ISSN Print: 2664-7559
ISSN Online: 2664-7567
IJSHPE 2025; 7(2): 101-104
Impact Factor (RJIF): 8.19
www.physicaleducationjournal.in
Received: 22-05-2025
Accepted: 24-06-2025

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Agility and motor coordination and their relationship to high jump effectiveness in junior athletes

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DOI: https://www.doi.org/10.33545/26647559.2025.v7.i2b.233

Abstract
Purpose
This study aims to:
1. Identify the correlation between selected motor abilities and high jump performance among junior athletes.
2. Determine the most critical motor abilities associated with high jump effectiveness.

Hypothesis
It is hypothesized that there is a statistically significant correlation between agility, coordination abilities, and high jump performance among junior athletes.

Methodology
The descriptive method with a correlational approach was used to address the research problem. The study was conducted on junior high jumpers at the Hillah Youth Forum in Babil Governorate. The population comprised 18 athletes, with a sample of 14 juniors selected for the study. Two athletes were excluded due to absence from the main experiment.

Research Domains
- **Human Domain:** Junior high jumpers at the Hillah Youth Forum, Babil Governorate.
- **Time Domain:** December 2, 2024 – February 2, 2025.
- **Spatial Domain:** High jump arena at the Hillah Youth Forum, Babil Governorate.

Procedures
An exploratory experiment was conducted on December 1, 2024, to ensure:
- Validity and reliability of the equipment and tools used.
- Measurement of the time required to conduct the experiment.
- Identification and organization of support staff roles.
- Assessment of the research sample's understanding of the experimental process.

The main experiment was conducted on December 8, 2024, at the high jump arena of the Hillah Youth Forum. Tests included agility and motor coordination assessments, followed by a high jump performance evaluation.

Keywords: Agility, motor, high jump, junior athletes

1. Introduction

1.1 Background and Significance of the Study

The most advanced nations in various fields are those that allocate significant and effective attention to physical education within both educational and training processes. The objectives of physical education extend beyond the cognitive dimension to encompass the enhancement of physical and motor abilities as well as the mastery of basic skills, tailored to the individual capabilities of athletes. This approach also recognizes the variation in intellectual levels among coaches, highlighting the importance of adopting evidence-based methodologies in skill classification and development to achieve high-quality, efficient performance [1].

High jump training is characterized by a certain degree of technical difficulty, as the high jump is one of the most critical events in track and field athletics. It is among the key events in which athletes can accumulate a substantial number of points, thereby directly influencing competitive standings and final results. This makes it essential to focus on developing the motor abilities that contribute to technical mastery in the high jump discipline.

1.2 Research Problem: Achieving elite athletic performance and notable accomplishments is a central goal for all stakeholders in sports.

This objective necessitates diligent effort and methodical planning grounded in sound scientific principles, free from subjective interpretations.

Through the researcher's observations of high jump athletes at the College of Physical Education and Sports Sciences, University of Babylon, it became evident that successful high jump performance demands the targeted development of agility and motor coordination. These two abilities play a pivotal role in mastering the technical requirements of the high jump. Therefore, this study seeks to identify the relationship between specific motor abilities-particularly agility and coordination-and high jump performance, with the aim of providing practical guidance for training and educational programs directed toward junior athletes.

1.3 Research Objectives

- To examine the correlation between selected motor abilities and high jump performance among junior athletes.
- To identify the motor abilities most closely associated with effective high jump execution.

1.4 Research Hypothesis

There is a statistically significant correlation between agility, coordination abilities, and high jump performance among junior athletes.

1.5 Scope of the Study

1.5.1 Human Domain: Junior high jump athletes at the Hillah Youth Forum, Babil Governorate.

1.5.2 Time Domain: December 1, 2024 – February 2, 2025.

1.5.3 Spatial Domain: High jump arena, Hillah Youth Forum, Babil Governorate.

2. Research Methodology and Field Procedures

2.1 Research Design

This study employed the descriptive method with a correlational approach to address the research problem and examine the relationship between selected motor abilities—specifically agility and coordination—and high jump performance among junior athletes.

2.2 Research Sample

The research population consisted of junior high jump athletes at the Hillah Youth Forum, Babil Governorate (N = 18). The study sample comprised 14 athletes, with two players excluded due to absence from the main experiment.

2.3 Tools and Equipment

The following equipment and tools were utilized in data collection [2]:

- High jump training ground at the Hillah Youth Forum.
- Activity mat.
- Hand pillows.
- Two stopwatches.
- Five-meter fabric measuring tape.
- Lenovo computer.
- Sony 13x video camera.
- Fluorescent adhesive tape.
- Scissors.
- Model (2).

2.4 Identification of Motor Abilities and Corresponding Tests [3]

The researcher determined the relevant motor abilities for high jump performance through a review of specialized literature, previous studies, and technical references. Agility and coordination were identified as the focus abilities, with corresponding tests selected from established measurement protocols (Table 1).

Table 1: Motor abilities, skills, and corresponding tests.

Motor Ability	Test Description
Agility	Running and changing direction (6 × 5 m) from a high start.
Coordination	Hand-to-hand shooting at overlapping rectangles.
High Jump Performance	Jumping over the crossbar onto a mat.

Agility Test – Running and Changing Direction (6 × 5 m) [4]

- **Objective:** Measure agility.
- **Equipment:** Flat ground, stopwatch, seven markers.
- **Setup:** Markers are positioned to create a zig-zag pattern. The first marker is on the starting line; the second is placed 5 m to the left; the third is 5 m to the right of the second marker, and so on until the sixth marker and finish line.
- **Procedure:** The athlete starts behind the first marker and runs toward each marker in sequence, changing direction according to the pattern.
- **Scoring:** Time to completion is recorded in seconds.

Coordination Test – Hand-to-Hand Shooting at Overlapping Rectangles [5]

- **Objective:** Measure eye–hand coordination.
- **Equipment:** Five tennis balls, wall with three overlapping rectangles, flat ground, measuring tape.
- **Rectangle Dimensions**

1. **Small:** 20 × 40 cm
2. **Medium:** 40 × 60 cm
3. **Large:** 80 × 60 cm (Lower edge of rectangles set at 180 cm above ground; a shooting line drawn 5 m from the wall).

- **Procedure:** The athlete stands behind the line and throws five balls in sequence, aiming at the smallest rectangle. Either hand may be used.
- **Scoring**
  - **Small rectangle:** 3 points.
  - **Medium rectangle:** 2 points.
  - **Large rectangle:** 1 point.
  - **Outside all rectangles:** 0 points.

2.4.3 High Jump Performance Test [6]

- **Objective:** Assess technical execution of the high jump.
- **Equipment:** High jump mat, crossbar, evaluation form, video camera.
- **Procedure:** Each athlete performs three attempts jumping to the right and three to the left over the crossbar under official event conditions.
- **Scoring:** A maximum of 10 points is awarded for correct performance, based on the best of the three attempts.

2.5 Exploratory Experiment

An exploratory experiment was conducted on December 1, 2024, to:

- Verify the validity and reliability of equipment and tools.

- Determine the time required for each test.
- Assign and familiarize support staff with their responsibilities.
- Ensure the participants understood the testing procedures.

2.6 Main Research Experiment
The main experiment was conducted on February 2, 2025, at the high jump arena of the Hillah Youth Forum. Tests administered included [7]:

- Agility Test (Running and Changing Direction).
- Coordination Test (Hand-to-Hand Shooting at Overlapping Rectangles).
- High Jump Performance Test.

2.7 Statistical Analysis
Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. The following statistical methods were applied:

- Mean.
- Standard deviation.
- Pearson correlation coefficient (*r*).

3. Results
3.1 Presentation and Analysis of Results
3.1.1 Correlation between Research Variables
Table 1. presents the descriptive statistics and Pearson correlation coefficients between the selected motor abilities (agility and coordination) and high jump performance among junior athletes.

Table 1: Correlation between motor abilities and high jump performance.

Variable	Mean	SD	Pearson's r
Agility	13.15	1.22	0.55
High Jump	12.12	2.32	—
Coordination	3.93	1.67	0.87
High Jump	11.12	2.74	—

Analysis of Table 1 shows that the Pearson correlation coefficient between agility and high jump performance was 0.55, indicating a statistically significant positive correlation. Similarly, the correlation coefficient between coordination and high jump performance was 0.87, which also represents a statistically significant positive correlation. These findings confirm the research hypothesis that agility and coordination abilities are strongly associated with high jump performance.

3.2 Discussion of Results
The results of the study indicate that both agility and coordination have a significant positive relationship with high jump performance among junior athletes. This is consistent with established sports science literature, which emphasizes the critical role of motor abilities in technical events such as the high jump [8].

Agility plays a crucial role in enabling athletes to execute rapid and precise movements, particularly in the approach run and take-off phases of the high jump. Coordination, on the other hand [9], allows for the efficient synchronization of body segments, contributing to proper technique during the jump and bar clearance [10].

The researcher attributes these results to the fact that developing coordination and agility enhances an athlete's ability to regulate body positions, adapt to dynamic movement patterns, and execute technical elements at the optimal time [11]. This not only improves performance efficiency but also supports the athlete's ability to apply training methods effectively under competitive conditions [12].

Furthermore, the availability of high levels of agility and coordination allows athletes to achieve greater technical precision, optimize energy use during jumps, and maintain consistent performance across repeated attempts [13]. These findings reinforce the importance of integrating targeted agility and coordination drills into training programs for high jump athletes, especially at the junior level where foundational skill development is critical [14].

4. Conclusion and Recommendations
4.1 Conclusion
Based on the study's findings, the following conclusions were drawn:

1. There is a statistically significant positive relationship between agility and high jump performance among junior athletes.
2. There is a statistically significant positive relationship between coordination and high jump performance among junior athletes.

4.2 Recommendations
In light of the conclusions, the researcher recommends the following:

1. Coaches should emphasize agility and coordination exercises within high jump training programs.
2. Motor abilities-particularly agility and coordination-should receive focused attention during the training process.
3. Future research should involve larger sample sizes to confirm and strengthen correlation findings.
4. Similar studies should be conducted to examine the role of motor abilities in other athletic skills.

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