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The Effect of Plyo-agility Exercises on Improving agility and Developing Defensive Tracking ability in Basketball players Under 18 Years of Age

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Abstract

The purpose of this research is to show analysis about the effect of plyo-agility drills on agility and defensive rebound in under 18 female basketball players. It evaluates the effectiveness of such exercises for enhancing defensive speed and reactive agility. A pre-post with experiment group design tested the effects of exercise on 12 players from Al-Hilla Basketball Club through 24 sessions for 8 weeks. finding the agility time decreased from 12.5 to 8.25 sec indicating superior speed and reaction. Defensive rebounding repetition count was 17.17-24.17 showed a higher defensive reaction. In contrast, plyo-agility training markedly improves agility and defensive performance of volleyball players. It is recommended to integrate regularly and progressively these tasks into the training process of young players, to gradually increase their intensity, and to train on a cyclic basis for the maintenance of improvements.

Keywords: Plyo-Agility exercises, agility, defensive rebounding, basketball, under 18 age group.

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Journal of Physical Education
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https://jcope.uobaghdad.edu.iq

Introduction

Agility is a basketball skill, and since the floor can change shape as inexplicably as a dream while the teams scuttle up and down it screaming to their enemies in quick bursts of gunfire, say, or something like that athletes have to be ready for any new reality they find themselves involved with. But there's a long of a lot more to getting faster than just training the way you always do and being able to change direction (COD) and out-cut some on defense. When it comes to the improvement of these skills, a lot of experts say that what athletes need to do is run agility drills paired with short bursts of explosive activities such as plyometrics to improve their basketball playing ability. Plyo-agility is an explosive combination of plyometric and agility training working to allow the athlete to move in one direction, make a split-second change and move again with great body control. This force-velocity profile is associated with enhancement of physical performance in team sports. Plyometric and agility training could help improve a basketball player's ability to grab that elusive basketball rebound on defense, new research suggests. It does enhance foot quickness, lateral slides and speed into defensive rebounding. These are the same factors that drive a game team's defense. Plyo-agility training is a recent training program that combines plyometric and agility training together, leading to the potential of improving the performance skills in youth players (U18).

The purpose of this study is to examine the effects of plyo-agility exercises on the agility and defensive rebounding ability in basketball players under 18. It is also intended to study how these drills influence the players' defensive physical performance, particularly running with and without change of direction into its high speed demand. Examining such effects may help in designing training programs which are more effective that improve players exposure.

Agility and cutting ability are the most important parameters to determine player performance in team sports, such as basketball. This is a sport that requires athletes to execute sharp, powerful moves on the court in order to keep up with an opponent's offensive and defensive plays – while some would argue at equally high levels. With the growing competition and evolution of team tactics, being able to respond more rapidly to defensive situations has become a necessity, especially among young players such as basketball under-18. But despite the significance of having agility and being able to change direction in an instant, not many coaches was successful in finding a solid training program that they could pass along to their younger players. Traditional conditioning may not have a great influence on defensive power production and little is known about the combination of plyometric and agility drill effects in improving basketball defensive capability. Thus, the problem is that it is necessary to determine if there is plyo-agility training to improve agility and defensive follow-through in those young players.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

The main question

Can plyo-agility exercises improve the agility of basketball players under 18, and increase their ability to develop defensive rebounding by improving the speed of change of direction?

Purpose The purpose of this study is to examine the effects of plyo-agility exercises on agility and defensive rebound performance in under-18 years old basketball players. It is also intended to assess how these drills influence the players' defensive physical capacity - more particularly CS – and his ability to change direction in high velocity. The investigation of these effects can aid in designing better training programs to improve athletes' performance against such game-specific situations.

Research objectives

1. To identify the impact of plyo-agility exercises on improving the agility of basketball players under 18 years of age.
2. To identify the impact of plyo-agility exercises on defensive rebounding in basketball players under 18 years of age.

Research hypotheses

1. There is a statistically significant difference between the pre-test and post-test in improving agility in basketball players under 18 years of age.
2. There is a statistically significant difference between the pre-test and post-test in developing defensive rebounding in basketball players under 18 years of age.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Methodology

The researcher used the experimental method with an equivalent group design due to its suitability to the nature of the research problem. The experimental method is one of the approaches that helps solve some problems related to experimental research in a scientific manner, especially in the field of physical education, due to its rigorous scientific approach within the methods related to scientific research.

Population and Sample

The research population consists of basketball players under the age of 18, specifically players from sports clubs that focus on developing the physical and tactical skills of young players. The ages of the club players in this research range from 18 years and under, which is the age range in which physical skills specific to basketball improve, such as agility, changing direction, and quick reactions to defensive and offensive situations in games. This age is considered suitable for developing skills that contribute to improving defensive rebounding and agility in basketball.

The research sample was selected from 12 players from Al-Hilla Basketball Club under the age of 18 using purposive sampling. This sample was selected with the aim of applying Plyo-Agility (plyometric-agile training) exercises to improve their motor skills, including defensive follow-up. Who were chosen intentionally and then randomly distributed using the method of drawing lots into two equivalent groups, experimental and control, with (5) players in each group.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Table 1. *Anthropometric measurements*

Measurements	Arithmetic mean	standard deviation	Torsion coefficient	median
Height (cm)	174.08	5.02	-0.28	74.5
Weight (kg)	71.00	5.66	-0.32	1.5
Age (years)	16.50	1.00	0.00	6.5
Training Age (years)	2.17	0.94	0.41	.0

Devices and Tools Used

Equipment and Methods Used in the Research: Data Collection Methods Tools and Equipment Used and Data Collection Methods

Research Tools

1. Basketball court.
2. Stopwatch.
3. Basketballs (25)
4. Measuring tape (2)
5. Whistles (4)

Equipment Used

Weight Scale

A digital scale is used to accurately measure the players' weight. Weight measurement helps in analyzing the relationship between weight and agility, as ideal weight contributes to improved physical performance.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Height Measurement

Height is measured using a height measuring device (such as a medical tape measure or an electronic height measuring device) to track height development and analyze its relationship to performance in plyo-agility exercises.

Training Cones

Training cones were used to define the paths that players should follow during rapid direction change drills. This helps measure players' ability to quickly steer and react to real-time path changes.

Speed Steps or Hurdles

Low hurdles or steps were used to train speed of movement. This type of exercise enhances players' ability to change direction quickly and is a component of agility training.

Statistical Analysis Software

SPSS software was used to analyze the statistical data resulting from the sports tests and exercises. The program helps calculate arithmetic means, standard deviation, median, and skewness coefficient for all player-related data (such as height, weight, age, and training age).

Methods of Data Collection

1- Arabic and foreign sources.

2- Tests.

Tests Used in the Research

Agility Test

Among the various tests for measuring agility, the T-Drill test is one of the most widely used in many sports, including basketball, to measure the ability to change direction quickly. This test relies on the player's ability to move quickly and efficiently in a range of different directions.

T-Drill Agility Test

Objective of the Test

This test is designed to assess reaction time and agility, which are key components in basketball, especially on defense by reacting to loose balls and making quick slides.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Required Equipment

- 4 training cones.
- 10-meter distance: The cones are placed 10 meters apart in a "T" shape.

Objective of the Test

The purpose of this test is to assess reaction time and also the ability to change direction, skills that are required in basketball, for example when defending being able to keep track of a quickly responsive attacker.

Required Equipment

- 4 training cones.
- 10-meter distance: The cones are placed 10 meters apart in a "T" shape.

Procedure

1. Four cones are placed on the ground with a distance of 10 meters between the top and bottom cones, and a distance of 5 meters between the two horizontal cones.

2. The player starts at the bottom right corner of the apparatus (Point A).

3. The player begins running in a straight line towards the top cone.

4. Upon reaching the top, the player quickly switches to the right side (Point B), then to the left side (Point C), and finally returns quickly to the starting point.

5. The time it takes the player to complete this route is recorded.

Score Calculation

- The score is the time it takes the player to complete the route.
- For example, if the player takes 12.3 seconds to complete the test, the score will be 12.3 seconds.

Test Name: Defensive Follow-Up

(1) The test has been modified by giving the player one attempt and allowing the player (12) touches of the ball, with the time taken during each touch being recorded.

Test Objective: To measure speed and accuracy in retrieving rebounds in defense.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

Required Equipment: Basketball hoop, basketball, timer

Playing Procedure: The player stands 3 meters from the hoop, which has a line drawn parallel to the ground at a height of 3 meters. The player throws the ball with both hands or one hand towards the hoop and over this line, then steps forward to catch the rebound and returns to the starting line. This process is repeated for 60 seconds.

Exploratory experiment

Pilot study is a prerequisite in scientific research, as it enables the researcher to identify problems that might occur during the larger study procedures. Based on the recorded observations, necessary corrections could be performed to make sure that results were trustworthy and method was good.

The researcher conducted a pilot study on a sample of four players from Al-Karkh Club on February 1, 2025. The objectives of the pilot study were:

1. To test the measurement tools: To ensure the accuracy of the tools used in data collection.

2. To examine the research design: To ensure that the chosen research method is suitable for data collection and analysis.

3. To analyze influencing variables: To identify factors that may affect the main experiment and that need to be controlled.

4. To improve procedures: To refine the methodology and practical steps in the research based on the collected observations.

5. To gather preliminary observations: To identify any problems or difficulties that the researcher may encounter during the experiment.

Pre-testing

This is a trial that is run to see how the tests are reacted to by the target group. By pre-testing, time and cost is saved by ensuring that the target population comprehends the tests that are to be conducted.

The researcher conducted the pre-tests on February 7, 2025, at 10:00 AM.

Exercises

- **Number of training units**: 24 training units.
- **Duration**: 8 weeks.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

● **Number of training sessions per week**: 3 sessions per week.

● **Main objective**: To improve agility and the ability to react quickly in defensive follow-up using advanced exercises.

Phase 1: Preparation (Weeks 1-2)

Objective: Improve flexibility and core strength.

• Adapt to simple agility exercises.

Training Units:

1. Unit 1:

Squat Jumps: 3 sets of 10 repetitions.

Bodyweight Squats: 3 sets of 15 repetitions.

Basic Balance Exercises: 3 sets of 30 seconds.

2. Unit 2:

Agility Ladder: 3 sets of 20 meters.

ZigZag: 3 sets of 20 meters.

Small Hurdle Jumps: 3 sets of 10 repetitions.

3. Unit 3

T-Drill: 3 sets of 5 repetitions.

Small Hurdle Jumps: 3 sets of 12 repetitions. Training intensity: ● At this stage, the focus is on getting used to the nature of the exercise and how to move.

Phase Two: Development (Weeks 3-4)

Objective

● Improve the ability to change direction quickly.

● Develop defensive follow-up in basketball situations.

Training Units

4. Unit 4

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

● Plyo-Agility Exercises (Stair Movement): 3 sets x 10 meters.

● High Hurdle Jumps: 3 sets x 10 repetitions.

● Sprinting with a sudden change of direction between cones: 3 sets x 15 meters.

5. Unit 5

● Defensive Slide Exercises with Footwork: 3 sets x 15 meters.

● Seated Jumps: 3 sets x 12 repetitions.

● Defensive Coverage: 3 sets x 20 meters.

6. Unit 6

● Cone Drills (Quick Change of Direction): 3 sets x 20 meters.

• Sprint running with changes of direction across cones: 3 sets x 20 meters.

• Jumping drill with defensive aiming: 3 sets x 10 repetitions.

Training Intensity

● Sub-maximal intensity, with increased speed and difficulty.

Phase 3: Improvement (Weeks 5-6)

Objective

● Enhance defensive tracking and speed.

● Improve the ability to react to an opponent.

Training Units

Unit 7

● Zig-Zag Agility (Quick Change of Direction): 4 sets x 20 meters.

● Defensive Tracking Against a Moving Opponent: 4 sets x 15 meters.

● Sprinting with Defensive Reaction: 4 sets x 20 meters.

8. Unit 8

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

Advanced Hurdles: 4 sets of 12 repetitions.

Sprint and Return: 4 sets of 15 meters.

Defensive Pursuit with Rebound Pass: 3 sets of 15 meters.

9. Unit 9

Plyo-Agility Test with Shooting: 4 sets of 20 meters.

Defensive Pursuit with Quick Reaction to Basketball: 4 sets of 15 meters.

Repetition of Defensive Moves in Near-Game Conditions: 4 sets of 5 minutes.

Training Intensity: Submaximal Intensity: Focusing on increasing the speed and accuracy of defensive moves.

Phase Four: Mastery (Weeks 7-8)

Objective

Improving defensive reaction under time pressure.

Improving overall defensive follow-up in various situations.

Training Units

10. Unit 10

• Advanced drills for changing direction under time pressure: 4 sets x 30 meters.

• Defensive pursuit drill throughout the game: 5 sets x 15 meters.

• Agility drills aimed at increasing accuracy: 4 sets x 20 meters.

11. Unit 11

• Shadow Defense drill: 4 sets x 20 meters.

• Sprint running with defensive reaction under match conditions: 4 sets x 20 meters.

• Defensive drill with quick substitutions: 5 sets x 15 meters.

12. Unit 12

Mini-defensive match with quick reaction: 5 sets x 5 minutes.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

Continuous defensive pursuit with rapid changes of direction: 4 sets x 20 meters.

- Running with bounce passes under pressure: 4 sets x 15 meters.

Post-Tests

The post-test is one of the tests that trainees take upon completion of the training program to ensure the achievement of the research objectives.After the training modules were implemented, the post-tests were conducted for the research sample on April 7, 2025.The post-tests were conducted under the same conditions as the pre-tests in terms of time, tools, and testing location.

Statistical Methods

Statistical methods are defined as the data that the researcher collects and analyzes to obtain results that help solve the research problem.

The researcher used the Statistical Package for the Social Sciences (SPSS) and some statistical methods to process the research data, namely:

1. Arithmetic mean
2. Standard deviation
3. T-test for paired samples

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

Results

Table 2. *Arithmetic means, standard deviations, calculated t-value, and significance of differences for the experimental group in the pre- and post-test results of the skills tests*

Tests	Unit of Measurement	Pre-test		Post-test		F	p	(T) Calculated	Significance
		S	± A	S	± A				
Agility	Th	12.5	1.17	8.25	0.75	4.25	1.71	-8.60	0.000
Defensive follow-up	repetition	17.17	0.94	24.17	0.94	7.00	1.014	7.26	0.000

The value of (t) is significant ≤ 0.05 at degrees of freedom (11)

Discussion

The researcher explains this development by a more pronounced ability of the players to process defensive situations faster and more reliable. This advancement means that the players have been more successful in defensive rebound and fast break from.

Plyo-agility drills are not only for speed, increasing a player's ability to react quicker to any movement in the game thereby improving defensive play. This improvement is related to being able to move faster and react more quickly to the opponent, crucial for basketball. In addition, better reactions are part of the neuromuscular adaptation to task-specific training in defending strokes and will make the player faster also have a stronger pattern off movement all over their court.

An additional study by Caprić (2022) demonstrates that plyometric exercises not only increase agility but also help with defensive rebounding by developing an explosive first step and ability to attack the opponent quicker. Intensive defensive rebounding appeared to improve the reaction speed and fight against basketball attack (Hussein & Amin, 2020), which is consistent with our test.

The increases in agility and defensive rebounding are also, it should be said, products of the physical changes to muscles and nerve tissue's pathways when the same exercise is undertaken

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

regularly. Fast-twitch muscles are activated via plyometric exercises like jumps and zigzag runs, which help build explosiveness for speed and agility. Over time, these exercises improve muscle oxygenation, increase endurance and become more responsive to changes in the game.

Likewise, you need some neuroplasticity – give your players a supple enough nervous system and they will be able to perform more complex actions and do so faster which was brought out in the tests where players got better.

On basketball, the rapid mobility and defense-follow up can not only help you advance the entire game performance. Agility is not only turning quickly, it's reaction to the opponent, covering space quickly and being part of a dynamic situation in the game. However, you should also train defensive reaction and plyo-agility drills that improve those components as well, which will up your athletic game.

Conclusions

1. Plyo-Agility training had a strong positive effect on agility of basketball players. Test time reduced from pre-test (12.5 s) to post-test (8.25 s), suggesting that the athletes were better able to respond rapidly to changes in direction during game play.
2. The findings revealed that the number of defensive rebounds per player has significantly enhanced from 17.17 to 24.17 due, while the rebounders are better to trap their opponent quickly simultaneously.
3. Fast, forward-focused responding and complete coverage of the court have helped to improve defensive skills while also allowing players to chase after their opponents more effectively.
4. The level of improvement was significant statistically in both tests ($p < 0.05$) which means that the players had a significantly improved performance and it is not due to chance but to intensive practice.
5. Hyperfolic feeding during the whole training cycle became pivotal in improving their physical status. The end of phase intensity was very high (80%-90 %) which significantly elevated players' strength to tolerate pressure and also contributed changes in some aspects of their defense.
6. It is recommended to continue plyo-agility training as a core component of basketball players' training programs, as it has proven effective in improving agility and defensive performance. Combining plyometric and agility exercises can be key to enhancing overall performance.
7. It is recommended that one steadily raise the intensity of training over the course of the training season as high-intensity in late stages has led to impact performance positively. It is necessary to modulate the intensity of training according to the players' stage of development.
8. For defense, you should have at least drills working on getting to your opponent quickly (reaction time) and being able to get back in the play up the court; because these are basing

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
P-ISSN: 2073-6452, E-ISSN: 2707-5729
https://jcope.uobaghdad.edu.iq

foundation skills of basketball. Teaching defensive players the angles of pursuit and rapid change of direction situations in a game setting helps them maintain tempo with their opponent.

9. Periodic agility and defensive tracking tests are needed. These will act as a kind of ongoing progress indicator and hard evidence that the training is effective.
10. It is advised to use drills that mimic game-like situations and the time pressured environments of a real game. These are drills that will improve the reaction time of your players and make them better defenders in crucial game situations.
11. This technique could be applied in other basketball clubs especially with the youth categories, where agility and defensive movement skills might develop better interpretations to support an increased performance in forthcoming years.

Journal of Physical Education
Volume 38 – Issue (1) – 2026 Open Access
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https://jcope.uobaghdad.edu.iq

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