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Effect of core strengthening on dynamic balance and agility in badminton players

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Abstract
Background: Badminton is the most popular sport in world. However, badminton players require repetitive movements, like jumping, squatting, changing in position. This repetitive movement can affect lower limb injury. Balance is a major factor to prevent injury.
Aim and Objectives: To find out the effect of core strengthening on dynamic balance and agility in badminton players.
Methodology: 30 badminton players between the age 10-19years (mean age14±) were selected and informed consent was taken. Subjects filled Questionnaire, and modified star excursion tests for dynamic balance and core strengthening program were done, data was collected and analysed & treated. Total 4 weeks 5 times in week of exercise protocol given. Modified star excursion scale used for dynamic balance pre and post of training period. Illinois t-test test used for assess the agility pre and post of training period.
Result: The result showed that there is significant effect of core strengthening on dynamic balance and agility. The result showed increased distance in all three directions on modified star excursion scale and increased agility on t test. The p values of anterior, posteromedial, lateral distance are 0.0655, >0.10, >0.10 that is significant. The p value of agility score is 0.02 that is significant.
Conclusion: There is effect of core strengthening on dynamic balance and agility in badminton players.

Keywords: Badminton, dynamic balance, agility, core strength

Introduction
Badminton is a racquet sport played using racquets to hit a shuttlecock across a net. There is high level skill required to play badminton at the elite level, though to be a successful player they also need good reflexes and be quick and agile around the court. The important factors for badminton players are muscle strength, muscular endurance, power, speed, agility, flexibility, balance and coordination. Functional movements are highly dependent on this part of the body, and lack of core muscular development can result in predisposition of injury [1].
Core muscles includes transverse abdominal muscle, abdominal external oblique muscle, multifidus muscles, abdominal internal oblique, psoas major muscle. A core muscle is used to stabilize the thorax and the pelvis during dynamic movement and it also provides internal pressure to expel substances. Static core functionally is the ability of one's core to align the skeleton to resist a force that does not change. The core strength training plays an important role in reducing and preventing lower and knee joint injuries [2].
Badminton players need to conduct various movement patterns during the game including specialized twists, jumps, footwork, and swings to strike the shuttlecock and keep it moving back and forth on the court. Thus, the game is characterized by a changing actions of short period and high or intensity coupled with a short resting times [3].
It appears that repeated activation of core musculature along with extremity movements helps to improve postural control. During performance of sports skills, a stable core provides a foundation upon which the muscles of the upper and lower extremities can accelerate body segments and transfer force between distal and proximal body segments [4].
The core muscle strengthening may help to improve dynamic balance and muscle coordination between lower and upper extremities, as well as reducing injury risk and muscle imbalance. Thus, the purpose of this study to find out the effect of core strengthening on dynamic balance and agility in badminton players.

Aim and Objective

Aim: To find out the effect of core strengthening on dynamic balance and agility in badminton players.

Objectives: To find out the effect of core strength on dynamic balance by using modified star excursion scale.
To find out the effect of core strength on agility by using Illinois t test for agility.

Material and Method

Study setting: ground and badminton court.

Study design: experimental study

Target population: badminton players.

Sample size: 30

Sampling method: convenient

Material: Star excursion balance test.
Illinois test for agility.

Procedure

Informed Consent form was taken.
All procedure explained to them.
All subjects were tested to assess agility dynamic balance test before and after four weeks of training period.
Samples completed their training five times in a week for four weeks.
Agility performance was evaluated by using the t test.
Dynamic balance was evaluated by using the modified star excursion test.
Data was documented and analyzed and subjected for statistical analyzed.

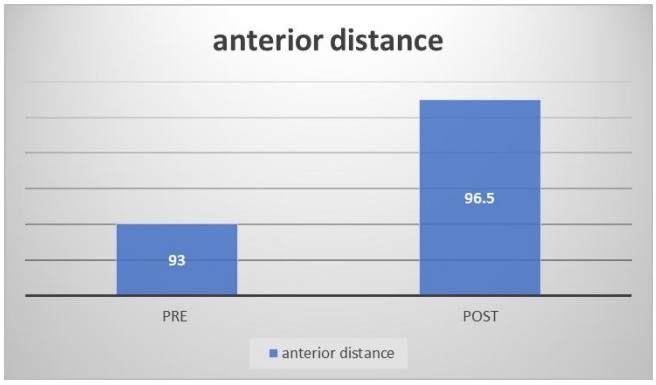
Results

Modified star excursion scale

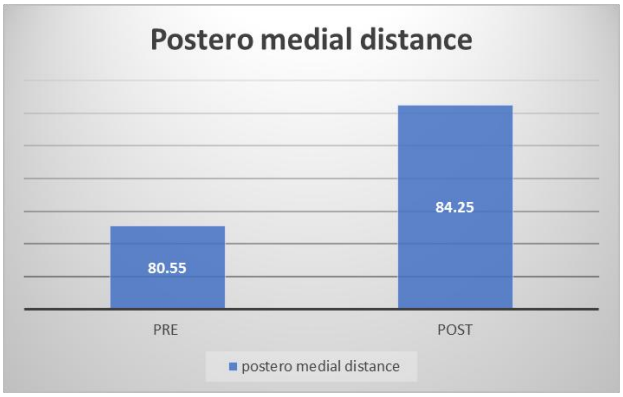
The mean value of anterior distance pre and post is 93 and 96.5 respectively.
The mean value of postero medial distance pre and post is 80.55 and 84.25 respectively.
The mean value of lateral distance pre and post is 70.1 and 74.16 respectively.

Agility test

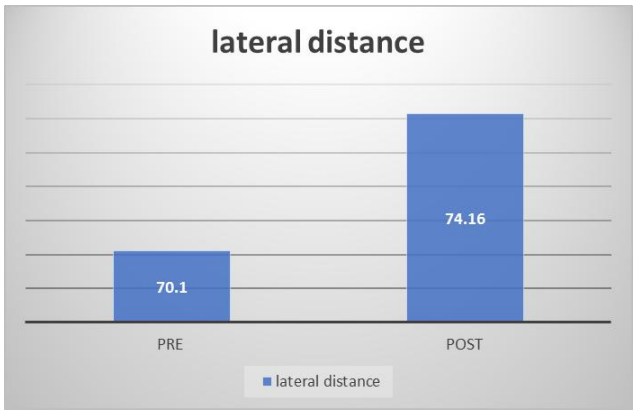
Mean value of agility test pre and post is 12.5 and 12.13 respectively.



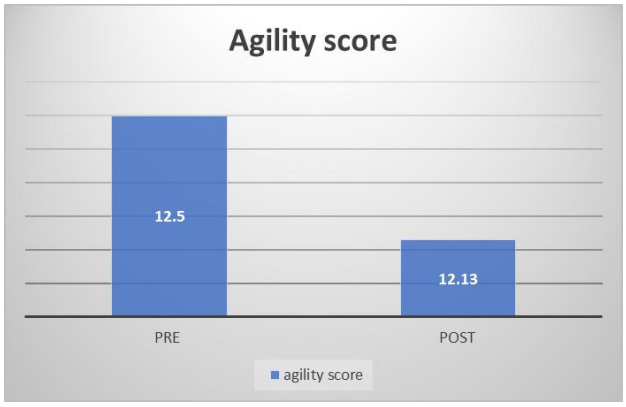
Interpretation: Graph no 1showed that there is increased anterior distance after the core strengthening.



Interpretation: Graph no 2 showed that there is increased posteromedial distance after the core strengthening.



Interpretation: Graph no 3 showed that there is increased lateral distance after the core strengthening.



Interpretation: Graph no 4 showed that there is slight increase in score of agility.

Discussion

The purpose of the current study was to examine the effect of core strengthening on dynamic balance and agility in badminton players. We hypothesized that balance would improve in badminton players after 6 weeks of core strengthening program. The result of this study showed that there is effect of core strengthening on dynamic balance and agility. The study was included 30 sample size. The value of anterior distance is 0.0655 that is significant. The p value of posteromedial distance is >0.10 that is significant. The p value of lateral distance >0.1 that is significant. The p value of agility score is 0.02 that is significant. The result indicated that all the three direction of modified star excursion score is increased direction. Modified star excursion scale (0.99 reliability) was used to access the dynamic balance. T-test of agility (0.98 reliability) was used to access the agility.

According to all the evaluation we tried to find out the effect of core strengthening on dynamic balance and agility.

Core muscles are located in the vertebral column and around abdominal cavity. Depending on the role and properties of the core muscles it can be divided into deep and shallow core muscles, the former covering the transverse abdominis and multifidus muscle, while the latter contains the rectus abdominis, abdominal oblique muscle, external oblique, and lumbar Para spinal muscles. Strengthening the core muscle could have resulted in a smaller displacement in the mediolateral centre of pressure and also, in the centre of mass. This means that, the motion at the level of the trunk and hip is properly controlled, resulting in the significant dynamic balance improvement that has been recorded in the previous study [5].

The core muscles after four weeks of strengthening will respond like any other skeletal muscle, to training, thereby improving the ability of the neuromuscular system to perform dynamic, eccentric, isometric stabilization contractions in response to gravity and momentum. Higher core stability performance might lead to improved synchronization of motor units and lowering of neural inhibitory reflexes [6]. It is well known that position of the spine significantly determines the position of the body's COG and compensatory muscle synergy/strategy to counteract the perturbations, to maintain the body's equilibrium state and to regulate body's postural control. Higher core stability performances allow optimal and long sustained contraction of the deeper spinal stabilizer muscles. These stabilizer muscles due to their close proximity with the spine are responsible for better control of the intersegment motion of the spine and thus a better control of the body's COG.

Study also indicated that core training not only improve the core muscle strength, but also improve the stability of the body movement during the LOS test which requires the well coordination of the upper and lower extremity limb, because a recent study also indicated that pilates traning can enhances the control of trunk movement, and improves the neuromuscular coordination of movements [7].

Dynamic balance refers to the capability of having suitable reactions regarding the motor system, in order to be able to cope up with the requirements needed for the quick alterations of position in the tarso, while performing activities that add stress on the knee joint. Operationally, the dynamic stability may be defined as the ability of the body to maintain position or intended trajectory after internal or external disturbances [8, 9].

A stable erect body posture, or any specific joint, is controlled by the neuromuscular system in relation to the shift in the involved parts at the time of action including the core. [10]. Pain may also affect dynamic balance in individuals with PFPS [11].

Deficiency in the control of the neuromuscular system of the body's trunk or core may affect the dynamic stability of the lower extremity, which can lead to the tibiofemoral or patellofemoral joints [6].

The current study used a variety of core strengthening methods using stable surface, using limb movement to challenge the postural control system, and performing some exercises in weight bearing position thereby contributing to improved balance scores. The exercises included prone bridging (20secs hold with 20 reps), supine bridging (20secs hold with 20 reps), sideline bridging (20secs hold with 20 reps), quadraped alternate arm leg raise (20reps.), crossover crunch (20 reps), supine bridge with alternate leg extension (20 reps).

The finding of this study showed significant improvement in the overall performance of modified star excursion scale. In next study we can concentrate on particular one direction after same program. We can specifically evaluate the anterior distance, postero medial and lateral distance. However, the result of this study showed there is effect of core strengthening on dynamic balance and agility in badminton players.

Conclusion

From the above study we can conclude that there is effect of core strengthening on dynamic balance and agility in badminton players.

Future Scope of Study

Regular monitoring of core strengthening session
Advance training or exercise can prescribe.

Limitation of Study

Less study duration.
Less sample size.

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