



DESIGNING AND CODIFYING A TEST TO MEASURE THE ACCURACY OF PERFORMING THE SCORING SKILL BY JUMPING FORWARD AND SOME BIOMECHANICAL VARIABLES AFTER PERFORMING PHYSICAL EFFORT IN HANDBALL

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Abstract

The study aimed at designing and codifying a test to measure the accuracy of performing the scoring skill by jumping forward in handball to identify an index for the values of some biomechanical values in the skill of scoring among players. The study used the descriptive survey approach. The study sample consisted of players of the specialized school in handball for the sports season (2019-2020) with a total of (54) players. A test was designed to measure the accuracy of scoring forward in order to adopt it as a test for evaluating the performance of players and come up with accurate results in mechanical analysis, where the successful attempt is considered to find out the biomechanical variables. The main experiment was performed to the study sample using a video camera as well as (Kinovea-v18) related to analyzing the skills, while Data were processed using (SPSS -21).

The new testing method confirmed its ability to determine imbalance points and improve scoring performance from the forward area. The testing method concluded a number of conclusions, including:

- 1-Designing and codifying a test to measure the accuracy of scoring from jumping forward and some biomechanical variables after the performance of physical effort in handball.
- 2-The highest level gained by the study sample individuals was within the medium range and the lowest level was medium.

Keywords: biomechanics, motor analysis, physical effort, test and measurement, scoring skill by jumping, handball.

Introduction

Based on a review of previous researches and studies, we noticed that scholars and specialists in the domain of tests and measurement invented several instruments that cope with those variables relating to humans. However, this does not mean that they gained a finite accuracy which is free from errors; even if we reach accurate numbers in measurement and tests, results will be different when we use more accurate instruments. Such a variation in results is attributed to the development of the equipment and devices used in tests and measurements in addition to the instability of the individual's level which varies based on the individual's readiness and motives as well as the errors of notice and experimentation that are based on self-evaluation. Tests and measurements have become important components for development; people all over the world gained more ability to encounter life requirements and problems and gave more accurate values for performance either in individual or group games. The scientific tests in sports domain play a vital role in diagnosis, classification, evaluation as well as assigning scores, standards and levels. Dhurgham A. Neamah Al-Jadaan (2020) suggested that we should employ those methods since evaluating the accuracy of passing, scoring would promote performance. They asserted that good scoring is an effective and necessary skill that is characterized by strength, speed and accuracy in shooting the ball towards the goal without violating the rules of the game, in addition to its role in guiding athletes to identify weaknesses and strengths concerning the physical characteristics and skills that should be evaluated among athletes. (Dhurgham Al-Jadaan, 2018) suggested that players should score quickly without hesitation or delay in order not to allow the

goalkeeper to know the expected movement of the forward players and thus protect the targeted area by the player. Scoring skill is considered as one of the basic skills in handball on which the match score depends, where the most scoring team wins the match. (Hosam Mohammad Jabir, et al, 2017) suggested that scoring is the final conclusion of forward attack, with the hope of scoring a goal, where a suitable situation is created in which a team member is given the chance to score directly with a good chance of scoring a goal. Therefore, several researchers and coaches aim to investigate the objective tests that give accurate measurements of the physical and skilled capabilities for the different sports activities. Handball is one of the most interesting team game for practitioners and spectators; therefore, those interested in the game have to cope with all the new developments in order to be equivalent to the popularity of this game in terms of the increased number of practitioners and spectators in the international and Olympic championships, in addition to the local championships of each national federation throughout the world. Therefore, researchers developed a test that cope with the atmospheres of matches, in that spaces are narrowed in front of forward players and they are prevented from scoring, especially from the nearest distances. Distance; in this case, the forwarders are obliged to get away from the defenders to avoid the occurrence of legal penalty related to colliding with the opponent player in addition to reducing the distance between the forward player and the goalkeeper. Dhurgham AbduSalem (2014) suggested that the player should have a high level of accuracy in implementation due to the close distance between the forward player and the goal, where he attempts to reduce the distance between the shooting area and the goal, which is considered as one of the most important factors in handball; when the distance is closer, the probability of scoring increases. It is well-known that any trait, phenomenon or state cannot be interpreted, determined or analyzed unless it is tested or measured. The game of handball requires a high level of skilled performance in addition to a high physical effort since the game is characterized by rapid rhythm. Dhurgham AbdulSalem Neamah has and Ali Mohammad Hadi (2018) suggested that due to the different scoring distances that range between short, middle and long distances, the scoring accuracy depends on the player's ability to score from long and short distance in addition to the distance between the forward player and the opponent defender. The study problem lies in the negligence of coaches and those working in the training domain for the way of measuring the level of accuracy of skilled performance in general and the measuring scoring from



forward-jumping in particular, since the forward players have an important role in deciding the final score of the match and giving accurate information about the training status of the team. Such a negligence could be attributed to the few number of tests, after the physical effort, that should be based on scientific bases in order to assess the skilled performance of players. Therefore, the authors suggested designing tests that cope with this development, since this problem is worth more investigation to provide the Arabic and foreign library as well as researchers with an important reference in tests and measurement.

The Study Objectives

- 1-Designing and codifying a test to measure the accuracy of performing the skill of scoring from jumping forward after the physical effort in handball.
- 2-Finding out standard scores and levels to test the accuracy of performing the skill of scoring from jumping forward after the physical effort in handball .
- 3-Identifying some biomechanical variables among the study sample individuals.

The Study Hypotheses

- 1-Developing and codifying a test to measure the accuracy of performing the skill of scoring from jumping forward after the physical effort in handball.
- 2-Identifying the standard scores and levels to test the accuracy of performing the skill of scoring from jumping forward after the physical effort in handball.

The Study Methodology

Since selecting the appropriate approach to investigate any problem depends on the nature of the problem itself. Therefore, the researchers used the descriptive approach in order to achieve the study objectives and test its hypotheses.

The Study Sample

The study sample consisted of some players in the specialized school of handball for the sports year (2019-2020), with a total of (54) players; representing about (80.59%) of the study population which consisted of (67) players. In order to verify the consistency of the study sample concerning the variables that may affect the proceedings of the experiment, the researchers conducted a statistical processing using the skewness and showed all the values that had a skewness of (± 3) (Wadie' Yaseen Mohammad and Hassan Mohammad Abid, 1999); indicating that the study sample individuals are consistent in the anthropometric variables

(mean, standard deviation) (height, 1.62, ± 0.20) m, (age , 16.60, ± 0.752) year , (mass, 63.166, ± 3.544) kg.

The Used Equipment And Methods

- Arabic and foreign references.
- Handball pitch and legal balls.
- Rubber hoses.
- A metal measurement tape.
- Medical scale.

The Field Procedures of the Study

The researchers designed and codified suitable tests to achieve the study objectives after reviewing some available researches and studies about designing and codifying tests.

The steps of designing tests (the primary version of the test).

The researchers prepared the primary version of the tests and introduced it to a number of specialists. After reviewing the literature relevant to tests and measurements in handball, the researchers were able to cite a new idea to test the accuracy of performing the scoring skill by jumping forward.(Neamah, D. A., & Mustafa, U. S, 2018) suggested that skilled performance is one of the most important components in the game of handball since it is a rapid game with repeated movements and most of its skills are characterized by working according to aerobic energetic system. Therefore, players should have the persistence that enable them to perform well during the match; in this vein, a specific test was developed and introduced to a number of specialists in the domain of test, measurement and handball.

Tests in the Final Version

The objectives of the test: measuring the accuracy of performing the skill of scoring depending on the arm area.

Instruments: (10) handballs, handball pitch, rubber hoses as shown in the figure below, posters, measurement tape , registration sheet, a recorder.

Procedures

determining the area from which the player starts to move, which is typically in the middle of the court, the way through which the player plays and the area at which he ends playing. The goal is divided into rectangles with different measurements (50, 55, 55, 65, 70) cm, starting from the right and according to the degree of difficulty in relation to the horizontal division (the goal width). As for the vertical division, the goal height is divided into three rectangles with different measurements (60, 75, 65) cm. The rectangles are divided by rubber ropes with 1-cm thickness and a circular shape as shown in the figure below.

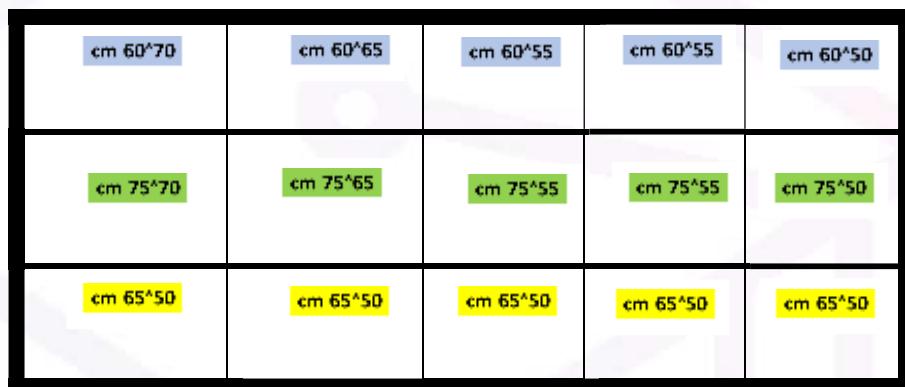


Figure (2): the divisions of handball goal

The Way of Implementation

The investigated player stands holding the ball in the restricted point, which is the middle of the court, where the player moves quickly towards the line of free throw (9-meter line) and then returns back to the starting point, then to the goal-area line and again to the starting point. Then, he moves to the goal-area line and moves in a diametric way towards the middle of the pitch. After that, the player moves towards the arm area to handle the ball from another member in the team, and then he reaches a point that is far away (11) meters from the internal edge of the goal and (2) meters from the line of free throw, which is considered as the starting point for the performance of the three steps to score towards the goal. All the previous movements are performed with the existence of a defender who acts passively (without obstructing the forward player), and each investigated individual is given (5) attempts.

Scoring

- 1- The investigated player is given scores from the right as follows (1,2,3,4,5) for the upper rectangles.
- 2- The investigated player is given scores from the right as follows (1,1,1,3,3) for the lower rectangles .
- 3- The investigated player is given scores from the right as follows (1,1,2,3,4) for the middle rectangles .
- 4- The investigated player is given the score of (zero) when he hits the ball in the vertical or horizontal bars of the goal or when the ball is scored outside the borders of the goal.
- 5- In case the ball touches any of the rubber ropes, half score is given for both areas.
- 6- The score of the test ranges between (0-25) scores.

The Pilot Study

The researchers conducted a pilot study to some players of Basra municipality club with a total of (3) players. The pilot study aimed to identify the suitability of the measurements and determine some test requirements before codifying tests.

The scientific parameters of the test:

The researchers codified the test and applied the scientific bases as follows:

The Test Validity

In order to verify the test validity, the authors introduced it to a number of specialists in the domain of handball, testing and measurement to confirm the suitability of the test. The results revealed that the test measures what it is designed to measure. The authors used the apparent validity which was (100%) after performing the needed modifications. The test was held on a sample that consisted of (5) players from Basra municipality club to verify its reliability.

The Test Reliability

Reliability was verified by test-retest, where the test was reapplied after one week on the same sample that consisted of (5) players. After that, the researchers used Pearson correlation coefficient for the two tests and the results revealed that there is a statistically significant relationship between the two tests as shown in table (1).

Table (1) Reliability degree for measuring the accuracy of performing the scoring skill from the arm

| Test | First test | | Second test | | R-value | Sig. level |
|---|------------|-------|-------------|-------|---------|------------|
| | Mean | SD | Mean | SD | | |
| Measuring the accuracy of performing the scoring skill from the arm | 16.220 | 1.215 | 14.300 | 1.529 | 0.901 | .025 |

Objectivity

Objectivity was performed by two arbitrators. After the results were registered, they were statistically processed using Spearman law as shown in table (2).

Table (2) Objectivity degree for measuring the accuracy of performing the scoring skill from the angle

| Test | First test | | Second test | | R-value | Sig. level |
|---|------------|-------|-------------|-------|---------|------------|
| | Mean | SD | Mean | SD | | |
| Measuring the accuracy of performing the scoring skill from the arm | 14.250 | 2.020 | 13.500 | 2.039 | 0.945 | .005 |

The Main Study

The main study was conducted over a period of (10) days, (6-15/12/2020).

The Mechanical Variables

- 1-Approaching speed: it is the sum of dividing the horizontal distance passed by the player during the last two steps and it is measured by m/s.
- 2-The speed of the ball: it is measured by calculating the distance between the ball center at a certain point and another point after (5) pictures divided by the time of transmitting the ball center between two points and it is measured by m/s.
- 3-Motion amount (momentum) : it is the sum of multiplying the body mass by its speed.
- 4-Kinetic energy: it equals half the sum of multiplying half the body mass by square speed.



The Statistical Methods

The researchers used (SPSS-22) according to the following laws:

1-Mean, 2- standard deviation, 3- percentage, 4- Pearson correlation coefficient, 5- Spearman correlation coefficient, 6- (Z-test).

Displaying, analyzing and discussing the results:

Displaying the Test Results

Table (3) The descriptive analysis

| Descriptive analysis | Lowest value | Highest value | Mean | SD | Variance | Skewness | kurtosis |
|----------------------|--------------|---------------|---------|------|----------|----------|----------|
| Test | 12.00 | 19.00 | 15.8333 | 1.87 | 3.168 | -.139 | -.850 |

Table (3) showed that the highest value of the sample was (19.00), while the least value was (12.00). The mean was (15.8333) with a standard deviation of (1.78). The skewness value was less than (± 1), which means that we can depend on the test since it is suitable for the sample level and approaches the normal distribution, which lies between (± 1), and is called Quartile skewness scale.

The standard scores of the test:

After calculating the raw scores, which are non-significant, since they represent primary results for the test and it is difficult to compare these scores with the test items. Therefore, the researchers changed the raw scores into standard ones by using the modified standard scores by sequencing method; the raw scores are the primary results of the test, which requires changing the raw scores into standard ones, considering it as a way for determining the relative state of the raw scores, so that we can interpret the scores and evaluate their results.

The score (100) represents the maximum evaluation for the distribution of the standard scores, the score (50) represents the middle evaluation, while the score (0) represents the lowest limit of evaluation. The mean of tests is set at the score (50), and then the fixed amount is added to the mean in the table of standard scores. After that, the scores are arranged in an ascending order till we reach the score (100), then the fixed value is subtracted from the mean in the same table and the score is ordered in a descending way until we reach the score (1).

Table (4) The raw and standard scores among the sample individuals

| Raw scores | Standard scores |
|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 24.555 | 100 | 20.105 | 75 | 15.655 | 50 | 11.205 | 25 |
| 24.377 | 99 | 19.927 | 74 | 15.477 | 49 | 11.027 | 24 |
| 24.199 | 98 | 19.749 | 73 | 15.299 | 48 | 10.849 | 23 |
| 24.021 | 97 | 19.571 | 72 | 15.121 | 47 | 10.671 | 22 |
| 23.843 | 96 | 19.393 | 71 | 14.943 | 46 | 13.493 | 21 |
| 23.665 | 95 | 19.215 | 70 | 14.765 | 45 | 10.315 | 20 |
| 23.487 | 94 | 19.037 | 69 | 14.587 | 44 | 10.137 | 19 |
| 23.309 | 93 | 18.859 | 68 | 14.409 | 43 | 9.959 | 18 |
| 23.131 | 92 | 18.681 | 67 | 14.203 | 42 | 9.781 | 17 |
| 22.953 | 91 | 18.503 | 66 | 14.053 | 41 | 9.603 | 16 |
| 22.775 | 90 | 18.325 | 65 | 13.875 | 40 | 9.425 | 15 |
| 22.597 | 89 | 18.147 | 64 | 13.697 | 39 | 9.247 | 14 |
| 22.419 | 88 | 17.969 | 63 | 13.519 | 38 | 9.069 | 13 |
| 22.241 | 87 | 17.791 | 62 | 13.341 | 37 | 8.891 | 12 |
| 22.063 | 86 | 17.613 | 61 | 13.163 | 36 | 8.713 | 11 |
| 21.885 | 85 | 17.435 | 60 | 12.985 | 35 | 8.535 | 10 |
| 21.707 | 84 | 17.257 | 59 | 12.807 | 34 | 8.357 | 9 |
| 21.529 | 83 | 17.079 | 58 | 12.629 | 33 | 8.179 | 8 |
| 21.351 | 82 | 16.901 | 57 | 12.451 | 32 | 8.001 | 7 |
| 21.173 | 81 | 16.723 | 56 | 12.273 | 31 | 7.823 | 6 |
| 20.995 | 80 | 16.545 | 55 | 12.095 | 30 | 7.645 | 5 |
| 20.817 | 79 | 16.367 | 54 | 11.917 | 29 | 7.467 | 4 |
| 20.639 | 78 | 16.189 | 53 | 11.739 | 28 | 7.289 | 3 |
| 20.461 | 77 | 16.011 | 52 | 11.561 | 27 | 7.111 | 2 |
| 20.283 | 76 | 15.833 | 51 | 11.383 | 26 | 6.933 | 1 |

The Standard Levels of the Test:

Table (5) The raw and standard scores and the number of players in the normal distribution curve among the sample individuals

| Ratios and standard level in the normal distribution curve | Standard scores | Raw scores | Number of players | Percentage |
|--|-----------------|----------------|-------------------|------------|
| Very good (4.86) | 81-100 | 21.173 or more | / | / |
| Good (24.52) | 61-80 | 17.613-20.995 | 15 | 27.78 |
| Middle (40.96) | 41-60 | 12.985-14.053 | 22 | 40.74 |
| Pass (24.52) | 21-40 | 10.493-13.875 | 17 | 31.48 |
| Low (4.86) | 1-20 | 10.315 or less | / | / |

Table (5) showed that the levels achieved by the study sample in the test were medium, where the number of players was (22), while the highest number of players was in the good level with (15) players, whereas no players were registered in the "very good" level. The researchers attributed this finding to the inner understanding of information in the motor performance, where most players depend on the information that were taught during the training units due to their impact on learning the basic skills in addition to the experience that players gain during training sessions and the intensive repetition. Furthermore, this is a stage of applied implementation of skills, and this gives players more ability to perform and have more scoring accuracy. Also, this skill is a basic and interesting one that encourages players to perform well since competition exists amongst players who are interested in doing their best in implementing the targeted skill. The researchers also attributed that to the individual differences between the study sample individuals, where we noticed that some players are characterized by high skills, which resulted from the intensive training and the ability to cope with the difficulties that face them while training. Dhurgham AbdulSalem (2015) referred to (Owen) who suggested that repeating the skilled training as many times as possible while taking sufficient rest periods provides players with a sufficient opportunity to master the skill and perform it well, since the intensive training of compound skills and repeating them accurately contribute to performing them well while playing. Additionally, performing the skill requires high accuracy in performance since the player moves in a small area that includes two or three steps and the scoring angle is small; therefore, the



player needs to swing his arm to the back to take the suitable position for scoring. This finding agrees with (Dhurgham and Kamel Shsnin, 2017), who suggested that pulling the ball in hand within the shortest way to the throwing-shoulder level and then returning the throwing arm while keeping the shoulder to the back, would give more power, with more focus on the movement of the wrist joint and the fingers in directing the ball.

Table (6)

The biomechanical variables among the study sample individuals

| Number | biomechanical variables | Measurement unit | Mean | SD |
|--------|-------------------------|------------------|---------|-------|
| 1 | Approach speed | m/s | 2.431 | 0.088 |
| 2 | Ball speed | m/s | 17.315 | 0.577 |
| 3 | Momentum | Kg*m/s | 153.09 | 5.732 |
| 4 | Kinetic energy | joule | 185.976 | 3.684 |

Table (6) showed that the variable of approach speed was small since the distance moved by the player is relatively large as the defender player attempts to obstruct the forward player in addition to reducing the distance moved by the scoring player. Therefore, the approach speed is relatively small; a state that was suggested by speed law which stated that when the time is less, the player's speed increases with the fixation of distance. The variable of ball speed depends on the approaching speed and the arm strength in addition to the player's ability to convert power from the arm to the ball; when the arm's movement is rapid and more extended to the back in preparation for the scoring process, the arm movement will be better and thus the speed of the ball will be stronger. Therefore, we notice that the study sample individuals did not achieve the targeted speed of the ball since the players are young in addition to not pulling the arm towards the back, and this resulted in a slow speed. This finding was confirmed by (Dhurgham Al-Jadaan, 2020) who suggested that the speed of the ball resulted from the movement from the lower limbs to the upper limbs across the trunk, towards the arm and finally towards the ball. Additionally, the period of the player's flying after leaving the ground up to the moment of landing is low; therefore, the player should score before touching the ground to avoid error. Accordingly, the speed of movement should be increased by producing power and transmitting it from the center foot to the trunk, then to the throwing arm and finally to the ball; this

reflects a set of rapid transfer processes in order to get a higher speed. The variable of momentum depends on the player's speed; when the speed is high, momentum will be high. Therefore, we noticed that the player's speed is low since he moves in a small area with no more than three steps, and thus time is too short. As for the kinetic energy, we noticed that it was relatively low and this adversely affected the speed of the ball in terms of the physical effort exerted by the player before scoring, which includes rapid movements since he deals with time; when the speed is high, time becomes less and thus the variable of kinetic energy is low. This finding was confirmed by Eiman Shakir Mahmoud (1992) who suggested that more momentum and approaching speed increased the kinetic energy and suggested that horizontal speed is the basic foundation to gain the vertical height after impulse with the lowest decrease of speed at taking off. Reesan Khoraibit and Najah Mahdi Shalash (1992) suggested that muscular contraction creates power during a short period of time since speed should be too high in order to be more influential in terms of body impulse; this is confirmed by the following relationship:

$$\text{Impulse} = \text{force} \times \text{time}.$$

Conclusions:

- 1- Designing and codifying a test to measure the accuracy of performing the scoring skill by jumping forward and some biomechanical variables after performing physical effort in handball.
- 2- The highest level achieved by the study sample individuals was within the medium level and lowest level was medium.
- 3- The level of the study sample seemed physically-low and this was suggested by the variable of speed.
- 4- The level of the sample performance was within the pass, medium and good levels.
- 5- The variable of kinetic energy is low due to the exerted effort and thus speed is low.

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