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Coach's Eye Program for Providing Immediate Feedback and Its Role in Developing Dribbling Skills with Directional Changes in Basketball

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ORIGINAL STUDY

Coach's Eye Program for Providing Immediate Feedback and Its Role in Developing Dribbling Skills with Directional Changes in Basketball

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Abstract

The significant advancements in learning, particularly the integration of artificial intelligence (AI) applications, have led to noticeable improvements in the educational process. AI is considered one of the most prominent modern technologies employed, especially in the field of physical education. The research problem emerges from the researchers' practical experience as instructors at the College of Physical Education and Sport Sciences. Through their teaching of basketball, they observed that the learning process struggles to keep pace with modern advancements—particularly in providing feedback to learners. Delays in delivering feedback negatively impact students' performance and their development of the dribbling with direction change skill. Additionally, there is a lack of accurate and immediate monitoring during the learning process. Accordingly, the research problem was: "To what extent does the use of the Coach's Eye application contribute to providing immediate feedback to improve the dribbling with direction change skill in basketball?" The study aimed to examine the role of the Coach's Eye application in providing immediate feedback during learning and to assess the feasibility of using it to deliver real-time feedback and improve the performance of second-year students at the College of Physical Education and Sport Sciences for Women – University of Baghdad. The conclusions highlighted the importance of the Coach's Eye application in delivering immediate feedback and enhancing the learning process. Real-time feedback was found to increase students' motivation and confidence in performing the dribbling with direction change skill. The researchers recommended integrating AI technologies into physical education as a supportive tool for developing students' skills and ensuring accurate, immediate feedback. And this achieves one of the sustainable development goals of the United Nations in Iraq which is (Quality Education).

Keywords: Coach's eye application, Immediate feedback, Dribbling with direction change

1. Introduction

In recent years, the world has witnessed numerous developments and challenges in the fields of technology and education, particularly with the increasing use of artificial intelligence applications, which play a vital and distinctive role in advancing the educational process. This is especially evident in the field of physical education, as well as across various other disciplines, where AI applications have become essential tools, heavily relied upon in professional practice. Scientific research in the field of educational technology is increasingly focused on integrating artificial intelligence to enhance learning environments, increase their effectiveness, and achieve diverse learning outcomes. This, in turn, facilitates the educational process and enables faster attainment of learning objectives. Feedback is considered one of the fundamental and essential elements in the learning process, as it enables learners to acquire and master skills correctly through repetition and correction. The use of the Coach's Eye application supports learners in immediately identifying and correcting their errors, enhancing their performance, and providing them

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with specific guidance on how to execute the skill properly. This facilitates accurate skill acquisition and encourages continuous repetition. Moreover, it assists in correcting learners' mistakes during the learning process, thereby improving their overall skill development. The research problem lies in the fact that the dribbling with direction change skill is one of the fundamental techniques in basketball, requiring precise ball control, motor balance, and the ability to make quick decisions during execution. Many students face challenges in mastering this skill, such as losing control of the ball while changing direction or failing to recognize movement errors in real time, which negatively affects their performance. In light of technological advancements, intelligent applications such as Coach's Eye have emerged as effective tools for providing immediate feedback, thereby contributing to the development and improvement of skill acquisition. However, the effectiveness of this application in developing learners' performance in the dribbling with direction change skill has not been sufficiently studied. This raises a question regarding its impact compared to traditional methods. Accordingly, the research problem was formulated as follows: To what extent does the Coach's Eye application contribute to providing immediate feedback and enhancing female students' performance in the dribbling with direction change skill? Magill (2001) affirms that the role of feedback for both the learner and the instructor is essential in acquiring motor skills.

Basketball is a team sport that requires precision and concentration in the execution of its skills. Mastery of the fundamental skills in basketball forms the foundation for success in the game and the achievement of victory. A team whose players lack proficiency in essential skills—such as dribbling, passing, and shooting—cannot succeed, nor can it effectively plan or secure wins. As noted by Moawad (2003), the basic technical skills in basketball represent the foundation of the game and serve as the means by which players execute game strategies with precision and speed. A team whose players can control the ball effectively, perform passes quickly, and shoot accurately toward the basket is considered a strong team.

The significance of this research lies in understanding how the use of the Coach's Eye application contributes to providing immediate feedback during skill acquisition. It also facilitates the analysis of learners' needs and the provision of appropriate solutions to help them overcome challenges and make measurable progress in acquiring basketball skills.

The significance of this research lies in recognizing that the use of the Coach's Eye application contributes to providing immediate feedback during skill acquisition, analyzing learners' needs, and offering appropriate solutions to help them overcome challenges and make progress in learning basketball skills.

The aim of the research is to examine the effectiveness of the Coach's Eye program in delivering immediate feedback and its role in developing the dribbling with direction change skill among second-year female students at the College of Physical Education for Women.

2. Research hypothesis

There is no statistically significant relationship between the use of the Coach's Eye application and the acquisition of the dribbling with direction change skill in basketball.

2.1. Research scope

1. **Human Scope:** Second-year female students at the University of Baghdad – College of Physical Education and Sport Sciences for Women, academic year 2022–2023.
2. **Temporal Scope:** From February 12, 2023, to April 16, 2023.
3. **Spatial Scope:** The outdoor basketball court.

2.2. Methodology and procedures

The research population was identified by the researchers as second-year female students at the College of Physical Education and Sport Sciences for Women during the 2022–2023 academic year, with a total of 63 students. An intentional sample was selected from Section (B), which included 20 students. From this group, the research sample consisted of 10 students who maintained regular attendance. To ensure homogeneity within the sample, the coefficient of skewness was calculated for height, weight, and age, as presented in Table 1.

Table 1 presents the characteristics of the sample in terms of height, body mass, and age. The arithmetic mean and standard deviation were calculated for each

Table 1. Homogeneity of the sample in terms of height, body mass, and age.

Measurement	Values	Arithmetic Mean'	Standard Deviation	Median	Skewness Coefficient
Height	cm	161,60	3,806	161,50	0,687
Weight	kg	70, 10	0,482	71,00	0,687
Age	years	23,60	0,482	23,00	0,687

variable to assess the homogeneity of the sample. The statistical values indicate a close range among the participants in these variables, confirming the sample's homogeneity and its suitability for the purposes of the study.

2.3. Instruments and tools used in the research

The researchers utilized Arabic and international sources, the Internet, the Coach's Eye application, testing and measurement tools, a data collection form, an assisting work team, a medical scale for measuring weight, one Dell computer operating on Windows XP, an iPhone mobile device, six cones, five basketballs, a measuring tape for height, one whistle, and a measuring tape.

To identify the research variables, the researchers reviewed a wide range of Arabic and international sources relevant to the study topic. A number of tests were selected for measurement purposes and were presented through a questionnaire form, which was reviewed by a panel of five experts (Appendix 1). The experts reached an 80% agreement on selecting the first test, which is:

2.4. Test name

Assessment of Performance Level in the Dribbling with Direction Change Skill (Zidan, 2000).

2.5. Purpose of the test

To measure the performance level of the dribbling with direction change skill.

2.6. Tools used

Basketball court, 5 basketballs, adhesive tape, 6 cones, stopwatch.

2.7. Performance procedure

A starting line is marked by placing a 3-meter strip of adhesive tape at the centre of the basketball court. Six markers, each 40 cm in height, are positioned in a straight line. The distance between each marker is 1.5 meters, with the first marker placed 2 meters from the starting line.

Test Conditions Each participant is given three attempts.

The player performs the dribbling skill by manoeuvring the ball between the markers in a forward direction only. The performance is evaluated by a panel of judges, and the total score for each attempt is 10 points.

2.8. Pilot study

The researchers conducted the pilot study on Sunday, February 12, 2023, at 10:00 a.m., involving five students outside the main research sample. The study was carried out in the indoor hall of the College of Physical Education and Sport Sciences for Women, University of Baghdad. During the pilot study, the dribbling with direction change test—previously approved by the panel of experts—was implemented (Appendix 1). The pilot sample participants were recorded while performing the dribbling skill. The purpose of the pilot study was to identify potential errors, assess the effectiveness of using the Coach's Eye application, and determine its ability to provide immediate feedback to the students. It also aimed to evaluate the quality and accuracy of the video recordings and detect any technical or performance-related issues. Four days later, the test was repeated under the same conditions.

3. Scientific foundations

3.1. Validity

The researchers employed content validity by presenting the dribbling with direction change test to a panel of experts specializing in testing, measurement, and basketball. The experts reached a consensus of 80% or higher, agreeing that the test accurately measures the objective for which it was designed.

3.2. Reliability

The researchers established the reliability coefficient using the test–retest method. The initial test was conducted on February 12, 2023, and the retest was administered on Thursday, February 16, 2023. The Pearson correlation coefficient was calculated, and the results indicated that the test demonstrated a high degree of reliability.

3.3. Coach's eye application

Coach's Eye is a specialized application used for analyzing athletic performance. It provides advanced video tools that enable athletes to review and analyze movements in detail. In this study, the dribbling with direction change skill was recorded and then replayed in slow motion, with visual and auditory annotations added to analyze errors and demonstrate how to correct them. The application also allows for performance comparison, thereby contributing to the improvement of skill acquisition. The research sample consisted of second-year female students at the

Fig. 1. Interface of the coach's eye application.

Fig. 2. Illustration of error identification and correction process.

College of Physical Education and Sport Sciences for Women. Using this application, a video of the dribbling with direction change skill was recorded through the app's built-in camera, allowing for performance analysis and the provision of immediate feedback to the student. The application enables repeated viewing of the student's errors and allows the video to be sent to the student multiple times for review and correction. Additionally, it supports slow-motion replay, which facilitates the identification of errors and focused attention on them. Visual annotations can also be added to highlight mistakes and explain how to correct them effectively.

Among the key features of this application are slow-motion video recording; drawing and annotation tools, such as lines and circles, to highlight errors and indicate necessary corrections; the ability to compare two video clips to assess performance before and after adjustments; video sharing capabilities; and performance analysis, which includes providing real-time feedback during training.

Fig. 1 displays the interface of the Coach's Eye application upon installation. Fig. 2 shows the application's interface in use, featuring an image of a student performing the scoring skill while changing direction. The image highlights key focus areas,

including the wrist joint, the trunk's angle of inclination, and the knee joint angle. Errors are marked using circles or lines to clearly illustrate the areas requiring correction.

3.4. Main experiment

The researchers conducted the main experiment on Sunday, April 16, 2023, involving ten second-year female students from the College of Physical Education and Sport Sciences. The focus was on examining the role of the Coach's Eye application in providing immediate feedback and enhancing the dribbling with direction change skill. The participants completed the test and received real-time feedback through the application, which analyzed their motor performance by recording their movements. Based on the recorded videos, the application provided instant feedback, comments, and corrective suggestions related to the dribbling with direction change skill. The experiment lasted for 12 weeks, with one training session per week, during which the participants received feedback through the application.

3.5. Statistical procedures

The Statistical Package for the Social Sciences (SPSS) was used to analyze the data statistically.

4. Results

As shown in Table 2, the statistical values for the variables related to the dribbling skill with directional change and several biomechanical variables (wrist joint angle, knee joint angle, and trunk inclination) are presented. The table includes the arithmetic mean, median, standard deviation, and skewness coefficient for each variable, calculated to assess the nature of the data distribution. The dribbling skill with directional change recorded a mean value of 6.00 and a standard deviation of 1.05, indicating slight variability among participants. Furthermore, the skewness coefficient of 0.712 suggests a moderately normal distribution.

Table 3 illustrates the results of the Pearson correlation coefficient analysis conducted to examine the relationship between the dribbling skill with directional change and selected biomechanical variables, namely: wrist joint angle, knee joint angle, and trunk inclination angle.

The findings revealed statistically significant correlations of varying strength among the examined variables at a significance level of 0.05, suggesting that these biomechanical factors have a measurable influence on skill performance.

4.1. Wrist joint angle

The results indicated a statistically significant correlation with the dribbling skill ($r = 0.0520$), suggesting that as the wrist angle increases, the level of performance decreases.

4.2. Knee joint angle

The results revealed a statistically significant correlation, with a coefficient of $r = 0.931$, indicating that an increase in the knee joint angle was associated with improved performance in the dribbling skill with directional change.

4.3. Trunk inclination angle

The results demonstrated a statistically significant correlation, with a coefficient of $r = 0.645$, indicating a clear influence on the performance of the dribbling skill with directional change.

Table 2. Mean, standard deviation, median, and skewness coefficient for the dribbling with direction change skill and selected variables: Wrist joint, knee joint, and trunk inclination.

Variables	Unit of Measurement	Arithmetic Mean	Standard Deviation	Median	Skewness Coefficient
Dribbling with Direction Change	Degrees	6.00	1.05	6,00	0,712
Wrist Joint Angle	Degrees	124.08	3.41	123.6	0,660
Knee Joint Angle	Degrees	114,53	7,71	114,53	0,648
Trunk Inclination Angle	Degrees	44,81	4,07	45,05	0,119

Table 3. Correlation between the dribbling with direction change skill and the variables: Wrist joint, knee joint, and trunk inclination.

Variables	Arithmetic Mean	Standard Deviation	R2	Sig	Significance
Dribbling with Direction Change	6,00	1,05	-	-	-
Wrist Joint Angle	124,08	3,41	0,0520	0,048	Significant
Knee Joint Angle	114,53	7,17	0,931	0,039	Significant
Trunk Inclination Angle	44,81	4,07	0,645	0,012	Significant

5. Discussion of results

Based on Table 3, the results indicate that there were statistically significant differences in the dribbling with direction change skill during the provision of immediate feedback, accompanied by improvement in the acquisition of basketball skills. The findings also revealed a noticeable enhancement in mastering the dribbling with direction change skill when using the Coach's Eye application to deliver feedback, as it facilitated faster error detection and correction.

This is consistent with the findings of Abdul Majeed (2017), who affirmed that artificial intelligence applications—as a form of modern technology—have the capacity to produce optimal results in the teaching and development of skill performance in sports. He also noted their effectiveness in saving time and effort for both coaches and athletes.

Furthermore, based on the results presented in Table 3, statistically significant differences were observed in the wrist joint variable. These findings led the researchers to emphasize the importance of such variables in helping the learner achieve proper body positioning to maintain control of the ball during dribbling with direction change.

As for the knee joint angle and trunk inclination angle, statistically significant differences were also observed in both variables, highlighting their importance in performing the dribbling with direction change skill. These findings underscore the significance of motor performance during skill execution, as the skill requires a high degree of precision and concentration. This aligns with the view of researchers who note that correct execution of the motor pathway or motor task acts as a stimulus for performance, ultimately leading to successful execution. Accuracy, in this context, is the result of the interaction among various biomechanical variables that operate in a smooth and coordinated manner (Hadi et al., 2023).

Repeated execution and practice of the skill significantly contribute to the successful performance of the dribbling with direction change skill. This success is further supported by the provision of immediate feedback, which plays a crucial role in enhancing the accuracy and effectiveness of the skill.

Interactive technologies, such as artificial intelligence, have proven to be highly effective in enhancing athletes' motor performance, with positive outcomes consistently favoring modern technological tools. This is supported by Al-Baytar (2016), who emphasized that the effectiveness of modern technology has a significant impact on students' outcomes. He further stressed the importance of establishing a learning environment that considers students' individual differences, scientific and technological advancements, and is adequately prepared to support teachers.

Based on Table 3, significant correlations were observed for the dribbling with direction change skill during the provision of immediate feedback to the research sample. The researchers emphasize that continuous guidance during the learning of basketball skills—or any other sports skills—is highly effective. Immediate feedback enhances motor skill retention and reduces errors during the learning process. In physical education classes—and based on our experience as instructors of basketball—we have found that providing immediate feedback and correcting errors during skill acquisition significantly contributes to improving performance. It allows for timely correction of mistakes, reduces the time and effort required, and ensures that all students receive the necessary guidance to address their errors effectively. The Coach's Eye application significantly contributed to error correction for all students, offering the ability to rewatch mistakes at any time and benefit from them. This aligns with the findings of Ahmed (2014), who emphasized the importance of feedback in learning various motor skills. He stated that feedback increases motivation to perform, provides learners with additional energy to enhance their efforts, strengthens their correct responses, and supports the learning process by supplying essential information for correction.

Studies confirm that the use of artificial intelligence in sports not only aids in error correction but also enhances learning, motivates students, and increases their learning drive through the provision of immediate feedback.

The results demonstrated that the use of the Coach's Eye application was effective in providing immediate feedback to students, assisting in error correction, and improving their performance. Fundamental basketball skills, such as dribbling and shooting, are among the more complex skills that require extensive practice and consistent follow-up. These skills involve specific instructional steps that must be learned prior to execution and demand continuous error correction in order for the learner to master them. Feedback is considered one of the key scientific concepts that holds significant importance in the field of learning and in enabling learners to master a skill and its steps correctly. This is supported by Ibrahim (2001), who noted that there are different types of feedback based on the timing of its delivery. Immediate feedback involves providing the learner with information, guidance, or cues intended to reinforce or correct performance, and it is directly linked to the observed behavior, occurring immediately after it. In contrast, delayed feedback provides information after a longer period of time.

The results also indicated that the Coach's Eye application, as one of the artificial intelligence tools,

played an effective role in improving students' motor performance. The integration of technology into the educational process provided learners with an interactive environment enriched with diverse information sources and opportunities to acquire skills, experiences, and engage in exploration—while keeping pace with a rapidly evolving world. This aligns with the assertion of Abdul Rahim (2008), who stated that educational technology is an integrated system that functions to design and evaluate the educational process in order to achieve targeted objectives through the use of the latest research and technological capabilities to reach educational goals.

Based on the above, the researchers emphasize the importance of integrating artificial intelligence applications—specifically the Coach's Eye application—into the learning process to enhance motor performance and ensure the correct execution of the instructional steps for skill acquisition. This integration is highly beneficial in providing immediate feedback, boosting self-confidence, fostering exploration, and supporting the learning and application of modern technologies. Learning requires repetition and consistent practice to enable the learner to perform a skill with ease. It is essential for the teacher to closely observe students' errors during the lesson, provide corrections, and emphasize areas of difficulty. The Coach's Eye application has proven effective in identifying and correcting these errors by enabling focused observation. This aligns with the view of Abdullah (2024), who stated that identifying the mistakes that occur during a lesson is a crucial part of the teacher's role in enhancing the learning experience and improving students' performance through monitoring their actions, recording observations, and reflecting on how they apply the skills.

Based on the discussion of the results, the researchers reached the following key conclusions:

1. The immediate feedback provided by the Coach's Eye application contributed to students' recognition of their mistakes and improvement of performance through repeated practice and continuous movement adjustment.
2. Integrating technology into the teaching of motor skills plays a vital role in enhancing the quality of learning and advancing the educational process.
3. Reducing errors and improving students' learning outcomes, as the application helped them acquire the skill more quickly and with greater precision.

The researchers recommend the following:

1. It is advised to use the Coach's Eye application—particularly in basketball—to analyze players' performance and provide immediate feedback, which contributes to enhancing their skill execution.
2. Modern technologies, including artificial intelligence applications and other digital tools, should be integrated into educational curricula, as they significantly contribute to curriculum development and the improvement of students' motor performance.
3. Students should be trained and equipped with the necessary skills to use the Coach's Eye application effectively, and it should be incorporated into practical lessons to maximize its educational benefits.
4. Encourage students to use the Coach's Eye application to create a motivational and interactive learning environment that fosters continued engagement with the material—even outside official training hours.
5. Conduct a comparative study of different feedback methods delivered through artificial intelligence to determine the most effective approach for teaching motor skills.
6. Carry out future experimental studies on other motor skills.

Conflicts of interest

None. We confirm that all tables and figures in this article are ours and written by the researchers themselves.

Authors' contributions

All contributions of this study were done by the researchers Lecturer Dr. Hanaa Abbas Abdullah contributed to the experimental phase and the printing of the research. Assistant lecturer Sara Hikmat organized the research methodology. Prof. Dr. Liqaa Abdullah was responsible for formatting the manuscript. Asst. Prof. Dr. Dhiffaf Al-Shwillay in revision, Asst. Lect. Inam G. Al-Azzawi in translating.

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Data availability

The data that support the findings of this study are available on request from the corresponding author.

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6. Appendix (1): Names of Experts and Specialists

Name	Specialization	Affiliation
Prof. Dr. Ismail Abd Zaid	Teaching Methods – Football	Al-Mustansiriyah University – College of Basic Education
Prof. Dr. Warda Ali Abbas	Tests and Measurement	College of Physical Education and Sport Sciences for Women – University of Baghdad
Asst. Prof. Dr. Nada Mohammed Ameen	Training – Basketball	College of Physical Education and Sport Sciences for Women – University of Baghdad
Asst. Prof. Dr. Sahar Hurr	Motor Learning – Basketball	College of Physical Education and Sport Sciences for Women – University of Baghdad