

Impact of core muscle training on explosive strength for school going state level participants

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Abstract

Purpose of the present study was to investigate the impact of core muscle training on explosive strength. Thirty male school going state level participants (age 15.93 ± 1.55 , height 1.58 ± 0.10 , body weight 47.35 ± 8.66) were divided into a control (n=15) and an experimental (n=15) group. Participants were assessed before and after the training program on standing broad jump for explosive strength. The experimental group performed core muscle training thrice a week for six weeks. Data analysis explored a significant effect of core muscle training on explosive strength in experimental group ($p < 0.01$).

Keywords: Core muscle training, explosive strength, standing broad jump

Introduction

The word “core” has been accustomed talk over with the lumbo pelvic-hip-complex

[1] that involves deeper muscles, like the internal oblique, transverses abdomens, transverse ospinal (multi fidus, rotetors, semi spinals), quardratus lumborum, and posas major and minor, and super facial muscles, like the muscle abdominis, external oblique, erector spine, latissimus dorsi, gluteus maximus gluteus medius, hamstrings, and rectus femories [2]. Core stability and balance are important for better performance in the majority sports and activities. This can be thanks to the 3 dimensional nature of the many sporting movements that demands that athletes should have sensible strength with in the hip and trunk muscles to supply effective core stability. Some sports need sensible balance, some force production, others body symmetry; however all of those successively need a stable core [3].

An individual’s core stability and core strength are very important when an individual’s center of gravity is stirred outside the bottom of support (e.g. during several sporting movements). The individual after has to build postural changes to stop a loss of balance and to reposition the centre of gravity back at intervals the bottom of support [4]. The acceleration or deceleration of body segments throughout sports performance is decided by the power of the core musculature to regulate the higher and lower extremities [5]. Thus the core will be considered because the kinetic link between the lower and higher extremities and is important in effective force transfer through the body [6, 7]. During any active movement, the core muscles act together. Some decrease to effectuate movement, while the rest contract and operate to supply stability, prolong to rein the movement, or convey signals to the brain relating the movements and locations of the muscles and bones. When particular core muscles are feeble or exhausted, the nervous system comes forward and enables other muscles. This alternation causes unusual strain on the joints, lessens power, and brings up the risk of injury [8].

Primary muscles involve in core muscle are the pelvic floor muscle, trasversus abdominis, multifidus, internal and external obliques, rectus abdominis, erector spine. The lumbar muscles, quadratus lumbo rum, deep rotators as well as cervical muscles, All of them are residing in Dhupguri, District of Jalpaiguri, West Bengal. They were randomly selected and divided into two groups, i.e., group-A (n=15) served as experimental group and group- B (n=15) served as control group. Mean age of the subjects were 15.93 ± 1.55 yr. Mean height were 1.58 ± 0.10 cm and mean body weight were 47.35 ± 8.66 kg. All participants were experienced in performing core exercises both static and dynamic and they were completely fit prior to the testing and did not report any feelings of pain while performing the tests. Pre- test data on explosive strength were collected at the end of the regular training session and continued by the training schedule of the present study and at the end of training schedule the post- test data were collected before the beginning of the next regular training session. During the research work they did not participate in any kind of other trainings. Core exercise programme of the training runs for six weeks. Experimental group was involved in the core exercise programme thrice a week, and the control group did not participate in any kind of training programmes. Test, re-test method were used for this present study.

Explosive strength: Explosive strength is the ability to exert maximal force in minimal time. Explosive strength was assessed by standing broad jump. Subject was asked to square on the takeoff board together with his feet parallel to each other. From this position the subject was asked to require a preliminary movement by flexing his knees and swinging his arms attainable. The measurement of the jump was made from border of the takeoff board to the closest imprint created by the subject in landing. 3 trials were permissible in succession and also the distance of all the jumps were

measured to the closest centimeter. The best performance out of 3 trials was taken in to account.

Detailed programme for core training

The treatment was administered on experimental group for the period of six weeks, thrice in a week which control group did not get any kind of training. Duration of Each session lasted for 30-50 minutes and the load was increased gradually after every two weeks.

An exercise programme for 6 weeks on following listed core muscle exercises had been planned comprising-jogging, jumping, throwing, stretching, resistance exercises etc.

Table 1: Core training plan for 6 weeks

Exercise	Week 1-2		Week 3-4		Week 5-6	
	Repetitions	Sets	Repetitions	Sets	Repetitions	Sets
Forward bridge	30 sec. hold	2	60 sec. hold	2	90 sec. hold	2
Side bridge	20 sec. hold for left and 20 sec. hold for right	2	40 sec. hold for left and 40 sec. hold for right	2	60 sec. hold for left and 60 sec. hold for right	2
Brid dog	3 sec. hold, 10 for left and 10 for right	3	3 sec. hold, 15 for left and 15 for right	3	3 sec hold, 20 for left and 20 for right	3
Leg raises	10 sec. hold	3	15 sec. hold	3	20 sec. hold	3
One leg squat	30 sec hold, 5 for left and 5 for right	3	30 sec hold, 10 for left and 10 for right	3	30 sec hold, 15 for left and 15 for right	3
Overhead squat	10 (5 kg) in number	3	15(5kg)	3	20 (5kg)	3
Sit-twist	10 (2 kg) in number	3	15 (2kg) in number	3	20 (2kg) in number	3

Details of Core muscle exercises Forward bridge

Hold a straight body position supported on elbows and toes. Contract the abdominal muscle and hold back in neutral position.

Side Bridge

Lie on one side, ensuring top hip is positioned above the bottom hip. Push up until there is a straight body line through feet, hips, and head.

Brid dog

Position hands below shoulders and knees below hips. Position back in neutral, extended one leg backwards and raise the opposite arm until level with back. Ensure back does not extend and shoulders and pelvis do not tilt sideways. Bring leg and arm back to start position and swap sides.

Leg raises

Lie on back with knees extended on floor. Place back in neutral position and lift both legs straight up keeping legs extended. Hold with hips flexed to 90°, then return slowly to start position.

One leg squats

Standing with back in neutral and hands on hips. Flex left knee to 90° so foot is off floor and balancing on right leg. Keeping head looking forward and hips straight, flex the right hip and knee. Squat as low as possible, hold and return to straight position, remain balanced on right leg and repeat.

Overhead squat

Using 5kg weight lifting bar, place hands shoulder width apart on bar. Raise the bar above head and straighten arms. Feet shoulder width apart, squat down as low as possible while maintaining balance, keeping bar, head and back vertical straighten legs and repeat.

Sit-twist

Sit up with knees bent and lean back at 45°. Feet off floor, keeping back in neutral, using a 2 kg medicine ball, twist waist and shoulders to one side with ball held out in front of the subject. Return to forward and repeat.

Statistical analysis

To compare and find out the effect of core training “t” test was applied. Descriptive statistics was also used for summarizing numerical data to make them more easily interpretable. The level of significance was fixed at 0.01 and 0.05 level of confidence.

Results

Average age of the experimental group was 15.67 ± 1.45 and height was 1.56 ± 0.11 , average weight for experimental group was 45.87 ± 9.02 (table 2). **Table 2:** Group-An Experimental Group

	Age	Height	Weight
Average	15.67	1.56	45.87
SD	1.45	0.11	9.02

Average age, height and weight of the control group were 16.20 ± 1.66 , 1.59 ± 0.10 and 48.33 ± 8.3 (table 3).

Table 3: Group-B Control Group

	Age	Height	Weight
Average	16.20	1.59	48.83
SD	1.66	0.10	8.31

Standing broad jump pre-test score for experimental group was 2.11 ± 0.29 (table 4), pre-test result for control group in standing broad jump was 2.14 ± 0.15 (table 5). Post test result of standing broad jump for experimental group was 2.20 ± 0.28 and for the control group it was 2.14 ± 0.14 . The result shows that significant in the level of 0.01 improvement happened in experimental group after giving a 6 week core muscle training. And post test result of control group noticed was not significant.

Table 4: Pre- test and post- test value of experimental group-A

Gr. A Boys	Pre	Post
Mean	2.11	2.20
SD	0.29	0.28
Observations	15	15
DF	14	
t Stat	3.91*	
t at 0.01	2.98	
t at 0.05	2.14	

*Sig. at 0.0

Table 5: Pre- test and post- test value of control group B

Gr. B. Boys	Pre	Post
Mean	2.14	2.14
SD	0.15	0.14
Observations	15	15
DF	14	
t Stat	0.81 NS	
t at 0.01	2.98	
t at 0.05	2.14	

NS = Not Significant

Discussion of the result

Main findings from these studies were significant improvement in explosive strength of school going state level participants. And the findings showed the quality of the core muscle training design.

In this study, the training program was design to improve muscular strength level focusing on explosive strength. We used a balanced training load and methodology.

It is our belief that the positive result found in the present study may be related, though in a subjective and empirical way, to the athletes adherence to the training program. Its unusual design and diversified structure may have contributed to improve performance and to the maintenance of high level of motivation. Furthermore, we believe that such a program greatly contributes to motor learning with positive repercussions on future motor behavior.

Supportively, it is worth reporting the absence of injury during this core muscle training program. This is also an advantage of the proposed program, confirming that core muscle training in school going participants helps to prevent

and reduce injury risk when properly designed and competently supervised [10,11]. Experimental group performer's demonstrate significant correlation between tests and re-test as compared to control group performers. These results provide the basis for future research, but do not provide answers to many of the unknown questions concerning the improvement in different age groups and player's development of explosive strength through core muscle training. Additional research should focus on specific sports and actual sports performance outcomes. The body of literature concerning athletic performance specifically explosive strength continues to evolve, but many essential questions remain unanswered.

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