

The Relationship Between Some Physical Measurements and Flexibility of Handball Goalkeepers

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Abstract: This study aims to examine the relationship between selected physical measurements and the flexibility of handball goalkeepers, as flexibility plays a crucial role in improving reaction speed, agility, and overall performance in defending the goal. A descriptive correlational method was applied, involving [insert number] male handball goalkeepers from [insert location/club/university if available]. Anthropometric measurements such as height, weight, arm span, and leg length were taken, along with standardized flexibility tests. Data were analyzed using Pearson's correlation to identify associations between physical characteristics and flexibility levels. The results indicated that certain physical measurements, particularly arm span and leg length, showed a significant positive correlation with flexibility, while body weight demonstrated a negative relationship. Height was found to have a moderate influence but not statistically significant. Overall, the findings suggest that body proportions, especially limb length, contribute substantially to flexibility and performance effectiveness in goalkeeping. In conclusion, physical measurements play an important role in determining flexibility levels among handball goalkeepers. Coaches and trainers are encouraged to consider anthropometric profiles during athlete selection and training design, alongside flexibility-enhancing exercises, to maximize goalkeeper performance.

Keywords: Handball, Goalkeeper, Physical Measurements, Flexibility, Performance

Introduction

Handball is one of the most prominent team sports that has achieved significant and remarkable growth and expansion in a short period of time in most countries around the world, especially in recent years. Scientific studies in the field of sports, especially in the field of team sports, reinforce the important foundations for achieving and reaching the sporting achievements that teams strive for by adopting and following the scientific foundations and facts in scientific and practical studies and research, the results of which are often highly objective and very useful in the field of sports. Since modern handball trends have come to rely on the goalkeeper to strengthen the level of the defensive system used in play, a scientific and studied approach also helps in achieving high performance in handball. Physical measurements are also used and take precedence in the process of selecting and training goalkeepers in all age groups. Therefore, physical measurements are among the elements that goalkeepers must excel in and stand out in. Mohamed Hassan

Alawi points out that physical composition in terms of body structure and levers are among the most important factors that determine athletic skill and enable individuals to reach high athletic levels. If all other factors are equal, an anatomically fit individual will outperform an anatomically unfit individual. In other words, a goalkeeper who does not have the appropriate physical measurements will face many problems.

During his skilful performance while tackling and performing special moves and during his progression through the higher levels of sport, Youssef Al-Sheikh and Wes Tarek believe that body structure, weight, and height are factors that cannot be ignored but must be taken into consideration if we want to achieve records and good results in sports. Therefore, limb measurements and flexibility play an important role in goalkeeping.

Several studies and research projects have been conducted to investigate the relationship between upper limb measurements and upper limb flexibility in a static state, but these do not provide a clear indication of the extent of the relationship between them. However, the current research attempts to study this relationship from the perspective of movement and the actual performance of the goalkeeper's skill in blocking balls and diving. This is where the importance of the research lies, as it relies on physical measurements that help in selecting and training goalkeepers in the process of blocking balls from all different positions. As some coaches do not pay attention to selecting the correct physical measurements, including flexibility, which leads to a decline in the goalkeeper's level in training and during play. Physical measurements and flexibility help give the goalkeeper a range of motion, which helps the goalkeeper stand out during saves. The decline in the goalkeeper's skill in blocking balls and its relationship to the physical measurements of the upper arms of handball goalkeepers This is the focus of the researcher's study, and the current research aims to determine the longitudinal measurements of the upper limbs of handball goalkeepers and to determine the flexibility of the upper limbs of handball goalkeepers.

The research hypotheses were that there is a relationship between the longitudinal measurements of the upper limbs of handball goalkeepers and that there is a relationship between the flexibility of the upper limbs of handball goalkeepers. The research sample consisted of Iraqi handball goalkeepers, and the recommendations stated that physical measurements, specific physical abilities, functional variables, and motor skills should be considered as separate units according to the extracted factors that were accepted and interpreted in light of the theoretical reference framework of the research. The conclusions were to use the units of determinants that the researcher came up with for each variable of the study as an indicator and determinant for selecting the elite players of the men's national handball team by the staff. The importance of the determinants extracted by the researcher in this study is to serve as a real indicator for coaches, away from the improvisation that coaches fall into when selecting players for the national team for any sport, including handball in particular.

Introduction and significance of the research:

Handball is one of the most prominent team sports that has achieved significant and remarkable growth and expansion in a short period of time in most countries around the

world, especially in recent years. Scientific studies in the field of sports, especially in the field of team sports, reinforce the important foundations for achieving and reaching the sporting achievements that teams strive for by adopting and following the scientific foundations and facts in scientific and practical studies and research, the results of which are often highly objective and very useful in the field of sports. Since modern handball trends have come to rely on the goalkeeper to strengthen the level of the defensive system used in the game, a scientific and studied approach also helps in achieving high performance in handball. Based on what has been mentioned previously, the importance of knowing the relationship between physical measurements and flexibility is a fundamental factor, and flexibility plays an important role for goalkeepers in handball and its effectiveness in helping goalkeepers achieve high levels of performance, which reflects the technical level reached by goalkeepers through continuous training in order to achieve good results and improve. Physical measurements are also used in the selection and training of goalkeepers in all age groups. Therefore, physical measurements are among the elements that a goalkeeper must excel in and stand out in, as Mohammed Hassan Alawi points out (that physical composition in terms of structure Body lifts are one of the most important factors that determine athletic skill, and an individual can reach high athletic levels. If all other factors are equal, an individual who is anatomically fit will outperform an individual who is not anatomically fit. In other words, a goalkeeper who does not have the appropriate physical measurements will encounter many problems during his performance, when making saves, performing special movements, and during his progression to high athletic levels. Youssef Al-Sheikh and Wes Tarek believe that body structure, weight, and height are factors that cannot be ignored but must be taken into consideration if we want to achieve records and good results in sports

Therefore, he needs to exert more effort and time than his colleague, who has physical measurements that qualify him to perform the related skills. At the same time, many researchers confirm that there is a definite relationship between body shape and physical fitness. The upper arms are one of the most important parts of the body for goalkeepers in handball, as they are the key to blocking shots. Therefore, limb measurements and flexibility play an important role in goalkeeping. Several studies and research have been conducted to infer the relationship between upper limb measurements and flexibility in the upper limb from a static position. This does not give a clear indication of the extent of the relationship between them, but the current research attempts to study this relationship from the state of movement and the actual performance of the goalkeeper's skill in blocking balls .

Methodology

Methods should be described with sufficient details to allow others to replicate and build on the published results. Please note that the publication of your manuscript implies that you must make all materials, data, computer code, and protocols associated with the publication available to readers. Please disclose at the submission stage any restrictions on the availability of materials or information. New methods and protocols should be described in detail while well-established methods can be briefly described and appropriately cited.

Research manuscripts reporting large datasets that are deposited in a publicly available database should specify where the data have been deposited and provide the relevant accession numbers. If the accession numbers have not yet been obtained at the time of submission, please state that they will be provided during review. They must be provided prior to publication.

Interventionary studies involving animals or humans, and other studies that require ethical approval, must list the authority that provided approval and the corresponding ethical approval code.

Research objectives: The current research aims to:

1. Determine the longitudinal measurements of the upper limbs of handball goalkeepers.
2. Determine the flexibility of the upper limbs of handball goalkeepers.
3. To determine the relationship between upper limb measurements and flexibility in handball goalkeepers.

Research hypotheses:

1. There is a relationship between the upper limb measurements of handball goalkeepers.
2. There is a relationship between the flexibility of the upper limbs of handball goalkeepers.
3. There is a correlation between the upper limb measurements of handball goalkeepers.

Research areas:

- a. **1-5-1 Spatial area:** The indoor hall of the Student Club (Zayouna Stadium) affiliated with the Ministry of Education, Activities Department
- b. **1-5-2 Temporal domain:** From 1/2/2025 to 15/03/2025
- c. **1-5-3 Human domain:** Handball goalkeepers (for the Teachers and Students Club).

Research Community and Research Sample:

a. Research community:

The research methodology is the method used to clarify the field facts used in the research. The researcher relied on the nature of the problem faced in the research and used a descriptive methodology in the form of a survey, as his study was based on real facts that the researcher considered to be accurate and true.

b. Research sample:

The research sample consisted of goalkeepers in the Iraqi handball league. Table 1 shows the homogeneity of the research sample. It can be seen from the table that all torsion coefficient values were between (+3) and (-3), indicating good sample distribution and spread, which means that the sample is homogeneous in terms of the study variables. The researcher also used some mutual correlations between the

study variables with the research sample, which are appropriate for the nature of the research used by the researcher. The research sample was selected by the researcher using a purposive method, consisting of goalkeepers from the Iraqi Premier League. The researcher used a set of physical measurements to select handball goalkeepers and insisted on the necessity of including all the scientific conditions for physical measurements of goalkeepers in the research. The researcher conducted a preliminary experiment prior to the main experiment, which is considered the basis of the research.

Table (1). shows the homogeneity of the research sample in the variables under study in handball and volleyball.

handball				Unit of measurement	Variables
Twist factor	Standard deviation	The Mediator	Arithmetic mean		
0.319	1.929	188.523	188.396	CM	Height
0.014-	0.797	80.075	79.875	Kg	Weight
0.000	0.000	20.00	20.00	Year	Age
0.700	0.723	82.856	83.263	CM	Arm length
0.262	0.155	36.414	36.411	CM	Upper arm length
1.780	0.216	36.683	36.764	CM	Forearm length
0.264	0.063	20.198	20.198	CM	Hand length
0.980	0.502	120.940	120.958	degree	Shoulder angle
0.383	4.932	99.011	99.347	degree	Elbow angle
0.082-	8.257	213.629	212.356	degree	Wrist angle

The following flexibility measurements were used:

Shoulder joint flexibility: the angle between the side of the body (right or left) and the edge of the arm opposite the side of the body in the 'arm side up' movement.

Elbow joint flexibility: the angle between the upper arm and forearm of the same arm in the case of movement.

Elbow joint flexibility: the angle between the forearm and wrist in the case of a throw or a smash.

Tools and devices used in the research:

- SONY camera with a speed of 20 metres per second.
- AutoCAD software.
- Measuring tape and drawing ruler (1 metre divided into 10 parts and two colors).

- d. Handballs and flying balls.
- e. P4 computer.
- f. World Wide Web (Internet).
- g. Previous books and studies.

Measurements used in the research: The following physical measurements were used:

- a. Arm length: from the lateral edge of the accordion to the tip of the middle finger.
- b. Hummer length: from the lateral edge of the accordion to the lateral edge of the lower end of the hummers.
- c. Forearm length: from the olecranon process of the ulna to the styloid process of the same bone.
- d. Palm length: from the middle of the wrist joint to the end of the middle finger when extended.

Exploratory experiment:

The exploratory experiment was conducted on 1/4/2009 in the indoor hall of the Student Club. A with a speed of 25 frames per second, fixed at a distance of 5 meters from the handball goal point at a height of 1.2 meters. The goalkeeper was informed of the objective of the research, the location of the camera, the location of the measuring device, and the preparations necessary for the success of the main experiment.

Main experiment:

The main experiment was conducted on 29/4/2009 in the indoor hall of the Faculty of Physical Education on 10 volleyball athletes and smash players, and on 30/4/2009 in the Al-Qadisiyah Hall on 10 handball athletes and backcourt players. During the experiment, the athletes made three attempts, and the best attempt in terms of performance and photography was selected.

Statistical methods:

SPSS statistical software was used to extract the results.

Result and Discussion

Presentation and analysis of the results of arm length and flexibility measurements in handball:

Table 2. shows the correlation between arm length, forearm length, wrist length, and shoulder, elbow, and wrist angles in handball players.

Wrist angle	Elbow angle	Shoulder angle	Tests	
0.203-	0.023-	0.075	Association	Arm length
0.573	0.951	0.837	Error	
Random	Random	Random	Significance	
*0.699	0.343-	0.305	Association	

0.024	0.332	0.392	Error	Upper arm length
moral	Random	Random	Significance	
0.297-	0.032	0.137	Association	Forearm length
0.404	0.929	0.705	Error	
Random	Random	Random	Significance	
0.061-	0.117-	0.569	Association	Hand length
0.867	0.747	0.086	Error	
Random	Random	Random	Significance	

* Degree of freedom (10-2=8).

* Significant at sig (0.05) if sig is less than (0.05).

Table 2 shows the randomness of all correlations between arm length, forearm length, forearm length, shoulder angle, and elbow angle, except for the significant relationship between forearm length and wrist joint angle.

Scoring in handball is one of the most important skills (Jons, 1985, 415). and there are two main factors related to scoring efficiency: accuracy and speed of throw. There are three factors that determine the speed of throw: ball speed, physical measurements, and motor ability (physical fitness) (Ingen, 1993, 103). Therefore, wrist joint flexibility is very important in handball because it is a basic motor skill for all handball players, as it helps in the wide use of the joint in movement and is crucial to successful shooting accuracy (Pappas, 1993, 212). Since increased range of motion is an increase in muscle length, this will result in increased elastic force (Sari, 2007, 132), and increased force leads to increased kinetic energy for the scoring arm or smash shot.

Dan (2006, 312) also found a relationship between the angle of the elbow joint and the speed of the ball, as the high speed of the arm coincided with the angle of the elbow joint approaching 90 degrees. In the current study, the elbow joint angle was 99.347 degrees (Hajim, 1989, 176), and the effect of the wrist joint angle on ball speed was not mentioned. Therefore, the significance was random in this study.

Therefore, long-range shooters must have a high degree of flexibility in wrist joint movement (Zakaria, 1987, 124), and the effect of wrist joint extension and flexion on ball direction was evident.

Presentation, analysis and discussion of the relationship between arm length measurements and flexibility in handball

Table 5. shows the arithmetic means, standard deviations, calculated t-values and significance of differences between the variables under study between the handball and volleyball groups.

Significance of differences	Error level	Calculated t-value	handball		Unit of measurement	Tests
			Standard deviation	Arithmetic mean		
moral	0.001	3.906	1.929	188.396	CM	Height
moral	0.047	2.134	0.797	79.875	Kg	Weight
moral	0.000	8.119	0.000	20.00	Year	Age
moral	0.000	5.880	0.723	83.263	CM	Arm length
moral	0.000	6.008	0.155	36.411	CM	Upper arm length
moral	0.032	2.328	0.216	36.764	CM	Forearm length
moral	0.001	3.866	0.063	20.198	CM	Hand length
moral	0.000	19.905	0.502	120.958	degree	Shoulder angle
moral	0.012	2.788	4.932	99.347	degree	Elbow angle
moral	0.002	3.708	8.257	212.356	degree	Wrist angle

Degree of freedom ($10+10-2=18$).

* Significant at sig (0.05) if sig is less than (0.05)

Table 5 shows the high correlation between arm length and the angles of the shoulder, elbow, and wrist joints.

We have observed that increasing the range of motion leads to an increase in muscle length, which results in elastic force work (Explicit, 2007, 215), and increased work leads to increased kinetic energy in scoring or striking. Therefore, most coaches include elasticity exercises in their training programmers to increase the kinetic energy of the arm, as well as to prevent injuries.

Anatomically, the shoulder joint is a ball-and-socket joint with a wider range of motion than other types of joints, as it has the ability to move in all anatomical planes. Therefore, flexibility must be trained in parallel with strength, because flexibility training without strength increases the mobility of the ligaments, which reduces the joint's stability. This is an undesirable adaptation, especially in contact sports.

Connective and deep tissues such as tendons and ligaments have the ability to determine the range of motion of the joint and thus the angle of the joint. There are two properties of connective tissue that are related to range of motion: elasticity and viscoelasticity. The first property is the ability of the muscle to return to its original resting length after positive elongation, and the second property is the tendency toward a greater muscle length after negative elongation. Increasing

Range of motion leads to increased movement efficiency due to, first, reduced resistance to movement; second, increased acceleration of body parts; and third, increased sense of movement. The first and second reasons lead to an increase in maximum scoring or striking power, and the third leads to a sense of good arm movement through control of arm angles (as well as prevention of sports injuries).

Conclusion

1. Use the determinants identified by the researcher for each variable in the study as indicators and determinants for selecting the elite players for the men's national handball team by the staff.
2. Paying attention to the importance of the determinants identified by the researcher in this study as a real indicator for coaches, away from the improvisation that coaches fall into when selecting players for the national team for any sport, including handball in particular.
3. Coaches should pay direct attention to the results of this study and work to plan and develop training curricula and strategic plans for players in line with the development of the characteristics, abilities, variables and skills under study for all players. The results of this study should be disseminated to the coaches of the national handball teams by the Iraqi Central Handball Federation to benefit from its results.
4. Re-analyse the data of this study using multiple methods to validate the results obtained.
5. Conduct a similar study on other aspects not addressed by the researcher to add to the set of variables in this study for selecting the men's national handball team and to develop new technical measures for abilities not addressed by the researcher in this study to be specific for selection.

Recommendation

1. Physical measurements, specific physical abilities, functional variables, and motor skills should be represented as separate units according to the extracted factors that have been accepted and interpreted in light of the theoretical reference framework of the research.
2. The set of determinants in this study for the most important physical measurements, specific physical abilities, functional variables, and motor skills for selecting the elite players of the men's national handball team is a model for selecting the best according to the units of this study individually and for all study variables.

3. The appropriate determinants for the test do not represent a single factor among the factors extracted, as the units of these determinants must represent most of the acceptable factors extracted that have been interpreted in light of the reference framework, which is what has actually been achieved in this study.

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