor. One leg is bent with the knee flexed to 90°. Do not flex the cervical Spine. Leave the elbows on the floor while elevating the head and shoulders a short distance off the floor.

3. Pelvic Bridging Intervention: This exercise activates & strengthens the Internal Oblique, Rectus Abdominis Muscles.

Procedure: The Subject performing this intervention lies supine with the Hands in side of the body. Both legs are bent with the knee flexed to 90°. Trunk is elevating at the lower back region and hip as short distance off the floor.

4. Spinal (Lumbar) Extension Intervention: This exercise activates & strengthens the Transvers Abdominis Muscles.

Procedure: The Subject performing this intervention is lying in Prone position with the subject outside the bed up to the chest with the hands behind the head while the Physiotherapist holds his/her feet together Now tell the subject to come upwards up to the maximum available range.

Statistical Analysis

Table 1: Age wise distribution of subjects

Age Group	No of Subject	Males and Females
18-22 Years	22	12 Males+ 10 Females
22-30 Years	15	08 Males+ 17 Females

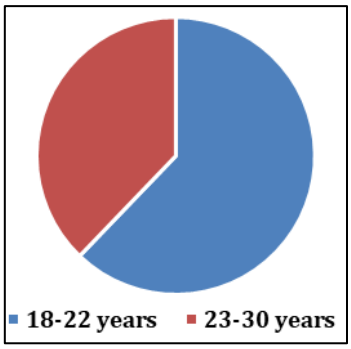

Fig 1: Sales

Table 2: Gender wise distribution of subjects

Gender	No of Subject
Males	20
Females	17

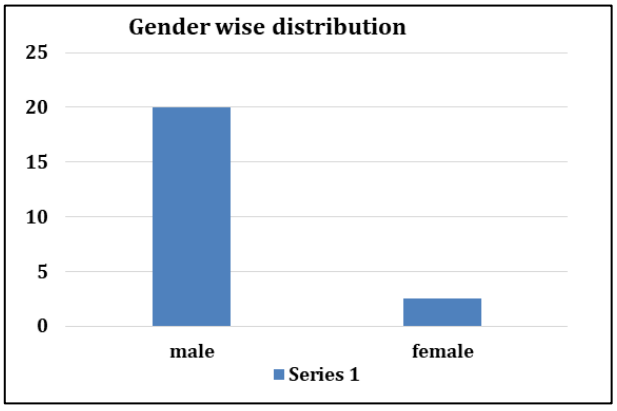

Fig 2: Gender wise distribution

In total 37 people, males are 20 and females are 17.

- The data pre & post assessment score of 37 subjects was entered in MS Excel before it was statistically analysed.
- Statistical analysis was performed using graphed instant (version 3.05) software using Paired T Test.
- Mean and Standard Deviation were calculated for all the needed variables.
- Level of significance was set at 95%.
- The p value was obtained < 0.0001 which is considered extremely significant.

Table 3

Sit-up-test	Mean ± Sd	P value	T value	Significance
Pre -assessment	23.889 ± 0.4450		23.954	Not significant
Post -assessment	32.917 ± 0.4653	< 0.0001	33.445	extremely significant

Results

- A Sample Size of 37 was taken between the age group of 18- 30 years of age from Jalgaon, University Population in India. 12 Males & 10 Females were between 18-22 years of age while between 22 -30 years of age data was 8 Males & 17 Females. These subjects played unprofessional cricket for 6 weeks that is 3 days a week and for 2 hours on those days. Two Tests as Outcome Measures were done as Preassessment Test and the same 2 tests were done as Post Assessment Test on all the subjects namely Sorensen Test and Sit -up Test. The Assessment format included 5 days a week for 6 consecutive weeks, initially 2 weeks only 5 repetitions after 2nd week 10 repetitions. They were told to cool down for 2 minutes after all 4 exercises. The 4 exercises/intervention included Side Push up Intervention (Both Sides), Curl- up Intervention, Pelvic Bridging Intervention and Spinal (Lumbar) Extension Intervention. An Inclusion & an Exclusion Criteria was selected and approved by the ethical committee. On the Alternate day they were told to do stretching and recreational activities like chess and Table tennis. Statistical analysis was performed using graphed instant (version 3.05) software using Paired T Test and 'P' Value was found to be extremely significant 'P <0.0001' core stability exercises are effective in improving core strength in unprofessional cricketers. Mean and Standard Deviation were calculated for all the needed variables. Level of significance was set at 95%.

Discussion

- The objective of this study protocol was to assess core muscle strength in non-professional cricketers. Core muscle training is a very important movement pattern specific training. CST improved dynamic balance and flexibility in all directions in the non-professional cricketers thus in non-contact sports.
- The result shows that there was statistical significance and a difference between pre-test and post-test. The difference is 40.00 (mean difference) before the test and 42.917 (mean difference) after the test.
- The result of this study shows that a 6-week core muscle training program can improve core muscle strength in non-professional cricketers non-contact sports. This can be attributed to an adaptation to the exercises used. While the core strengthening training included exercises such as Side Push up (both sides), Curl Up Pelvic Bridging and Spinal Extension Interventions.
- Core stability can improve hip and core muscle strength, which is important for increasing dynamic balance. Lack of adequate coordination in the core muscles can lead to reduced movement efficiency and injury. The core muscles of the body generate the necessary rotational torque around the body and produce limb movement.
- A study by (Stanton, R *et al*; 2004), found the effect of 6 weeks of Swiss ball training on core stability and running economy in an athletic population. After the basic stability training program, the subject improved their functional mobility. The thoracolumbar fascia, which is attached to the leg and arm, is thought to be actively activated. It is possible that synergistic activation occurs and maintains balance and increases the speed of the athlete by following the basic stability program for two weeks. In this exercise, a positive stimulus is induced to induce muscle hypertrophy, to improve the power of the leg muscles, thereby increasing the speed of the athlete. This coincides with my study.
- A study by (Seater Bakken AH *et al*; 2011) found that a 6-week core resistance program is effective in increasing shooting speed in female handball players. Greater core stability benefits athletic performance by providing a foundation for greater force production in the upper and lower extremities. This is also consistent with my study.
- Results of the 6-week CST exercise protocol showed significant improvements in lower back flexibility and lateral bending and dynamic balance in all directions.

Limitations

- Exact diagnostic changes were not available.
- Sample Size was only 37 from Jalgaon, University Population in India.
- No Control Group was taken.

Conclusion & Clinical Implication

Core stability exercise is effective in improving core muscles strength in unprofessional cricketers.

Core stability exercise is effective in improving strength, flexibility, balance, and improving physical fitness in unprofessional cricketers

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