ISSN: 2798-7345 (online)
ISSN: 2830-2648 (print)
JOURNAL OF EDUCATION AND SPORT SCIENCE (JESS)
http://publikasiilmiah.unwahas.ac.id/index.php/JESS
Vol (7) No (2)

Flexibility and Its Relationship with Jump-Shot Accuracy According to the Wing Position in Handball Players in Wasit Governorate

[1]Hasaneen Abbas Fadhel*
hasaneen.alfatlawi@uowasit.edu.iq

Sajad Iyad Hadi Al-Harkani[2]
Sajjada.hadi621@uowasit.edu.iq

[1,2] **College of Physical Education and Sports Sciences, University of Wasit, Kut, Iraq**

Abstract

The study aimed to investigate the relationship between flexibility and jump-shot accuracy from the wing position among handball players in Wasit Governorate. Flexibility training is considered one of the essential components that should receive particular attention during specialized training. Therefore, specific exercises should be incorporated to develop flexibility associated with jump-shot accuracy from the wing position, thereby contributing to more efficient use of time and effort and providing coaches with an effective training means for achieving optimal performance outcomes.

Based on the researchers' experience in handball as a former player, current coach, and university lecturer, it was observed that many coaches do not adequately consider modern training methods and approaches for developing the flexibility component, particularly the trunk flexibility required by wing players. This observation constituted the research problem and guided the selection of an appropriate methodological approach to address it. The researchers employed a **descriptive research design**, given its suitability to the nature and objectives of the study.

The main findings indicated a strong relationship between the range of spinal extension and jump-shot accuracy in handball. A strong relationship was also found between the dynamic movement of the spine around its vertical axis and shooting accuracy. The researchers recommend emphasizing the development of trunk flexibility among first-division handball teams, particularly teams that lack an alternative player capable of performing effectively in the wing position. They also recommend increasing collaborative research between college faculty members and coaches from various sports to contribute to the advancement of high-performance sport.

Keywords: flexibility; accuracy; wing position; handball.

1. Introduction

Development has encompassed all aspects of human life, and such progress is the result of sound planning, systematic approaches, and the continuous efforts of scientists and

researchers to achieve desired outcomes across various fields, including the field of sports. This development necessitates the adoption of new requirements to achieve high levels of athletic performance while taking into account individual differences among athletes in general and in handball in particular.

Handball is a team sport that requires a high level of physical and technical abilities, including strength, speed, flexibility, and other physical attributes. The game is characterized by dynamic and exciting offensive actions that attract spectators; consequently, most of its fundamental skills are offensive in nature. The execution of these offensive skills requires specific physical capabilities, particularly flexibility during shooting actions performed by wing players. This is especially important because left-handed players are relatively difficult to recruit for the wing position, which may compel coaches to assign right-handed players to this position.

Therefore, players need to effectively utilize their physical and technical abilities during matches to compete efficiently and contribute positively to team performance. In particular, effective coordination between wing players and the rest of the team is essential for achieving the tactical and performance objectives of the game.

The significance of the present study lies in examining the relationship between flexibility and shooting accuracy from the wing position in handball, particularly with respect to the shooting arm, in order to obtain improved team performance and enhance the player's performance level during competition.

1.2 Research Problem

Handball is a team sport characterized by excitement and dynamic performance, requiring comprehensive preparation of its players in the technical and physical aspects, in addition to tactical and psychological preparation. Individual physical and technical characteristics play a prominent and effective role in achieving advanced competitive standings when they are appropriately reflected in final performance during competition.

Based on the researcher's experience as a former handball player, a handball coach in local clubs, and a faculty member at the College of Physical Education and Sports Sciences, University of Wasit, it was observed that most coaches pay insufficient attention to flexibility and shooting accuracy from the wing position. Instead, greater emphasis is often placed on shooting from positions directly in front of the goalkeeper.

Accordingly, the researcher considered it important to investigate this problem and examine the relationship between flexibility and the accuracy of cross-body shooting from the wing position, with the aim of identifying appropriate solutions that may contribute to achieving positive performance outcomes for the team. This motivated the researcher to conduct the present study entitled:

“Flexibility and Its Relationship with Jump-Shot Accuracy According to the Wing Position in Handball Players in Wasit Governorate.”

1.3 Research Aim

- To identify the relationship between flexibility and shooting accuracy from the wing position using the shooting arm.

1.4 Research Hypothesis

- There is a statistically significant correlation between trunk flexibility and shooting accuracy from the wing position.

1.5 Scope of the Study

1.5.1 Spatial Scope

Maytham Habib Sports Hall, Wasit Governorate, Iraq.

1.5.2 Temporal Scope

From November 5, 2025, to January 5, 2026.

1.5.3 Human Scope

Handball players in Wasit Governorate.

2. Research Methodology and Procedures

2.1 Research Design

The researcher employed the **descriptive research design**, as it was considered appropriate to the nature of the study.

2.2 Research Sample

The research sample consisted of **20 handball players from Wasit Governorate**, representing a sample of the research population, which comprised **80 players**. Thus, the sample represented **25% of the total population**. The participants were selected using a **purposive sampling method**.

2.3 Instruments and Equipment Used in the Study

- Handball court
- Measuring tape
- Chalk
- Stopwatch
- Whistle

Tests:

1. **Flexibility Tests**

Test 1: Trunk Rotation Flexibility to Both Sides

Purpose of the test: To measure spinal flexibility in terms of the **dynamic range of motion around the vertical axis**.

Equipment: Wall, measuring tape, and chalk.

Test Procedure:

1. A vertical line was drawn on the wall perpendicular to the floor. This line was extended downward to the point of contact with the floor, from which another line was drawn on the floor perpendicular to the wall line.
2. At shoulder height, a scale ranging from **0 to 75 cm** was marked on the wall. The **35-cm mark** was positioned opposite the participant's shoulder to measure right-arm movement. Another scale ranging from **75 to 0 cm** was marked slightly below it to measure left-arm movement, with the 35-cm mark aligned with the participant.
3. The participant stood with the **left side of the body facing the wall**. The distance between the participant and the wall was equal to the length of the left arm when extended laterally. The toes were positioned in contact with the line marked on the floor.
4. The participant raised the right arm laterally and rotated the trunk to the right, attempting to touch the upper scale at the furthest point that could be reached.
5. To measure flexibility toward the left, the participant stood with the **right shoulder facing the wall**, raised the left arm laterally, and rotated the trunk to perform the same movement, attempting to touch the lower scale at the furthest point that could be reached.
6. The participant's feet were not permitted to move during the performance.
7. The knees were not permitted to flex during the performance.
8. The participant was required to maintain the final position for **two seconds** at the maximum point reached, while strictly adhering to the specified performance requirements.

Scoring: The distance reached by the participant was recorded to the nearest possible centimeter *(Mohamed Sobhi Hassanein, 1987, p. 337)*.

Test 2: Shoulder Flexibility

Purpose of the test: To measure shoulder flexibility.

Equipment: A vertical graduated stand marked in centimeters and fixed to the floor. The zero point of the scale was positioned parallel to the floor. A small horizontal movable bar was attached to the stand and could be moved upward and downward along the graduated support.

Test Procedure:

- From a supine position, with both arms extended overhead, the participant held a ruler with both hands, keeping it parallel to the floor. The participant then moved the arms backward to the maximum possible distance without flexing the elbows.
- The examiner, seated in front of the participant, raised the movable bar until it touched the lower surface of the ruler held by the participant.
- The participant was not permitted to flex the elbows.

- The participant was required to maintain the maximum position reached for **two seconds**.
- The participant was allowed **two attempts**, and the better result was recorded.

Scoring: Shoulder flexibility was determined as the vertical distance, in centimeters, from the floor to the movable bar touching the lower surface of the ruler held by the participant.

2. Shooting Accuracy Test from the Wing Position

Test Name: Jump-Shot Accuracy Test from the Wing Position

Purpose of the test: To measure **jump-shot accuracy** from the wing position.

Equipment and Materials:

- Eight regulation handballs.
- Four square targets attached to the four corners of the goal. Each target measured **60 × 60 cm**.
- A starting line marked **11 m from the goal line**.

Test Procedure: The player held the ball and stood at the starting point. Upon hearing the starting signal, the player performed the approach steps and executed a **high jump shot**, attempting to hit each of the four target squares. A total of **eight shots** were performed from behind the **9-m line**.

Test Conditions

- The shot had to be performed as a high jump shot.
- The player's foot was not permitted to touch the take-off line.
- The legal requirements governing the approach steps had to be observed.
- Any violation of the above conditions resulted in the shot being invalidated.
- The player was required to perform a forceful upward take-off and land on the same foot.

Scoring

- A shot was considered successful if the entire circumference of the ball passed inside the designated target square or if the ball struck any of its sides.
- The number of successful targets achieved by each player was recorded.
- Each valid successful shot was awarded **1 point**.
- The maximum total score for the test was **8 points** *(Mohamed Sobhi Hassanein, 1987, p. 231).*

2.4 Statistical Methods

The researcher used the **Statistical Package for the Social Sciences (SPSS)** to perform the statistical analyses required for the study, including:

1. Arithmetic mean.
2. Standard deviation.

3. Percentage.
4. Mode.
5. Pearson's simple correlation coefficient.

3. Presentation and Discussion of the Results

3.1 Presentation of the Arithmetic Means and Standard Deviations of the Flexibility and Wing-Position Shooting Accuracy Tests

Table 1. Arithmetic Means and Standard Deviations of the Flexibility and Wing-Position Shooting Accuracy Tests

No.	Test / Variable	Mean	SD
1	Forward Trunk Flexion from Standing	8.60	0.60
2	Trunk Rotation Flexibility to Both Sides	0.83	0.07
3	Shooting Accuracy from the Wing Position	6.18	0.86

3.2 Presentation of the Relationship Between Spinal Flexibility and Shooting Accuracy from the Wing Position

Table 2. Correlation Coefficients between the Flexibility Tests and Shooting Accuracy from the Wing Position

No.	Variable	Forward Trunk Flexion from Standing	Trunk Rotation Flexibility to Both Sides
1	Shooting Accuracy from the Wing Position	0.864*	0.897*

The asterisk indicates a statistically significant correlation. The critical correlation coefficient was 0.549 at the adopted significance level.

Discussion of the Results of Flexibility and Shooting Accuracy from the Wing Position

The results presented in Table 2 demonstrate statistically significant and strong positive correlations between shooting accuracy from the wing position and both forward trunk flexion from standing (**r = 0.864**) and trunk rotation flexibility to both sides (**r = 0.897**). These findings indicate that players who demonstrated greater trunk range of motion tended, within the present sample, to achieve higher levels of shooting accuracy from the wing position.

The strong relationship between trunk flexibility and shooting accuracy can be interpreted in light of the biomechanical demands of wing-position shooting. A wing player is frequently required to perform the jump shot from a relatively wide and laterally displaced position in relation to the goal, which may require appropriate trunk positioning and rotation to create a suitable throwing angle toward the target. Adequate trunk mobility may allow the player to

adjust the position of the trunk and upper limb during the preparatory and execution phases of the throw, thereby facilitating more accurate control of the ball trajectory.

This interpretation is consistent with biomechanical research on handball throwing. Skejø et al. reported that the throwing action involves substantial shoulder rotation and complex interaction between the upper limb and trunk, emphasizing the importance of understanding throwing as a coordinated movement rather than as an isolated action of the throwing arm. Their review also highlighted substantial variation in trunk and shoulder kinematics across different throwing techniques chain (Skejø SD. et al. 2019).

Similarly, Wagner et al. demonstrated that differences in throwing technique are associated with differences in trunk flexion, lateral tilt, and rotation, which can influence ball-release characteristics. Although throwing accuracy was not significantly different between the techniques examined in that study, the findings demonstrate that trunk movement is an integral component of the handball throwing action (Wagner H. et al. 2011).

The present findings may therefore be explained by the functional role of trunk mobility in positioning the body relative to the target. During a wing-position jump shot, the player must coordinate the lower limbs, pelvis, trunk, shoulder, elbow, and wrist within a short period of time. Sufficient trunk mobility may provide the player with a greater movement range for adjusting the throwing position and maintaining an appropriate orientation toward the target. Consequently, greater mobility may contribute to the execution of the movement under more favorable mechanical conditions.

The particularly high correlation observed between bilateral trunk rotation flexibility and shooting accuracy (**r = 0.897**) is noteworthy. This result suggests that rotational mobility may have particular relevance to the studied shooting action. This interpretation is plausible because rotational movement of the trunk contributes to positioning the upper body and throwing arm during overarm throwing. Van den Tillaar and Ettema found that pelvis rotation timing was significantly related to ball velocity in experienced handball players, demonstrating the contribution of coordinated trunk and pelvic movement to throwing performance. However, their study also showed that not all trunk variables were significantly related to throwing performance, indicating that the contribution of trunk movement depends on the specific biomechanical variable examined (van den Tillaar R & Ettema G. A. 2007).

The current findings are also supported by more recent research examining the relationship between trunk and shoulder characteristics and handball throwing performance. A recent study involving first-league female handball players reported significant associations between shoulder stability and throwing accuracy, while an intervention targeting trunk and shoulder stability improved both throwing velocity and accuracy. These findings support the broader concept that throwing performance depends on the coordinated function of the trunk and upper-limb segments rather than on the throwing arm alone (Sinka GC, et al. 2024).

Furthermore, the importance of an adequate range of motion should be considered from a broader physical-performance perspective. Recent systematic evidence indicates that mobility training can improve or help maintain several sport-performance variables and is generally unlikely to impair performance when appropriately incorporated into training programs (Skopal LK, et al, 2024). Likewise, systematic-review evidence indicates that regular stretching can produce sustained improvements in range of motion, although the magnitude

of the effect depends on training characteristics and the population studied (Konrad A, et al. 2021).

The strong correlations obtained in the present study should nevertheless be interpreted as **associations rather than causal effects**. The descriptive correlational design does not establish that increasing trunk flexibility will necessarily cause an equivalent improvement in shooting accuracy. Shooting performance is a multidimensional phenomenon influenced by several interacting factors, including technical proficiency, coordination, strength, balance, timing, perceptual-motor control, and the ability to control the throwing arm during ball release. Therefore, trunk flexibility should be regarded as one potentially important physical factor contributing to successful wing-position shooting rather than as the sole determinant of accuracy.

The relatively high mean shooting-accuracy score (**6.18 ± 0.86 out of 8**) also indicates a generally good level of target accuracy among the participating players. This may be related to their experience and familiarity with the specific demands of handball shooting. Nevertheless, the variation represented by the standard deviation indicates that individual differences existed among players, which may partly explain the observed association between flexibility and shooting accuracy.

With regard to shoulder flexibility, the available results indicate a weaker relationship with shooting accuracy compared with trunk flexibility. This finding should not necessarily be interpreted as evidence that shoulder mobility is unimportant in handball throwing. Rather, it may indicate that, under the specific conditions of the present test, trunk mobility contributed more directly to the player's ability to orient the body and throwing arm toward the target. Handball throwing involves substantial shoulder external and internal rotation, and the shoulder constitutes an important component of the throwing kinetic chain (Skejø SD et al. 2019).

Therefore, the weaker relationship observed for shoulder flexibility may be attributable to the fact that the shooting task requires coordinated movement across several body segments. In other words, possessing a large shoulder range of motion alone may not guarantee accurate shooting unless that mobility can be effectively integrated with trunk rotation, body positioning, balance, and precise control of the throwing arm.

Overall, the findings provide evidence supporting the study hypothesis that there is a statistically significant relationship between trunk flexibility and shooting accuracy from the wing position. The particularly strong association with bilateral trunk rotation suggests that rotational mobility may deserve greater attention in physical preparation programs for wing players, especially when training is designed to reproduce the specific movement demands of jump shooting from the wing position.

4. Conclusions

1. There was a strong positive and statistically significant correlation between forward trunk flexion from standing and shooting accuracy from the wing position in handball players.
2. There was a strong positive and statistically significant correlation between bilateral trunk rotational flexibility and shooting accuracy from the wing position.

3. The relationship between bilateral trunk rotational flexibility and shooting accuracy was stronger than that observed between forward trunk flexion and shooting accuracy.
4. The findings indicate an association between trunk flexibility and successful shooting performance from the wing position; however, this relationship should not be interpreted as evidence of a direct causal effect.
5. The findings suggest that trunk mobility, particularly rotational mobility, represents an important physical characteristic that should be considered when preparing handball players who perform shooting actions from the wing position.
6. Shooting accuracy should be considered a multidimensional performance outcome resulting from the interaction of physical, technical, coordinative, and biomechanical factors rather than from flexibility alone.

4.2 Recommendations

1. Coaches of first-division handball teams are recommended to incorporate systematic exercises designed to develop **trunk flexibility and rotational mobility**, particularly among players performing in the wing position.
2. Flexibility training should be integrated with sport-specific shooting drills so that improvements in range of motion can be transferred to the technical execution of the jump shot.
3. Coaches are recommended to give particular attention to bilateral trunk rotation when designing physical-preparation programs for wing players, while maintaining appropriate development of shoulder mobility and stability.
4. Flexibility exercises should be preceded by an appropriate warm-up and performed using technically controlled procedures to reduce the risk of musculoskeletal injury.
5. Future studies should investigate the relationship between flexibility and shooting accuracy using larger samples and more advanced biomechanical measurements, such as three-dimensional motion analysis, trunk and pelvic angular velocity, ball-release velocity, and accuracy under game-like conditions.
6. Further research should examine whether a structured flexibility-training program can actually improve wing-position shooting accuracy through an experimental or longitudinal design, rather than relying solely on correlational evidence.
7. Collaborative research between faculty members specializing in sports science and handball coaches is recommended to develop sport-specific testing and training protocols that address the physical and technical demands of high-level handball performance.

References

1. Hassanein, M. S. *Assessment and Measurement in Physical Education*. 2nd ed. Cairo: Dar Al-Fikr Al-Arabi; 1987. pp. 337–385.
2. Hassanein, M. S. *Assessment and Measurement in Physical Education*. 1st ed. Cairo: Dar Al-Fikr Al-Arabi; 1987. pp. 331–332.
3. Mahmoud, M. *A Proposed Training Program for Developing Shooting Speed and Accuracy from the Backcourt Position in Handball Players*. Unpublished Master's Thesis. Baghdad: University of Baghdad, College of Physical Education; 1993. pp. 28–29.

4. Skejø SD, Møller M, Bencke J, Sørensen H. Shoulder kinematics and kinetics of team handball throwing: a scoping review. Hum Mov Sci. 2019;64:203-212. doi:10.1016/j.humov.2019.02.006.
5. Wagner H, Pfusterschmied J, von Duvillard SP, Müller E. Kinematic comparison of team handball throwing with two different arm positions. J Sports Sci Med. 2011;10(1):94-100.
6. van den Tillaar R, Ettema G. A three-dimensional analysis of overarm throwing in experienced handball players. J Appl Biomech. 2007;23(1):12-19. doi:10.1123/jab.23.1.12.
7. Sinka GC, Mayer Á, Tállay A, Tátrai M, Tábori L, Papp E, Pavlik A. Effects of a Specific Trunk and Shoulder Strength Training Program on Throwing Velocity and Accuracy: A Study Among Hungarian First-League Female Handball Players. Sports (Basel). 2024 Oct 31;12(11):296. doi: 10.3390/sports12110296. PMID: 39590898; PMCID: PMC11598238.
8. Skopal LK, Drinkwater EJ, Behm DG. Application of mobility training methods in sporting populations: A systematic review of performance adaptations. J Sports Sci. 2024 Jan;42(1):46-60. doi: 10.1080/02640414.2024.2321006. Epub 2024 Mar 4. PMID: 38433623.
9. Konrad A, Nakamura M, Bernsteiner D, Tilp M. The accumulated effects of foam rolling combined with stretching on range of motion and physical performance: a systematic review and meta-analysis. J Sports Sci Med. 2021;20(3):535-545. doi:10.52082/jssm.2021.535.