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RESEARCH ARTICLE

Effects of Plyometric Training Versus Core Strengthening Training to Improve Speed and Power Performance in Athletes - A Comparative Study

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Abstract: Core stability and plyometric training has been common elements of training program athelets. Core stability allows stabilization of spine and trunk of the body in order to allow maximal translation of force to the extremities. Developing core strength and stability enables athelets to maximize their power output and perform complex athletic movements that require coordination, balance and technical skills. The core is particularly important in sports because it provides "Proximal Stability for Distal Mobility". The core muscle is a key factor that stabilizes the spine and trunk during exercise, while maximizing leg balance and athletic performances. Plyometric training is more dynamic and involves explosive strength training. Energy consumption .faster speed of muscle contraction or speed in general. Plyometric exercises are typically used by sprinters and power athelets to develop their fast muscle twitch muscle fibres and improve their speed and agility. Plyometrics is a type of exercise training that uses speed and force of different movements to build muscle power. Plyometric training can improve the physical performance and ability to do different activities. The subjects in the clinical study are atheletic players aged between 17 to 23 are underwent Core Strenghtening and Plyometric Training. The samples are collected according to the inclusion and exclusion criteria after which an informed consent has been obtained. This study consists of 30 samples which are divided into two groups each group consists of 15 samples. Leaping upwards into the air is called a vertical jump or vertical leap. It is a common test used to gauge athletic performance as well as an exercise for increasing strength and endurance. Vertical jumps are used to both train and test for power output in athletes. Plyometric are particularly effective in training for power output, and include different types of vertical jumps. Sprint or speed test can be performed over varying distances, depending on the factors being tested and the relevance to the athletes sports. The aim of all speed tests is to cover the set distance in the quickest possible time.

Keywords: Core Stability, Plyometric Training, Athletic Performance, Explosive Strength, Power Output

INTRODUCTION

Core stability and plyometric training has been common elements of training program athletes. Core stability allows stabilization of spine and trunk of the body in order to allow maximal translation of force to the extremities. Developing core strength and stability enables athletes to maximize their power output and perform complex athletic movements that require coordination, balance and technical skills. The core is particularly important in sports because it provides "Proximal Stability for Distal Mobility" .The core muscle is a key factor that stabilizes the spine and trunk during exercise, while maximizing leg balance and athletic performances. Plyometric training is more dynamic and involves explosive strength training. Increased power output in the muscles. Increased force in muscles contractions with less energy consumption faster speed of muscle contraction or speed in general. Plyometric exercises are typically used by sprinters and power athletes to develop their fast muscle twitch muscle fibers and improve their speed and agility. Plyometrics is a type of exercise training that uses speed and force of different movements to build muscle power. Plyometric training can improve the physical performance and ability to do different activities. Plyometric training is a classification of strength training primarily consisting of various form of jumping exercises. A large body of research demonstrated the effectiveness of plyometric training interventions in enhancing several components of athletic performance, including jumping, sprinting, and change of direction ability. Consequently plyometric training has become highly popular among strength and conditioning practitioners.[1]

Plyometric training has been shown to be beneficial in adolescent overhead athletes. However, existing research on the effects of plyometric on sports performance. The current evidence suggests that sports performance consisting of throwing capacity, jumping, ability, and sprint performance significantly improved due to plyometric training interventions in adolescent overhead athletes. Plyometric training is an effective training method to improve explosive strength and can significantly enhances the explosive of lower limb in adolescent athletes. Upper and Lower limb Plyometric training induces distinct neuro muscular adaptations in the upper and lower body musculature and is an efficient method for enhancing athletes physical fitness .Upper and Lower Limb body muscle power , linear sprint speed ,upper and lower body muscle strength, agility, and flexibility. There is growing body of research examining

the effects of plyometric jump training (PJT) on repeated sprint ability (RSA) in athletes.PJT improves RSA best and mean performances in athletes, improvements in RSA in response to PJT are likely due to neuro-mechanical factors (e.g., strength, muscle activation and coordination) that affect actual sprint performance rather than the ability to recover between sprinting efforts. Core stability and plyometric training have become common elements of training program in competitive athletes. Core stability allows stabilization of the spine and trunk of the body in order to allow maximal translation of force to the extremities.

Plyometric training is more dynamic and involves explosive –strength training. Integration of these exercises theoretically begins with core stabilization using more static exercises allowing safe and effective transition to plyometric exercises. Core stability and plyometric exercises are training methods that athlete's use to improve their performance .core stability and plyometric group showed significant increase in performance tests. Core and plyometric training may reduce injury and enhance muscle function in some athletes to compare the effects of plyometric or core training on injury, muscle damage , training variables in marathon. A weekly plyometric training session may be superior to core or no additional training in improving training variables of recreational marathon runners. O2max as a result of PLY in a group of highly trained distance runners, 9 weeks of PLY improved Running economy, with likely mechanisms residing in the muscle, or alternatively by improving running mechanics.Plyometric training improves running economy (RE) and ultimately distance. The present study was aimed to prove that the effects of strengthening exercise for lower limb muscles, Plyometric training helps to improve the speed, power and strength of the lower limb muscles. The Goal of the therapy is to improve the speed, power, and strength of the lower limb muscles for the athletic runners.

MATERIALS AND METHODS

- **Study design:** Comparative study
- **Sampling method:** convenient sampling
- **Sampling size:** 30 Participants
- **Study duration:** 6 WEEKS
- **Study setting:** Meenakshi College of Physiotherapy

Inclusion criteria:

- Competitive athletes
- Age group: 17-23 years
- Sex: Female

Exclusion criteria:

- Athletes who have sustained a recent injury or fracture.
- Ankle, knee, hip, and back pathology in the three months prior to the study.
- Any surgery for reconstructing a lower extremity.
- Participating in sports other than athletics.
- Back pain.

Group A: Plyometric training:

After obtaining informed consent, the samples are chosen based on inclusion and exclusion criteria. 30 samples were splited into two groups for this study. Every group has 15 samples.

Fifteen samples are drawn from this group in order to perform plyometric exercises; these comprise 5 SETS with 20 repetitions of the subsequent exercises:

1. Kettle weighted box jump
2. broad jump
3. skaters jump
4. scissor jump
5. Lateral box jump.

A training session should last approximately forty minutes, three times a week, for duration of six weeks.

WEEKS	EXERCISE	REPETITIONS	INTENSITY
WEEK 1	Kettle weighted box Jump Broad jump Skaters jump Scissor jump Lateral box jump	5 REPETITIONS	MILD

WEEK 2	Kettle weighted box jump. Broad jump Skater jump Scissor jump Lateral box jump	5 REPETITIONS	MILD
WEEK 3	Kettle weighted box jump Broad jump Skater jump Scissor jump Lateral box jump	5 REPETITIONS	HIGH INTENSITY
WEEK 4	Kettle weighted box jump Broad jump Skater jump Scissor jump Lateral box jump	5 REPETITIONS	HIGH INTENSITY

Group B: Core strengthening training:

After obtaining informed consent, the samples are chosen based on inclusion and exclusion criteria. 30 samples were splited into two groups for this study. Every group has 15 samples.

Fifteen samples are drawn from this group in order to perform plyometric exercises; these comprise 5 SETS with 20 repetitions of the subsequent exercises

1. Double leg kick
2. Single leg kick
3. Bicycle kick
4. Jackknife
5. Crisscross

WEEK	EXERCISE	REPETITIONS	INTENSITY
WEEK 1	1. Double leg kick 2. Single leg kick 3. Bicycle kick 4. Jackknife 5. Crisscross	5 repetitions	Mild Intensity
WEEK 2	1. Double leg kick 2. Single leg kick 3. Bicycle kick 4. Jackknife 5. Crisscross	5 repetitions	Mild Intensity
WEEK 3	1. Double leg kick 2. Single leg kick 3. Bicycle kick 4. Jackknife 5. Crisscross	5 repetitions	High Intensity
WEEK 4	1. Double leg kick 2. Single leg kick 3. Bicycle kick 4. Jackknife 5. Crisscross	5 repetitions	High Intensity

FIGURE 1. KETTLE WEIGHENED BOX JUMP

FIGURE 2. LATERAL BOX JUMP

FIGURE 2. LATERAL BOX JUMP

FIGURE 3. SCISSORS JUMP

FIGURE 3. SCISSORS JUMP

FIGURE 4. SKATERS JUMP

FIGURE 5. BROAD JUMP

FIGURE 6. DOUBLE LEG KICK

FIGURE 7. DOUBLE LEG KICK

FIGURE 8. SINGLE LEG KICK

FIGURE 9. SINGLE LEG KICK

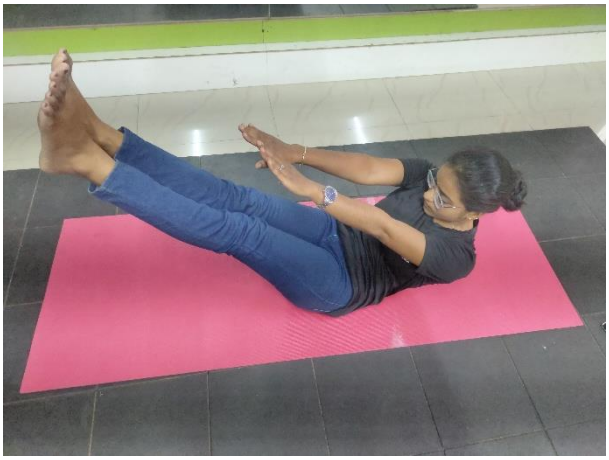
FIGURE 10. BICYCLE KICK

FIGURE 11. BICYCLE KICK

FIGURE 12. CRISS CROSS

FIGURE 13. CRISS CROSS

FIGURE 14. JACKKNIFE



Outcome measures:

Vertical jump test:

Leaping upwards into the air is called a vertical jump or vertical leap. It is a common test used to gauge athletic performance as well as an exercise for increasing strength and endurance. Vertical jumps are used to both train and test for power output in athletes. Plyometric are particularly effective in training for power output, and include different types of vertical jumps.

20m sprint test:

Depending on the variables being tested and their applicability to the athlete's sport, sprint or speed tests can be conducted over a range of distances. To travel the predetermined distance as quickly as possible is the goal of every speed test. Depending on the distance run, this test aims to determine acceleration, maximum running speed, and speed endurance.

RESULTS

Table1: Pre and post values of group A - vertical jump test and sprint test (plyometric training)

	Mean	**Mean**	**Standard deviation**	**Standard deviation**	***t*-value**	***P*-value**
	Pre-test	Post-test	Pre-test	Post-test		
Vertical jump test	35.67	52.87	4.5617	7.3956	6.15338	4.8640
Sprint test	5.39	4.32	0.3590	0.2965	2.18572	0.1282

From the above given table it has been arrived to the descriptive statistics, mean, standard Deviation, the post mean value of group A Vertical jump test = 52.87 and 20m sprint test = 4.32 it is Calculated with paired t test as in graph 1 and 2.

Figure 1. Pre and post score mean values of vertical jump test and 20m sprint test of group B

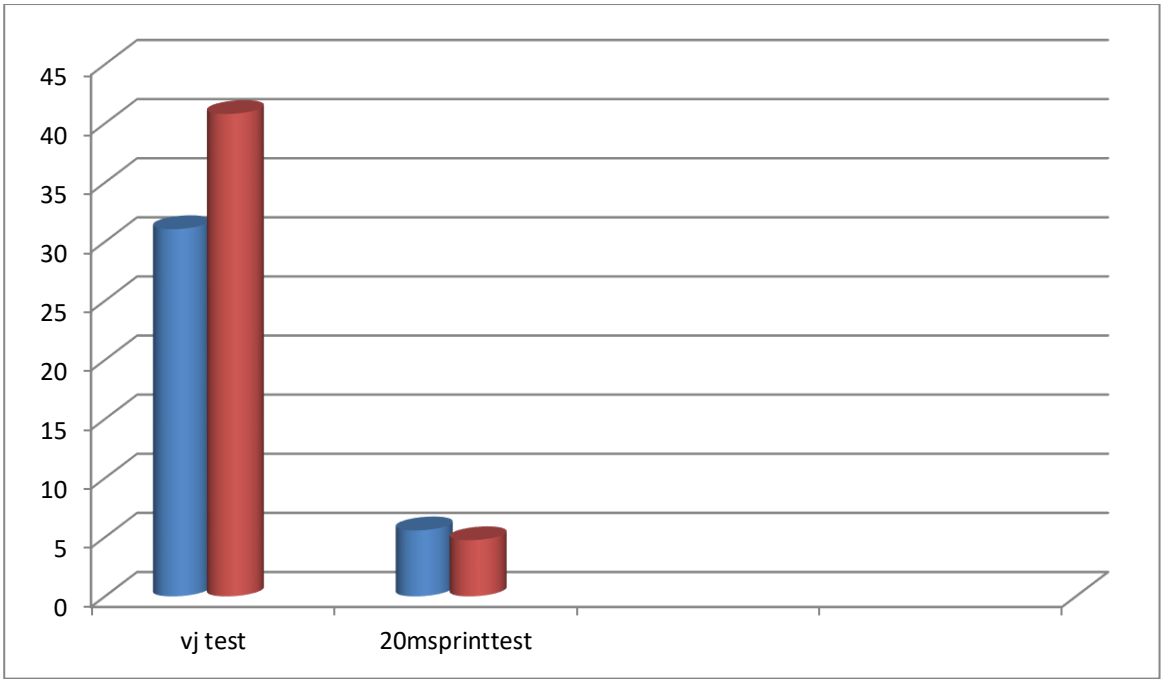


TABLE 2: Post score mean values of vertical jump test and 20m sprint test of group A and group B

	Vertical Jump Test		**20m Sprint Test**		***t* Value**		***P* Value**	
	Mean	Standard Deviation	Mean	Standard deviation	Vj test	20m sprint test	Vj test	20m sprint test
GROUP A	52.87	7.3956	4.32	0.2965	6.15338	2.18572	4.8640	0.1282
GROUP B	40.81	6.8124	4.75	0.4734	4.4571	1.8846	2.1137	0.1184

The present result shows that statistics analysis of paired t test done on the mean and standard Deviation, which is converted into the post test. The post means value of Group A (52.87) And Group B (40.81), it is calculated with paired t test. We also arrived highly significant Difference Group A, who received PLYOMETRIC TRAINING. Both the groups were statistically significant but the value of Group B who received CORE STRENHTHENING is less as Compared to Group A, for evaluating vertical jump test and 20m sprint test. This present study shows that significant improvement in Group A compare to Group B.

DISCUSSION

The study shows that primary conclusions were that both groups vertical jump test and 20m sprint test scores improved after applying two distinct programs for 6 WEEKS. Core strengthening however, did not result in any further improvements in any outcome metrics. The vertical jump test and 20m sprint test showed improvements in both groups in this study. However, after eight weeks of training, plyometric training has significantly outperformed core strengthening. The present study findings add to the body of literature by examining modifications in the vertical jump test and 20m Sprint Test and designing an 8-week training program. Prior research has elucidated the possible significance of core strength for sportspeople. For the purpose of athletic Performance, the core produces the proper amount of strength, transfers power between the upper and lower extremities, and protects against injuries. Several pieces of evidence have been reported in the literature to bolster the beneficial effects of plyometric training on neuromuscular kinematic properties and performance. The isometric maximum voluntary torque, rate of torque development, impulse overtime, and maximum voluntary contraction were all shown to be enhanced by plyometric practice. These results corroborated a thorough meta-analysis that found athletes can be thought of as Progressing in core strengthening in a similar way that is, by mastering simpler exercise before Moving on to more difficult ones. As a result, after eight weeks of training, the results showed that plyometric training was substantially higher than core strengthening training.

CONCLUSION

The study found that Athletic performance can be enhanced by both plyometric and Core strengthening training. When compared to Group B participants who underwent core strengthening training, those in Group A,

who underwent plyometric training demonstrated a noticeably greater improvement in Performance.

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