

The effect of an electronic device designed to measure the degree of bending of the knee angle in developing the skill of catch and Clearance the high ball for football goalkeepers under (15 years)

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Abstract

The development taking place on the sports field at the general level and in the game of football at the private level, being the most popular game in the world, has reached very advanced stages. The use of modern aids and technology has contributed greatly to this development from the collective and individual aspects, as the goalkeeper is the most important position in the team, the use of devices gave objective readings about the goalkeeper's ability in terms of skill and physical aspects, as the importance of the research lies in designing an electronic device to measure the degree of bending of the knee angle because of its great importance in developing the skill of catching and dimensions of the high ball for football goalkeepers. The researchers chose a sample under the age of 15 years. Being an emerging age group, we consolidate the correct motor program for the skill to reach the best performance. The research aimed to prepare exercises using the device designed to develop the skill of catching and clearance the high ball, and also to identify the rate of development of the aforementioned skill. The research assumed that there were statistically significant differences in favor of the post-test results. The research sample was determined practically by (4) goalkeepers for the Iraqi Al-Zawra'a Club, where the researchers used the experimental approach, which is the approach that suits the nature of the research. The researchers concluded that the use of assistive means and electronic devices, including the designed device, contributed significantly to developing the skill of catching and clearance of the high ball through the exercises prepared on the device. The researchers recommend the use of modern technology and modern sports equipment in preparation for exercises, as it gives an accurate objective reading, which is the foundation stone for building exercises and measuring the rate of development

.Key Words: football, goalkeeper, knee degree

Introduction

The great development witnessed by the world in all fields, including the sports field, has led to the development of Sports levels and the achievement of great achievements for various sports events,

and these achievements did not come by chance or out of a vacuum but were achieved thanks to the ability of researchers and specialists to employ various sciences and through proper scientific planning to serve the achievement in these events (Mohameed and Nawfal., 2018).

Football is one of the prominent sporting events that has received increasing attention from various countries and at all levels. Such interest has made researchers always strive to develop the game by raising the levels of players from a physical, tactical, and psychological perspective, in addition to developing their skill aspect (Ghazi and Saleh., 2019). Football has become an extremely competitive sport, with teams striving to gain an edge over their opponents. This has led to the development of specialized strategies and techniques to improve player performance and win more games, Technological advances such as data analytics and AI have further improved the game (Abdulhameed and Abdulkareem., 2021).

The goalkeeper has special importance and a great responsibility in football matches. A poor performance by the goalkeeper may lead to losing the match, while a good performance can secure the match. It is one of the most special positions in football and its primary function is purely defensive, specializing in defending the team's goal. Against the opposing team's attackers and preventing them from scoring goals, this task requires special specifications, as the goalkeeper must have physical and skill capabilities in addition to choosing the correct technique and position through the appropriate angles, especially the knee angle, as it is one of the most important angles influencing readiness and preparation for flight (Gamal., 2018).

The skill of catch and clearance the high ball is one of the skills used by the goalkeeper to catch the high lateral ball that comes from the fixed ball, or from the moving ball by the opposing team player who lifts it high to his attacking colleague, then the goalkeeper comes out to catch it and cut it off from the attackers, and the receipt of the high ball from the side by the goalkeeper is in the form of a dueling movement in the case of defensive retreats nearby (hussein and Malek., 2023). The goalkeeper has to regulate the timing of jumping and catch the ball with his hands, and he has to bend his arms to put the ball between his hands, arms, and chest and put the weight of his body when he goes down from jumping on the back foot, and Mufti Ibrahim says, "on the goalkeeper, as soon as the ball meets the fingers, the hands work to absorb the force of the ball, and this is done from the joints of the wrists, elbows, and shoulders, as the arms come back a little," and here we emphasize the goalkeeper's readiness posture and take the appropriate position to the degree of bending the knee angle (Lazam and Abdul Altef., 2019).

Modern technology and auxiliary tools are considered one of the main factors contributing to the development and improvement of the basic skills of goalkeepers (Zaidam and Hamid., 2019). Training in management assistance is an important applied aspect aimed at reaching the player to the correct performance that provides the correct movement mechanism, so it requires the goalkeeper to take the correct skill technique at the right time adapted to different playing situations, and this is not achieved by simply relying on exercises, but the training process has adopted the auxiliary tools that those responsible hope to accelerate the process of development of skill ability, as approaching the optimal performance form and method is a fundamental duty of the training process (Mohsen and Khadem., 2021).

Hence, the importance of research into designing a device to measure the degree of bending of the knee angle and using it in training for the purpose of developing the skill of catch and dimensions of the high ball by using the appropriate bending of the knee angle.

Material & methods

The researchers used the experimental method to study a sample of the Iraqi Al-Zawra'a Football Club (4 goalkeepers), as shown in Table 1.






Table 1. shows the homogeneity of the sample according to growth indicators

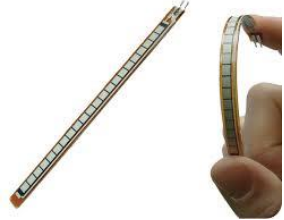







The variable	Unit of measurement	mean	median	Standard deviation	Skewness
height	Cm	180.25	180.50	3.5	0.321
Weight	Kg	67.5	65	2.38	0.01
Age	Year	12.87	12.75	0.85	0.75
Training age	Year	2.95	2.9	0.42	0.64

The researchers used the following tools and methods in order to conduct research:

Knee angle curvature measuring device:

Materials used in the manufacture of the device:

No	Device Parts	No	Purpose	Figure
1	Connecting wires (Breadboard Jumper Wires)	1	deliver power (L, N) from the Arduino microcontroller board to the board	
2	Connecting wires (Row Dupont Cable M-F)	1	used to connect the sensor in the Arduino microcontroller board	
3	Connecting wires (Row Dupont Cable F-F)	1	used to connect the sensor in the Arduino microcontroller board	
4	battery connector	1	deliver power from the battery to the Arduino microcontroller board	
5	lithium Battery	2	deliver power to the Arduino microcontroller board	

6	fliX Sensor number	1	Sensor to the measurement of elasticity extracted through the value of the angle by software code	
7	0.5 mm Copper wrapping wire reel 30 AWG 3 pin	1	used to connect the signal and electricity between the ports	
8	Microcontroller board (Arduino Uno R3)	1	a smartboard that is programmed by code to implement what is required of it by several sensors that input, read and extract the signal via Bluetooth or monitors, etc	
9	lithium holder	1	rectangular base for carrying the battery	
10	HC-06: Bluetooth	1	Bluetooth connector for data extraction to the mobile	
11	1000um impedance	1	used with flexibility sensor to adjust the reading value	
12	Arduino base	1	used to carry and install the Arduino.	
13	knee belt	1	The device is attached by knee belt as to easily attach it to the knee joint	

The work of the device: This device gives instantaneous measurements of the degree of curvature of the knee angle.

Device Description: The machine is manufactured by (Arduino Uno R3). The device is attached by special rubber rest. The device is designed to give comfort when performing. The goalkeeper wears it when performing the test. The device has two entry ports, the first for the purpose of connecting electricity to the device. It operates with a voltage (5V), the second (USB) port for the purpose of giving orders and programming the device. The device in turn has two outlets for the purpose of connecting voltage (L, N) in addition to the reference to sensors.

Method of operation: the goalkeeper wears the device at the knee joint where there is a sensor (flex Sensor) and the device is connected to the power source (lithium battery) and the device is turned on and connected to Bluetooth via the mobile, and as soon as the first movement starts, the sensors send a digital data signal to the mobile via Bluetooth, where they review the values of the degree of curvature of the knee angle over time.

Tools used: questionnaire form, SPSS program, Footballs (number) (4), Surface laptop (3)

The main experience: The pretests were held on 25-05-2023 at the stadium of the Iraqi football club Al-Zawra'a.

The high ball catch, and clearance test was applied as follows:

High altitude ball catch test: (Jabber., 2012).

Purpose of the test: Measure the goalkeeper's skillful ability to catch high balls over the head.

Necessary tools: Half of a regular football field, Goalkeeper in the penalty area, Footballs number (10), Legal goal, Soccer Training Cones, Tape measure, Registration form, Whistle.

Performance method: The goalkeeper stands in the place specified for him in the goal and according to the position of the ball from the goal, and upon hearing the instruction by the coach, the goalkeeper must go out of the goal to the divided areas to catch the ball high in front of the penalty area as shown in figures (1).

Recording method:

- (3) points are awarded when the ball is caught completely directly from above and above the opposing player.
- (2) points are given when catching the ball in two batches.
- (1) point is awarded when the ball is removed from above the opposing player.
- (0) points are awarded as a zero in case the tester does not reach the ball, or the ball enters the goal by the opposing player.

The sum of the scores of the ten attempts is calculated: (Total try scores (10) / 10 = post-test grade)

Test conditions:

- The tester (goalkeeper) is given ten balls, (4) balls from the front, and three (3) balls for each side from outside the penalty area.
- The goalkeeper's exit is within the designated test area according to the division of the penalty area.
- The other goalkeeper enters as the opposing player in these areas to increase the competition between the testers and the speed of the goalkeeper to catch the ball from the highest point, according to international football law(IFAB).

If the ball does not reach the specified places from the coach, the attempt is repeated.

The researchers prepared special exercises according to the designed device and the skill of catching and clearance the high ball for goalkeepers in football. The exercises were applied in the main section of the training unit and under the direct supervision of the researchers on Saturday, 30/05/2023. The application of the exercises ended on Thursday, 25/07/2023, on the research sample and in proportion to the level of the sample and their skill and motor abilities, The researchers sought to prepare these training of (24) training units over two months (3) units per week.

A sample of a daily training unit:

- (1) The Objective of the training: to develop the skill of catching or clearance a medium-height ball for football goalkeepers .

Goalkeepers: Number (4).

Exercise tools: knee angle measuring device, football number (15), football field penalty area, training mannequins Opposite the goal in the center.

Number of repetitions: (10 – 15).

Number of Sets: (2).

Positive rest between groups: (5) minutes.

The method of performing training: the device is placed on the inside of the knee joint and the goalkeeper stands ready in the center of the goal and when the ball is shot by the coach on the training mannequins, the goalkeeper receives a rebound ball from the training mannequins, the goalkeeper then prevents the ball from entering the goal, either catching it or clearance it away the training is performed (right and left) according to the direction of the ball.

- (2) The Objective of the training: to develop the skill of catching or clearance a medium-height ball for right-sided football goalkeepers .

Goalkeepers: Number (4).

Exercise tools: knee angle measuring device, football number (15), football field penalty area, training mannequins Opposite the goal in the left.

Number of repetitions: (10 – 15).

Number of Sets: (2).

Positive rest between groups: (5) minutes.

The method of performing training: the device is placed on the inside of the knee joint and the goalkeeper stands ready in the left side of the goal and when the ball is shot by the coach on the training mannequins, the goalkeeper receives a rebound ball from the training mannequins on the right side, the goalkeeper then prevents the ball from entering the goal, either catching it or clearance.

- (3) The Objective of the training: to develop the skill of catching or clearance a medium-height ball for left-sided football goalkeepers.

Goalkeepers: Number (4).

Exercise tools: knee angle measuring device, football number (15), football field penalty area, training mannequins Opposite the goal in the right.

Number of repetitions: (10 – 15).

Number of Sets: (2).

Positive rest between groups: (5) minutes.

The method of performing training: the device is placed on the inside of the knee joint and the goalkeeper stands ready in the right of the goal and when the ball is shot by the coach on the training mannequins, the goalkeeper receives a rebound ball from the training mannequins on the left side, the goalkeeper then prevents the ball from entering the goal, either catching it or clearance.

The Post-test were conducted on 30-07-2023 at the stadium of the Iraqi football club Al-Zawra'a and the high ball catching and clearance test was applied to find out the extent of the effect of the exercises prepared according to the device designed on the sample under study.

Presentation and analysis of results

Once the researcher has completed the tests on the research sample, the findings are presented in tables, displaying their statistical values. This step is crucial as it serves as an illustrative tool for the research. The results are then thoroughly discussed. To enhance clarity, the findings will be sequentially presented and discussed for each variable that was studied.

Table 2. Shows the statistical values of the individuals of the research sample

The variable	Unit of measurement	pretests		Post-test		Skewness	t	sig
		mean	Standard deviation	mean	Standard deviation			
Catching high-altitude balls	Point	16.10	3.57	18.10	4.30	2.00	3.56	0.01

* At a degree of freedom (3) and a probability of error (0.05)

Presentation and analysis of the results of pre-and post-tests of the catching skill and the clearance of the high-altitude ball among the members of the research sample.

shown in table (2) that the value of the arithmetic mean and standard deviations of the pretests and post-test of the results of the altitude high ball catching test is as follows:

The value of the arithmetic mean of the results of the pretests among the members of the research sample was (16.5), while the amount of its standard deviation was (3.57), and the value of the mean of the post-test was (18.10)with a standard deviation of (4.30), while the amount of differences in the mean between the first and the post- Test was (2.00). By treating these results statistically, it turned out that the value of (t) was (3.56), and the error rate was (0.01). It is below the level of significance (0.05) by a degree of freedom (3). Which indicates that there are significant differences between the pretests and post-test and in favor of the results of the post-test of the researched variable among the individuals of the research sample, the results indicated that there is a percentage of evolution of the results of this variable.

Discussion

Discuss the results of the results of pre-and post-tests of the catching skill and the clearance of the high-altitude ball among the members of the research sample.

The results were presented in Table (2) between the pre-test and post-test for the catching skill and the clearance of the high-altitude ball in favor of the post-test. The researcher attributes because of this to the application of exercises using the designed device has contributed significantly to the development of skills among the members of the research sample in terms of taking the appropriate position to prepare and make the right decision to tackle the ball, These exercises develop the motor program of the skill in a way that suits the anthropometric measurements and the physical and skill abilities of the goalkeeper, which helps him achieve more understanding of the nature of exercise performance, which makes him succeed in performing skills in various playing situations, , The auxiliary tools also motivate the goalkeeper to perform exercises with desire and enthusiasm, as well as when placed with training modules that generalize motor programs, and this is reflected on the skill performance in the match.

The researchers agree with this (Ghazi Mahmoud Saleh and Riad Mazher, 2014), who emphasizes that "the process of organizing training plays a fundamental role in developing the basic skills of players in line with the players' abilities, and the training conditions and possibilities lead to preparing the player well, and also play a positive and significant role in the process of understanding and developing the players ' motor skills".

The researchers add that the method adopted in building the exercises prepared according to the use of the designed device contributed to achieving these moral results, as well as focusing on giving the appropriate and accurately programmed repetitions commensurate with the capabilities of the research sample members, and continuous guidance by the support team in motivating them to implement these exercises while working to correct errors by repeating. The research sample also contributed to the positive effects on the development of their level, through the formation of the training load and changing its ratio and types.

This is confirmed by (Yousef Lazim Kammash, 2002) that "the degrees of training load play a fundamental and important role in the development of special basic skills of football players, as a result of its various effects on vital body systems during training or competition", and it is necessary to use auxiliary means and tools and take advantage of them to contribute to improving the level of skill performance and increases the effectiveness of teaching and improving skills.

This is what he pointed out (Mohammed Adel,1989), "that the importance of auxiliary means, devices and tools does not lie in the means and tools themselves, but in what these means, devices and tools achieve specific behavioral goals provided that they are part of a systematic sequential plan to achieve the goals of the training educational unit.

He agrees (expresses khion, 2002) that "similar means and tools are used to provoke the learner to appropriate performance in the appropriate conditions", and this is confirmed by (Dan Austin & Bryan Mann, 2015) by saying that "training on means, devices and auxiliary tools is an important applied aspect aimed at getting the player to the correct performance that provides the correct movement mechanism, the necessary strength, speed and timing".

(Youssef Qatami and Naifa Qatami 1998), agree on the importance of the means and tools used in the research "that the means and tools help make the individual more focused on the skill to be learned and developed and the tools used help to diversify the performance of skills that improve performance for the better."

The researcher believes that the auxiliary means and tools have an important and effective impact on the training process, and this is indicated by the sources and references mentioned above, while the impact of using auxiliary means and tools for the purpose of developing skills lies through the performance and repetition of motor exercises with the basic skills of football goalkeepers, in other words, it should be close to the playing conditions, taking into account the change in exercises and its multiplicity, as well as the goalkeeper's rush towards the skill and motor performance of modern and easy to use means and tools. Which has never been used before, which generates confidence, desire, pleasure in performance and pushes him towards providing a better level, Which indicates that the direction of the indicator is towards the positive impact of Skill Development, and that

providing the goalkeeper with the opportunity to perform exercises at a slow speed during the first repetitions allows a clear vision, This is reflected in the level of skill performance, due to the generation of motor programs and cognitive experiences according to the correct motor pathways in the motor memory that contribute to the process of proper performance, and through the use of auxiliary means and tools in training, the coach can make the ball in the position he wants, and when the goalkeeper applies the exercises repeatedly to the same ball positions and in the same way that must be learned in order to perform the motor and skill response speed and reach the required level.

Conclusions

- (1) The use of electronic devices in sports leads to reducing time and saving effort to reach the best results.
- (2) Through this device, it is possible to find out the degree of curvature of the ideal knee angle and write the training program for the guard on these results.
- (3) Some guards exaggerate the degree of bending the angle of the knee down, thinking that it gives the best amount of force needed to counter the ball, and this concept is wrong.
- (4) The results proved that each guard has a degree of bending the knee angle is different from the other and there is no ideal degree.

Recommendations

Emphasizing the use of exercises using auxiliary means because of its extremely important impact on the development of the skill of catching and clearance the high-altitude ball among football goalkeepers under 15 years. The researcher recommends goalkeeping coaches to use regular scientifically based training curricula when preparing special exercises in terms of the sequence of exercises used, the amount of load given, the duration of breaks during the training unit and leaving random work. Conducting research and studies on games, events and other skills at different age stages.

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Appendices

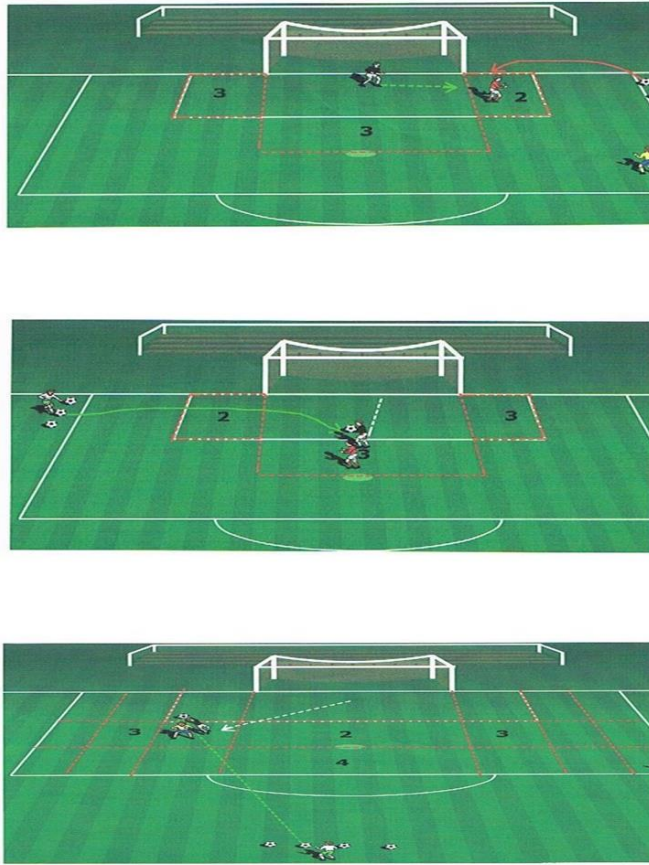


Figure1. High altitude ball catch test.



Figure2. Knee angle curvature measuring device:

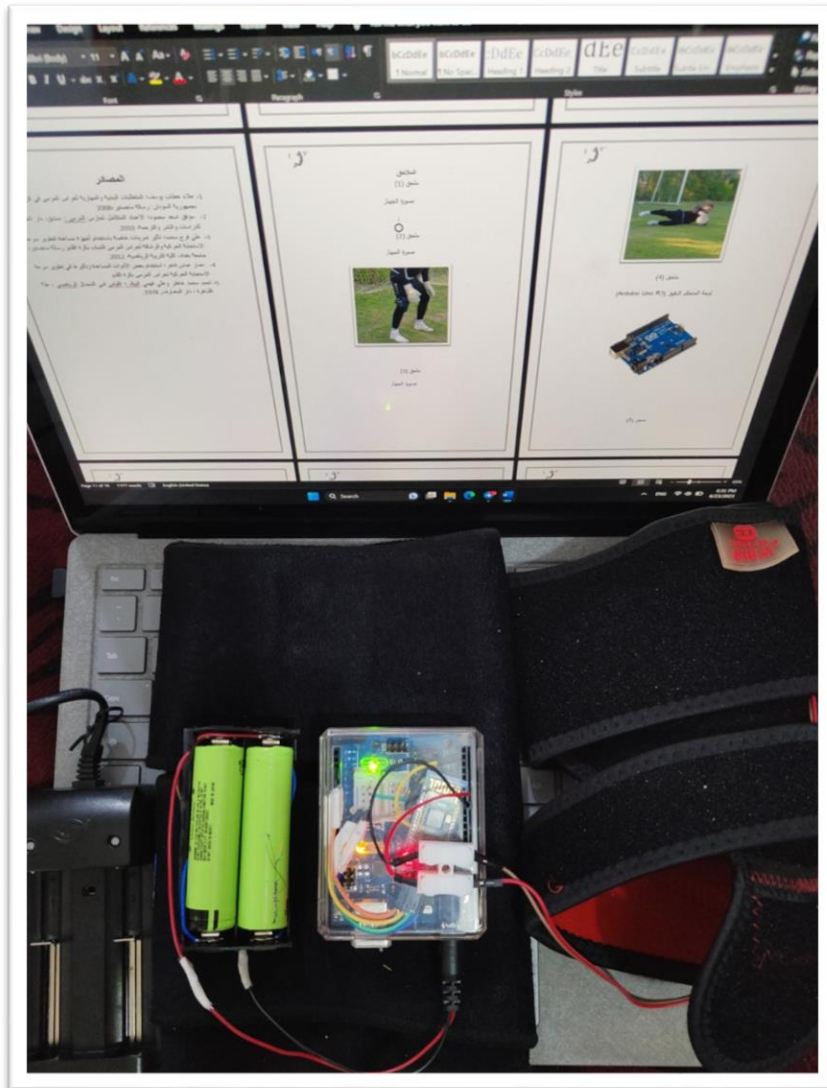


Figure3. The device in its final form