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**PLYOMETRIC TRAINING: SURVEY OF EFFECTS ON PHYSICAL
FITNESS LEVEL OF ATHLETES**

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**Alia , Dr. Noor Muhammad Marwat , Dr. Ejaz Asghar , Aqeel Ahmed , Imran Ullah ,
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Abstract

Purpose of this particular study was aimed to find out the effects of plyometric training on physical fitness of male and female athletes of Punjab, Pakistan. Non-probability convenient

sampling method was adopted for sampling. Researchers selected 50 male and 50 female athletes were selected for research study. Age of participants varied between 18 to 30 years. Injured players and coaches were excluded from the study. Researchers applied various exercises protocols of plyometric training with multiple sessions. Pre- and post-test data was collected. Results of the study rejected shows that null hypothesis was rejected and objectives were supported. Plyometric exercise improved athletes' performance and physical fitness level of Pakistani athletes.

Introduction

Plyometric training is a category of explosive body weight resistance exercises which focuses on exploiting the additional force output of the stretch reflex of a muscle to increase physical fitness like coordination, flexibility, endurance, speed and power. A period of rapid concentric contraction in the muscle after a rapid eccentric lengthening of the muscle fiber under load enhances the force generated by the muscle. The stretch-shortening cycle captures the energy of the stretched muscle in its elastic components and augments the next concentric contraction provided it is rapidly executed. This effect can enhance physiological qualities indicative of improved sports performance and fitness (speed, strength, and power) when harnessed and trained correctly (Vaczi M, Racz L, 2013). Correspondingly, the mode of exercises are wide and diverse ranging from double-leg, single-leg, in place, etc these exercises are not however limited to the lower extremities as upper body exercises (plyometric push-ups, chops, and medicine ball exercises) are commonly used for throwing sports (Meylan C, 2009). The length of plyometric training programs, training dose (intensity, duration, and frequency of individual sessions), types of exercise, and placement in a sessions planed program vary according to the sport, the training level of the athlete (Booth, Mark A. 2016). Previous many years, effects of plyometric training in athletes and its potential benefits and harms were among the most debated research topics in exercise science and physiology. During the 1970s and 80s, researchers and scientific societies postulated an increased risk of sustaining injuries when conducting plyometric training because of the immaturity of the skeletal system (Ryan JR, 1976). The current position statement on athletes' plyometric training of the Strength and Conditioning Association even concludes that children and adolescents may increase their risk for negative health outcomes during adulthood if they do not participate in physical activities that build up strength and improve motor performance skills (Lloyd RS, 2015).

Objective of the Study

1. To find out the effects of plyometric training on physical fitness of male and female athletes of Pakistan.

Hypothesis

H01- There is no significant effects of plyometric training on physical fitness of male and female athletes of Pakistan.

Methodology

For attainment of desired results and findings researchers selected 100 athletes of both genders from province of Punjab, Pakistan. Male and female athletes were equal in number and they were randomly selected for study. Age of participants varied between 18 to 30 years. Injured

players and coaches were excluded from the study. Researchers applied various exercises protocols of plyometric training with multiple sessions. The exercises included; jumping, running, push-ups, step-ups, squats, hops and ball throw activities for 20 to 30 minutes for fitness. After one week the duration and intensity level was increased and this was repeated for mentioned repetitions and sets of sessions. The session was conducted for four weeks and then the fitness was examined as per the given criteria. Pre- and post-test data was collected. The following exercises were used for intervention.

Plyometric Training Program				
Warm-up exercise before training (Running like Jogging, Dynamic Stretching) and cool down after training (Static Stretching) continue 5 mints.				
Body Part	Plyometric Exercise	Rapt×sets	Rest between sets	Training intensity
1 st week of training				
Lower Body	Cone hops, standing broad jump, trunk jumps	25 × 4	2-3 min	Low
UpperBody	Push-up, jumping spider, medicine ball chest passing	25 × 4	2-3 min	Low
2 nd week of training				
Lower Body	Zigzag drill, lateral leg hops, squat jump	30 × 4	2-3 min	Low
UpperBody	Rotational throws, push-up, wall toss ball touch, jumping jacks	30 × 4	2-4 min	Medium
3 rd week of training				
Lower Body	Side to side ankle hops, box jump, squat jump	25 × 5	2-4 mint	Medium
UpperBody	Step-up, overhead medicine ball throw	25 × 5	2-3 mint	Medium
4 th week of training				
Lower Body	Vertical jump, lateral cone hops, trunk movements with knees up, standing long jump with single leg	30 × 5	3-4 mint	High
UpperBody	Side throws(medicine ball), step-up, plank hops	30 × 5	3-4 mint	High

First of all, collected pre- test data and later on post-test data was recorded.

Fitness Test used for Assessment of Physical Fitness			
S.NO	Variables	Test Items	Components
1	Coordination	Wall Toss Test	Ability to perform movements with perfection and efficiency.
2	Strength and Power	Standing Broad Jump	Ability to overcome resistance and explosive power of leg and trunk

			extensor muscles
3	Flexibility	Sit and Reach Test	Ability of joints to move in maximum range without getting damaged.
4	Endurance	12- min Run Test	ability to resist fatigue with work long period of time, and Circulatory respiratory endurance,
5	Agility	Hexagon Test	Speed and change of direction
6	Speed	35 meters Sprint Test	Ability to cover a distance in a short period of time.

Statistical Analysis

Collected data was analyzed through descriptive statistics. Mean, standard deviation and p-values were calculated. Results obtained after analysis have been presented with help of tables. Level of probability was adjusted at .05 for statistical significance.

Results

Coordination Ability

Male					Female				
Wall Toss Test	N		Mean	St. D	N		Mean	St. D	p-value
	5	Pre	26.78	5.326	5	Pre	31.90	6.768	
	0	Post	27.10	5.425	0	Post	32.70	6.750	

Strength and Power

Male					Female				
Standing Broad Jump	N		Mean	St D	N		Mean	St.D	p-value
	5	Pre	189.8	4.783	5	Pre	251.68	10.56	
	0	Post	200.0	3.127	0	Post	258.70	12.97	

Flexibility

Male					Female				
Sit and Reach	N		Mean	St. D	N		Mean	St.D	p-value
	5	Pre	34.92	2.876	5	Pre	27.86	3.348	

Test	0	Post	36.70	3.498	0	Post	29.20	4.566	
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Endurance

Male					Female				
12 mint Run Test	N		Mean	St. D	N		Mean	St. D	p- value
	5	Pre	2204.7	415.38	5	Pre	2134.6	446.86	
	0	Post	2295.0	417.96	0	Post	2240.0	469.51	

Agility

Male					Female				
Hexago n Test	N		Mean	St. D	N		Mean	St. D	p- value
	5	Pre	24.48	5.556	5	Pre	34.90	6.798	
	0	Post	26.10	5.625	0	Post	35.70	6.950	

Speed

Male					Female				
35- meters Sprint Test	N		Mean	St.D	N		Mean	St. D	P-V
	5	Pre	5.589	0.653	5	Pre	3.789	0.764	
	0	Post	5.773	0.850	0	Post	4.970	0.361	

Discussion

Athletes felt confident and better after plyometric training. Effects of high intensity interval plyometric training on the development of physical fitness were observed on selected athletes. Exercise protocol of training used improved speed, muscular power, strength, physical fitness and physical performance abilities of participants. Plyometric training included different types of exercises like push-ups, throwing, running and jumping (Arefa Cassoobhoy, 2020). Resistance/plyometric training increased endurance (strength, speed) and some basic skills (Abdullah, S, 2018). Plyometric exercises may increase performance and decrease injury risk in competitive athletes. During most functional activities, the knee joint is subjected to high abduction and adduction moments, and, therefore, a theorized relationship exists between these moments and knee injuries. Plyometric training program had a significant decrease in the number of serious knee injuries (Hewett TE, 1996). Effect of 4-week plyometric training session on lower body muscle, before and after the 4 week period, EMG of the biceps muscles of femur while performing the Squat Movement (absolute strength) but the EMG for the biceps muscles femur was insignificant ($p > 0.05$) for the explosive power (Myer et al., 2006).

Conclusion

Null hypothesis was rejected and researcher's objectives were supported by the results of the study. After application of plyometric exercises protocol improvement in performance of athletes, physical fitness level, strength, power and agility was observed.

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