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An analytical study of some biomechanical variables and high-jump shooting accuracy for Al-Shorta and Al-Karkh Club players in the Premier Handball League (2022-2023)

Intisar Kadhim Abdul Karim [1], Wedad Kadhim Majeed [2], Zubaida Salah Hadi [3]

1&2&3 Physical Education and Sport Sciences College for Women/ University of Baghdad

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Abstract

The introduction to the research summarized biomechanics, the first among the sciences that advanced the sports field, as biomechanics is one of the sciences that takes care of the development of sports movements through study, analysis, biomechanical evaluation, clarifying differences, and finding relationships. In view of the development that the game of handball has witnessed and the expansion of its base in most countries of the world, the need for research and investigation has increased to solve problems related to performance in order to diagnose and treat them because it is one of the games that is characterized by variable kinetic performance between moving with and without a ball, as well as rapid starting and sudden stopping to get rid of supervision and shooting at the ball. The goal and other multi-playing situations that the player employs during the tactical duty to achieve the main goal, which is to shoot to score a goal against the opponent's goal. The problem of the research is that mastering the skill of shooting from jumping high is important for handball players, and because of its frequent repetition in the match, it is one of the keys to determining the outcome of the match. Therefore, mastering it and controlling how it invests its biomechanical variables in achieving high shooting accuracy represents a positive advantage that leads the team to outperform the competitor. Through the researchers' follow-up of the matches of the Iraqi teams, the researchers found that this problem is worthy of study for the purpose of comparison in the biomechanical variables to be used during performance. The aim of the research is to identify the values of some biomechanical variables in the jumping shooting skill of the players of the Al-Shorta and Al-Karkh Sports Club. Excellent. The descriptive approach was used on a sample chosen intentionally, consisting of (20) players from the Al-Shorta Club and Al-Karkh Sports Club in the Premier Handball League (2022-2023). The two researchers reached a number of conclusions, the most important of which were: The level of the members of the research sample was similar between the Al-Shorta Club and Al-Karkh. In the variable of propulsion and the resulting flight and height of the body's center of mass, the members of the Al-Shorta Club invested in the biomechanical variables of the arm better than the members of the Karkh Club in serving the goal. The researchers concluded that both the variables of the wrist joint and the angle of bending of the arm as well as the inclination of the torso had a positive role in The Al-Shorta Club player outperformed the Al-Karkh Club players in shooting accuracy, and the Al-Karkh Club players were unable to invest the payment variable effectively in achieving shooting accuracy. and this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education). The two researchers came up with these recommendations: the importance of analyzing the performance of high-level players for the purpose of determining the degree of investment in biomechanical variables and their role in achieving shooting accuracy. Emphasis is placed on making comparisons between the Premier League teams.

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Keywords | **Analytical study, biomechanical variables, high jump shooting accuracy with handball**

Introduction:

The scientific and technical development that the world has witnessed now has a major role in applying scientific and technological foundations that contribute to raising the scientific level in general, and sports in particular. Accordingly, it can be said that achieving the best sports achievement or the highest level of skill performance is linked to closely link with the development of science and technological progress. Biomechanics is considered the first among the sciences that advanced the sports field, as biomechanics is one of the sciences that takes care of the development of sports movements through study, analysis, biomechanical evaluation, clarifying differences, and finding relationships. In view of the development that the game of handball has witnessed and the expansion of its base in most countries of the world, the need for research and investigation has increased to solve problems related to performance in order to diagnose and treat them because it is one of the games that is characterized by variable kinetic performance between moving with and without a ball, as well as rapid starting and sudden stopping to get rid of supervision and shooting at the ball. The goal and other multi-playing situations that the player employs during the tactical duty to achieve the main goal, which is to shoot to score a goal against the opponent's goal. The player's success in performing the basic offensive skills, including all types of shooting, does not depend on developing physical and skill abilities. Rather, it goes beyond that to taking into account the distinctive mechanical aspects of the performance and the smoothness of the movement he performs, which is represented by performing the movement without stopping between parts and stages of the performance, which results in the skill being performed quickly and then Taking advantage of the momentum generated by the whole and its transmission through the smooth movement of body parts to achieve the mechanical goal of the shooting skill, which is to score a goal with all speed and accuracy. Mastering the skill of shooting from jumping high is important for handball players, due to its frequent repetition in the match, as it is one of the keys to determining the outcome of the match. Therefore, mastering it and controlling how to invest its biomechanical variables in achieving high shooting accuracy represents a positive advantage that leads the team to outperform the competitor. Through the researchers' follow-up of the matches of the Iraqi teams, they found that this problem is worthy of study for the purpose of comparison in the biomechanical variables to be used during performance. Therefore, the importance of the research lies in an analytical study of some biomechanical variables and the accuracy of shooting from jumping high among the players of the Al-Shorta Club and Al-Karkh. The aim of the research was to identify: · Evaluate some biomechanical variables in the jump shooting skill of Al-Shorta and Al-Karkh Sports Club players, the value of shooting accuracy from jumping high for the players of the Al-Shorta and Al-Karkh Sports Club , and differences in some biomechanical variables and high-jump shooting accuracy between Al-Shorta and Al-Karkh Club players in the Premier League. Human field: Al-Shorta and Al-Karkh Sports Club players. Time field: from 21/4/2022 until 8/7/2023. Spatial field: Wissam Al Majd Club Hall/Interior Hall of the Specialized School for Gifted Care.

Method and procedures:

The research population was determined by the researchers, namely the handball Premier League clubs, which numbered (160) players, and the research sample represented the players of the Al-Shorta and Al-Karkh Sports Club for the sports season (2022/2023), who numbered (30) players, as each team included (15) players. It was chosen intentionally, and the number reached (20) players who are continuing training only, excluding goalkeepers, with a percentage of (20%) from the original population. In order for the sample to be

homogeneous, the skewness factor was extracted, which included (height, weight, age), as shown in Table No. (1)

Table .1 shows the homogeneity of the sample in terms of length, mass, and age

Variables	Arithmetic mean	standard deviation	Mediator	Skewness coefficient
Length(m)	177.85	4.71	177.00	0.984
Mass (kg)	80.15	6.54	79.00	0.067
Age (years)	31.50	2.28	32.00	-0.310

The results showed homogeneity of the sample through the confinement of the Skewness coefficient between (±1) this indicates a moderately homogeneous distribution of the research sample

The researchers used Arab and foreign sources, the International Information Network (the Internet), the Kinovea program, the Arion coach device, testing and measurement, a data collection form, an assistant work team, one (1) electronic stopwatch, a flamingo type manual calculator, and a medical scale to measure weight. (2) video cameras with a speed of 120 images/second, Japanese-made, (1) Dell computer running (Windows 8), a length measuring tape, a whistle (1), a tripod, and an adhesive tape with a width of (5 cm). For the purpose of determining the research variables, the researchers reviewed many Arab and foreign sources that dealt with the subject of the research, and a number of tests were chosen to measure the accuracy Shooting from jumping high in handball, as shown in Appendix No. (1), was reviewed through a questionnaire form and presented to a group of (5) experts the experts agreed by 80% on choosing the first test**,** which is**:**

Testing the accuracy of shooting from a high jump (Dhiaa) (7)

- Purpose of the test: to measure the accuracy of shooting from jumping high
- Tools used: (8) balls. Make 4 squares in each of the four corners of the goal so that they are square in shape along the side.(60*60)
- Method of performance: The player stands behind the starting line, directly in front of the goal, holding the ball. Upon hearing the signal, the player begins to take 2-3 steps to approach, then shoots from the jump upwards on the square, so that the rise to the jump is from a distance of no less than 7 metres.
- Test conditions: Not taking more than three steps, not touching the player's foot to the rising line, and shooting from the jump upwards in eight attempts, two attempts on each square.
- Scoring method: The player gets one point for each correct shot. The total score for the test is eight points, and the ball is considered a goal if it passes its entire circumference within the square specified by the player. Each player is given two attempts, and the best attempt is chosen between them.

Exploratory experience:

The researchers conducted the exploratory experiment on Wednesday, July 6, 2022, at 3 p.m., on (3) players from outside the research sample (Al-Hashd Al-Shaabi Sports Club) in the Al-Karkh Educational Indoor Hall.

The first test was carried out during the experiment for the accuracy of shooting from jumping high, which was agreed upon by the experts. The members of the exploratory sample were filmed while executing the skill of shooting from jumping high with a video camera at a speed of 120 images/second and using the Arion coach

device. After four days, the test was repeated under the same conditions. .

Biomechanical variables for shooting high jumps:

Some of them were extracted using the Kinovea motion analysis program and others through the ARION COACH device, as it is one of the motion analysis devices recently manufactured in the sports field. It consists of two smart insoles, and it has a program (an application that is downloaded on the phone) and gives all information about Every step and every performance performed by the athlete thus contributes to providing sufficient information about performance in a quick and easy way. This device is a practical solution for the dynamic analysis of the pressures and forces that occur in areas of the foot. As in Figure (1).

Figure (1) Arion coach device

Biomechanical variables:

- The device gives the values of the variables directly through its own program.
- Propulsion: It is a measure of the rate of force during a unit of time and was measured for the last step and was measured with the Arion coach device.
- Contact time: It is the time during which the foot remains in contact with the ground during each step. It can be an indicator of your recent progress and was measured with the Arion coach device.
- The flight time of the rising leg at the moment of shooting: It is the amount of time during which both feet are far from the ground and was measured with the Arion coach device.
- The height of the body's center of mass at the moment of shooting: It is the vertical distance between the ground and the body's center of mass at the highest point the player reaches.

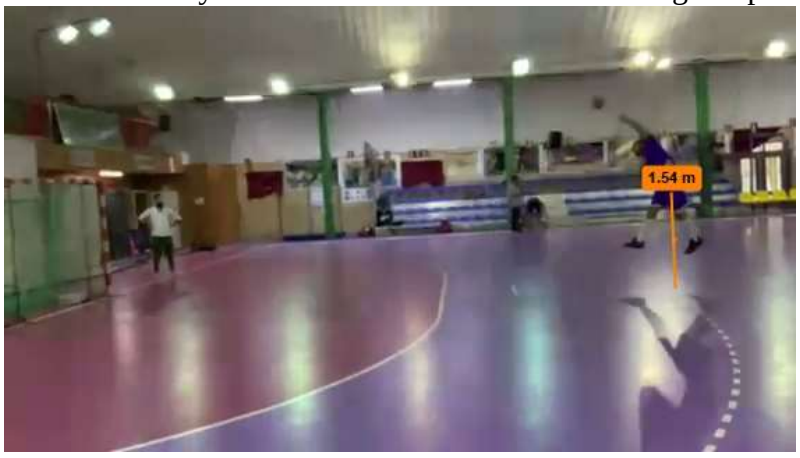

Figure (2) Shows the height of the body's center of mass

- The flexion angle of the throwing arm at the moment of shooting: It is the maximum flexion of the arm.

Figure (3) Shows the bending angle of the throwing arm at the moment of shooting

- The angle of the wrist at the moment of shooting: It is the angle between the line connecting the point of the elbow joint to the point of the wrist joint on the one hand, and the point of the front of the palm and the point of the wrist joint of the hand on the other hand.

Figure(4) Shows the angle of the wrist at the moment of shooting

- The angle of inclination of the torso at the moment of shooting**:** It is the angle between the torso line (from the point of the shoulder joint to the point of the hip joint) and the horizontal line passing through the point of the hip joint.

Figure (5) Shows the angle of inclination of the torso at the moment of shooting

Main experience:

The researchers conducted the main experiment test on Saturday, September 20, 2022, on (10) players from the Al-Shorta Club in the indoor hall of the Specialized School for the Care of the Gifted, and on Sunday, September 21, 2022, on (10) players from Al-Karkh Club. The athlete in the Wissam Al Majd Club hall. A video camera was used at a speed of (120 images/second) and was placed at a height of (1.25) m and a distance of (3) m from the middle of the test implementation area. Before the test implementation began, a detailed explanation was given by the researchers about the test.

Statistical treatments:

The statistical package (SPSS) was used to process the results statistically.

Results:

Table .2 shows the arithmetic means, standard deviations, median, and skewness coefficient for the accuracy of the high jump shooting skill and some biomechanical variables**.**

Variables	measuring unit	Arithmetic mean		standard deviation		Mediator		Skewness coefficient	
		Al-Shorta	Al-Karkh	Al-Shorta	Al-Karkh	Al-Shorta	Al-Karkh	Al-Shorta	Al-Karkh
Shooting accuracy from jumping high	degree	7.10	5.70	0.316	0.78	7.00	6.00	3.162	-0.16
paying off	N	615.10	392.30	59.87	73.77	623.50	379.50	-0.566	1.08
Contact time	second	1.34	1.21	0.031	0.08	1.34	1.20	-0.156	0.30
Flight time	second	34.00	34.00	8.028	4.30	34.50	50.50	0.351	0.04-
Height of the body's center of mass	m	1.50	1.31	0.059	0.08	1.515	1.29	0.060	1.04
The bending angle of the throwing arm	degree	76.90	60.66	6.280	8.60	75.00	68.00	0.958	0.05-
Wrist angle at the moment of shooting	degree	135.50	128.10	5.563	11.08	133.50	129.00	1.152	0.29
The angle of inclination of the torso at the moment of shooting	degree	77.40	67.10	7.043	7.86	75.50	66.50	0.716	0.63

Table .3 shows the values of the statistical parameters of the differences between the biomechanical variables and the accuracy of shooting from jump for the players of Al-Shorta and Al-Karkh Club.

Variables	Arithmetic mean		standard deviation		T value	Level Sig	Type Sig
	Al-Shorta	Al-Karkh	Al-Shorta	Al-Karkh			
Shooting accuracy from jumping high	7.10	5.70	0.316	0.78	3.873	0.000	Sig
paying off	615.10	392.30	59.87	73.77	7.689	0.324	Non Sig

Contact time	1.34	1.21	0.031	0.08	0.777-	0.457	Non Sig
Flight time	34.00	34.00	8.028	4.30	5.632-	0.340	Non Sig
Height of the body's center of mass	1.50	1.31	0.059	0.08	5.656	0.120	Non Sig
The bending angle of the throwing arm	76.90	60.66	6.280	8.60	1.576	0.014	Sig
Wrist angle at the moment of shooting	135.50	128.10	5.563	11.08	0.926	0.037	Sig
The angle of inclination of the torso at the moment of shooting	77.40	67.10	7.043	7.86	0.866	0. 049	Sig

The value of (t) is below the significance level of 0.05

Discussion:

From Table (3), the results of the research indicated that there were significant and non-significant differences between the biomechanical variables and the accuracy of shooting when jumping high between the Al-Shorta Club and Al-Karkh Sports Club, and it was in favor of the Al-Shorta Club.Through the results mentioned in Table (3), we see that the differences in propulsion, flight time, and height of the body's center of mass are not significant. Through these results, the researchers see that both teams emphasize the importance of these variables and their role in the player obtaining a good body position for the purpose of achieving good accuracy in shooting.As for the variable of shooting accuracy, the variable of the angle of flexion of the shooting arm, the angle of the wrist at the moment of shooting, and the angle of inclination of the torso at the moment of shooting, it was found that there were significant differences between the two samples and in favor of the Al-Shorta Club.This confirms that the Al-Shorta club players worked to invest in the biomechanical variables from the moment of foot contact and push to the moment of shooting in a way that achieves the goal.

The researchers believe that the angle of flexion of the throwing arm and the angle of the wrist at the moment of shooting are particularly important in participating in directing the ball toward the goal, as the smaller the angle of flexion of the arm, i.e. the closer it is to the longitudinal axis of the body, the better the result in terms of accuracy and speed. Also, the process of extending and bending the throwing arm helps to give the ball greater instant speed. Shooting.This is confirmed by Mahjoub when he says, "The transfer of force from the lower limbs to the upper limbs contributes to giving additional strength to implement the goal" (12). Abdul Hussein adds that "the movement begins in the shoulder joint and then continues in the rest of the joints with force and increases in speed, so the movement begins from the joints of the lower limb, passing through the torso, and then ending with the wrist of the hand (3). Researchers agree with the above that the wrist joint represents the final stage that controls directing the ball to the desired place. They believe that the value of the wrist angle for members of the Al-Shorta Club changed according to the area in which the shot was to be aimed, the force of momentum, the height of the player, and the throwing arm. Therefore, in order

for the attacking player to be able to achieve accuracy in shooting, the correct performance must be implemented, which is achieved by investing in the implementation of biomechanical variables in a way that serves Achieving correct performance. (Nabih) emphasizes that "accuracy is one of the important and necessary components in handball, and we may not be exaggerating if we say that this component is closely linked to achieving goals. Shooting is a skill that depends on this component to a high degree" (14) .(Zubaida and others) also point out that "correct behavior for executing the kinetic path or kinetic duty acts as an incentive for performance and thus success in achieving performance, as accuracy is the result of the interaction of other mechanical variables that work in the form of an interconnected chain " (19) .Hamid and others also pointed out that "the skill of shooting from a jump requires that players in particular possess momentum because it possesses a large part of kinetic performance in addition to other qualities" (10).

Table .4 shows the correlation between high-jump shooting accuracy and biomechanical variables for Al-Shorta and Al-Karkh Club.

Variables Al-shorta	Arithmetic mean		Standard deviation		Correlation		Sig		Type sig	
	Al-shorta	Al-karkh	Al-shorta	Al-karkh	Al-shorta	Al-karkh	Al-shorta	Al-karkh	Al-shorta	Al-karkh
Paying off	615.10	392.30	59.87	73.77	1	0.21	0.05	0.45	Sig	Non sig
Contact time	1.34	1.21	0.031	0.08	0.166	0.17	0.02	0.11	Sig	Non sig
Flight time	34.00	34.00	8.028	4.30	0.044	0.19-	0.00	0.02	Sig	Sig
Height of the body's center of mass	1.50	1.31	0.059	0.08	0.241	0.21	0.02	0.04	Sig	Sig
The angle of bending of the arm at the moment of aiming	76.90	60.66	6.280	8.60	0.043	-0.48	0.04	0.03	Sig	Sig
Wrist angle at the moment of aiming	135.50	128.10	5.563	11.08	-0.158	1	0.04	0.05	Sig	Sig
The angle of inclination of the torso at the moment of aiming	77.40	67.10	7.043	7.86	-0.020	1	0.05	0.04	Sig	Sig

From Table (4) we notice the presence of significant correlations between the accuracy of shooting from a high jump and the biomechanical variables under investigation for the Al-Shorta Club. We also note the presence of a significant correlation between most of the mechanical variables and the accuracy of shooting, with the exception of momentum and time to rise for the Al-Karkh Club players .Propulsion and the variables that accompany it and follow it constitute an important mechanical factor that can affect the effectiveness of the player's flight in the air and thus the result of the shot, because the stage of pushing the player to the ground and getting up represents the final product of the body's movement on the ground, and through the force of propulsion, the amount of good flight for the player's center of mass is determined.Abbaas

and Khalil confirm, saying, "The pushing phase begins after the force reaches its maximum at the maximum flexion of the knee joint at the moment of vertical stop" (2). Effective propulsion is achieved through force and the variable contact time. Therefore, the athlete must realize that the amount of time it takes at the moment of contact affects the amount of maintaining the transfer of kinetic energy and the speed gained from the previous steps without losing energy, in addition to achieving the greatest force propulsion while ascending. Al-Fadhli points out that "the more the performance and application of the rise is at a high level of skill, the more it indicates a high force push and in the shortest time" (1). The researchers believe that repeating the skill from different positions and according to the angles of performance improves the maintenance of strength and speed at the moment of pushing high at this stage by increasing the connection between the moments of fulcrum and pushing high, which has a positive impact on all pushing movements with the legs through the exertion of rapid forces in a short time to achieve accuracy in Shooting. In order to develop the performance of the skill of shooting high jumps, coaches must pay attention to the mechanical and physical performance requirements because they are linked together. Therefore, it is necessary for the players' exercises to include special exercises for strength, speed, and muscular ability of the legs and arms, and to repeat the skill from different positions and with variable resistances and according to the performance angles for adaptation events and to increase the competition factor. And excitement during exercise. This is what was confirmed by (-Sumayah et al.) "The use of special strength training exercises that included physical exercises similar to the performance of the skill in terms of muscle contraction and its direction, and controlling the appropriate amount of force, in addition to the specificity of these exercises in the distribution and exchange of the work of the muscle groups to avoid fatigue and boredom among the players." (15). The flight time also reflects the amount of height of the body's center of mass, as the greater the flight time, the greater the height and flight the player is able to achieve, meaning that the player's body stays in the air longer, which increases the opportunity to control the ball and aim to the area that he deems best. Ahmed confirms that increasing the strength of the legs leads to an increase in the athlete's flight speed, which in turn leads to an increase in his height at the moment of hitting the ball and thus increases the time that the athlete stays in the air (4). For the purpose of achieving a high height of the center of mass of the body, in this type of shooting, appropriate extension of the body parts is required, which achieves a good height. In addition, increasing the height of the center of mass of the body means there is a good push of force by the player, which allows the player a longer time in order to achieve better accuracy, as he pointed out. Researchers (Cristina Von Heijne) pointed out the necessity of fully extending the legs at the moment of pushing because it has an important mechanical role in producing good force and raising the body's center of mass to the highest point in a way that serves the goal of the movement (6).Regarding the variable of the torso inclination angle, the player must move his torso back slightly in line with the angle of the knee joint to maintain mechanical balance, which enhances the skill of shooting with high accuracy. This is in line with what Mardan (Hussein et al.) mentioned: "The torso's inclination back contributes well to the value of Strength: "This indicates that the inclination of the torso at the moment of shooting is important in creating kinetic balance (11)." The wrist angle variable represents the final stage of shooting, as the player attempts to direct the ball accurately to the appropriate place, which refers to the final part of the performance. (Morad et al.) point out that the development of the level in the game of handball is governed by several factors, the degree of their importance varying, as some view exercise as the most important variable because of its role in developing various handball skills and thus it is possible to determine the level (13). (Zaid and others) point out (that the nature of interaction and cooperation between athletes reflects the players' awareness and awareness in striving to implement what is asked of them during training is an important factor in determining the level of the team) (5). Now, on the other hand, and as a result of the convergence of levels between the teams, biomechanical specialists confirm that The decisive factor in effectively contributing to

developing the level is mechanical analysis because of its role in tracking and evaluating the level. (Diar) points out "the importance of analysis for the purpose of raising and improving the level of sports performance.(8) " Therefore, Shahad et al.'s study confirms that by analyzing the movement mechanically, we can provide coaches with information about the player's performance and how to invest the mechanical foundations in serving the goal of the movement. (16). (Zainab) also pointed out that "knowing the players' biomechanical variables can lead us to the correct path to skill performance and the need to know the precise contribution of each variable to performance in order to later emphasize these variables that contribute more to the accuracy of skill performance and work to develop it, and to enhance other less variables." Contribution to training in order to develop better performance . (18)(Ahmed's) study concluded that "the correct behavior for implementing tactical sentences during performance acts as a motivation towards performance and thus achieving the goal, which is accuracy of shooting .(9) . From the above, researchers emphasize the necessity of kinetic analysis in detecting and evaluating the level of performance and working to contribute with the rest of the sciences in developing the level of players, as mechanical analysis of movement currently represents a pillar and a basic feature that many international teams rely on in tracking the path of its role in developing performance and achieving victory over the competitor. And this agrees With Zubaida et al.'s study of the importance of bending the torso forward at the moment of shooting, as it requires the player to be able to control his body parts.(20) .The study (rawaa and Bushra) emphasized "the importance of achieving the appropriate real paths for the body parts during the performance of this event" (17).

Conclusions:

- Members of the Al-Shorta Club invest in the biomechanical variables of the arm better than members of the Karkh Club in serving the goal.
- The researchers concluded that the variables of the wrist joint, the angle of bending of the arm, as well as the inclination of the torso had a positive role in the superiority of the Al-Shorta Club player over the Al-Karkh Club players in shooting accuracy.
- Al-Karkh Club players were unable to invest the payment variable effectively in achieving shooting accuracy
- Both teams are working to invest in biomechanical variables in order to achieve accurate shooting, and this is what we notice through the significant differences in most of the variables under study.

Recommendations:

- The importance of analyzing the performance of high-level players for the purpose of determining the degree of investment in biomechanical variables and their role in achieving shooting accuracy.
- Emphasis on making comparisons between Premier League teams.

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دراسة تحليلة لبعض المتغيرات البايوميكانيكية ودقة التصويب من القفز عاليا للاعبي نادي الشرطة والكرخ في الدوري الممتاز في كرة اليد (٢٠٢٢_٢٠٢٣)

انتصار كاظم عبد الكريم 1 ، وداد كاظم مجيد 2 ، زبيدة صلاح هادي 3
3&2&1 جامعة بغداد / كلية التربية البدنية و علوم الرياضة للبنات

مستخلص البحث

يعد البايوميكانيك احد العلوم التي تعتني بتطور الحركات الرياضية من خلال الدراسة والتحليل والتقويم البايوميكانيكي وتوضيح الفروقات وإيجاد العلاقات . ونظرا للتطور الذي شهدته لعبة كرة اليد واتساع قاعدتها في اغلب بلدان العالم فقد زادت الحاجة الى البحث والتقصي لحل المشكلات التي تتعلق بالاداء لتشخيصها وعلاجها ، لكونها من الالعاب التي تمتاز بالاداء الحركي المتغيرما بين التحرك بكرة ومن دون كرة وكذلك الانطلاق السريع والتوقف المفاجئ لتخلص من الرقابة والتصويب على المرمى وغيرها من مواقف اللعب المتعدد التي يوظفها اللاعب في اثناء الواجب الخططي لتحقيق الهدف الاساس وهو التصويب لتسجيل هدف في مرمى الخصم . **تكمن مشكلة البحث** ان اتقان مهارة التصويب من القفز عاليا تعد مهمة للاعبي كرة اليد ولكثرة تكرارها في المبارة . أذ تعد احدى مفاتيح تحديد نتيجة المباراة لذلك فأن اتقانها والتحكم في كيفية استثمارها متغيراتها البايوميكانيكية في تحقيق دقة التصويب العالية تمثل ميزة إيجابية تقود الفريق الى التفوق على المنافس .ومن خلال متابعة الباحثين لمباريات الفرق العراقية وجد الباحثين ان هذه المشكلة جديرة بالدراسة لغرض المقارنة في المتغيرات البايوميكانيكية لاستثمارها اثناء الأداء.**وهدف البحث التعرف** الى قيم بعض المتغيرات البايوميكانيكية في مهارة التصويب من القفزعاليا للاعبي نادي الشرطة والكرخ الرياضي .والتعرف على قيمة دقة التصويب من القفز عاليا للاعبي نادي الشرطة والكرخ الرياضي ، والتعرف على الفروق في بعض المتغيرات البايوميكانيكية ودقة التصويب من القفز عاليا بين لاعبي نادي الشرطة والكرخ في الدوري الممتاز.وتم استخدام المنهج الوصفي على عينة اختيرت بالطريقة العمدية قوامها (20) لاعبا من نادي الشرطة ونادي الكرخ الرياضي في الدوري الممتاز في كرة اليد (٢٠٢٢_٢٠٢٣).**وتوصلت الباحثات الى عدد من الاستنتاجات كانت أهمها:**استثمار افراد نادي الشرطة المتغيرات البايوكينماتيكية للذراع بشكل افضل من افراد نادي الكرخ في خدمة الهدف ،واستنتج الباحثون الى ان كل من متغير مفصل الرسغ وزاوية ثني الذراع وكذلك ميل الجذع كان لها دور ايجابي في تفوق لاعب نادي الشرطة على لاعبي نادي الكرخ في دقة التصويب، ولم يستطيع لاعبي نادي الكرخ في استثمار متغير الدفع بشكل فعال في تحقيق دقة التصويب. وهذا ما يحقق احد اهداف التنمية المستدامة للامم المتحدة في العراق (التعليم الجيد). **وخرجت الباحثات بعدة توصيات** منها:أهمية تحليل أداء اللاعبين ذو المستويات العليا لغرض الوقوف على درجة استثمار المتغيرات البايوميكانيكية ودورها في تحقيق دقة التصويب. والتأكيد على اجراء المقارنات لفرق الدوري الممتاز بين المراتب

الكلمات المفتاحية | **دراسة تحليلية ، المتغيرات البايوميكانيكية ، دقة التصويب بالقفزعاليا بكرة اليد**