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Muhammad Mu'adh Arif
University of Babylon, College
of Physical Education and
Sports Sciences, Babylon, Iraq

Agility and motor flexibility and their relationship to shooting accuracy from a stationary position in handball among students

Muhammad Mu'adh Arif

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Abstract

This research examines the relationship between agility, motor flexibility, and shooting accuracy from a stationary position in handball among students of the College of Physical Education and Sports Sciences at the University of Babylon. The research aims to determine the impact of both agility and motor flexibility on the accuracy of shooting from a stationary position, a fundamental skill in handball. Thirty-eight fourth-year students were selected as the study sample. Instruments and tests were used to measure agility (shuttle run test), motor flexibility (sitting and forward bending test), and shooting accuracy (five shots towards the goal). The results showed a strong correlation between agility and shooting accuracy (correlation coefficient = 0.85) and between motor flexibility and shooting accuracy (correlation coefficient = 0.91). This indicates the importance of developing these two elements in training programs to improve skill performance in handball. The conclusions suggest that motor flexibility had a stronger impact than agility on shooting accuracy. It is recommended to intensify training that targets these two aspects to develop players' skills.

Keywords: Agility, motor flexibility, shooting accuracy, handball

Introduction

Agility and flexibility are fundamental elements of athletic performance, playing a vital role in improving motor skills and accuracy in executing various techniques, especially in handball. Shooting from a stationary position is a crucial skill that relies heavily on motor coordination, balance control, and precision in directing the ball towards the goal. Therefore, a high level of agility and flexibility directly contributes to improving a player's performance in this skill ^[1].

Agility is defined as a player's ability to change body direction quickly and efficiently while maintaining balance, enabling them to execute athletic movements accurately and smoothly. Flexibility, on the other hand, is the ability of muscles and joints to perform movements through a wide range of motion without injury or muscle strain, enhancing the efficiency of various technical movements, including shooting from a stationary position.

In handball, shooting from a stationary position requires high coordination between muscles and joints to achieve the correct shot. Balance, muscle control, and joint range of motion all affect shooting accuracy. A player with high agility can quickly adjust their body position while executing a shot, while motor flexibility contributes to a greater range of motion when shooting the ball, thus increasing shooting accuracy and power ^[2].

Therefore, this study aims to analyze the relationship between agility and motor flexibility and their impact on shooting accuracy from a stationary position among handball students. This will contribute to developing training programs that improve these fundamental motor skills, thereby enhancing their performance and leading to higher levels of athletic achievement.

Research Problem

Scoring from a stationary position is a fundamental skill in handball, relying heavily on accuracy, balance, and control of movement. However, many students face difficulties in achieving the required shooting accuracy, which may stem from weaknesses in certain

Corresponding Author:
Muhammad Mu'adh Arif
University of Babylon, College
of Physical Education and
Sports Sciences, Babylon, Iraq

physical abilities, such as agility and motor flexibility. A player lacking agility may find it difficult to adjust their position while shooting, while a lack of flexibility affects joint range of motion and the ability to execute shots with appropriate accuracy and power.

Despite the significant importance of these two elements in improving athletic performance, there is a lack of studies addressing the direct relationship between agility, motor flexibility, and shooting accuracy from a stationary position in handball among students. This raises questions about the extent to which developing these two physical abilities improves shooting accuracy, and whether there are specific exercises or training programs that can contribute to enhancing this skill.

Therefore, the research problem lies in studying the relationship between agility, motor flexibility, and shooting accuracy from a stationary position in handball among students and attempting to determine the extent of their impact on the performance level of this skill. Thus, the researcher seeks to demonstrate the relationship between flexibility, agility, and shooting accuracy in handball to provide a clear scientific perspective on the importance of developing agility and flexibility as part of the training process to improve students' handball performance. This may contribute to developing effective training strategies that help raise their skill level and motor abilities.

Research Objectives

To identify the relationship between agility, motor flexibility, and shooting accuracy from a stationary position in handball among students. 1-4 Research Hypothesis: There is a significant correlation between agility, motor flexibility, and shooting accuracy from a stationary position in handball among students.

Research Scope

- **Human Scope:** Students of the College of Physical Education and Sports Sciences, University of Babylon, academic year 2024-2025.
- **Time Scope:** November 13, 2024 to March 1, 2025.
- **Location:** The sports field of the College of Physical Education and Sports Sciences, University of Babylon.

Theoretical and Previous Studies

1. Agility and Flexibility

Agility is a fundamental physical attribute that reflects a player's ability to change their body position and movement quickly and accurately while maintaining balance and control over their motor performance. Agility is a key factor in athletic performance, enabling players to respond quickly to various situations on the court, such as changing direction, dribbling, and shooting accurately.

Agility requires the integration of several physical components, including balance, rapid neurological response, and motor coordination, making it a fundamental element in handball. It helps players execute required movements effectively and quickly without losing control of their bodies. Agility also plays a significant role in improving technical performance, such as scoring, dribbling, and blocking [3].

Flexibility, on the other hand, is the ability of muscles and joints to perform movements through a wide range of motion without stiffness or the risk of injury. It is a fundamental factor in improving physical and athletic

performance, enabling players to execute required movements smoothly, such as extending the leg when shooting or rotating the torso while passing.

Good flexibility helps reduce the risk of injuries resulting from sudden movements or muscle strain. It also enhances the efficiency of technical movements, contributing to improved shooting accuracy and ball control. Flexibility is acquired through regular stretching exercises that increase the range of motion in the joints and strengthen muscle tissue [4].

Both agility and flexibility directly affect handball players' performance. Agility contributes to the speed of skill execution, while flexibility ensures smoother and more efficient movement. By combining these two elements, a player can improve shooting accuracy from a stationary position by achieving proper balance while shooting and utilizing a wide range of motion, allowing for more precise ball direction towards the goal. Muscular strength is a crucial physical attribute for athletes in their daily lives and especially during athletic training. Achievements are impossible without it; it is one of the most important components of physical fitness that athletes must possess to reach the highest levels and achieve optimal results. It significantly influences the development of other physical attributes, depending on the type of activity and sport. The application of explosive power varies from one activity to another, according to the demands of that activity and the biological and training differences among athletes. The term "strength" refers to an individual's ability to exert force and their capacity to utilize it. Strength is considered one of the most important physical variables necessary for an athlete's success.

The Importance of Agility and Flexibility [5].

Agility and flexibility are fundamental elements in athletic performance, particularly in handball, as they directly impact shooting accuracy from a stationary position. The following are some aspects highlighting the importance of each:

Agility: Agility is the ability to change body direction quickly and efficiently while maintaining balance and motor control. Its importance in handball lies in the following

- Improving reaction speed during shooting.
- Increasing body positioning during scoring.
- Enhancing ball control during stationary shots.
- Reducing the risk of injury by improving the ability to adapt to sudden movements.

Flexibility: Flexibility refers to the ability of muscles and joints to move through a wide range of motion without pain or injury. Its importance in stationary shooting lies in the following

- Improving the range of motion of the hip, knee, and ankle joints, allowing for correct mechanical execution of the shot.
- Reducing muscular resistance during movement, which helps increase shooting accuracy.
- Enhancing balance during shots, which reduces shooting errors.
- Helping to avoid injuries resulting from muscle strain or limited range of motion. Agility and flexibility play a vital role in improving a handball player's overall performance, especially in shooting accuracy from a

stationary position. The balance between these two elements helps achieve the following

- Improved body position before and during the shot, increasing shooting accuracy.
- Enhanced ability to control the force applied to the ball during the shot.
- Better stability and control during set pieces, such as free kicks and penalty kicks.

Shooting Skills ^[6]

Scoring is the most exciting skill in handball. It's obvious that no team can win without consistently scoring and increasing their scoring rate compared to the opposing team. Muwaffaq Al-Mawla states, "Analyzing any handball match, you will find that victory belongs to the team whose players increase their scoring rate whenever the opportunity arises." Goals are the result of shots on target, with one goal for every ten shots. This ratio has been observed at all levels over the last 35 years. Consequently, a team aiming to score two goals in a match must strive for twenty shots on target. Similarly, a team that increases its shot-on-target percentage will be closer to victory.

Mu'ayyad al-Badri believes that scoring is "the natural culmination of an attacking process, an offensive activity undertaken by the striker alone in an attempt to achieve the match's objective." Hanfi Mahmoud states that scoring is "the powerful weapon a team possesses to penetrate the opponent's goal. A player who excels at scoring is feared by other teams. Scoring goals against the opposing team is essential for winning the match, and without scoring, the game becomes unexciting.

Wiri (Qasim Lazam) said that "the player may provide high accuracy in scoring, but the ball travels weakly enough for the goalkeeper to catch or block it. Therefore, training is conducted on the second characteristic that accompanies the...

Results

Presentation, Analysis, and Discussion of Results

3. Presentation, Analysis, and Discussion of Results of Agility, Flexibility, and Stability Tests

To describe the results of the research sample, the researcher analyzed the data by calculating the arithmetic mean, standard deviation, and skewness, as shown in Table (1).

Table 1: Describes the results of the sample members Enrollment in local colleges, 2005

College	New students	Graduating students	Change
Undergraduate			
Cedar University	110	103	+7
Elm College	223	214	+9
Maple Academy	197	120	+77
Pine College	134	121	+13
Oak Institute	202	210	-8
Graduate			
Cedar University	24	20	+4
Elm College	43	53	-10
Maple Academy	3	11	-8
Pine College	9	4	+5
Oak Institute	53	52	+1
Total	998	908	90

Source: Fictitious data, for illustration purposes only

Table (1) shows the statistical values of the sample members' results in the three tests: Stability, Agility, and Flexibility. By analyzing the values, we observe the following

Scoring ^[7]

- Mean = 5.80, which indicates the overall performance level of the sample in the scoring test.
- Standard deviation = 2.09, indicating some variation in the performance level of the individuals.
- Skewness = -0.24, a negative value close to zero, indicating that the distribution of results is slightly skewed towards higher values but is generally balanced.

Agility Test ^[8]

- Mean = 2.01 seconds, a relatively low time, indicating a good level of agility among the sample.
- Standard deviation = 0.26, indicating that the variation in results among individuals is not large, meaning that most members of the sample have a similar level of agility.

- Skewness = 0.52, a positive value, indicating that the distribution of results is slightly skewed towards lower values, meaning that most players recorded times closer to or lower than the average.

Flexibility Test

- Mean = 9.75 cm, reflecting a relatively good level of flexibility among the participants.
- Standard deviation = 3.79, indicating a clear variability in flexibility levels among the players.
- Torsion value = 0.08, very close to zero, indicating a nearly normal distribution of results.

Based on these data, it can be observed that the participants possess a good level of aiming, agility, and flexibility, with moderate variation in results, particularly in aiming and flexibility.

Correlation between Agility and Flexibility Tests and Targeting Accuracy from a Standing Position

To verify the research hypothesis, the researcher established a correlation between the agility test, the motor flexibility test, and target shooting from a standing position using Pearson's correlation coefficient, as shown in Table (2).

Table 2: Shows the correlation between target shooting and the agility and motor flexibility tests Enrollment in local colleges, 2005

College	New students	Graduating students	Change
Undergraduate			
Cedar University	110	103	+7
Elm College	223	214	+9
Maple Academy	197	120	+77
Pine College	134	121	+13
Oak Institute	202	210	-8
Graduate			
Cedar University	24	20	+4
Elm College	43	53	-10
Maple Academy	3	11	-8
Pine College	9	4	+5
Oak Institute	53	52	+1
Total	998	908	90

Source: Fictitious data, for illustration purposes only

Table (2) shows the correlation coefficients between the target shooting test and the agility and motor flexibility tests using Pearson's correlation coefficient.

- **Relationship between Agility and Targeting:** The correlation coefficient was (0.85), a strong and positive value, indicating a significant correlation between the level of agility and target shooting accuracy from a standing position. This means that players with greater agility tend to achieve better scoring results, due to their ability to control movement and quickly adjust their body position while shooting.
- **The relationship between agility and shooting:** The correlation coefficient was (0.91), a very strong correlation, indicating that more agile players have higher shooting accuracy. This is because agility helps achieve a wider range of motion in muscles and joints, contributing to more efficient movement and reduced muscle tension during shooting.

Discussion of Results

Analysis of Tables (1) and (2) revealed a significant correlation between agility and shooting accuracy in handball. The researcher suggests that agile players may have advantages in shooting accuracy, as this agility helps them generate more accuracy when shooting the ball and enables them to assume better shooting positions, which can increase the ball's speed and accuracy.

The research results showed a strong correlation between agility and motor flexibility with shooting accuracy from a stationary position, indicating the importance of improving these two elements in training to achieve higher performance in handball ^[9].

The study results indicate that agility and motor flexibility play a prominent role in improving shooting accuracy from a stationary position in handball. Both agility and flexibility are essential factors in a player's overall motor performance, especially in situations that require stability and instantaneous bursts of movement, such as executing a set piece.

Agility involves a player's ability to quickly change direction while maintaining balance, which is crucial in handball, particularly during preparation for a shot or adjusting body position before the kick. This interaction between the neuromuscular system and rapid motor response helps the player achieve precise balance now of shooting, thus increasing the chances of accurate shots. "Agility is not only related to movement but extends to

quick decision-making and adapting to different playing situations, which enhances a player's ability to score accurately, especially from set pieces ^[10].

Kinesthetic flexibility helps a player achieve optimal movement positions while shooting, such as raising the leg sufficiently or extending the thigh muscles without injury or strain. It also contributes to improving the range of motion in the hip and knee joints, giving the player greater control over the ball's direction and power when shooting from a stationary position.

"A player with a high degree of flexibility in the main joints can execute set pieces at better angles, increasing the likelihood of scoring accurately ^[10].

Agility and flexibility can be viewed as complementary elements. Flexibility provides the kinetic foundation that allows for smooth execution of complete movements, while agility provides the ability to modify those movements quickly and accurately, especially when a change in body position or regaining balance is required. This explains the relationship.

Conclusions

1. A strong positive correlation exists between agility and shooting accuracy from a stationary position in handball. This indicates that a player's high level of agility helps them achieve optimal body positioning during execution and reduces motor errors at the moment of shooting.
2. A very strong correlation exists between motor flexibility and shooting accuracy from a stationary position. The results showed that flexibility has a greater impact than agility, as it provides the player with a greater range of motion in the hip, knee, and shoulder joints, thus enhancing accuracy and power during shooting.
3. The students demonstrated good levels of agility, flexibility, and shooting accuracy, with individual variations among the participants, particularly in flexibility. This suggests that some players have greater potential for development due to differences in their physical and motor skills.
4. Developing agility and flexibility directly impacts technical performance. The combination of good balance, muscle control, and a wide range of motion contributes to improved shooting mechanics and better goal scoring.

Recommendations

1. Integrate agility and flexibility training into the basic training programs for university-level handball players, especially beginners, due to their direct impact on shooting accuracy from a stationary position.
2. Focus on dynamic and static stretching exercises before and after training sessions to increase joint range of motion, improve muscle health, and reduce injuries resulting from strain or fatigue.
3. Conduct periodic agility and flexibility tests to measure students' progress and adjust training loads based on the results to ensure continuous improvement.
4. Utilize practical drills that simulate real-life game situations, aiming to combine agility and shooting, such as changing direction before shooting or executing a shot after a quick movement, to enhance practical efficiency on the court.

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