

EFFECT OF 6-WEEK PLYOMETRIC TRAINING ON VERTICAL JUMP PERFORMANCE OF MAYCHEW ATHLETES

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ABSTRACTS

Numerous studies have shown that plyometric training have positive effect in improving the power performance of an athlete. This study was designed to examine the effect of six week plyometric training on vertical jump performance of Maychew athletes. Height, weight, BMI and age were measured; in a pre and post test vertical jump test was conducted and also six week plyometric training protocol was given to the athletes. Twenty male (Mean \pm SD) age: 18.45 ± 1.73 yrs; height $1.69 \pm .079$ meter; weight 56.75 ± 6.04 Kg; Body Mass Index (BMI) 19.85 ± 1.65 and thirty female age: 17.33 ± 1.99 yrs; height $1.56 \pm .076$ meter; weight 45.17 ± 5.95 Kg; BMI 18.7 ± 1.59 . Paired sample t- test; $t(49) = 3.734$, $p < .001$ demonstrates that plyometric training significantly improve the vertical jump performance of an athlete.

Keywords: Athlete, Performance, Plyometric Training and Vertical jump.

INTRODUCTION

Success in many sport activity demands, heavily up on the athlete's leg power and muscular strength such as in jumping, track and field events and other activities (Shankarmani et al, 2012). Performance of a number of individuals and team sports that require jumping, kicking and sprinting rely heavily on explosive leg power. Consequently, during the past decades much effort from both coaches and researchers has been focused on determining the optimal training method for development of leg power and dynamic athletic performance (Markovich, 2007). Traditionally, training for power has been done by training for strength first and then training for speed and quickness. Particularly, plyometric exercise combines both strength and speed simultaneously which is well- suited to track and field (Amnes et al, 2009). The goal of any athletic training program is to improve the specific physical capabilities needed for that specific sport (Amnes et al, 2009). Plyometrics is also known as jump training, plyometrics is a form of conditioning aimed at created controlled impact and maximum power and is used primarily by athletes. This method involves stretching the muscles prior to contracting them and done correctly it strengthens muscles, increases vertical jump and decreases impact forces on the joints. They involve explosive movements with high level of intensity and effort.(Amnes et al, 2009). Plyometrics are training techniques used by players in all sports (Chad, 1998) to increase strength and explosiveness (Adhikari et al, 2011, page 1). The primary objective of training for track and field athletes as they must develop the abilities of power and strength to perform each event with the maximum degree of explosiveness (Amnes et al, 2009). The primary objective of plyometric training is to increase power (Amnes et al, 2009). Plyometrics emphasize the simultaneous application of maximum strength and speed (Amnes et al, 2009). Plyometric training is a method of choice when aiming to improve vertical jump ability and leg muscle power (Markovich, 2007). Plyometric training can contribute to improvements in vertical jump performance, acceleration, leg strength, muscle power, increased joint awareness and overall proprioception (Shaji and Suluja, 2009). Plyometric exercises that involve stretching an active muscular prior to its shortening have been shown to enhance performance during the concentric phase of muscular contraction (Gehri et al, 1998) Plyometrics are exercises that aim to develop explosive ability by conditioning the neuromuscular and elastic characteristics of the muscle (Amnes et al, 2009). Researchers have suggested that plyometric exercises were initially utilized to enhance sport performance and more recently being used in the rehabilitation of injured athletes to help in preparation for a return to sport participation(Chmielewski et al, 2006) as stated on (Shaji and Suluja, 2009). Other researchers have shown that plyometric training when used with a periodized strength training program can contribute to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awereness and overall pro-perception (Adam et al, 1992; potteiger et al, 1999; paasukeet et al,2001; miller, 2002) as issued on (Adhikari et al, 2011).

Hypothesis

Therefore, the researcher hypothesized that there is significant difference before and after 6-week plyometric training.

METHODOLOGY

Data collection

To analysis this thesis it took 7 weeks to study, at first word to word advertisement done in maychew athletics training center and maychew athletics project training center junior track trainee athletes and they have shown good response and 50 voluntaries (boys and girls) are responded. Beside this, the first week the procedure was explained individually in the local language (Tigrinia/Amaharic) by help of local staff. The voluntaries were requested to sign on concern form and given an assurance to be taken care if they were injured during the procedure. The voluntaries' were first analyzed as inclusion criteria was between 15-19 years, and he or she was ruled out of any kind of orthopedic/neurological related problems or any injuries within past 4 months, or any kind of congenital deformities, with a help of Physiotherapist and followed by physicians. Finally on end of 1st week of study we have collected 50 athletes (20 boys and 30 girls) and fixed a day for test, and approximately 50 volunteer were appointed per day and 6 consecutive weeks were taken for test at Maychew Stadium. With an instruction to wear half sleeve loose T-shirts and shorts. The subjects were selected using non-randomized convenient sampling technique.

Instructions

On 1st week of study, we again instructed the athletes about their dress wearing and asked them to do standardized warm-up exercises, for 5 minutes prior to the 15 min before test, and advised them, not to involve and vigorous activity or exercises for past 48 hrs and take normal diet and fluid. Beside this, three Maychew Athletics Training Center and one Maychew Athletics Project training center coaches instructed and demonstrate plyometric training to the athletes.

Testing procedures

Body weight

2012 digital manual body glass weighing scale; Capacity: 150kg; Graduation: 0.1kg; and N.W:1.9KG was used to measure participants' body mass. As the body weight fluctuates during different time of the day, all readings were taken in the evening (5:30-6:00). The subjects dressed light clothing and barefoot, got on to the each side of the scale with weight distributed evenly between the feet. The measurement was taken three times and the average was taken with the participants standing ahead. The body weight was measured to the nearest of 1Kg.

Height measure

Stadiometer apparatus is low cost and quick & accurate test for measuring height. As equipment, steel ruler and tape measure placed against a wall. Procedure, subject standing height was the measured to the maximum distance from the floor to the highest point on the head, when the subject was facing directly ahead. Shoes should be off, feet together, and arms by the sides. Heels, buttocks and upper back should also be in contact with the wall when the measurement was made. Reliability of stadiometer height measurement can vary throughout the day. So to ensure reliability height should be measured at the same time of day. Height measurement was taken in the morning (6:30-7:30).

Vertical jump test

Stand with one arm fully extended upward. Do this with the arm you would use to grab an object at the height of your leap. Press your outstretched arm and the corresponding side of your body against a wall. Mark the height of your reach with chalk. Step away from the wall. Stand only as far away from the wall as is necessary not to come into contact with it during your vertical leap. Put chalk or a safe colored substance on your fingertips that will not stain the wall. Jump as high as you can and touch the highest point of the wall possible. Record the difference between your reach marker and the marker from the height of your leap. Vertical jump test three times; the best of three vertical jump heights to nearest to half of centimeter was recorded.

TABLE NO. 1
PLYOMETRIC 6-WEEK TRAINING PROTOCOL

The plyometric 6-week training protocol was given to athletes two days per week (Piper & Erdmann, 1998) as stated on (Singh, Jeet & Singh, 2011).

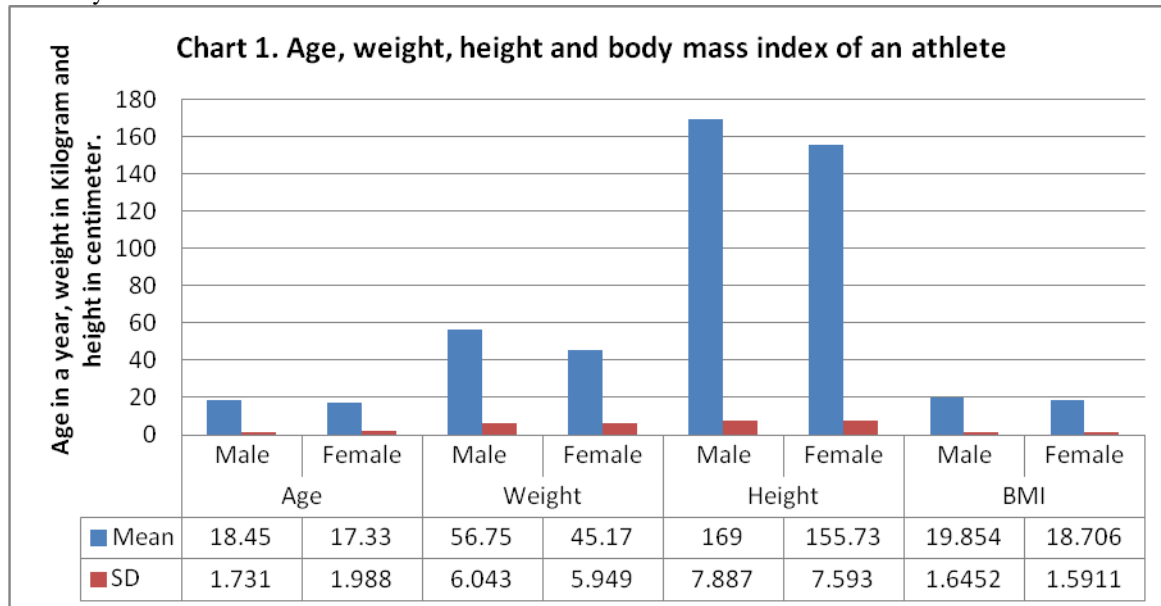
Training week	Training volume(foot contacts)	Plyometric drills	Sets×Reps	Training intensity
Week 1	80	Side to side ankle hops	2×12	Low
		Standing jump and reach	2×12	Low
		Front cone hops	5×4	Low
Week 2	100	Side to side ankle hops	2×10	Low
		Standing long jump	5×6	Low
		Lateral jump over barrier double	2×12	Medium
		Leg hops	5×4	Medium
Week 3	110	Side to side ankle hops	2×10	Low
		Standing jump and reach	4×6	Low
		Front cone hops	2×10	Medium
		Double cone hops	3×8	Medium
		Lateral cone hops	2×8	Medium
Week 4	100	Diagonal cone hops	4×8	Low
		Standing long jump with lateral Sprint	4×6	Medium
		Lateral cone hops	4×7	Medium
		Single leg bounding	4×7	High
		Lateral jump with single leg	4×4	High
Week 5	100	Diagonal cone hops	2×5	Low
		Standing long jump with lateral sprint	4×4	Medium
		Cone hops with 180 degree turn	4×5	Medium
		Single leg bounding	2×7	High
		Lateral jump single leg		High
Week 6	100	Diagonal cone hops	2×10	Low
		Hexagonal drills	2×10	Low
		Cone hops with change of direction sprint	34	Medium
		Lateral jump single leg	46	High

Data Analysis

The Statistical analysis was performed with the Statistical Package for Social Science (SPSS 20.0). Mean and standard deviations were calculated for each variable. Further, their bar chart has been drawn. Pearson Product Moment Coefficient of Correlation (r) was used to establish relationship between power performances and the independent variable. For all statistical tests; an alpha level of $p < 0.005$ level of significance was set. Paired Samples t-test was computed to see the effect of plyometric training.

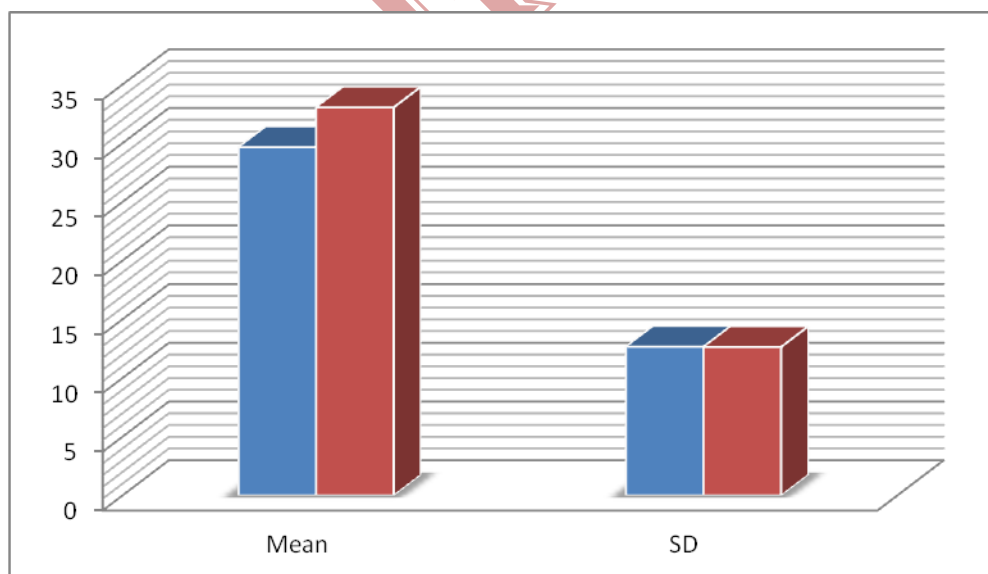
RESULTS

The number of both male and female students as well as their Mean and Standard deviation for age, height, weight and body mass index is shown in chart-1.



Twenty male (Mean \pm SD) age: 18.45 ± 1.73 yrs; height $1.69 \pm .079$ meter; weight 56.75 ± 6.04 Kg; Body Mass Index (BMI) 19.85 ± 1.65 and thirty female age: 17.33 ± 1.99 yrs; height $1.56 \pm .076$ meter; weight 45.17 ± 5.95 Kg; BMI 18.7 ± 1.59 . Moreover, boys were older, heavier, and taller than girls.

Similarly, Vertical jump performance result in pretest and post test mean and standard deviation was explained in chart 2.



Vertical jump performance height (Mean \pm SD) in pretest 29.66 \pm 12.67 centimeter and post test 33.05 12.64 centimeter. From the above analysis one can easily discern that athletes were jumped vertical jump height better in post test than pretest. This betterment was due to 6-week plyometric training provided to them.

TABLE -2
SUMMARY FOR IMPROVEMENTS IN VERTICAL JUMP PERFORMANCE OF 6- WEEK PLY METRIC TRAINING.

Variables	Paired Differences					't' ratio	df
	Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference			
				Lower	Upper		
Pre test	-3.39	6.42	.91	-5.22	-1.57	-3.73	49
Post test							

The above mentioned table depicts that the pretest and post test vertical jump power performance have positive and very high relationship. So, the results in the pretest vertical jump power performance means score was 29.66 (SD = 12.67), and post test vertical jump power performance mean was 33.05 (SD = 12.64). This difference was statistically significant $t(49) = 3.73$. This shows that there was significant difference before and after plyometric training.

DISCUSSION

This cross sectional study reported there was gender difference in age, height, and weight and body composition. Furthermore, boys were older, heavier, and taller than girls. Similarly, previous studies revealed also, there is gender difference in height and body weight and age (Temfemo et al, 2008). This difference manifests from 14years old (Johnson and Nelson, 1986). Present study demonstrates that plyometric training significantly improve vertical jump height in all four types of standard vertical jump (Markovich, 2007). This study shows there is significant difference on pretest and post test. Plyometric training significantly improve vertical jump power performance of an athlete. Strengthening our study, previous study shows, plyometric training is effective in improving vertical jump height (Shaji and Suluja, 2009). Plyometric exercises are an effective means of improving vertical jump performance in untrained females (Charles, 2011). Plyometric training provides a statistically significant and practically relevant improvement in vertical jump height (Markovich, 2007). Similarly, very recent studies demonstrate that application of plyometric exercises pointed to a significant progress in the improvement on the special physical abilities and skillful performance of basketball players (Kassem, 2010). Plyometric with weight training is effective in improving vertical jump performance (Shankarmani et al, 2012). Present study revealed that better improvement was observed in arm and leg strength of male basketball players than volleyball players due to application of plyometric exercises and also basketball more of explosive power than volleyball players (Adhikari et al, 2011).

CONCLUSION

The proposed Hypothesis stands true and this study can conclude that plyometric training significantly improve the power performance of an athlete.

REFERENCE

- Gehri, et al. (1998). A comparison of plyometric training techniques for improving vertical jump ability and energy production. *J. Strength and Cond. Res.* 12(2):85-89. 1998.1pp
- Kassem,H.(2010).The Effect of Plyometric Exercises Use on the Physical and Skillful Performance of Basketball Players. *World Journal of Sport Sciences* 3 (4): 316-324, 2010.1pp.
- Shaji , J. and Suluja,I. (2009). Comparative Analysis of Plyometric Training Program and Dynamic Stretching on Vertical Jump and Agility in Male Collegiate Basketball Player. *Al American Journal Medicine Science* (2009)2 (1):3 6 -4 6.2pp.
- Chmielewski et al, (2006). Plyometric exercise in the rehabilitation of athletes: Physiological responses and clinical application. *Journal of orthopedics sports physical therapy*; 36 (5), 308-319.1pp

Charles, C. (2011). Effect of plyometric training and squats on the vertical jump performance of untrained females. Unpublished thesis. The University of Memphis.1pp.

Shankarmani et al, (2012). Effectiveness of Plyometrics and Weight Training in Anaerobic Power and Muscle Strength in Female Athletes. International Journal of Pharmaceutical Science and Health Care Issue 2, Vol. 2 (April 2012) ISSN: 2249-5738 pp.

Adhikari et al, (2011). Effect of Plyometric Training on Arm and Leg Strength between Basket Ball and Volleyball Players. VSRD-TNTJ, Vol. 2 (9), 2011, 413-423 .1pp

Markovich, G.(2007), Does Plyometric Training Improve Vertical Jump Height? A Meta-Analytical Review. British Journal Sports Medicine 2007 June; 41(6): 349–355.1pp.

Martinez et al, (2010). Effects of Combined Electrostimulation and Plyometric Training on Vertical Jump and Speed Tests.1pp

Temfemo, A. Hugues, J. & Chardon. (2008). Relationship Between Vertical Jumping Performance and Anthropometric Characteristics During Growth in Boys and Girls. Euro Journal Pediatric (2009) 168: 457-464.

Johnson, B and Nelson, J.(1986). Practical Measurements for Evaluation in Physical Education. 4th ed. USA. Macmillan Publishing Company.

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