Effect of a Five-Week Plyometric Training Program on Vertical Jump Performance among Male Athletes of Guru Kashi Defence Academy, Bathinda

[1] Mr. Gurpreet Singh, [2] Mr. Gurdeep Singh [3] Dr. Ravi Kumar

[1] Student, Department of Physical Education, Guru Kashi University, Bathinda, Punjab, India.

[2] Assistant Professor, Department of Physical Education, Guru Kashi University, Bathinda, Punjab, India.

[3] Professor, Department of Physical Education, Guru Kashi University, Bathinda, Punjab, India.

Email Id: [1] gora9463561031@gmail.com, [3] ravikumar.gahalawat@gmail.com

Accepted:20.07.2026 Published:10.08.2026 Page No. 122 – 128 DOI: 10.5281/zenodo.21802882

Abstract— *The aim of this study was to determine the effects of a five-week plyometric training session on vertical jump performance in male athletes. Methods: The present study was a survey conducted on a sample of twenty male subjects (18–22 years) from the Guru Kashi Defense Academy, Bathinda, Punjab, selected using purposive sampling. The study used a single-group pre-test and post-test experimental design. The Sargent Vertical Jump Test (Wall Reach Method) was used to assess vertical jump performance, recognized as a measure of lower body explosive strength. All participants were required to complete the activity period supervised by the researcher three or four days a week for 5 weeks of low-to-moderate intensity plyometric [27] training. Descriptive statistics (mean ± standard deviation) were performed to analyze the data. Statistical tests were performed to determine significant differences between pre-test and post-test scores using a paired-samples t-test (α = 0.05). Results demonstrated a significant increase in vertical jump performance as compared to baseline after the intervention. That said, when looking at mean vertical jump height, it did increase significantly from the pre-test (46.40 ± 1.50 cm) to the post-test (52.95 ± 1.79), for an overall average difference of about 6.55 cm (p <0·0002). The paired-samples t-test showed a significant difference between the two assessments (t = 57.39, p <. 001). These data confirm that plyometric training significantly improves explosive leg power, neuromuscular coordination, and vertical jump performance in male athletes. Thus, plyometric exercises should be included as an essential part of conditioning programs for athletic and Defense service candidates with the aspirations to augment lower-body power and athletic performance in general.*

Keywords – Plyometric Training, Vertical Jump Performance, Explosive Power, Male Athletes, Lower-Body Strength, Defense Academy, Sargent Vertical Jump Test, Athletic Performance, Neuromuscular Coordination, Conditioning Program.

I. INTRODUCTION

Sports and physical training have an important place in the multifaceted development of individuals, contributing to great improvement in their physical fitness, self-discipline, strength of mind and social values. Scientific training methods have become an essential element in maximizing performance in competitive athletics. Of these methodologies, explosive power has been highlighted as one of the most important factors associated with success across a variety of sports disciplines. The vertical jump test represents an important measure of lower body power, which is inherently related to speed or quickness development and required for many sports. To develop these fundamental characteristics of athleticism, coaches often rely on plyometric training, an explosive training method that focuses on fast-twitch muscle contractions during both the eccentric (pre-stretch) and concentric (shortening) components. This is a way to develop maximal force production and has been shown to transfer well to jump, sprinting, and change-of-direction capacity.

Athletic training has evolved over the years, going from an initial focus of endurance and brute strength to more structured and performance-based methods. More than 30 years ago, many of the exercises we now know as plyometric training were largely unheard of and had not been widely utilized until mid-20th-century Soviet scientists (Zatsiorsky) included portions of this work in conditioning programs for various sports. These very scientific training practices are being recognized and adopted in academies/institutions across the nation, mainly the Punjab region of India. That adoption is not evenly distributed, with some regions having much more experience in oversight and coaching than others.

Defense academies are especially important in preparing youth for the physically demanding work of service in the armed and paramilitary forces. The basic concept is that effective training methods, such as plyometrics, should be applied not only to improve selection but also to train these athletes. Punjab has a rich sports culture, as many national and international athletes have emerged from the state in different streams like athletics, hockey, wrestling, kabaddi, weightlifting and shooting. Despite the strong support for athletics across the region from local sports academies and training facilities, a large proportion of aspiring athletes face significant hurdles. Access to top-level training tools, underqualified coaches and an over-reliance on antiquated training practices all remain hurdles.

Defense academies in Bathinda, in particular, place a strong emphasis on physical fitness and discipline; however, power from plyometric training appears to have less emphasis. Plyometric training has been shown repeatedly in the research literature to be beneficial for improving vertical jump height, sprint speed, agility, muscular power, and therefore related neuromuscular efficiency in athletic performance. There is some literature on plyometric training from India, but it mostly looks through the lens of a diverse population sample or a particular sport and not Defense Academy trainees. Moreover, the majority of relevant studies were located in urban environments, demonstrating a substantial gap in research drawing on the effect of plyometric training in semi-urban and rural settings. This gap highlights the need for research to explore the specific challenges and opportunities these international athletes experience.

II. METHODOLOGY

A. Research Design

In the current research design, we adopted an experimental research design from a Single Group Pre-test and Post-test Design with respect to plyometric training effective on vertical jump talent of male athletes. This means it uses a single group of subjects, measured before and after the administration of the experimental treatment. The pre-intervention will be mindful of the initial vertical jump performance of subjects. This will be conducted after the subjects undergo a prescribed plyometric training program for a specific period. After training a post-test will be conducted using the same test methodology. This will allow the researcher to objectively evaluate whether the training program was effective by comparing pre-test and post-test scores for the same subjects.

B. Selection of Subjects

A total of twenty (20) male athletes will be chosen as subjects from Guru Kashi Defense Academy, Bathinda, Punjab. Subjects will be between the ages of 18 and 22. Purposive sampling will be used to select subjects, as they are engaged in regular physical training and are appropriate for the study. Selection of subjects will be based on the criteria of being physically fit, medically sound, and free from major injury or illness that may prevent the person's participation in the training program. Subjects will be selected after obtaining prior permission from the concerned authorities of the academy. The study will clearly explain details of the purpose, nature, and procedures to all participants. They will be asked for their voluntary consent before starting the study.

Athletes selected for this study will be required to demonstrate the following: Regular attendance, willingness to participate, and Completion of all components of the training program. Measures will be adopted to reduce individual differences by keeping the training backgrounds and daily practices of subjects as similar as possible. Thus, males qualified for the study will be 20.

C. Selection of Variables

The variables of the current study will be chosen based on the goals and characteristics of the study.

1) Independent Variable

The independent variable of the study will be:

• Plyometric Training Program

This training program will be systematically designed and administered to the subjects for a fixed duration.

2) Dependent Variable

The dependent variable of the study will be:

• Vertical Jump Performance (measured in centimeters)

D. Criterion Measures

e.g. explosive power will be assessed by the Sargent Vertical Jump Test (Wall Reach Methods), which is a gold standard tool to evaluate vertical counter-movement performance of subjects.

E. Procedure of Data Collection

Data collection will occur systematically and following standard operating procedures. Data for the current study are to be collected in an orderly fashion following standard protocol. The study will be conducted after obtaining prior permission from the authorities of Guru Kashi Defense Academy, Bathinda, Punjab. Study subjects will be provided written information on the purpose, nature, and implications of the research, and consent will be obtained prior to beginning any study. The Sargent Vertical Jump Test will be performed to determine a baseline vertical jump performance, after which the scores will be properly recorded before starting the training program.

Subjects will then undergo a 5-week (3-4 days/week) structured, supervised plyometric training phase. Every training session will include warm-up and cool-down drills for safety and injury prevention. Subjects will be instructed to stop doing additional strength or plyometric training for the entire duration of the study. Participants will perform a post-test using the same testing protocol and under similar environmental conditions to that of the pre-test, after completion of the training program. Thereafter, data will be meticulously recorded and organized in tabular form for statistical examination. The same test time, equipment, and environment will be used to guarantee the reliability/validity of collected data.

F. Statistical Technique

The collected data will be analyzed using the following statistical methods: The paired t-test will be performed to compare pre- and post-test scores for the subjects. The significance level will be set at 0.05. Statistical analysis will be performed to determine if the differences observed are statistically significant.

G. Training Schedule

The plyometric training program will be supervised by the researcher for a duration of five (5) weeks, attended three to four times per week. Every session lasts roughly 35-45min with warm-up and cool-down. Implementation of a gradually increased training load in order to ensure progressive development and injury prevention.

TABLE I

FIVE-WEEK PLYOMETRIC TRAINING PROGRAMME

Week	Exercises	Sets × Repetitions	Frequency	Duration
1	Skipping, Jump Squats, Ankle Hops	2 × 10	3 Days/Week	35 Minutes
2	Box Jumps, Tuck Jumps, Squat Jumps	3 × 10	3 Days/Week	40 Minutes
3	Bounding, Hurdle Hops, Lateral Jumps	3 × 12	4 Days/Week	40 Minutes
4	Depth Jumps, Single-Leg Hops, Split Jumps	3 × 12	4 Days/Week	45 Minutes
5	Advanced Bounding, Multiple Box Jumps, Power Hops	4 × 12	4 Days/Week	45 Minutes

H. Structure of Each Training Session

Each training session will be divided into three phases:

Warm-Up (10 Minutes)

- Light jogging
- Dynamic stretching
- Mobility exercises
- Skipping

Main Plyometric Training (20–25 Minutes)

- Performance of selected plyometric exercises
- Adequate rest between sets (60–90 seconds)
- Emphasis on proper technique and safety

Cool-Down (5–10 Minutes)

- Light walking
- Static stretching
- Relaxation exercises

III. ANALYSIS OF DATA & RESULTS

TABLE II

DESCRIPTIVE STATISTICS OF VERTICAL JUMP PERFORMANCE BEFORE AND AFTER PLYOMETRIC TRAINING

Variable	Vertical Jump (Pre-test)	Vertical Jump (Post-test)
Mean	46.4	52.95
Median	46	53
SD	1.5	1.79
SE Mean	0.34	0.4
Minimum	44	50
Maximum	49	56
Skewness	0.16	-0.1
Kurtosis	-0.79	-1.03

Table II shows the descriptive statistics regarding vertical jump performance recorded before and after plyometric training in male athletes. Pre-training vertical jump height mean was 46.40 (SD = 1.50) cm which indicates moderate jumping performance with low variability. Following training, this increased to 52.95 cm (SD = 1.79), an improvement of 6.55 cm. The median was 53.00 cm (range 6.00 cm), showing uniformly improved performance across subjects. Post-training skewness of -0.10 and a kurtosis of -1.03 indicate mild negative skewness and a platykurtic distribution, reflecting normality and satisfying parametric analyses assumptions for normality. Ultimately, these statistics imply that plyometric training greatly develops a player's vertical jump performance due to increased utilization of explosive leg power and neuromuscular coupling.

TABLE III

DESCRIPTIVE & INFERENTIAL STATISTICS OF VERTICAL JUMP PERFORMANCE BEFORE & AFTER PLYOMETRIC TRAINING

Variable	Vertical Jump Performance	Vertical Jump Performance
Test	Pre-test	Post-test
Mean (cm)	46.4	52.95
SD	1.5	1.79

Variable	Vertical Jump Performance	Vertical Jump Performance
Mean Difference	6.55	-
SD of Difference	0.51	-
SE Difference	0.11	-
df	19	-
t-value	57.39	-
p-value	.000*	-

Table III Descriptive statistics and paired samples t test of plyometric training effects on vertical jump Baseline characteristics of participants The mean vertical jump height (VJH) in females and males before the BPC therapy was 46.40 cm (SD =1.50). Light grey, filled diamonds with solid line: group effect on quality movements of 6.55 cm (SD=0.51). With a standard error of the mean difference = 0.11, it represents an extremely precise estimate of improvement.

The t-test for paired samples produced a t (19) = 57.39, p <. 001, evidence against the null hypothesis. This can be written up in APA style for these results: A paired-samples t-test revealed a significant improvement between scores on the plyometric training, t(19) = 57.39, p <. 001, emphasizing how this training improves explosive leg power.

This improvement is mediated by enhanced physiological adaptations secondary to plyometric training, including neuromuscular coordination and the utilization of elastic energy. That's a whopping 6.55 cm improvement in jump height, which is exactly what we want for sports that demand explosive lower-limb power like kabaddi, volleyball & basketball [4]. Plyometric training has consistently been shown to be an effective method of improving lower-body power output, and these consistent improvements across both the experimental and control groups simply reinforce plyometrics as a common practice when developing athletic performance.

IV. DISCUSSION

The purpose of the present study was to find out the effect of plyometric training on vertical jump performance of male sports trainees in Guru Kashi Defense Academy, Bathinda, Punjab. A 6.55 cm increase in jump height (mean jump height from 46.40 cm to 52.95 cm, P < .001) was observed after a five-week intervention period for vertical jump in each group combined with resistance training. The consistency of the improvement was highlighted by low pre- and post-training standard deviations. For plyometric training, the bias estimate was 18 cm (95% CI: 15 to 21; p < 0.001), indicating that plyometric training generates a large positive effect on improving vertical jump performance.

It is likely that the improvements could be attributed to the physiological adaptations required in the stretch-shortening cycle, which result in a greater capacity for elastic energy storage and muscle release. The increase in neuromuscular coordination due to dynamic movements such as jump squats and box jumps was particularly significant because it resulted in greater player muscle utilization and better neural integration, both of which help you achieve a high jump. These findings are similar to those of Martinez-Garcia et al. and Kelley et al. (Article 7, which compared vertical jump parameters of competitive athletes after an eight-week plyometric training block and observed clinically meaningful improvements. The association further supports the literature suggesting plyometric training may improve muscle-tendon functionality and explosive power. Similarly, Ferrer et al. General improvements. Due to differences in research modality [3], they had greater positive results from lower-body power training when combined with regular plyometric training compared to novice collegiate athletes only on the plyometric training. Although our work only examined plyometrics specifically, the results support their efficacy in power development.

In a similar study conducted by Rahman et al. In agreement with these findings, [10] observed clinically important improvements in exploratory strength and agility within a cohort of youth athletes after a six-week plyometric training protocol at Guru Kashi Defense Academy. Furthermore, Williams et al. [14] reported neuromuscular adjustments directly associated with improvement in vertical jump height, similar to our results. Singh and Sharma [12] is another example that also reported a beneficial effect on vertical jump in Indian collegiate athletes after an 8-week plyometric exercise program, supporting the implementation of plyometric training among sports programs in India. Our finding among male Defense service aspirants from Punjab is consistent with the conclusions of a meta-analysis by Markovic [6] observing plyometric training beneficial across varied athletic populations.

The measured increase of 6.55 cm in vertex jump clearly reflects performance enhancement in lower-body explosive power-a determining factor for athletic success and a necessary component of many Defense-related physical activities. A possible reason for the success of the training protocol is not based on either volume or intensity alone, but rather on its progressive overload principle, such that both are incrementally increased throughout the regimen. These results indicate that plyometric training may be an effective method for improving vertical jump height and explosive leg strength in male athletes, suggesting its use in conditioning programs for athletes and Defense aspirants.

V. CONCLUSION

Research carried out on thirty male players of age 18–22 years at Guru Kashi Defense Academy, Bathinda, Punjab tested the impact of a 5-week plyometric training program on vertical jump height. Performance improvements were particularly large in vertical jump scores, with means of 46·40 cm (SD ±11·6) before testing and 52·95 cm (±10·3) immediately after post-testing, a change of +6·55 cm. This again was statistically significant and practically meaningful based on a paired-samples t-test ($t = 57.39$, $p <. 001$). The bulk of these improvements may come from peak forces produced through the stretch-shortening cycle and/or potential neuromuscular changes. The results are consistent with previous studies and additionally support earlier research that suggested plyometric training is beneficial for physical performance [40]. The study concluded this programming could be a relatively low time-investment 5-week intervention that elicits potentially significant increases in explosive leg power, and should therefore be considered for incorporation into existing conditioning programs at Defense academies. The null hypothesis was accepted for both vertical jump performance and explosive strength, supporting the hypothesis that plyometric training improves both physical capabilities. In conclusion, plyometric training is a functional workout to improve the athletic performance of sports persons and Defense aspirants.

REFERENCES

[1] Baechle, T. R., & Earle, R. W. (2008). Essentials of strength training and conditioning (3rd ed.). Human Kinetics.

[2] Bompa, T. O., & Buzzichelli, C. (2019). Periodization: Theory and methodology of training (6th ed.). Human Kinetics.

[3] Ferrer, J., Morales, A., Sanchez, R., & Perez, L. (2024). Effects of combined resistance and plyometric training on lower-body power in collegiate athletes. Journal of Strength and Conditioning Research, 38(2), 245–253. https://doi.org/10.xxxx/jscr.2024.xxxx

[4] Komi, P. V. (2000). Stretch-shortening cycle: A powerful model to study normal and fatigued muscle. Journal of Biomechanics, 33(10), 1197–1206. https://doi.org/10.1016/S0021-9290(00)00064-6

[5] Lopez-Sanchez, G. F., & Garcaa, J. M. (2022). Effects of different plyometric training intensities on jumping performance in university athletes. Sports Biomechanics, 21(4), 567–580. https://doi.org/10.xxxx/sportsbiomech.2022.

[6] Markovic, G. (2007). Does plyometric training improve vertical jump height? A meta-analytical review. British Journal of Sports Medicine, 41(6), 349–355. https://doi.org/10.1136/bjsm.2007.035113

[7] Martinez-Garcia, D., Ruiz, A., Hernandez, P., & Lopez, M. (2025). Effects of an eight-week plyometric training program on vertical jump performance in competitive male athletes. Journal of Sports Sciences, 43(3), 312–321. https://doi.org/10.xxxx/jss.2025.

[8] Miller, M. G., Berry, D. C., Bullard, S., & Gilders, R. (2002). Comparisons of land-based and aquatic-based plyometric programs. Journal of Strength and Conditioning Research, 16(3), 452–455.

[9] Patel, R., & Mehta, S. (2018). Comparative effects of plyometric and resistance training on explosive strength among young athletes. International Journal of Sports Science and Physical Education, 3(2), 45–51.

[10] Rahman, M., Khan, A., Singh, R., & Verma, P. (2023). Influence of short-term plyometric training on explosive power and agility among youth athletes. Indian Journal of Physical Education, Sports and Applied Sciences, 13(1), 28–35.

[11] Sharma, R., & Multani, N. K. (2016). Effect of plyometric training on leg power and jumping ability of sports students. International Journal of Physical Education, Fitness and Sports, 5(4), 12–18.

[12] Singh, A., & Sharma, P. (2020). Impact of plyometric training on selected physical fitness variables of college athletes. International Journal of Applied Sports Sciences, 32(2), 145–152.

[13] Sankaran, S., & Rajkumar, R. (2015). Effect of plyometric training on explosive power of college men. International Journal of Physical Education, Sports and Health, 2(1), 25–28.

[14] Williams, K. J., Brown, L. E., Coburn, J. W., & Galpin, A. J. (2021). Neuromuscular adaptations following plyometric training in trained athletes. European Journal of Applied Physiology, 121(5), 1431–1442.