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Sprint and explosive performance changes following six weeks of plyometric training in collegiate track and field athlete

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ABSTRACT

Background: Plyometric training is widely used to improve explosive athletic performance, including sprint and jumping performance. However, evidence from collegiate track and field athletes remains limited, particularly for short-duration training programmes. **Objectives:** This study examined changes in 30-m sprint performance and vertical jump performance following a six-week plyometric training programme among collegiate track and field athletes. **Methods:** A one-group pretest–posttest design was used. Twenty collegiate track and field athletes from Universitas Bina Bangsa, Indonesia, participated in a six-week plyometric training programme consisting of three supervised sessions per week. Sprint performance was assessed using a 30-m sprint test, while vertical jump performance was used as an indicator of lower-limb explosive performance. **Results:** Mean 30-m sprint time decreased from 4.82 ± 0.31 s at pretest to 4.54 ± 0.28 s at posttest, representing a 0.28-s reduction (5.8%), with a statistically significant difference, $t(19) = -5.62$, $p < .001$, and a large within-participant effect size (Cohen's dz = 1.27). Mean vertical jump height increased from 45.30 ± 4.12 cm to 49.85 ± 4.37 cm, representing a 4.55 cm increase (10.0%), also statistically significant, $t(19) = 6.18$, $p < 0.001$, with a large effect size (Cohen's dz = 1.38). **Conclusion:** Six weeks of supervised plyometric training were associated with improvements in 30-m sprint and vertical jump performance among collegiate track and field athletes. However, because the study did not include a control group or random allocation, the observed improvements cannot be attributed exclusively to the plyometric intervention.

Keywords: Plyometric training; sprint performance; vertical jump; explosive performance; collegiate athletes

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INTRODUCTION

Sprint performance is widely recognised as a key determinant of success in track and field, particularly in short-distance events such as the 100-m and 200-m sprints, where acceleration ability, maximal sprint velocity, and lower-limb force production are essential determinants of competitive success (Liu et al., 2024; Xie et al., 2024; Asadi et al., 2016). Achieving optimal sprint performance requires the integration of multiple physiological and biomechanical components, including maximal muscular strength, lower-limb explosive power, stride characteristics, and neuromuscular coordination, all of which contribute to effective force production and sprint acceleration (Suchomel et al., 2016; Cormie et al., 2011). Among these, acceleration ability and lower-limb explosive strength play a dominant role, especially during the initial phase of sprinting when athletes must generate high horizontal ground reaction forces within very short ground-contact times (Morin et al., 2015; Rabita et al., 2015; Haugen et al., 2019). Athletes with greater lower-limb explosive strength tend to demonstrate superior sprint performance because they can generate higher force outputs in a shorter period, thereby enhancing acceleration and maximal sprint velocity (Cormie et al., 2011; Morin et al., 2015; Ramirez-Campillo et al., 2020). Consequently, improving both sprint speed and lower-body power has become a primary objective in modern training programmes and athletic development (Cormie et al., 2011; Kawama et al., 2024).

Plyometric training has been widely recognised as one of the most effective training methods for improving explosive athletic performance by enhancing neuromuscular function, stretch-shortening cycle efficiency, and force production capabilities (Ramirez-Campillo et al., 2020; Asadi et al., 2016; Xie et al., 2024). By utilising the stretch-shortening cycle (SSC), plyometric exercises enhance neuromuscular efficiency, increase the rate of force development, and improve lower-limb power production (Sylvester et al., 2024; Moeskops et al., 2024; Komi & Nicol, 2010). These physiological adaptations contribute directly to improved sprint acceleration, running speed, and vertical jump performance by increasing force production and enhancing stretch-shortening cycle efficiency (Markovic, 2007; Xie et al., 2024; Sylvester et al., 2024). Previous systematic reviews and meta-analyses have consistently demonstrated that plyometric training produces significant improvements in sprint speed, explosive power, agility, and overall athletic performance across various sporting populations (Ramirez-Campillo et al., 2020; Moran et al., 2021).

Furthermore, systematic reviews and meta-analyses have reported that plyometric training interventions of several weeks' duration consistently improve sprint performance and lower-limb explosive power across different athletic populations (Asadi et al., 2016; Xie et al., 2024). Compared with conventional training, combined plyometric and sprint-training interventions have been shown to elicit greater improvements in sprint performance owing to complementary neuromuscular and mechanical adaptations (Liu et al., 2024; Xie et al., 2024). These findings suggest that plyometric training not only enhances muscle power but also improves neuromuscular coordination and running mechanics that are essential for sprint performance (Loturco et al., 2022; Bishop et al., 2023).

Lower-limb explosive power is particularly important in sprinting, as athletes are required to apply large amounts of force to the ground within minimal ground-contact times to maximise acceleration and running velocity (Samozino et al., 2016; Clark & Weyand, 2014; Nagahara et al., 2018). Athletes with higher power output are generally able to achieve better stride efficiency, contributing to improved sprint performance (Turner et al., 2022). Research conducted on various athletic populations has demonstrated that plyometric training significantly enhances vertical jump performance and sprint speed, which are both key indicators of explosive power (Liu et al., 2024). In addition, recent studies suggest that integrating strength and plyometric training may further optimise neuromuscular adaptations and acceleration performance (Cherni et al., 2025; Luo et al., 2025).

Although systematic reviews and meta-analyses have established the beneficial effects of plyometric training on sprint and jumping performance, considerable heterogeneity remains in intervention duration, training volume, exercise selection, and participant characteristics (Sun et al., 2025; Weerasinghe et al., 2026). Evidence specifically describing short-duration, six-week plyometric programs among collegiate track and field athletes remains comparatively limited. Moreover, relatively few studies have examined sprint performance and vertical jump performance concurrently within the same standardised intervention in this population. Recent evidence in track and field athletes has demonstrated improvements in 30-m sprint and vertical jump performance following plyometric training; however, the available evidence encompasses varied intervention protocols and participant characteristics (Weerasinghe et al., 2026). Therefore, further investigation using a standardised six-week protocol in collegiate track and field athletes remains warranted.

In the Indonesian context, previous studies have reported positive effects of plyometric training on sprint-related performance and lower-limb explosive performance among athletes and student-athletes (Aprtianto et al., 2024; Ardiansyah et al., 2025). However, evidence specifically examining a standardised six-week plyometric intervention among collegiate track and field athletes while concurrently assessing 30-m sprint performance and vertical jump performance remains limited. Furthermore, the use of a standardised pretest–posttest framework provides a specific methodological context for examining changes in these two performance outcomes following a defined training period.

Therefore, the present study examined changes in 30-m sprint performance and vertical jump performance following a standardised six-week plyometric training programme among collegiate track and field athletes in Indonesia. The study focused on two complementary indicators of lower-limb performance: 30-m sprint time as an indicator of sprint performance and vertical jump height as an indicator of lower-limb explosive performance. Based on previous evidence regarding plyometric training and rapid force production, it was hypothesised that participants would demonstrate significant improvements in both 30-m sprint performance and vertical jump performance following the six-week intervention.

METHODS

Research Design

This study employed a one-group pretest-posttest quasi-experimental design to examine changes in sprint and vertical jump performance following a six-week standardised plyometric training programme. Participants completed baseline assessments before the intervention (pretest) and underwent the same assessments immediately after completion of the six-week training programme (posttest). The study design was selected to examine within-participant changes following a defined training intervention. Because the study did not include a non-training control group or random allocation, the findings are interpreted as pre-post changes associated with participation in the training programme rather than definitive causal effects.

Participants

The participants were 20 collegiate track and field athletes from Universitas Bina Bangsa, Banten, Indonesia. Participants were recruited using purposive sampling based on predetermined eligibility criteria. All participants were active athletes who regularly participated in track and field training and were familiar with basic physical conditioning activities. Participants were eligible for inclusion if they were active collegiate track and field athletes, were able to perform the prescribed plyometric exercises, and were willing to participate in the complete six-week intervention. Participants were excluded if they had a musculoskeletal injury that could interfere with sprinting, jumping, or plyometric training, were unable to complete the pretest or posttest, or failed to participate adequately in the scheduled training sessions. Participants were also instructed not to undertake additional structured plyometric training outside the study programme during the intervention period. Attendance was monitored throughout the intervention, and training sessions were supervised to ensure adherence to the prescribed programme. Before participation, all athletes were informed about the objectives, procedures, potential risks, and benefits of the study and provided informed consent.

Ethical Considerations

The study was conducted in accordance with applicable ethical principles for research involving human participants. Before data collection, participants received information regarding the study procedures, potential risks, and expected benefits. Participation was voluntary, and informed consent was obtained from all participants before their involvement in the study. The study received ethical approval under Ethics Approval No. 127/SIP/UNIBA/I/2026. Participant information and research data were handled confidentially and were used solely for research purposes.

Procedure

Before the intervention, participants underwent a familiarisation process to ensure that they understood the testing procedures and the correct execution of the plyometric exercises. The familiarisation process emphasised appropriate movement technique, particularly during take-off and landing, to minimise technical errors and reduce the risk of injury. Following familiarisation, baseline measurements were obtained. The pretest consisted of two performance measures: the 30-m sprint test and the vertical jump test. The same testing procedures, equipment, and general testing conditions were applied during the pretest and posttest to improve measurement consistency.

The 30-m sprint test was used to assess sprint performance. Participants were instructed to sprint maximally over a 30-m distance from a standardised starting position. Sprint performance was expressed as sprint time in seconds, with lower values indicating better performance. Vertical jump performance was assessed using a standardised maximal vertical jump procedure. Participants were instructed to perform the jump with maximal effort following the prescribed testing technique. Jump performance was recorded in centimetres, with higher values representing better vertical jump performance.

Plyometric Training Intervention

Following completion of the pretest, participants undertook a structured six-week plyometric training programme. Training was performed three times per week for six consecutive weeks, resulting in 18 training sessions. Each session lasted approximately 60 minutes. The intervention incorporated five primary plyometric exercises: squat jump, countermovement jump, box jump, bounding, and depth jump. These exercises were selected to provide repeated exposure to rapid eccentric-concentric actions associated with the stretch-shortening cycle and to progressively challenge lower-limb explosive movement.

The training programme used progressive loading across the six weeks. Progression was achieved through changes in training volume, exercise complexity, and exercise intensity while maintaining appropriate movement technique. Adequate rest intervals were provided between sets to support high-quality explosive execution and reduce excessive fatigue. The detailed six-week training protocol is presented in **Table 1**.

Table 1. Six-Week Plyometric Training Protocol

Week	Exercise Focus	Sets	Repetitions	Intensity/Progression	Rest Between Sets
1	Squat jump, CMJ, bounding	2-3	6-8	Low	90-120 s
2	Squat jump, CMJ, bounding	3	6-8	Low moderate	90-120 s
3	Squat jump, CMJ, box jump, bounding	3	6-8	Moderate	120 s
4	CMJ, box jump, bounding, depth jump	3	5-8	Moderate	120-150 s
5	CMJ, box jump, bounding, depth jump	3-4	5-8	Moderate high	150 s
6	CMJ, box jump, bounding, depth jump	3-4	5-6	High but technically controlled	150-180 s

Training Session Procedure

Each training session followed a standardised sequence. The session began with approximately 10-15 minutes of warm-up, including light aerobic activity, dynamic mobility, and movement preparation. This phase was followed by approximately 30-35 minutes of plyometric training, during which participants performed the exercises prescribed for the corresponding week. Rest intervals were provided between sets and exercises to facilitate recovery and maintain movement quality. The duration of recovery was progressively adjusted according to the intensity and complexity of the exercises. The session concluded with approximately 5-10 minutes of cool-down activities. All training sessions were supervised to ensure that the prescribed exercises, repetitions, sets, and recovery periods were followed. Exercise technique was monitored throughout the intervention, particularly during landing and take-off phases. Participants were encouraged to prioritise movement quality rather than completing repetitions with compromised technique.

Table 2. Standard Training Session Structure

Training Component	Approximate Duration	Description
Warm-up	10-15 min	Light activity, dynamic mobility, and movement preparation
Plyometric training	30-35 min	Prescribed plyometric exercises according to weekly progression
Recovery	90-180 s/set	Recovery between sets according to exercise intensity
Cool-down	5-10 min	Low-intensity activity and stretching
Total	**60 min**	**Standardised training session**

Data Analysis

Data were analysed using SPSS version 26. Descriptive statistics were calculated and presented as mean and standard deviation (SD). The Shapiro-Wilk test was used to examine the normality of the outcome data. Because the study involved a single group measured at two time points, changes between pretest and posttest were analysed using a paired-samples t-test when the data met the assumptions of parametric analysis. Statistical significance was set at $p < 0.05$. To complement the significance testing, Cohen's dz was calculated to estimate the magnitude of within-participant changes. Effect sizes were interpreted as small (0.20), moderate (0.50), and large (0.80). Importantly, Levene's test and independent-samples t-test were not used, because the study did not include an independent control group. This analytical approach is consistent with the one-group pretest-posttest design.

RESULTS AND DISCUSSION

Results

Descriptive Statistics

Descriptive statistics were computed to provide an overview of the central tendency and variability of sprint speed and explosive power before and after the plyometric training intervention.

Table 3. Descriptive Statistics

Variable	Test	N	Mean	Std. Deviation
Sprint Speed (30 m)	Pretest	20	4.82	0.31
	Posttest	20	4.54	0.28
Explosive Power (Vertical Jump)	Pretest	20	45.30	4.12
	Posttest	20	49.85	4.37

Table 3 summarises the descriptive statistics for sprint speed and explosive power before and after the intervention. The findings demonstrate a clear improvement in sprint performance, with mean sprint time decreasing from 4.82 ± 0.31 s at pre-test to 4.54 ± 0.28 s at posttest, indicating enhanced running speed following the training programme. Similarly, explosive power, as assessed by vertical jump performance, increased from 45.30 ± 4.12 cm to 49.85 ± 4.37 cm. These results suggest that the plyometric training intervention contributed to improvements in neuromuscular function and the capacity to generate force rapidly, both of which are critical determinants of sprint performance. The present findings are consistent with previous research reporting significant gains in sprint speed and explosive power following plyometric training interventions (Markovic & Mikulic, 2010; Ramirez-Campillo et al., 2015).

Normality of Change Scores

The normality assumption was assessed using the Shapiro Wilk test on the within-participant change scores, calculated as posttest minus pretest. This approach was used because the paired-samples t-test evaluates the distribution of the difference scores rather than the pretest and posttest scores separately. The Shapiro Wilk test indicated that the change scores for both outcomes did not significantly depart from a normal distribution. For 30 m sprint time, the change scores were normally distributed, $W = 0.956$, $p = 0.474$. Similarly, the change scores for vertical jump height showed no significant departure from normality, W = 0.971, p = 0.782. Thus, the normality assumption for the paired-samples t-test was considered satisfied.

Table 4. Shapiro Wilk Test of Change Scores

Variable	Mean Change ± SD	W	df	p
30-m sprint time (s)	−0.28 ± 0.22	0.956	20	0.474
Vertical jump height (cm)	4.55 ± 3.29	0.971	20	0.782

Homogeneity Test

Levene's test was conducted to examine the homogeneity of variance between measurements.

Table 5. Test of Homogeneity of Variances

Variable	Levene Statistic	df1	df2	Sig.
Sprint Speed	1.24	1	38	0.271
Explosive Power	0.98	1	38	0.328

Table 5 shows the results of Levene's test for homogeneity of variance. The significance values for both sprint speed (p = 0.271) and explosive power (p = 0.328) were greater than 0.05, indicating that the data met the assumption of homogeneity of variance. The Shapiro–Wilk test indicated that sprint performance and vertical jump performance were normally distributed (p > .05). Levene's test also indicated homogeneity of variance for all outcome variables (p > .05). Therefore, parametric statistical analyses were performed.

Pretest–Posttest Comparisons

Paired-samples t-tests were conducted to examine within-participant changes in 30-m sprint performance and vertical jump height following the six-week plyometric training programme. Mean differences were calculated as posttest minus pretest. The results are presented in **Table 6**.

Table 6. Paired-Samples t-Test of Pretest and Posttest Performance

Variable	Pretest, Mean ± SD	Posttest, Mean ± SD	Mean Difference	t	df	p
30-m sprint time (s)	4.82 ± 0.31	4.54 ± 0.28	-0.28	-5.62	19	< 0.001
Vertical jump height (cm)	45.30 ± 4.12	49.85 ± 4.37	4.55	6.18	19	< 0.001

The paired-samples t-test results demonstrated a statistically significant reduction in 30-m sprint time following the six-week training period. Mean sprint time decreased from 4.82 ± 0.31 s at pretest to 4.54 ± 0.28 s at posttest, representing a mean reduction of 0.28 s. This change was statistically significant, t (19) = -5.62, p < .001. Because lower sprint time represents better performance, the negative mean difference indicates an improvement in sprint performance. A statistically significant improvement was also observed in vertical jump height. Mean vertical jump height increased from 45.30 ± 4.12 cm at pretest to 49.85 ± 4.37 cm at posttest, corresponding to a mean increase of 4.55 cm.

This difference was statistically significant, t(19) = 6.18, p < 0.001. The positive mean difference indicates an improvement in vertical jump performance. Overall, both performance outcomes showed significant within-participant improvements from pretest to posttest. These findings indicate that participants performed better on both the 30-m sprint and vertical jump tests after completing the six-week training period. However, because the study used a one-group pretest-posttest design without a control group, these statistically significant changes should be interpreted as pretest-posttest improvements associated with participation in the training programme rather than definitive evidence of a causal effect of plyometric training.

Effect Size

To determine the magnitude of the training effect, Cohen's d effect size was calculated.

Table 7. Effect Size (Cohen's d)

Variable	Cohen's d	Effect Magnitude
Sprint Speed	1.27	Large
Explosive Power	1.38	Large

Table 7 summarises the effect size analysis based on Cohen's d. The calculated effect sizes for sprint speed (d = 1.27) and explosive power (d = 1.38) fall within the "large" category, indicating a substantial impact of the plyometric training intervention on performance outcomes. In line with Cohen (1988) classification, these values exceed the conventional threshold for large effects, underscoring the practical significance of the observed improvements.

Discussion

Changes in Sprint Performance

The present study found a significant improvement in 30-m sprint performance following six weeks of plyometric training. Mean sprint time decreased from 4.82 ± 0.31 s at pretest to 4.54 ± 0.28 s at posttest, representing a reduction of 0.28 s or approximately 5.8%. The paired-samples t-test indicated a statistically significant pretest–posttest difference, $t(19) = -5.62$, $p < 0.001$, with a large within-participant effect size (dz = 1.27). These findings are consistent with previous research indicating that plyometric training can improve sprint performance across athletic populations (Xie et al., 2024; Asadi et al., 2016).

The observed improvement is also consistent with evidence from systematic reviews and meta-analyses. Ramirez-Campillo et al. (2021) reported that plyometric jump training can improve sprint performance and jumping ability across different athletic populations. Similarly, Moran et al. (2021) found meaningful improvements in sprint performance following plyometric interventions, particularly when training was implemented for several weeks. The present findings therefore provide additional evidence that a relatively short six-week training period may be accompanied by meaningful changes in sprint performance among collegiate track and field athletes.

One possible explanation for the improvement is the enhanced utilization of the stretch-shortening cycle (SSC). Plyometric exercises involve rapid transitions between eccentric and concentric muscle actions, which may improve the ability to produce force rapidly during explosive movements (Moeskops et al., 2024; Sylvester et al., 2024). Improvements in reactive strength and neuromuscular coordination may subsequently contribute to more effective force production during sprint acceleration (Philipp et al., 2024; Markovic & Mikulic, 2010). However, because SSC function, reactive strength, and neuromuscular coordination were not directly measured in the present study, these mechanisms should be regarded as plausible explanations rather than demonstrated mechanisms.

Changes in Vertical Jump Performance

Vertical jump performance also improved significantly following the six-week training period. Mean vertical jump height increased from 45.30 ± 4.12 cm at pretest to 49.85 ± 4.37 cm at posttest, representing an improvement of 4.55 cm or approximately 10.0%. The difference was statistically significant, $t(19) = 6.18$, $p < 0.001$, with a large within-participant effect size (dz = 1.38).

This finding is consistent with previous evidence showing that plyometric training can improve jumping performance through repeated exposure to high-velocity stretch-shortening cycle movements (Ramirez-Campillo et al., 2021; Moran et al., 2021). The improvement observed in the present study may reflect enhanced ability to rapidly generate and apply force during the take-off phase of the vertical jump. Previous research has similarly identified improvements in explosive performance following structured plyometric interventions (Asadi et al., 2016; Xie et al., 2024).

The concurrent improvement in sprint and vertical jump performance is particularly relevant because both outcomes require rapid force production by the lower limbs. Nevertheless, the present study measured vertical jump height rather than mechanical power directly. Therefore, the finding should be described as an improvement in vertical jump or lower-limb explosive performance rather than a direct increase in mechanical explosive power. This distinction is important because direct assessment of power would require additional measurements involving force and/or velocity.

Potential Mechanisms Underlying Performance Improvements

Several physiological and neuromuscular mechanisms may plausibly explain the observed improvements. Plyometric training requires rapid eccentric-to-concentric transitions and may enhance the efficiency of the stretch-shortening cycle, neuromuscular coordination, and the ability to generate force over short time intervals (Moeskops et al., 2024; Sylvester et al., 2024). These adaptations may be relevant to both sprinting and jumping because both activities require rapid application of force against the ground.

Another possible mechanism involves changes in the muscle–tendon unit. Previous research has suggested that repeated high-intensity plyometric loading may influence tendon mechanical properties, including stiffness, potentially improving the storage and return of elastic energy during explosive movements (Cormie et al., 2011; Suchomel et al., 2022). Similarly, improvements in the rate of force development and neural activation may contribute to the ability to generate force rapidly during sprint acceleration and jumping (Blazevich & Fletcher, 2023; Suchomel et al., 2024).

However, these mechanisms were not directly examined in the present study. No measurements of tendon stiffness, electromyographic activity, muscle architecture, reactive strength, or rate of force development were obtained. Accordingly, the proposed mechanisms should be interpreted as explanations supported by previous literature rather than as physiological adaptations demonstrated by the present data. Future research combining performance testing with biomechanical and neuromuscular measurements would be necessary to determine which mechanisms contribute most strongly to the observed changes.

The magnitude of the observed changes should also be interpreted cautiously. The within-participant effect sizes were large for both sprint performance ($dz = 1.27$) and vertical jump performance ($dz = 1.38$). These estimates indicate substantial standardised pretest–posttest changes, but they do not establish that the plyometric intervention alone caused these changes. Without a control group, alternative explanations such as maturation, concurrent training, familiarisation with the testing procedures, changes in general training status, or other time-dependent factors cannot be excluded.

Practical Implications

The findings have practical implications for the development of plyometric programmes for collegiate track and field athletes. A six-week programme consisting of regular supervised plyometric sessions was accompanied by improvements in both 30-m sprint performance and vertical jump height. This suggests that plyometric training may be incorporated as a component of athletic preparation when the objective is to develop lower-limb explosive performance and sprint-related capabilities.

For coaches, the findings support the use of progressive plyometric exercises as part of a broader training programme rather than as a replacement for sport-specific sprint, strength, and technical training. Because the present study did not compare different training frequencies, exercise volumes, or plyometric modalities, the findings should not be interpreted as evidence that the specific six-week protocol is superior to other training approaches. Instead, the results provide preliminary evidence that a structured plyometric component may be practically useful within collegiate track and field training.

The observed improvements in both sprint and vertical jump performance also suggest that these two measures may be useful complementary indicators when monitoring changes in lower-limb explosive performance. Nevertheless, coaches should consider athletes' training status, event specialisation, injury history, and recovery capacity when determining plyometric volume and progression.

Limitations and Future Research

Several limitations should be considered when interpreting the findings. First, the study included only 20 athletes from a single university, which limits the generalisability of the findings to other collegiate or elite athletic populations. Second, the one-group pretest–posttest design did not include a control group or random allocation. Therefore, although significant improvements were observed after the six-week training period, the findings cannot establish that plyometric training was solely responsible for the observed changes. Future randomised controlled trials should compare plyometric training with usual training, alternative training methods, or an appropriate control condition.

Third, the intervention lasted only six weeks. Although this duration was sufficient to observe measurable pretest–posttest changes, longer interventions are required to determine whether these improvements are maintained or continue to increase over time. Fourth, the study did not objectively quantify potentially relevant factors such as sleep, dietary intake, recovery status, concurrent training load, or physical activity outside the prescribed programme. Although participants were instructed to maintain consistent habits and avoid additional vigorous exercise, residual confounding cannot be excluded.

Fifth, the study assessed vertical jump height rather than mechanical power directly. In addition, potential mechanisms involving SSC function, tendon stiffness, neuromuscular activation, muscle architecture, and rate of force development were not directly measured. Future studies should therefore combine sprint and jump testing with force plates, electromyography, contact-time measures, or other biomechanical and neuromuscular assessments. Finally, the participants' specific track and field event characteristics should be considered in future research because sprinting, jumping, and throwing events may respond differently to plyometric loading.

Overall, the present findings provide preliminary evidence of substantial pretest–posttest improvements in sprint and vertical jump performance following six weeks of plyometric training. However, larger randomised studies involving multiple institutions, adequately characterised athletic events, longer follow-up periods, and direct physiological measurements are needed to establish the causal effectiveness and mechanisms of plyometric training more definitively.

CONCLUSION

The present study found significant improvements in 30-m sprint performance and vertical jump height following a six-week plyometric training programme among collegiate track and field athletes. However, given the one-group pretest–posttest design, these findings represent performance improvements observed following the intervention and do not provide definitive evidence of a causal effect. From a practical perspective, structured plyometric training may be incorporated as a component of university-based athletic conditioning programmes to support sprint and lower-limb explosive performance. Nevertheless, the findings should be interpreted cautiously because of the absence of a control group, lack of randomisation, small sample from a single institution, short intervention period, and limited objective monitoring of potential confounding factors such as nutritional intake, sleep, recovery, and additional training. Future research should employ randomised controlled designs with larger multicentre samples, longer intervention periods, and direct biomechanical and neuromuscular assessments to strengthen causal inference and clarify the mechanisms underlying changes in sprint and vertical jump performance.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to this research.

AI DISCLOSURE STATEMENT

The authors used QuillBot, an AI-powered writing assistance tool, solely for language editing, grammar checking, paraphrasing, and improving manuscript clarity and readability. The authors remain fully responsible for the accuracy and scientific integrity of the manuscript.

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