Educational Forum
Journal of Educational Studies
Faculty of Education
University of Maiduguri, Borno State
Nigeria

Vol 14 No. 2
June 2026

EFFECT OF 9-WEEK PLYOMETRIC TRAINING PROGRAMME NN VERTICAL JUMP OF MALE AMATUER BASKETBALL PLAYERS OF UNIVERSITY OF MAIDUGURI, BORNO STATE, NIGERIA

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Abstract

Introduction: Vertical jump of amateur adult basketball players is recorded using standing vertical jump within the range of 51 to 64 cm (20 to 25 inches) for men and 38 to 51 cm (15 to 20 inches) for women. Elite or collegiate-level players frequently exceed these averages, reaching 70 to 92 cm (28 to 36 inches. The exact measurement of a player's vertical jump is usually determined using the Standing Vertical Jump Test (SVJ), the Running Vertical Jump Test (RVJ or the Sergent Jump Test (SJT), this study employed the Sergent Jump Test.

Objective: *The study investigates the effect of 9-week plyometric training programme on vertical jump scores of male amateur basketball players of University of Maiduguri by exploring its optimization effects on heart rate recovery after exercise.*

Methods: *The pre-test post-test quasi experimental control group research design was used for this study. Simple random sampling technique was used to select thirty (30) participants (Male students of University of Maiduguri who play basketball). The fish bowl simple random sampling technique was used to randomly assign participants to experimental and control groups (n1=15, n2=15). The experimental group participated in 9-week plyometric training programme on physical efficacy index,(Modified Harvard Step Test) 3 times per week, (Mondays, Wednesdays and Fridays), while the control group were engaged in interactive sessions 3 times per week(Tuesdays, Thursdays and Saturdays) covering various topics on the history of basketball, the rules and regulation of basketball, officials of basketball both officiating and table officials and measurements of basketball courts. Data were analysed using descriptive statistics of mean and standard deviation to analyse the demographic characteristics of the participants while the inferential statistics of paired t-test was used to analyse hypothesis*

Results: *The findings of the study showed that, the weight and height of both the experimental and control group were similar at the base line (88.6 ±5.01 vs 86.5±5.06 kg and 1.94±4.32 and 1.82±4.50 meters) respectively. The results of the study showed the mean for vertical jump scores for the experimental group increased from 3.01±4.388m at pre-test to 3.11±4.658m at post-test, indicating a significant increase in average jump score of 10 cm following 9-week plyometric training. programme. The results showed significant increase ($P<0.05$) on vertical jump scores of the experimental group before and after 9-week plyometric training programme on vertical jump scores.*

Conclusion: *Plyometric training programme can significantly increase(improve) vertical jump of male amateur basketball players.*

Keywords*: 9-weekPlyometric Training programme: Vertical Jump (VJ); Amateur Basketball Players*

Introduction:

The main objective of every basketball player is to score points during a game. In an attempt to do so, the player might perform a jump shot, set shot, layup shot, or free throw. As the discipline has evolved and more athletic players have practiced this sport discipline, the defense has become increasingly efficient. As a result, coaches focus more on developing the cardiorespiratory endurance of their athletes in other to cope with the vigorous demands of the game of basketball.

Athletes need to load and explode in multiple directions, and in multiple times during basketball competitions. Being able to move quickly and explosively takes time and progression. Athletes need to be able to train on their landing and maintain good alignment as they work towards more difficult movements and exercises. A plyometric training programme is made up of several exercises that targets the upper and lower body. Each is described so that coaches, trainers and athletes can easily start doing this workout. It is important to warm up and condition the body as well as doing some light weight training and other strength training before embarking on plyometric training. That pre-conditioning saves as a base level of conditioning that will keep the athlete from getting injured .Some commonly used plyometric training exercises include: Side-to-Side Ankle Hops, Single Foot, Standing Jump-and-Reach, Standing Jump over an Obstacle, Squat Jumps, Hopping and jumping, Speed/Sprint Bounds, Hops, jumps, Leaps, Bounds, Deep Jumps, Split Lunges, Box Jumps, Explosive Push Ups, and Medicine Ball Throws, (Potach, 2004).

Plyometric Training Concepts for Sport Performance Enhancement. (Eccentric Phase):

The eccentric Phase of Plyometrics increases the activities of the muscle spindle by pre-stretching the muscle before activation. The amortization Phase of Plyometrics is the time laps between the end of the eccentric contraction (the loading or deceleration phase) and the initiation of the concentric contraction (the unloading or force production phase). The concentric Phase of Plyometrics occurs immediately after the amortization phase and involves a concentric contraction. In the amortization phase, when performing a vertical jump, the longer one takes at the end of the counter movement before performing the jump, the lower the eventual jump height due to the inability of the muscles to recover the stored elastic energy, (Chimera, Swanik & Swanik, 2004).

The improved muscular performance that occurs during the pre-stretch in the muscle is as a result of the combined effects of both the storage of elastic potential energy and the proprioceptive properties of the muscle. The percentage that each component contributes cannot be estimated at this time, but the degree of muscular performance, as stated earlier, is directly dependent upon the transitional time from the eccentric to the concentric contraction. Training that enhances neuromuscular efficiency decreases the time between the eccentric and concentric contraction, thereby, improving performance. This can be accomplished through integrated training paradigm which stated in order to move with precision, force most be generated eccentrically, stabilized (amortization phase) and accelerated (concentrically), (Chimera *et al,* 2004).

Booth, and Mark, (2016) investigated the Effects of Plyometric Training on Sports Performance, and reported that athletes that are involved in court sports (e.g. Basketball, Volleyball, Handball, and Tennis), experience high levels of transfer of plyometric training effects to sports specific performance. Basketball, volleyball, netball, handball, and tennis tend to require high levels of speed, agility, and jumping ability to perform tasks such as shooting in basketball and blocking in volleyball. Booth *et al* (2016) compared the effect of traditional plyometric training and loaded plyometric exercise using weight vests on 27 elite male basketball players, the results of the study

showed an improvement in both PT and loaded PT groups in counter-movement -jump (CMJ), standing jump (SJ), and five (5) repetition jumps performance with a significantly higher effect in the loaded group, (Booth *et al* ,2016).

Similarly, Galay, Poonia, Singh & Vidyabharati, (2021), reported that drop height played a pivotal role in the magnitude of gains with PT in 33 elite junior basketball players. The training protocol of drop jump (DJ) at a height of either 50 or 100 cm, three times per week for 6 weeks increased vertical jump (VJ) height of 4.8 cm and 5.6 cm, respectively, (Galay *et al*, 2021).

In a more comprehensive study of upper- and lower-body PT conducted by Santos and Janeira, (2008), on 24 junior recreational basketball players, the results of the study showed a significantly improvement in the intervention group on standing jump (SJ), counter movement jump (CMJ), deep jump (DJ), and medicine ball throw performances after 10 weeks. A detraining effect 6 weeks after training was found when the PT stimulus was removed despite the continuation of regular basketball training. Performance improved by +11.1% when compared with control +4% in 19 adolescent volleyball players with 6 weeks of aquatic PT and in 22 male handball players +2.78% CMJ, 2.68% DJ, with a combined PT and sprint training protocol over 12 weeks, (Santos *et al,*2008).

Furthermore, in another study conducted by Deng, *et al*, (2022), on 26 elite junior tennis players; they reported an increase in ball speed by 1–3% during a tennis serve when high volume upper-body PT was added to the traditional tennis warm-up before competition. The results also showed that tennis players also benefit from PT, (Deng *et al,* 2022).

Mechanism by which Plyometric Training Enhances Sports Performance

There are three mechanisms by which plyometric training can improve performance:

i. enhanced muscle spindle activity
ii. desensitization of the GTO, (**Golgi** tendon organ**)**
iii. and enhanced intramuscular and inter-muscular neuromuscular efficiency (George, 2015.)

Enhanced Muscle Spindle Activity:

The speed of muscular contraction is regulated by the neuromuscular system. The human movement system will only move within a set speed range regardless of how strong the muscle is. The faster the eccentric loading, the greater the concentric force production. For example, the quadriceps are loaded more rapidly when dropping from a 1-meter box compared to a 0.25-meter box.

Desensitization of Golgi Tendon Organ:

Desensitizing the GTO increases the stimulation threshold for muscular inhibition; this promotes an increase in the rate of force production with a greater load applied to the musculoskeletal system. When GTO is stimulated two important proprioceptors play a vital role in flexibility, the GTO and muscle spindle work together reflexively to regulate muscle stiffness. When GTO is stimulated, it causes its associated muscles to relax by interrupting its contraction. When a muscle is inhibited by a GTO, the process is called autogenic inhibition. The function of the GTO can be considered the opposite of the muscle spindle, which serves to produce muscle contraction, (Mollie & Martin, 2017).

Table 4.7: Summary of Paired t-test on Vertical Jump Score of Male Amateur Basketball Players of University of Maiduguri following 9-week Plyometric Training Programme.

Groups	D	SD	t	df	P-value	Decision
Experimental Group Pre-test						
0.53		± 2.70	1.00	14	0.000	Ho Rejected
Post-test						
Control Group						
Pre-test						
0.67		± 2.58	1.00	14	0.003	Ho Rejected
Post-test						

Key=D=Mean difference between pre-test and post-test on physical efficiency index expressed in meters (m).

The paired t-test summary shown on table 4.7, shows mean difference in vertical jump score of 0.53 between the pre-test and post-test values for the experimental group, with a standard deviation of ±2.07 and paired t-test value of 1.00 and p-value of 0.000. The results indicate a significant difference in the means of vertical jump score between the pre-test and the post-test values for the experimental group,it was concluded that ,9-week plyometric training programme had significant effect on vertical jump score of the participants in the experimental group, ($P<0.05$).

Summary of findings: The paired t-test summary shown on table 4.7, shows mean difference in vertical jump score of 0.53 between the pre-test and post-test values for the experimental group, with a standard deviation of ±2.07 and paired t-test value of 1.00 and p-value of 0.000. The results indicate a significant difference in the means of vertical jump score between the pre-test and the post-test values for the experimental group. Hence, null hypothesis 3 was rejected($P<0.05$), it was concluded that ,9-week plyometric training programme had significant effect on vertical jump score of the participants in the experimental group, ($P<0.05$). The paired t-test summary shown on table 4.7 shows mean difference in vertical jump score of 0.67 between the pre-test and post-test values for the control group with standard deviation of ±2.58 and paired t-test value of 1.00 and p-value of 0.003.

Conclusion: 9-week Plyometric training programme have significant effect on Vertical Jump of male amateur basketball players of University of Maiduguri.

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