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Effect of plyometric exercises on leg power of college women

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Abstract

Plyometric exercise is one of the most time-efficient training methods available, and has arguably the greatest transfer to sport application. One of the most exciting training innovations over the past 25 years in sports is plyometric training. Plyometric exercise can be applied in complex training sessions to develop explosive power. The purpose of the study was to find the effect of plyometric training on leg power of college women. A total of 40 female students of Lakshmbai National College of Physical Education, Thiruvananthapuram were selected as subjects. On the basis of the initial test scores experimental and control groups were formed. The experimental group underwent training sessions which were prescribed on the basis of different intensity level

Keywords: plyometric, standing broad jump

Introduction

The human organism has been designed to be active. Anthropologists indicate that the need to be active is associated with fight or flight response. In search of food, primitive people sometimes had to fight with other predators or flee for safety. In either case, the response was often vigorous activity. Our ancestors were also required to do vigorous activity over a major part of their normal daily routine. Even-though exercise became less necessary as part of normal work of many adults, the need for regular exercise has not decreased. Physical fitness is the entire human organism's ability to sustain in nature and modern world. Development of physical fitness is not possible without regular exercise. People regularly use different kinds of sport activity as a form of exercise.

Sport is as old as human society and it has achieved a universal following in modern times. Due to improvement in the standard of sports, popularity and importance of sports has increased over the last few decades. The rising standard and physical fitness have become the first and foremost factors for excellence in sports.

Over the last few decades the standard of sports and games has seen its extremes. The cause of this tremendous improvement is the introduction of scientific approach. Owing to the innovation in different sports, specificity of training is considered to be a fundamental component of any detailed goal oriented conditioning programme. Whether one is training to improve functional ability, rehabilitate a musculoskeletal injury, or develop sport specific physiological attributes, the specific nature of the prescribed training regimen, and the exercises contained within, will dictate the magnitude of the adaptive response expressed at the myofibril level. When preparing to develop and enhance an athlete's capacity to execute movement skills and physical attributes positively correlated to successful athletic performance, the athlete must participate in a conditioning program that is specific to the demands of their particular athletic event.

All the time development is according to the rate of demand of each sport. Plyometrics is the term now applied to the exercise that has its roots in Europe, where they were first known simply as jumping training. The actual term plyometrics was first coined by Fred Wilt, one of America's most forward thinking Track and Field coaches. Based on its Latin origin plyometric is interpreted to mean measurable increase. Plyometric training has been advocated for athletes participating in sports that require explosiveness, high power outputs and increased vertical jumping ability. *"Plyometric exercises are defined as eccentric loading immediately*

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followed by concentric contraction”

Plyometric exercises have been used successfully by many athletes as a method of training to enhance power. In order to realise the potential benefits of plyometric training the stretch-shortening cycle (SSC) must be invoked. This requires careful attention to the technique used during the drill or exercise. The rate of stretch rather than the magnitude of stretch are of primary importance in plyometric training. In addition, the coupling time or ground contact time must be as short as possible. The challenge to a coach or athlete is to select or create an exercise that is specific to the event and involves the correct muscular action. As long as one remembers specificity and ensures there is a pre-stretch first, the only limit is one's imagination. Simple plyometric drills such as skipping, hopping and bounding should be introduced first. More demanding exercises such as flying start single-leg hops and depth jumps should be limited to thoroughly conditioned athletes.

Plyometric exercise and weight training can be combined in complex training sessions to develop explosive power. Higher than normal forces are put on the musculo-skeletal system during plyometric exercises. Hence, it is important that the athlete to has a sound base of general strength and endurance. Most experts state that a thorough grounding in weight training is essential before you start plyometrics. It has been suggested that an athlete be able to squat twice their body weight before attempting depth jumps. However, less intensive plyometric exercises can be incorporated into general circuit and weight training during the early stages of training to progressively condition an athlete.

Plyometrics consists of hopping, skipping, jumping and throwing activities designed to make you faster. During the plyometric component of the complex component, you must train at maximum speed; sub maximal effort will only produce sub maximal effect. This is the application of law of specificity; if you want to complete at higher speed you must train under higher speed.

These exercises have been credited with inducing neuromuscular adaptations in the stretch reflex, elasticity of muscle and Golgi tendon organs. The stretch reflex is initiated during the eccentric loading phase and can facilitate greater motor-unit recruitment during the ensuing concentric contraction. The series and parallel connective-tissue components of muscle also store elastic energy, which can generate additional force if a muscle recoils quickly in the form of concentric contraction. Lastly, Golgi tendon organs usually have a protective function against excessive tensile loads in the muscle. However, after plyometric training, Golgi tendon organ desensitization is thought to occur, allowing the elastic components of muscles to undergo greater stretch. When the stretch reflex and stored elastic energy are combined, a more powerful concentric force is created. Wilk *et al.* suggested that muscular performance gains after plyometric training are attributed to these neural adaptations rather than to morphologic changes. For this reason, plyometric training may enhance neuromuscular function and prevent knee injuries by increasing dynamic stability. Three

main components of a plyometric movement are the eccentric action, amortization phase and concentric action. The eccentric component is where the initial pre stretch or counter movement occurs. It is the process that stores potential energy for ensuing movement. The amortization phase, as the name implies, is the time in which high potential energy is converted to kinetic energy. The concentric movement is the final force created (propels a person or implement upward or forward.)

The golden rule of any conditioning program is specificity. This means that the movement you perform in training should match, as closely as possible, the movements encountered during competition. If you are a rugby player, practicing for the line out or a volleyball player interested in increasing vertical jump height, then drop jumping or box jumping may be the right exercise. However, if you are a javelin thrower aiming for a more explosive launch, then upper body plyometrics is far more appropriate.

Plyometric exercise can be done for upper body and lower body separately. Lower body Plyometrics emphasize quick foot movement and ability to get off the ground quickly. Upper body plyometric exercises emphasize using medicine ball to teach muscles to respond quickly to external forces.

Legs support the whole body by bearing the weight of the body. Besides, how to get great legs is a topic of concern for those who like to flaunt. A woman's body goes through various phases. During menstruation, most women experience achy legs. Leg pain is common in pregnant women. After childbirth, leg exercises play an important role in a woman's life, as these exercises help the body to regain the original muscle tone and strength. Plyometric exercises may increase performance and decrease injury risk in competitive female athletes. Hence, a study was under taken to study the effect of plyometric exercises.

Methodology

The participants thirty female students were selected randomly from Lakshmibai National College of Physical Education, Thiruvananthapuram as subjects for the study. Their age ranged from 17 to 26 years. The testes were administrated to collect the data on on selected variable is standing broad jump. Random group design was used. The subjects were randomly divided into two groups. One group was given experimental treatment and the second group acted as control group. In addition to its daily routine the experimental group trained with selected plyometric exercises. The control group carried out its daily routine work. Data was collected on leg power by administering Standing Broad jump. The test was administered at Lakshmibai National College of Physical Education, Kariavattom Thiruvananthapuram. Pre-test was conducted on 7th December 2016 and post test was conducted on 29th march 2017. The pre-test and post-test data collected on Standing Broad Jump of Experimental and Control group was analysed using Descriptive statistics such as Mean, Standard Deviation. Independent t-test was applied for comparing two groups on their test scores. The level of significance was fixed at 0.01.

Table 1: Exercises Selected For the Training

Type of exercise	Examples	Intensity
Standing based jumps performed on the spot	Tuck Jumps Split Jumps Squat Jumps	Low
Forward jumps from standing	Bounds and hops over 10 to 20 metres	Low to Medium
Multiple double leg hops from standing	Double footed jumps over hurdles Double footed jumps up the steps	Medium
Multiple single leg jumps from standing start	Single leg hops up stadium steps	High
Drop jumps	2 x 6 jumps for height or distance	High
Speed bounds	4 x 20 metres	High
Multiple jumps with run up	3 x 2 hop and jump into sand pit with a 5 stride approach	Very High

Findings

Performance of the subjects in the pre-test on standing broad

jump is presented in figure 1

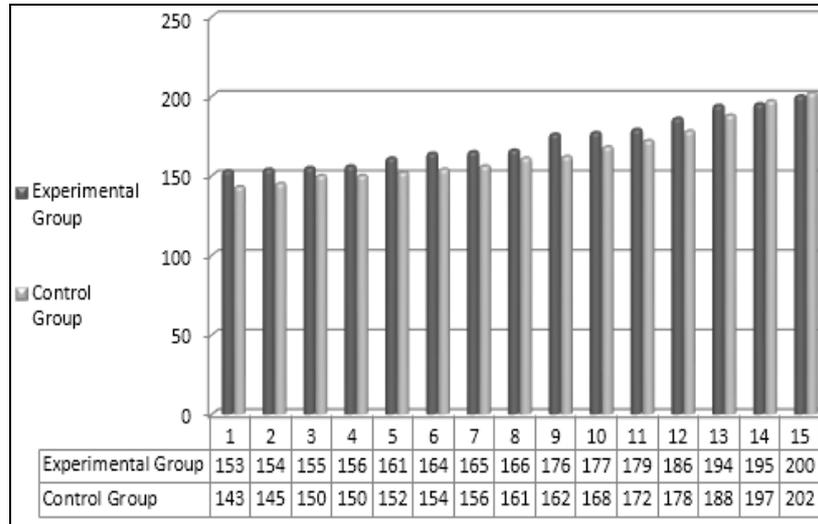


Fig 1: Performance of subjects in pretest on standing broad jump

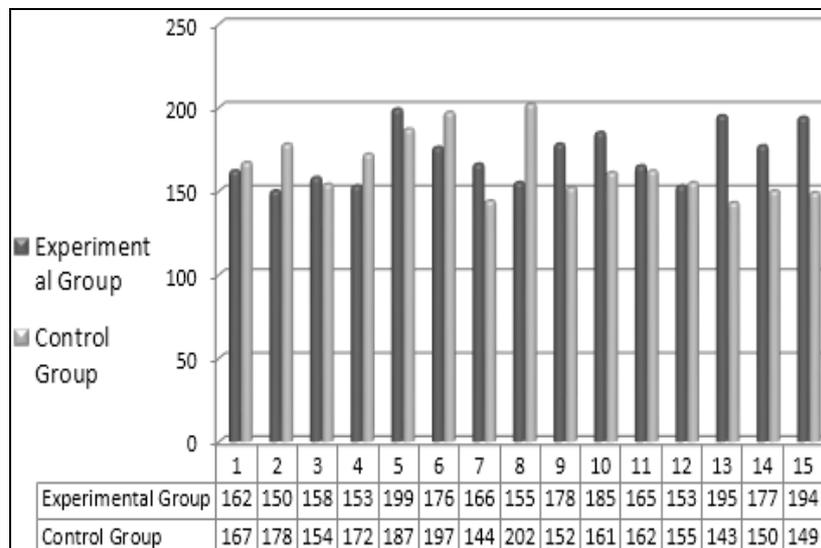


Fig 2: Performance of subjects in the post test on standing

Figure 1 and 2 show the status of standing broad jump of the thirty subjects. On the basis of overall performance of the two groups on both pre and posttests, the experimental group appears to be better than the control group. The improvement by the Experimental group is greater than that of the Control group.

Table 2: Significance of Difference between Experimental and Control Groups in Standing Broad Jump Pre-Test

Groups	Mean	N	Df	t-value
Experimental group	171.06	15	28	0.29
Control group	164.86	15		

Results present in the table 2 denote that the mean (171.06) showed by experimental group in standing broad jump pre-test is higher than the mean (164.86) show by the control group.

Table 3: Significance of Difference between Experimental and Control Groups On Improvement in Standing Broad Jump

Groups	Mean	N	MD	Df	t-value
Experimental group	172.06	15	1	28	1.09**
Control group	165.33	15	0.47		

Significance at 0.01 level **

Results presented in table 3 denote that the mean difference (1) showed by experimental group in standing broad jump is higher than the mean difference (0.47) shown by the control group.

The obtained t-value showed significant difference between the experimental and control groups.

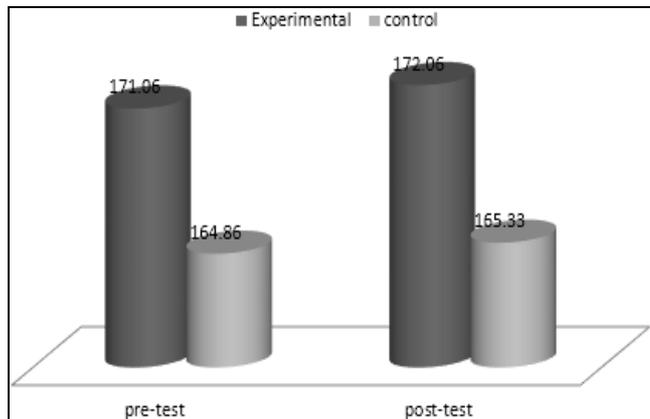


Fig 3: Comparison of mean scores on standing broad jump of experimental group and control group

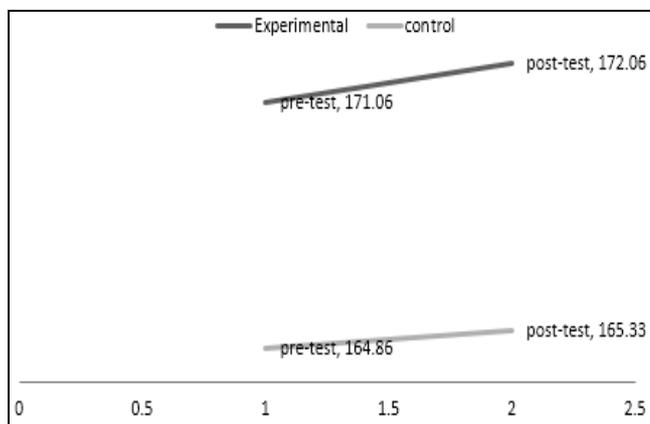


Fig 4: comparison of pretest and posttest means of experimental group on standing broad jump

Discussion of findings

Based on the analysis of statistical results of the experimental and control groups on Standing Broad Jump it is clear that plyometric training helped improve leg power of the experimental group. The statistical value of t-test substantiates that systematic plyometric exercises have a positive influence in increasing the leg power of women.

It is evident from table 3 that the exercising group showed significant improvement in Standing Broad Jump compared to the Control group. Plyometric techniques can be executed for the entire body and also simulate specific movements observed in competition. As long as the principles of progressive overload are maintained and appropriate recovery is allowed, lower body training is an applicable method of training for athletes for all sports. Legs support whole body by bearing the weight of the body. Women's body goes through various phases. During menstruation, most women experience achy legs. Leg pain is common in pregnant women. After childbirth, leg exercises play an important role in women's life. Plyometric exercises will increase performance and decrease injury risk in competitive female athletes.

Since the result of this study showed significant difference in the effect of plyometric exercises on college women, the

hypothesis that there will be significant difference between experimental and control groups is accepted.

Conclusions

The following conclusions were drawn on the basis of results obtained and within the limitations of the study.

Combination of jumps, bounds & skip exercises brings drastic improvement in standing broad jump performance of women.

Recommendations

- Similar study may be conducted to find the effect of various plyometric exercises on hand power of women.
- Similar studies can be conducted to find the effect of plyometric exercises on various sports events.
- Similar studies can be conducted to find the different between horizontal plyometric exercises and vertical plyometric exercises.
- Similar study may be conducted to find the effect of jump exercises, Bounds & Skips exercises and their various combinations on improvement of sports performance.

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