



# The Effect of Intensive Plyometric Training on the Development of Specific Endurance and Performance in the 110-Meter Hurdles for Youth

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Received: 07-10-2025  
Accepted: 13-11-2025  
Published: 28-12-2025



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**Abstract:** *One exciting sporting event that requires speed, strength, and adrenaline is the 110-meter hurdles. Since the runner's speed starts to decrease in the 110-meter hurdles race at the beginning of muscle strain, which is determined at some point during the total distance of the race, and this stress affects the level of achievement, the researcher sees a weakness in both speed endurance and strength endurance, which is related to the quality of The significance of researching this came from preparing intensive trainings in the style of In order to determine the effects of plyometric training on the special endurance and performance of 110-meter hurdle runners, this study employed an experimental design with a two-group design. The participants were young athletes from Diwaniya Athletics Clubs; the sample size was ten athletes between the ages of eighteen and nineteen. The researchers then divided the participants into two groups, with five competitors in each. If the variables in question are well matched, we should expect good results from this setup. Results The dimensional test yields a tangible distinction in performance between the two groups, but the explosive strength, speed-associated force, and speed stamina of the experimental group benefited relatively greater from plyometrics training than those of the control group.*

**Keywords:** Plyometric training; Specific endurance; Speed endurance; 110-meter hurdles; Explosive power

## Introduction

The world of professional sports has expanded at a blisteringly rapid pace, fueled by the massive investments of the more prosperous nations into sports research and development. By harnessing prevalent techniques, athletes have achieved peak performance and attained Olympic and international medals, utilizing their physical and technical potential. All of this is not coincidence, rather the result of the continuous application of modern science to training and planning.

There are few sports events more thrilling than the 110-metre hurdles, that most demanding combination of speed, strength and — as you might expect — continuity. There is a time for it as the 110m hurdles is both a short race and a short race, it is the shortest hurdles race in athletics so there is that record pressure there. Even more so for the event and its limiter specialists trying to score better. This is a performance-based event and is still intrinsically based on physical characteristics specifically, the endurance capacity for speed and strength and how well, they are integrated. Those two are composite properties that are highly related to the fatigue resistance.

This relationship is reflected by the ability of the neuromuscular system to produce different amounts of force during certain points of the race, particularly in regards to stride length and stride frequency. To increase speed performance, these parameters can be optimized either or both. However, somewhere along the total distance of the race, physical fatigue starts to happen, so the hurdlers do tend to decrease their over-all speed the last 10 meters in the 110-meter hurdles, which negatively impacts performance achievement. That decrease is primarily for speed endurance and strength endurance (two measures very responsive to training type and athlete experience), according to study author Matt Theobald.

This is significant since the use of jump exercises with a range of loads will ascertain the impact of high and extremely high intensity plyometric workouts on special endurance and performance in the 110m hurdles.

### **Research Problem**

One of the key reasons for the poor level of performance in this event is the restricted usage and insufficient regulation of acceptable training techniques, according to the researcher's field observation and follow-up of short-distance runners in Iraq, including the 110-meter hurdles event. Furthermore, not enough emphasis is placed on training for speed and strength endurance using specialized approaches, including intense training with high-intensity plyometric exercises, to get desired levels of performance.

Hence, the core of the research problem is to find ways to train local age groups, especially youth, using techniques that are different from conventional wisdom and compared to those of elite hurdlers. The goal is to increase performance and attain cutting-edge outcomes.

### **Research Objectives**

1. To identify the effect of intensive plyometric training on specific endurance and performance in the 110-meter hurdles for youth.

### **Research Hypotheses**

1. There is a strong correlation between specific endurance and performance in the 110-meter hurdles and intense plyometric training.
2. The experimental and control groups' pre- and post-test values for various endurance and performance measures in the 110-meter hurdles varied significantly, with the post-test values favoring the experimental group..

### **Research Scope**

#### **Human Scope:**

Youth hurdlers (110-meter hurdles) from Al-Diwaniyah clubs, registered with the Iraqi Central Athletics Federation for the 2024–2025 season.

#### 1.5.2 Temporal Scope:

1/2/2025 to 20/6/2025.

#### 1.5.3 Spatial Scope:

The track of Afak Sports Club.

## Definition of Terms

Intensive training (High-Intensity Training – HIT) in athletics is defined as a training method that relies on exerting maximal physical effort over short time intervals, followed by specific rest periods. By 2026, intensive training evolved from being focused solely on “muscular fatigue” to emphasizing the “improvement of fast-twitch muscle fiber quality.”

## Methodology

### Research Method

Because this investigation called for an experimental approach, the researcher used the comparable groups design. Because testing is one of the best ways to get trustworthy information, this approach allows for the attainment of accurate outcomes.

### Population and Sample of the Study

The research population consisted of youth athletics players specializing in the 110-meter hurdles from Al-Diwaniyah clubs, totaling ten (10) athletes aged 18–19 years, representing Al-Diwaniyah clubs. Using a random selection method, the clubs of Afak, Al-Shamiya, and Nafar were chosen for the 2025 sports season. The research sample was then divided into two equivalent groups (experimental and control), with five (5) hurdlers in each group, after ensuring homogeneity and equivalence of the two groups in the study variables, as shown in Table (1).

Table (1). Shows the equivalence between the two groups in the tests used

No.	Variables	Control Group (Mean)	SD	Experimental Group (Mean)	SD	*t-value	Significance
1	110 m Hurdles Performance	18.98	0.163	18.55	0.281	0.126	Not significant
2	Speed Endurance (150 m)	18.946	0.791	18.958	0.733	0.026	Not significant
3	120 m Run with 12 Hurdles (Endurance)	22.908	0.668	22.866	0.665	0.108	Not significant
4	Vertical Jump from Squat Position for 30 s (Strength Endurance)	48.000	3.224	49.166	2.483	0.100	Not significant

\*The tabulated  $t$  value is (2.228) at a significance level of (0.05) and with (8) degrees of freedom.

## Tools and Equipment Used in the Study

### Tools Used in the Study

1. Arabic and foreign references
2. Thirty (30) hurdles
3. Boxes of different heights

## Equipment Used in the Study

1. Medical scale for measuring height and weight (German-made)
2. Two (2) electronic stopwatches (German-made)
3. Laptop computer (Dell, Chinese-made)
4. Athletics track and field facility

## Tests Used in the Study

### 110-Meter Hurdles Test

- a. Purpose: To measure performance level in the 110-meter hurdles.
- b. Equipment: Ten hurdles (height 0.914 m), whistle, three stopwatches.
- c. Performance Description: The start is from a seated position. Each participant runs the full 110-meter hurdles distance at maximum possible speed. The seated start is an essential technical and legal requirement of the 110-meter hurdles event. The test is performed once, with ten hurdles arranged in a straight line.
- d. Recording: The assisting team records the achieved time to the nearest fraction of a second using the middle stopwatch.

### Vertical Jump from Squat Position Test

Purpose:

To measure strength endurance of the leg muscles.

Equipment:

Whistle and stopwatch.

Performance

Description:

The athlete stands upright. Upon the start signal given by the whistle, the athlete begins jumping by pulling the legs toward the chest continuously for 30 seconds.

Recording:

The assisting team records the total number of jumps performed during the time period.

### 120-Meter Run with 12 Hurdles Test

Purpose:

To measure performance endurance.

Equipment:

Whistle, twelve hurdles, and three stopwatches.

Performance

Description:

Each participant runs a straight 120-meter distance at maximum speed from a standing start while clearing twelve hurdles.

Recording:

The assisting team records the time taken to the nearest fraction of a second using the middle stopwatch.

### 150-Meter Run Test

Purpose:

To measure speed endurance.

Equipment:

Whistle and three stopwatches.

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Performance	Description:
The athlete runs a distance of 150 meters at maximum speed.	
Recording:	
The time taken is recorded to the nearest fraction of a second using the middle stopwatch.	

### **Pilot Study**

The pilot study was conducted on Thursday, 14/2/2025, at 4:00 p.m. on the field of Afak Sports Club. It involved three (3) hurdlers from the research sample.

### **Experimental Design**

Before the experimental variable was introduced and each group was exposed to the experimental treatment, they were all pre-tested to identify their starting status. The first group, which served as a control, followed the coach-designed, conventional training regimen for building particular endurance. To improve their performance and endurance in the 110-meter hurdles event, the second group (the experimental one) underwent intense plyometric training. As shown in Appendix (1), the training program was eight weeks long and consisted of three training units each week.

### **Main Experiment**

#### **Pre-tests and Measurements**

Using the pre-test and post-test method for the control and experimental groups in the Afak Sports Club track for two days, 15-16/2/2025. The following tests were formatted as such:

- Day One: Speed endurance test, followed by a rest period of 15 minutes, then the strength endurance test.
- Day Two: Performance test for the 110-meter hurdles.

#### **Conducting the Training Session**

Researchers administered pre-tests to the experimental group before implementing their training program. Starting on 20/2/2025 and ending on 26/4/2025, the program was running.

#### **Post-tests and Measurements**

After the training program ended on April 26, 2025, the control and experimental groups were given post-tests on April 28, 2025. Similar to the pre-tests, the post-tests were administered in a controlled environment.

### **Statistical Methods**

In order to analyze the data, the researchers used SPSS, which stands for Statistical Package for the Social Sciences.

### **Result and Discussion**

The findings of the 110-meter hurdles pre- and post-tests for the control and experimental groups are presented, analyzed, and discussed in this section.

### **Presentation and Analysis of Pre- and Post-test Results**

This section details the research variables and the experimental and control groups' 110-meter hurdle performance before and after the intervention.

**Table (2).** Statistical parameters (mean and standard deviation) for the pre- and post-tests of both the experimental and control groups, and the calculated *t* value for the 150 m flying start test.

Variable	Group	Pre-test Mean	SD	Post-test Mean	SD	<i>t</i> value	Significance
150 m	Experimental	19.958	0.733	17.468	0.526	4.477	Significant
150 m	Control	19.746	0.791	18.436	0.475	2.659	Significant

Table (3). Statistical parameters (mean and standard deviation) and calculated *t* value for the 150 m run test for the control and experimental groups in the post-test.

Variable	Control Mean	SD	Experimental Mean	SD	<i>t</i> value	Significance
150 m Run	19.436	0.475	18.468	0.526	3.343	Significant

Table (4). Statistical parameters (mean and standard deviation) for the pre- and post-tests of both the experimental and control groups, and the calculated *t* value for the 120 m run with 12 hurdles.

Variable	Group	Pre-test Mean	SD	Post-test Mean	SD	<i>t</i> value	Significance
120 m with 12 hurdles	Experimental	22.866	0.665	20.533	0.691	9.239	Significant
120 m with 12 hurdles	Control	22.908	0.668	21.790	0.614	3.658	Significant

Table (5). The 120-meters hurdles run results post-test of control and experimental groups, statistical characteristics (mean  $\pm$  SD), and the *t* value estimation.

Variable	Control Mean	SD	Experimental Mean	SD	<i>t</i> value	Significance
120 m with 12 hurdles	21.790	0.614	20.533	0.691	3.327	Significant

Table (6). Statistical parameters (mean and standard deviation), and the *t* values calculated for the vertical jump from squat position for 30 sec (pre and post-tests for experimental and control group).

Variable	Group	Pre-test Mean	SD	Post-test Mean	SD	<i>t</i> value	Significance
Vertical jump (30 s)	Experimental	46.167	2.483	50.500	2.738	10.277	Significant
Vertical jump (30 s)	Control	46.000	3.224	48.333	2.422	4.183	Significant

Table (7). Statistical parameters (mean and standard deviation) and calculated *t* value for the post-test of the vertical jump from squat position for 30 seconds for both groups.

Variable	Control Mean	SD	Experimental Mean	SD	<i>t</i> value	Significance
Vertical jump (30 s)	48.333	2.422	50.500	2.738	1.452	Significant

Table (8). Mean and standard Deviation with regard to pre-test & post-test of experimental and control group and t value for 110 meter hurdles performance.

Variable	Group	Pre-test Mean	SD	Post-test Mean	SD	t value	Significance
110 m Hurdles Performance	Experimental	18.55	0.281	17.08	0.618	5.465	Significant
110 m Hurdles Performance	Control	18.98	0.163	18.40	0.147	3.530	Significant

Table (9). Statistical parameters (mean and standard deviation) and calculated *t* value for the post-test results of the control and experimental groups in the 110-meter hurdles performance test.

Table (10). Statistical parameters (mean and standard deviation) and calculated *t* value for the post-test of the control and experimental groups in performance.

Variable	Control Mean	SD	Experimental Mean	SD	t value	Significance
Performance	18.40	0.147	17.08	0.618	4.492	Significant

### Discussion of Pre- and Post-test Results for the Experimental and Control Groups

All of the study variables, including the 150-meter flying start, which measures speed endurance, the 120-meter run with 12 hurdles, which measures performance endurance, the 30-second vertical jump from a squat position, which measures strength endurance, and the 110-meter hurdles performance test, showed statistically significant differences according to the t-test results. These disparities were most apparent between the experimental group and the control group when comparing the pre- and post-tests.

Performance in the control group exceeded expectations and the researcher believes this is likely because they adhered to coach-planned, familiar training sets aimed primarily at the technical motor performance characteristics of the sport. In contrast, the experimental group was assigned strict science-based plyometric training, resulting in much greater pre-/post-test improvement.

One important adaptation of specific endurance training and fatigue resistance is the ability to produce energy in an anaerobic environment, enhancing biomechanical efficiency and performance. It is why athletes dominate training barriers and achieve great athletic performance. In the follow-up tests, the experimental group that completed the high-intensity intense plyometric exercise significantly outperformed the control group. This program included exercises that involved jumping (e.g., body weight, hurdle jumps, and box jumps of varying heights).

This improvement, the researcher suggests, is due to the heavy plyometric training protocol involving numerous jumping drills (additionally over body-load and with additional weights, boxes and hurdles) and the researcher's attention to detail in prescribing the specific rest durations between the multiple sets and repetitions. Some of the well programmed, frequent training, controlled training intensities and ideal patterns of rest time between repetitions leads to the performance enhancement as well. Member feedback

Directly contributing to performance growth include regular and well-programmed training, regulated training intensities, and the use of ideal rest times between repetitions.

### Conclusion

1. All research variables showed statistically significant variations between the pre- and post-test results, with the post-tests coming out on top for both the experimental and control groups.
2. On the post-tests, the experimental group that trained intensively with plyometric techniques showed a statistically significant advantage over the control group.
3. The experimental group improved their explosive strength, speed-strength, and speed endurance more than the control group.
4. The experimental group showed a more significant improvement in 110 m hurdles performance compared to the control group.

### Recommendations

1. Greater emphasis should be placed on training to develop stride length in short-distance running due to its importance throughout all phases of the race.
2. The relationship between ground contact time and flight time for each stride should be studied because of their mutual effect on achieving optimal stride length and frequency.
3. Special endurance training using various methods should be emphasized in short-, middle-, and long-distance running.

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