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Effects of Specific Training Program to Improve Lower Limp Explosive Power on Long Jump of Physical Education Students in Beijing City, the People's Republic of China

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Abstract

Background and Aim: Due long jump requires a significant amount of explosive power, particularly in the lower body muscles. Students who lack strength and power in their legs may struggle to generate enough force to propel themselves forward during take-off, resulting in shorter jumps. This research aims to study the effect of specific training programs to improve lower limb explosive power on the long jump of physical education students in Beijing City, The People's Republic of China.

Materials and Methods: This research is quasi-experimental. The population of this experiment consists of first-year male students in the academic year 2023 at Capital University of Physical Education and Sports, Beijing City, who have chosen to study the subject of athletics, totaling 85 students. The 85 students will participate in the long jump test and record their scores. After the test, a total of 62 students passed the test criteria. The researcher used the simple random sampling method to select 20 students as a sample group. In this experiment, the training will be conducted in 8 weeks, comprising sessions held 5 days per week, 2 hours per day. Additionally, standing long jump test and long jump test to evaluate explosive power will be conducted before, after 4 weeks of training, and after 8 weeks of training. In this research, mean, standard deviation, one-way repeated measures ANOVA, and dependent t-tests were used to analyze the data.

Results: After training with the specific program, the standing long jump test results and the long jump test results between the pre-test, after 4 weeks of training, and post-test showed a statistically significant difference at the 0.05 level.

Conclusion: The specific training program was effective in improving lower limb explosive power on the long jump of physical education students.

Keywords: Long Jump; Specific Training Program; Lower Limb; Explosive Power

Introduction

The long jump, an ancient discipline in track and field, holds a special place in the hearts of enthusiasts. It epitomizes the explosive power of athletes and exemplifies the seamless fusion of speed and strength. As a fast-strength event, its essence lies in athletes propelling their bodies forward through swift run-ups and forceful take-offs. Over time, the long jump technique has evolved from squatting to standing and walking styles. This evolution has led to a refined approach, take-off, airborne phase, and landing, forming a cohesive "kinematic chain" aimed at enhancing athletic performance (Cao, 2023).

The long jump is often referred to as a projectile sport, where the distance achieved by the jumper depends on both the take-off speed and angle at the moment of liftoff. Notably, the athlete's horizontal speed during the run-up and the vertical speed during take-off significantly influence these parameters. Consequently, success in the long jump requires athletes to develop a high level of proficiency in both running speed and take-off technique. Unlike many other explosive sports, the long jump demands a delicate balance of technical skill and athletic prowess (Li, 2020).

For the standing long jump event, the explosive power during the take-off stage is crucial, directly influencing students' performance. When guiding students in specialized strength training, teachers must prioritize the continuous enhancement of explosive power. This entails helping students fully activate relevant muscle groups during take-off, thereby enhancing their standing long jump performance. For instance, in high school and university strength training, teachers commonly utilize physical exercises like barbell bench presses and dumbbell lifts, suitable for students to independently engage during their free time (Young & Rath, 2011). Moreover, teachers emphasize correct exercise techniques to ensure students

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maintain muscle relaxation during workouts, avoiding overexertion and allowing for adequate muscle recovery to enhance overall strength and vitality. Therefore, explosive power in the lower limbs is a critical factor influencing performance in the long jump, as it directly affects an athlete's ability to generate the force necessary for takeoff. The success of a long jump largely depends on the force generated during the takeoff phase, which is directly linked to the explosive power of the lower limbs. Explosive power enables athletes to convert horizontal speed into vertical lift, optimizing the distance covered in the jump (Fletcher & Monte-Colombo, 2010).

Following this principle, teachers can draw from the training methods of professional athletes to further develop students' leg strength. By introducing external resistance in specialized strength training sessions, students are challenged to overcome this resistance, facilitating strength improvement. Additionally, teachers may incorporate specialized rubber bands around students' waists and abdomens to guide forward running until resistance is too strong to continue. Simultaneously, students engage in high leg-raising exercises while overcoming resistance during running drills. This ensures continuous adjustments in leg movements, leading to further enhancement in leg strength and subsequent improvements in explosive power for standing long jump. Ultimately, heightened explosive power extends students' standing long jump distances (Mao, 2023).

Currently, a first-year student in the academic year 2023 at Capital University of Physical Education and Sports, in Beijing City, The People's Republic of China, who chooses to study athletics often encounters problems with having basic skills that are not as good as they should be, particularly in explosive skills, in long jump training. Due long jump requires a significant amount of explosive power, particularly in the lower body muscles. Students who lack strength and power in their legs may struggle to generate enough force to propel themselves forward during take-off, resulting in shorter jumps (Lees & Fahmi, 1994).

From the above mentioned, the problem of explosive power in physical education students for the long jump event pertains to their ability to generate rapid and forceful movements from the lower body during take-off. Explosive power is crucial for achieving optimal jump distance in the long jump event, as it directly influences the athlete's ability to propel themselves off the ground with speed and force. Insufficient explosive power in the lower limbs can result in reduced jump distance and performance in the long jump event. This issue may stem from various factors such as inadequate strength and conditioning, improper training techniques, or biomechanical inefficiencies. Addressing the problem of explosive power in physical education students for the long jump requires implementing a structured and progressive training program specifically targeting explosive strength development. This program should include exercises and drills aimed at improving lower body strength, power, speed, and coordination. Additionally, coaches should provide proper instruction and feedback to ensure athletes perform exercises with the correct technique and intensity. By addressing these factors and implementing an effective training program, physical education students can improve their explosive power, leading to improved performance in the long jump event.

Therefore, the primary problem addressed in this research is the need to improve lower limb explosive power among physical education students, specifically focusing on its impact on long jump performance. Lower limb explosive power plays a critical role in athletic activities such as the long jump, yet there is a lack of specialized training programs tailored to improve this aspect among physical education students. Moreover, improving lower limb explosive power is essential for optimizing athletic performance, particularly in sports disciplines like the long jump where explosive power is crucial. By addressing this problem, the research aims to develop and implement effective specific training programs targeted at improving lower limb explosive power on the long jump among physical education students. This research holds significance in contributing to the overall athletic development and performance enhancement of physical education students, thereby promoting a higher level of competitiveness and success in athletics activities. Additionally, improving lower limb explosive power can have broader implications for overall physical fitness and well-being, leading to a healthier and more active lifestyle among students.

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Research Objectives

Main Objective

To study the effect of a specific training program to improve lower limb explosive power on the long jump of physical education students in Beijing City, The People's Republic of China

Subsidiary Objectives

1. To study the problem and obstacle of training lower limb explosive power on the long jump of physical education students in Beijing City.
2. To develop a specific training program to improve lower limb explosive power on the long jump of physical education students in Beijing City.
3. To compare lower limb explosive power on the long jump of physical education students before starting the training, after 4 weeks of training, and after 8 weeks of training.

Literature Review

1. Long Jump

1.1. The significance of the Long Jump

The long jump is a track and field event where athletes sprint down a runway and then leap forward from a takeoff board, aiming to achieve maximum horizontal distance in a single bound (Berg, 2003). The long jump requires a combination of technical skill, strength, and speed, making it a comprehensive assessment of an athlete's functional movement capabilities. Moreover, Long jump competitions showcase athletes' abilities to perform under pressure, demonstrating their skill, athleticism, and mental fortitude in a competitive setting. (Draper and Lancaster, 1985).

Due to the long jump is a track and field event that measures an athlete's ability to combine speed, strength, and technique to jump as far as possible from a running start. Its significance extends beyond just athletic performance, affecting various aspects of physical fitness and sports training. MacDougall & Sale (1981) indicated that the long jump is a key indicator of explosive power, particularly in the lower limbs. Athletes need to generate a high amount of force quickly to achieve maximum distance. This ability to exert force rapidly is crucial in many sports and activities, reflecting overall muscular strength and power. Success in the long jump relies on both speed and agility. The approach phase of the jump requires the athlete to run at high speeds, and the transition from running to jumping involves quick, coordinated movements. This event thus serves as a measure of an athlete's overall speed and ability to translate it into effective jumping performance (Hori & Newton, 2008). During triple jump training, students must not only execute each phase of the jump accurately but also seamlessly integrate running and jumping throughout the approach and take-off phases to achieve optimal results. If a student struggles with timing their steps correctly, the teacher can employ practical measures such as marking each step with chalk or using marking disks on the approach track. This technique enables the teacher to ensure that the student's approach rhythm and step length align with the designated markers.

1.2 Long Jump Training

Training for the long jump involves a combination of technical skill development, strength training, plyometrics (explosive), and speed work. Training the long jump can focus on the following aspects: (1) Technical Skill Development, which focuses on mastering the approach run, takeoff, flight, and landing phases of the long jump through drills and technique-specific training (Brüggemann, 2010); (2) Strength Training: Incorporate resistance training exercises targeting the lower body, such as squats, lunges, and deadlifts, to improve strength and power; (3) Speed Work: Integrate speed and agility drills into training sessions to improve sprinting technique, acceleration, and overall speed (Cronin & Hansen, 2005); (4) Plyometric Exercises (explosive), include plyometric drills like bounding, box jump, and depth jumps to enhance explosive power and improve the athlete's ability to generate force quickly (Markovic and Mikulic, 2010).

Makaruk & Zajac, (2015) indicated that enhancing long jump performance involves a multi-faceted approach focusing on improving strength, power, technique, and overall physical conditioning.

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Plyometric training, including exercises like depth jumps, bounding, and jump squats, enhances explosive power which is crucial for the take-off phase of the long jump. This type of training improves the fast-twitch muscle fibers responsible for rapid force production, contributing to better jump distances.

In summary, effective physical training for track and field jumping events requires a holistic approach that considers individual athlete characteristics, targets specific training needs, rationalizes intensity, and maximizes efficiency to optimize performance outcomes.

2. Lower Limb Explosive Power

2.1. The definition of lower limb explosive power

Lower limb explosive power refers to the ability of the muscles in the lower body—such as those in the legs, hips, and glutes—to generate a rapid and forceful contraction. This type of power is crucial for activities that require quick and powerful movements, such as jumping, sprinting, and sudden changes in direction. It involves the rapid generation of force, which is often measured through vertical jump tests, sprint times, and other performance metrics that assess the speed and strength of lower limb movements (Cronin & Hansen, 2005).

2.2 The Significance of Lower Limb Explosive Power

Lower limb explosive power significantly influences performance outcomes in sports and physical activities, affecting metrics such as jump height, sprint speed, and agility (Kibele & Kibele, 2009). Lower limb explosive power is not only essential for sports but also for everyday activities that involve quick movements, such as climbing stairs, lifting objects, and sudden changes in direction. Improved power in the lower limbs can enhance overall functional capacity and mobility. In sports such as sprinting, jumping events, and explosive team sports like soccer and football, lower limb explosive power is a determining factor for success. Athletes with high lower limb power can perform movements like sprint starts, jump shots, and powerful kicks more effectively. Therefore, for sports that require explosive movements such as jumping and sprinting, lower limb explosive power significantly influences skill execution and overall performance. Effective power development translates into better sport-specific skills and competitive advantage. (Hoffman & Newton, 2006). Lower limb explosive power is integral to enhancing athletic performance, preventing injuries, improving functional capacity, and mastering sport-specific skills. The development of explosive power through targeted training can significantly benefit athletes and individuals by improving their overall physical capabilities and effectiveness in both competitive and everyday scenarios.

Developing lower limb explosive power can help reduce the risk of injuries by improving muscle strength, coordination, and joint stability. Proper power training can enhance the ability of the muscles and tendons to absorb and manage the impact forces experienced during athletic activities. Therefore, lower limb explosive power is crucial for injury prevention as it enhances muscle strength, joint stability, and the ability to absorb impact forces. It also improves proprioception, balance, agility, and reaction time, all of which contribute to a lower risk of injuries. Incorporating explosive power training into an athlete's regimen can play a significant role in maintaining physical health and preventing common sports-related injuries. (Buchheit & Laursen, 2013).

McBride et al (2013) indicated that lower limb explosive power influences performance in various sports. It finds that higher levels of lower limb explosive power are associated with improved performance in activities such as sprinting and jumping. The research emphasizes the importance of incorporating explosive power training into athletic conditioning programs.

3. Principle of Training

The principle of training refers to the foundational concepts that guide the development of effective training programs. These principles ensure that training is systematic, progressive, and tailored to the specific needs and goals of the individual. Understanding and applying these principles is crucial for achieving optimal performance and reducing the risk of injury. The key principles of training must take into consideration the following aspects:

3.1. Specificity

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The principle of specificity is crucial for designing effective training programs that directly enhance performance in a specific sport or activity. By focusing on movement patterns, energy systems, muscle groups, and skill development relevant to the sport, athletes can achieve the most significant performance improvements. Specificity also includes skill development. Practicing sport-specific skills under conditions that closely resemble competition is essential for transferring training gains to actual performance (Magill, 2007).

3.2. Progressive Overload

The principle of progressive overload is a fundamental concept in exercise and training that refers to the gradual increase of stress placed on the body during exercise. This principle is essential for achieving continuous improvement in strength, endurance, and overall fitness. By progressively increasing the demands on the musculoskeletal and cardiovascular systems, the body adapts and becomes stronger and more efficient (Zatsiorsky & Kraemer, 2006).

3.3. Reversibility

The principle of reversibility, also known as the "use it or lose it" principle, is a key concept in training that refers to the loss of fitness and performance gains when training is reduced or stopped. Essentially, the benefits gained from training will gradually diminish if the stimulus that caused the adaptations is no longer present. This principle highlights the importance of consistent training to maintain physical fitness and athletic performance. The rate at which detraining occurs can vary depending on factors such as the length and intensity of the training program before stopping, the specific fitness components involved, and the individual's fitness level. Fitness gains are reversible; if training stops or decreases in intensity, the physiological adaptations and performance improvements will gradually diminish (Wilmore & Costill, 2005).

3.4 Individualization

The principle of individualization is a fundamental concept in training that recognizes that each individual responds differently to training stimuli. Factors such as genetics, fitness level, age, gender, health status, and personal goals all influence how a person adapts to training. This principle emphasizes the need to tailor training programs to meet the specific needs, abilities, and circumstances of each individual to optimize performance and reduce the risk of injury (McArdle et al, 2010).

3.5. Recovery and Adaptation

The principle of recovery and adaptation is a fundamental concept in training that emphasizes the importance of rest and recovery as integral components of the training process. It is during recovery that the body repairs and strengthens itself in response to the stresses imposed by training. Adaptation refers to the physiological changes that occur as a result of repeated exposure to training stimuli, leading to improvements in performance (Wilmore & Costill, 2005).

3.6. Variation

The principle of variation, also known as the principle of periodization, is a key concept in training that emphasizes the need for varying training stimuli over time to prevent plateaus, reduce the risk of overtraining, and continue making progress. Variation in training can involve changes in intensity, volume, frequency, type of exercise, and other factors to keep the body adapting and improving. The body adapts to training stimuli over time, which can lead to performance plateaus if the training program is not adjusted. By incorporating variation, athletes can continuously challenge their bodies in new ways, promoting ongoing adaptation and improvement (Bompa & Haff, 2009).

The principles of training provide a framework for designing effective and safe training programs. By applying specificity, progressive overload, reversibility, individualization, recovery, and variation, coaches and athletes can optimize performance and achieve their goals.

Summary, Long jump is a track and field event where athletes sprint down a runway and then jump as far as possible into a sand pit. It is a jumping event where the goal is to achieve the greatest horizontal distance from the takeoff point to the landing point. Athletes typically use a combination of speed, strength, technique, and coordination to propel themselves as far forward as possible during the jump phase. The

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distance is measured from the edge of the takeoff board to the nearest mark made in the sand by any part of the athlete's body. Through an extensive literature search, it was found that tailored training interventions incorporating plyometric exercises, resistance training, sprint drills, and technique refinement sessions have demonstrated promising results in improving jump distance and overall athletic performance. Plyometric exercises such as bounding and depth jumps, along with resistance training utilizing Olympic lifts, were particularly effective in enhancing explosive strength and coordination. Additionally, integrating sprint drills and technique refinement sessions optimized approach run mechanics and takeoff techniques, further contributing to improved jump outcomes. Therefore, this research aims to study the effect of specific training programs designed to improve lower limb explosive power in long jump performance among physical education students. Through the experimentation process, to study whether specific training programs can improve explosive power for long jump physical education students.

Conceptual Framework

The conceptual framework for this research is as follows:

1. The independent variable is the specific training program.
2. The dependent variables are the improvement of lower limb explosive power on the long jump of physical education students in Beijing City, The People's Republic of China.
3.

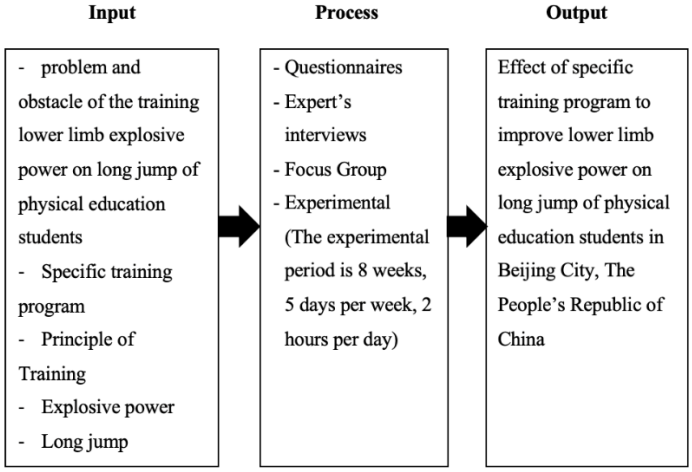

Figure 1 Conceptual framework

Methodology

Research Tools

In this research, the following tools were used to conduct the research: (1) Questionnaires for students. (2) Interview form, (3) Long jump test, (4) Specific training program, (5) Standing long jump test

Population and Sample

Population specification and size: The population of this experiment consists of first-year male students in the academic year 2023 at Capital University of Physical Education and Sports, Beijing City, The People's Republic of China, who have chosen to study the subject of athletics, totaling 85 students.

Sample: The 85 students will participate in the long jump test and record their scores. After the test, a total of 62 students passed the test criteria. The researcher used the simple random sampling method to select 20 students who passed the long jump test criteria and volunteered to participate as the sample group for this experiment.

Data Collection

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Qin, Q., Siriphan , C., & Watchayakarn, K. (2025). Effects of Specific Training Program to Improve Lower Limp Explosive Power on Long Jump of Physical Education Students in Beijing City, the People's Republic of China. International Journal of Sociologies and Anthropologies Science Reviews, 5 (2), 159-172; DOI: https://doi.org/10.60027/ijsasr.2025.5599

1. Draft the questionnaires for students to investigate the problems and obstacles in training lower limb explosive power for the long jump among physical education students. After that, the questionnaire was evaluated by 3 experts to evaluate its alignment with the objectives through Item-Objective Congruence (IOC).
2. The questionnaires will be distributed to all 20 students through on-site distribution to comprehend the difficulties and the problems during the training of lower limb explosive power for long jump physical education students.
3. Draft the questions for use in the experts' interview and evaluate the questions in the expert interview form by evaluating their alignment with objectives through the Item-Objective Congruence (IOC) with input from 3 experts.
4. 5 experts including, long jump coaches, physical education teachers, and long jump academic experts were invited to conduct face-to-face interviews, to create a question framework for the focus group, focusing on essential compositions for developing specific training programs to improve lower limb explosive power on long jump of physical education students.
5. 12 experts including, long jump coaches, physical education teachers, and long jump academic experts conducted a focus group to develop a specific training program aiming to improve lower limb explosive power on the long jump of physical education students in Beijing City, The People's Republic of China.
6. Try out a specific training program with 5 students to see if it is suitable for use with students or not, and if the intensity of the training is suitable or not.
7. Implement the training program in 8 weeks, with training sessions scheduled for 5 days each week (Monday-Friday), and 2 hours per day.
8. Conduct standing long jump test and long jump test before the starting of training, after 4 weeks of training, and completion of the 8-week training. Subsequently, analyze and compare the collected test data to study the effect of the specific training program to improve lower limb explosive power on the long jump of physical education students in Beijing City, The People's Republic of China.

Data Analysis

1. Descriptive statistical techniques, such as calculating the mean and standard deviation, are employed to analyze the data gathered from the questionnaire.
2. Evaluate the content validity of the questions in the questionnaires for students and expert interview form, by using the Indexes of Items of Objective Congruence (IOC), The IOC value of the questionnaires for students was 0.86, and the IOC value of the interview form was 0.89.
3. Expert interviews and focus group discussions were analyzed by using content analysis.
4. The results of the pre-test, after 4 weeks of training, and post-test (after 8 weeks of training) were analyzed by using one-way repeated measures ANOVA.
5. Dependent T-tests were employed to compare the test results between (1) the pre-test and after 4 weeks of training; (2) after 4 weeks of training and post-test; and (3) the pre-test and post-test, to evaluate differences within one group.
6. To determine the average score of questionnaires for students, based on the information provided by students, the researcher utilized the Likert scale for assessment.

The meanings of 5 scale evaluation are 1 = Very Poor, 2 = Poor, 3 = Moderate, 4 = High, 5 = Highest. The details of the score criteria are as follows:

Average score range	Meaning
1.00 - 1.79	Very Poor
1.80 – 2.59	Poor
2.60 – 3.39	Moderate
3.40 – 4.19	High
4.20 – 5.00	Highest

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Results

1. Investigate the current situation and the problem of training lower limb explosive power on the long jump of physical education students in Beijing City

The questionnaires were distributed on-site to 20 university students to evaluate the existing conditions and issues associated with lower limb explosive power training and long jump performance. The collected data will be analyzed to provide insights into the current state and difficulties of training, and the results can be analyzed as follows:

Table 1 Questionnaire survey results on the current situation and the problem of training lower limb explosive power on the long jump of physical education students in Beijing City

Questionnaire Items	Total Score		Result
	$\bar{x}$	S.D.	
1. How often do you participate in long jump training sessions?	2.90	0.54	Moderate
2. How do you rate your current level of lower limb explosive power?	3.00	0.45	Moderate
3. Do you have access to proper training facilities and equipment for explosive power training?	3.88	0.86	Poor
4. How satisfied are you with the current training program provided by your institution?	3.07	0.79	Moderate
5. Do you have challenges and problems in training for the long jump?	4.34	0.72	Highest
6. Have you experienced any injuries related to long jump training?	4.11	0.76	High
7. Do you think the improvement of lower limb explosive power can improve long jump performance?	4.72	0.59	Highest
8. How would you rate the effectiveness of your current training program in enhancing your long jump performance?	2.30	0.46	Poor
9. Do you think university need to improve the training program for lower limb explosive power?	4.70	0.64	Highest

Form Table 1 questionnaire survey results on the current situation and the problem of training lower limb explosive power on the long jump of physical education students in Beijing City, showed that physical education students have many challenges and problems in training for the long jump, this can be seen from question 5 “Do you have challenges and problems in training for the long jump?”, the result of this question was in the “Highest” ($\bar{x}$ = 4.34). Moreover, most physical education students agree that improvement of

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lower limb explosive power can improve long jump performance, this can be seen from question 7 "Do you think the improvement of lower limb explosive power can improve long jump performance?", the result of this question was in the "Highest" ($\bar{x}$ = 4.72). Many physical education students saw that the effectiveness of the current training program in enhancing long jump performance is not good enough. This can be seen from question 8 "How would you rate the effectiveness of your current training program in enhancing your long jump performance?", the result of this question was the "Poor" ($\bar{x}$ = 2.30).

2. Develop a specific training program aiming to improve lower limb explosive power on the long jump of physical education students in Beijing City, The People's Republic of China.

After conducting a focus group, a specific training program was developed, a specific training program will be conducted for 8 weeks, with sessions scheduled for 5 days per week, 2 hours per day. After that, try out a specific training program with 5 physical education students to evaluate its suitability for use. It was found to be appropriate for training physical education students on the long jump. From the tryout, it was found that the training program was designed with appropriate exercises and training intensity for physical education students.

3. Training by using a developed specific training program

To determine the developed specific training program can improve lower limb explosive power in the long jump for physical education students, this research conducted a standing long jump test and long jump test at three intervals: before the start of training, after 4 weeks of training, and upon completion of the 8-week training program. The standing long jump test and long jump test results were as follows:

1) The results of the standing long jump test of physical education students before, after 4 weeks of training, and after 8 weeks of training

Table 2 The mean and standard deviation of standing long jump test results of physical education students, as a sample group (n=20)

Standing long jump test	Mean ($\bar{x}$)	Std. Deviation (SD)
Pre-test	266.80	2.53
Week 4	271.30	2.32
Week 8	277.85	2.80

Table 2 shows the mean and standard deviation of the standing long jump test results for the sample group as follows: before training with the developed specific training program, the results were 266.80±2.53, after completing the training in week 4, the results were 271.30±2.32, and after completing the training in week 8, the results were 277.85±2.80.

Table 3 Comparative results of standing long jump test results before, after 4 weeks of training, and after 8 weeks of training with the developed specific training program

Source of Variance (Sov)	SS	Df	MS	F	P
Between Group	1235.03	2	617.52	602.20*	.00
Within Group	38.96	37	1.03		
Total	1273.99	39	618.55		

* P<.05

From Table 3, it was found that there was a statistically significant improvement in the standing long jump skill of physical education students in the sample group, before, after 4 weeks of training, and after 8 weeks of training with the developed specific training program.

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Table 4 Comparative results of standing long jump test results before and after 4 weeks of training

Period	Mean (x̄)	Standard Deviation (SD)	t	P
Before Training	266.80	2.53	472.42*	0.00
After 4 Weeks of Training	271.30	2.32		

* P<.05

From Table 4, the results of comparing the standing long jump test results of physical education students before and after 4 weeks of training with the developed specific training program showed a statistically significant difference at the 0.05 level.

Table 5 Comparative results of standing long jump test results between before and after 8 weeks of training

Period	Mean (x̄)	Standard Deviation (SD)	t	P
Before Training	266.80	2.53	444.39*	0.00
After 8 Weeks of Training	277.85	2.80		

* P<.05

From Table 5, the results of comparing the standing long jump test results of physical education students before and after 8 weeks of training with the developed specific training program showed a statistically significant difference at the 0.05 level.

Table 6 Comparative results of standing long jump test result between after 4 weeks of training and after 8 weeks of training

Period	Mean (x̄)	Standard Deviation (SD)	t	P
After 4 Weeks of Training	271.30	2.32	523.14*	0.00
After 8 Weeks of Training	277.85	2.80		

* P<.05

From Table 6, the results of comparing the standing long jump test results of physical education students after 4 weeks and after 8 weeks of training with the developed specific training program showed a statistically significant difference at the 0.05 level.

2) The results of the long jump test of physical education students before, after 4 weeks of training, and after 8 weeks of training

Table 7 The mean and standard deviation of long jump test results of physical education students, as a sample group (n=20)

Standing long jump test	Mean (x̄)	Std. Deviation (SD)
Pre-test	5.37	0.27
Week 4	5.58	0.25
Week 8	5.68	0.24

Table 7 shows the mean and standard deviation of the long jump test results for the sample group as follows: before training with the developed specific training program, the results were 5.37±0.27, after

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completing the training in week 4, the results were 5.58±0.25, and after completing the training in week 8, the results were 5.68±0.24.

Table 8 Comparative results of long jump test results before, after 4 weeks of training, and after 8 weeks of training with the developed specific training program

Source of Variance (Sov)	SS	Df	MS	F	Sig.
Between Group	1.00	2	0.67	90.80*	.00
Within Group	0.21	37	0.01		
Total	1.21	39	0.68		

* P<.05

From Table 8, It was found that there was a statistically significant improvement in the long jump skill of physical education students in the sample group, before, after 4 weeks of training, and after 8 weeks of training with the developed specific training program.

Table 9 Comparative results of long jump test results before and after 4 weeks of training

Period	Mean ($\bar{x}$)	Standard Deviation (SD)	t	P
Before Training	5.37	0.27	97.10*	0.00
After 4 Weeks of Training	5.58	0.26		

* P<.05

From Table 9, the results of comparing the long jump test results of physical education students before and after 4 weeks of training with the developed specific training program showed a statistically significant difference at the 0.05 level.

Table 10 Comparative results of long jump test results between before and after 8 weeks of training

Period	Mean ($\bar{x}$)	Standard Deviation (SD)	t	P
Before Training	5.37	0.27	88.97*	0.00
After 8 Weeks of Training	5.68	0.24		

* P<.05

From Table 10, the results of comparing the long jump test results of physical education students before and after 8 weeks of training with the developed specific training program showed a statistically significant difference at the 0.05 level.

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Table 11 Comparative results of long jump test results between after 4 weeks of training and after 8 weeks of training

Period	Mean ($\bar{x}$)	Standard Deviation (SD)	t	P
After 4 Weeks of Training	5.58	0.26	103.86*	0.00
After 8 Weeks of Training	5.68	0.24		

* P<.05

From Table 11, the results of comparing the long jump test results of physical education students after 4 weeks and after 8 weeks of training with the developed specific training program showed a statistically significant difference at the 0.05 level.

Summary

The research results concluded that the specific training program can improve lower limb explosive power on the long jump of physical education students. Moreover, the development of lower limb explosive power can enhance long jump performance, as evidenced by the results of the standing long jump test and long jump test.

Conclusion

The result showed that after 8 weeks of training with the specific training program, the lower limb explosive power on the long jump of physical education students was significantly improved, which is evident from the improved results of the standing long jump test and long jump test. There was a statistically significant improvement in the standing long jump test, between before training with the developed specific training program, before, and after completing the training in Week 4, and Week 8 [$F_{(2,37)} = 602.20$, sig. = .000], and there was a statistically significant improvement in the long jump test, before training with the developed specific training program, before, and after completing the training in Week 4, and Week 8 [$F_{(2,37)} = 90.80$, sig. = .000].

Discussion

After the 8-week training period using the developed specific training program, the lower limb explosive power on the long jump of physical education students in the sample group showed significant improvement. This is evident from the significant differences in the results of the standing long jump test and long jump test in the pre-test, the test after 4 weeks of training, and the test after 8 weeks of training. These findings are consistent with the research conducted by Makaruk & Zajac, (2015) which suggested that improving long jump performance requires a comprehensive approach that addresses strength, power, technique, and overall physical conditioning. Plyometric training—such as depth jumps, bounding, and jump squats—plays a crucial role in enhancing explosive power essential for the take-off phase of the long jump. This type of training boosts fast-twitch muscle fibers, which are key for rapid force production and result in improved jump distances.

Additionally, comparing the results of the standing long jump test and long jump test before training, after 4 weeks of training, and after completing 8 weeks of training revealed that improvements in lower limb explosive power can enhance long jump performance. These findings are consistent with the research conducted by Hoffman & Newton, (2006) which indicated that lower limb explosive power is crucial not only for sports but also for daily activities involving rapid movements, such as climbing stairs, lifting objects, and making quick directional changes. Enhancing this power improves overall functional capacity and mobility. In sports that demand explosive actions, such as sprinting, and jumping events, and high-intensity team sports like soccer and football, lower limb explosive power is a key performance factor. Athletes with greater lower limb power can execute actions like sprint starts, jump shots, and powerful kicks with greater efficiency. Thus, for sports requiring explosive movements, lower limb explosive power

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plays a vital role in skill execution and performance. Effective development of this power leads to improved sport-specific skills and a competitive edge. Moreover, this is also consistent with the research conducted by MacDougall & Sale (1981) which identified the long jump as a key measure of lower limb explosive power. Athletes must generate a significant amount of force quickly to achieve optimal jump distance. This capacity for rapid force production is essential in many sports and activities, as it reflects overall muscular strength and power. McBride et al (2013) also demonstrated that lower limb explosive power significantly affects performance across various sports. Their findings indicate that greater levels of explosive power in the lower limbs are linked to enhanced performance in activities like sprinting and jumping. The study highlights the critical role of including explosive power training in athletic conditioning programs to improve overall athletic performance.

Recommendation

Recommendation for current research

1. Expand the study to include a larger and more diverse group of physical education students from multiple universities in Beijing to increase the generalizability of the findings.

2. Conduct a follow-up study with a longer training duration, such as 12 to 16 weeks, to evaluate the long-term effects of the specific training program on lower limb explosive power and long jump performance.

3. Implement a control group that follows a different training regimen or no additional training to compare the effects of the specific training program.

Recommendation for further research

1. Compare the specific training program with other training methods, such as traditional strength training, plyometric training, and combined training approaches.

2. Study the impact of psychological and motivational factors on the effectiveness of the training program.

3. Investigate the effectiveness of the training program in reducing the risk of injuries and improving recovery times.

4. Assess how the specific training program affects athletes with varying levels of experience and skill.

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