Standard scores and levels for certain legal situations among first-class basketball referees

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Abstract

The significance of the research lies in the fact that electronic technologies represent an important step in evaluating legal situations, and the research problem centered on the lack of attention to visual requirements and the absence of a clear image of legal situations that may be difficult for the referee to apply correctly in addition to the lack of focus on visual requirements and the unclear depiction of some legal cases which make it difficult for the referee to interpret them correctly This is because the referee's main tool is visual perception, which interprets live situations such as violations, fouls, and other cases that arise during a game Moreover, there are numerous responses and challenges in evaluating legal situations as the evaluation often relies on subjective or visual estimates based on the opinions of others, leading to inaccuracies in assessing refereeing performance.

The objectives of the research were to prepare a set of legal situations for first-class basketball referees in Iraq, to design an electronic test for certain legal situations in basketball, and to identify the scores and standard levels for some legal situations in basketball The researchers used the descriptive survey method, and the research population consisted of 65 first-class basketball referees in Iraq To statistically analyze the data resulting from the test, the Statistical Package for the Social Sciences (SPSS) was used.

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In light of the results, several conclusions were reached, including the design and validation of the electronic test for some legal situations for first-class basketball referees in Iraq, which is the first of its kind in the Iraqi environment, setting reference standards to serve as criteria for evaluation, comparison, or selection, and determining the standard levels for the results of the electronic test for certain legal situations for first-class basketball referees in Iraq.

Keywords: Legal situations in basketball, electronic test, first-class referees, scores and standard levels.

Introduction:

The significant development that the world has achieved is merely the result of numerous research studies aimed at improving life in general and the sports field in particular. This necessitates that those involved in this field adopt modern methods and techniques to contribute to the development of sports games (Asmaa Hikmet Fadil & Khalil Setar Mohammed, 2022). Basketball is one of the team sports that has seen substantial growth at both local and international levels due to its diverse skills, fast performance, excitement, and thrill. There is considerable interest from the International Basketball Federation (FIBA) in the evaluation process and the preparation of officiating courses. Refereeing involves assessing situations and events based on a set of rules that must be taken into consideration to ensure the organization of matches and the effective application of rules to make fair decisions.

Basketball is related to various sciences, including testing and measurement, which play an essential role in evaluating and developing referees. Therefore, evaluations aim to find appropriate solutions and diagnose strengths and weaknesses accurately, helping referees interpret the situations they encounter. Recent studies indicate a strong trend towards electronic programs as they closely reflect reality in preparing tests. This benefits referees by establishing tests to diagnose and reduce mistakes that occur in matches. According to (Teda and S. Jackson, 1999), the primary goal of testing is to simulate match conditions with standardized procedures for recording (Faris Sami Yousif Shabba & Ali Kamal Hussein, 2013). Electronic technologies represent an important step in evaluating legal situations, contributing to early detection of referees' readiness (Faris Sami Yousif Shabba & Taha Mohamed Hamid, 2022), and increasing their effectiveness on the court by enabling quick and accurate decision-making.

In modern play, referees make approximately 700 decisions in each game (FIBA, 2022) due to the fast pace and high efficiency corresponding to the speed of the ball and the offensive and defensive movements of players. The importance of finding an electronic test lies in its contribution to understanding the levels of legal situations for first-class basketball referees, as situations that frequently recur in matches require a high level of knowledge about the game's rules and the ability to make timely decisions. The research problem is that the officiating

situations faced by referees during matches significantly impact game management and minimizing mistakes, given the speed of play and the changing dynamics of both teams. The evaluation method often used for responses and challenges in cognitive situations relies on subjective estimates, leading to inaccuracies in assessing refereeing performance. Researchers have noted a lack of attention to visual requirements and the unclear depiction of some legal situations that may be difficult for referees to apply correctly. Furthermore, first-class referees face challenges in developing their skills and objectively assessing their performance due to ongoing updates to the rules. Therefore, the researchers believe that first-class referees need a process to evaluate certain legal situations through an electronic test, which is an important part of the officiating process. The research objectives include preparing some legal situations for first-class basketball referees, designing an electronic test for specific legal situations in basketball, and identifying the scores and standard levels for these legal situations.(Abdulhussein et al., 2024)

Method and Tools:

The research problem necessitated the use of a descriptive method with a survey approach. The sample selection must accurately represent the research community, which consists of first-class basketball referees in Iraq for the sports season (2023-2024). The research sample included 65 referees, while a pilot sample consisted of 5 referees. Steps were taken to design a test for some legal situations involving 30 referees to determine the difficulty and discrimination indices, as well as the scientific foundations of the test. The test was then applied to the standardization sample, which comprised 55 referees. The skewness coefficient was calculated, along with the extraction of scores and standard levels for the sample.

Legal Situations Materials:

The materials that referee need during basketball games for legal situations were identified after reviewing scientific references and conducting some personal interviews. A total of 16 legal situation materials were determined and presented to experts and specialists in officiating materials, totaling 12, to assess their suitability. After analyzing the responses using the percentage agreement law of the experts' opinions, 11 legal situation materials were selected, as shown in Table (1).

Table (1): Legal Situations

No.	Name of the Legal Material	Agree	Disagree	Percentage (%)	Result
1	Jump ball and alternating possession	12	0	100	Significant
2	Player in the act of	12	0	100	Significant

	shooting				
3	Dribbling	4	8	33	Non-Significant
4	Travelling	10	2	83	Significant
5	Three Seconds	5	7	42	Non-Significant
6	Eight Seconds	8	4	67	Non-Significant
7	Shot clock	11	1	92	Significant
8	Ball returned to the backcourt	11	1	92	Significant
9	Goal tending and interference	10	2	83	Significant
10	Personal Foul	11	1	92	Significant
11	Technical Foul	11	1	92	Significant
12	Unsportsmanlike Foul	12	0	100	Significant
13	Disqualifying Foul	11	1	92	Significant
14	Fighting	9	4	75	Non-Significant
15	Special situations	11	1	92	Significant
16	Instant Replay System	7	5	58	Non-Significant

Legal Situations for First-Class Basketball Referees:

After identifying the 11 materials, cases suitable for them were prepared, and the clips, images, shapes, and drawings were modified using advanced editing programs to serve the electronic test and legal situations. Images that benefited the research were selected, and questions related to the legal situations were also prepared, consisting of 82 cases. These were presented to experts and specialists to assign importance ratings. The results were then processed to select cases with a reliance rate of 80% or above; any rate below that would lead to the case being discarded (Bashar Halim Diabarti, 2019). After analyzing the responses, 50 legal cases were approved, and they were then presented in a special questionnaire for international referees to agree upon and prioritize one of two adopted cases (A - B) for each material in its final form. The following agreements were made: case A was chosen for questions (2-4-5-6-9-11-13-15-16-19-20-21-23-25), while case B was chosen for questions (1-3-7-8-10-12-14-17-18-22-24). In conclusion, 25 legal cases were approved for research, as shown in Appendix (1).

Steps for Preparing the Electronic Test for Some Legal Situations for First-Class Basketball Referees:

The electronic test program was designed, including various components, after making several modifications and specific details related to the program. It consists of several components:

1. **The Icon:** This is the main interface displayed on the computer, which is a specific application. It is shaped like a referee's whistle with a circular basketball, and below it is the name of the application (Basketball Tests). When clicked with the mouse, the main interface of the program will appear, as shown in Image (1).
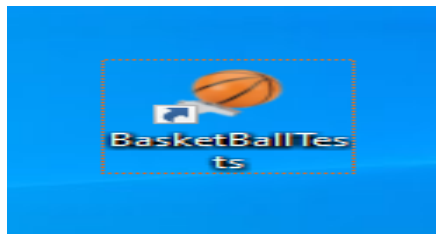
Image (1): Application (Icon)

2. **Main Interface:**

- **Basketball Test:** At the top of the interface is the name of the program.
- **USER NAME:** A unique username for each tester.
- **PASSWORD:** A unique password for each tester, as shown in Image (2), consisting of two main parts:

   a. The username and password for the researchers.
   b. The username and password for each tester.
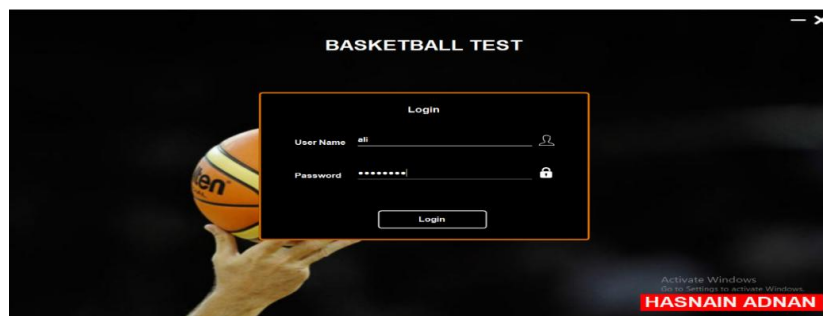
Image (2): Main Interface

3. **Upon entering the test, the interface for the first question appears as shown in Image (3), summarized as follows:**

   - **Top right:** The text question; the tester should read the question carefully before moving on to view the situation.
   - **Top left:** The remaining time for the test, which starts counting down.
   - **Top left:** Viewing the situation; the tester should focus on the video situation, as the video cannot be replayed once it finishes.
   - **Bottom right:** The total number of questions, and at the bottom center, the number of remaining questions.
   - **Bottom left:** The name of the referee (tester).

Image (3): Question Management

4. Clicking on "View Situation" (either an image or a video) will allow answering one of the options, as shown in Image (4).

Image (4): the complete question

Pilot Study on the Electronic Test for Certain Legal Cases:

The pilot study was conducted on (5) referees from the research sample to ensure the functionality of the program and to verify that there were no errors in setting up the test, running it, the method of accessing the electronic test, and the time taken for the test (mean = 13 minutes).

Testing Certain Legal Cases for First Division Basketball Referees:

The test for legal cases consisting of (25) officiating scenarios was applied to a sample of (30) referees on (Monday), March 4, 2023, in the Al-Shaab Sports Hall in Baghdad, involving (14) referees. The experiment was completed with (16) referees at the Ministry of Youth and Sports Hall in Karbala Governorate on (Tuesday), March 5, 2023.

Difficulty and Discrimination Indices:

The difficulty and discrimination indices for each question in the legal cases test were calculated. The recommendations from experts were followed, adopting a ratio between (0.2 - 0.80), and any ratio outside this range was excluded. As for the discrimination index, it was compared for distinctive cases against those that were not distinctive, according to the criteria set by Ebel, who indicates that an item is rejected if its index is (0.19) or below, and accepted if it is (0.20) or above (Salah El-Din Mahmoud Alam, 2011), as shown in Table (2).

Table (2): Difficulty and Discrimination Indices

Case number	Difficulty Coefficient	Discrimination Coefficient	Case number	Difficulty Coefficient	Discrimination Coefficient
1	63.33	0.73	14	56.66	0.86
2	43.33	0.86	15	63.33	0.73
3	66.66	0.66	16	66.66	0.66
4	63.33	0.73	17	63.33	0.73
5	56.66	0.86	18	56.66	0.86
6	66.66	0.66	19	66.66	0.66
7	66.66	0.66	20	66.66	0.66
8	56.66	0.86	21	56.66	0.86
9	56.66	0.86	22	66.66	0.66
10	63.33	0.73	23	56.66	0.86
11	43.33	0.86	24	63.33	0.73
12	43.33	0.86	25	63.33	0.73
13	66.66	0.66	-	-	-

Scientific Foundations of the Test:

Errors in any measurement cannot be completely eliminated; however, the goal of measurement specialists in all fields is to minimize these inevitable errors as much as possible. It is essential to verify the scientific parameters of the test before conducting the main experiment (Setar Mohammed et al., 2023).

Apparent Validity:

The test cases were presented to a group of (12) experts in testing, measurement, and basketball officiating to assess how well the test represents the aspects to be measured. This was done using the percentage agreement method to determine the extent of the test's representation. This type of validity was achieved, as shown in Table (1).

Discriminative Validity:

The t-test for independent samples was used to establish the validity of the test based on its ability to distinguish between individuals with high scores and those with low scores in the characteristic being measured by the test (Kamil Aboud Hussein, 2008). The sample consisted of (30) referees, with (15) referees in the upper group and (15) referees in the lower group. To apply the appropriate statistical formulation for this method, (Rabi Khafaf Jamil Al-Zuhairi & Omar Samir Dhnoon Mala Hamo, 2023) indicated that "in such cases, when the sample size is less than (100), (50%) of the sample can be taken as the upper group and (50%) as the lower group." After processing the results statistically, it was found that the test was valid since the value of (sig) was less than the error level (0.05) at a degree of freedom (28) and a significance level of (0.05), as shown in Table (3).

Table (3): Results of Discriminative Validity for the Upper and Lower Groups

Test Name	Unit of Measurement	Upper Group		Lower Group		t-value	Sig.*	Significance
		Mean	Standard Deviation	Mean	Standard Deviation			
Legal Cases	Score	17.00	1.690	13.27	0.799	7.733	0.00	Statistically Significant

* The error level is considered statistically significant when it is < (0.05) at a degree of freedom of (28).

Reliability:

The reliability coefficient is defined as the extent to which the test is free from random errors that may affect the measurement, i.e., the extent to which the test measures the true amount of the characteristic it aims to measure (Salah El-Din Mahmoud Alam, 2011). To ensure the stability of the results obtained from the test, the test-retest method was used. After obtaining the results from the first day of testing, the retest was conducted after (14) days on the same sample. The reliability coefficient was calculated using the Intraclass Correlation Coefficient (ICC), and the results showed a reliability coefficient of (0.777). (Cleophas & Zwinderman , 2016) indicate that an agreement level of 70-80% is considered good.

Objectivity:

Objectivity refers to the clarity of the instructions related to the implementation of the test. Here, objectivity is achieved because the test is electronic, governed by system controls, and the referee conducts the test and relies on their ability to see their score immediately after completing the test.

The main test experiment:

The test was conducted on a standardization sample consisting of (55) referees, with the assistance of the supporting team.

Statistical Package (SPSS):

The following were used: mean, standard deviation, median, skewness coefficient, percentage, intraclass correlation coefficient (ICC), difficulty and discrimination indices, standardized scores (Z-scores and T-scores), and the T-test for two independent samples with equal sizes.

Presentation of Results:

The statistical description of the legal cases test for first-class basketball referees, as shown in Table (4).

Table (4): The Statistical Description of the Standardization Sample

Legal Cases Test Values	Statistical Measures
Mean	14.80
Median	14.00
Standard Deviation	2.320
Skewness *	0.538
Minimum Value	11
Maximum Value	20

* Skewness is considered normal when the value is between ±1.

Raw and Standard Scores and Their Frequency for Legal Cases:

The purpose of extracting norms, which can be derived through statistical methods from raw scores, is to compare each referee's performance with the overall group performance they belong to (Ngham Khalid Yaseen, 2021). Norms also play an essential role in documenting test results in tables, complementing the standardization of proper test procedures (Faris Sami Yousif Shabba et al., 2017). Raw scores, by themselves, have no inherent meaning or significance, and are not suitable for comparison with scores in other tests or measurements unless converted into standardized scores (Douglas & Alan, 1998, p. 73). The modified T-score was used, as referenced by (Mohamed Hassan Allawi & Mohamed Nasr El-Din Radwan, 1988), to define the relative position of raw scores, allowing for interpretation and meaningful significance (Ammar Fares Attia Al-Samarrai & Faris Sami Yousif Shabba, 2024).

These norms are considered criterion-referenced standards, as they are established for the first time in the Iraqi environment. Criterion-referenced tests, as noted by (Mohamed Jasim Al-Yasiri, 2010), are among the most widespread types in the field of sports (Faris Sami Yousif Shabba & Laith Mohammed Abdulrazzaq, 2016). Refer to Table (5) for further details.

Table (5): Raw, Z-scores, and Modified T-scores for the Standardization Sample

No.	Raw Score	Z-score	Modified T-score	Frequency
1	11	- 1.64	33.62	1
2	12	- 1.21	37.93	9
3	13	- 0.78	42.24	9
4	14	- 0.34	46.55	11
5	15	0.09	50.86	3
6	16	0.52	55.17	8
7	17	0.95	59.48	8
8	18	1.38	63.79	2
9	19	1.81	68.10	1
10	20	2.24	72.41	3

Standard Levels:

The Gaussian curve was used, which is considered one of the objective methods for estimating scores. It is one of the most common distributions in physical education because many attributes measured in this field follow a normal distribution (Amira Hanna Marqous, 2001). Accordingly, three standard levels were adopted by merging every two levels into one under the curve, as shown in Table (6).

Table (6): Standard Levels and Percentages Under the Curve

Standard Levels	Above Average	Average	Below Average
Percentages	% 15.73	% 68.26	% 15.73

Below are the boundaries of the raw scores and modified T-scores that correspond to these levels, as shown in Table (7).

Table (7): Boundaries of Raw Scores and Modified T-scores Corresponding to

Standard Levels, Sample Size, and Percentages of Results for

the Legal Cases Test for First-Class Basketball Referees

Standard Levels	Raw Score Limits	Modified T-score Limits	Sample Size	Percentages %
Below Average	0 – 8.33	0 – 26.66	0	0
Average	8.34 – 16.66	26.67 – 53.32	33	60
Above Average	16.67 - 25	53.33 - 80	22	40

Discussion of Results:

The results of the legal cases test indicate that the referees' scores are distributed across the second and third levels (Average and Above Average). At the second level (Average), their percentage reached (60%), which is lower than the percentage in a normal distribution of (68.26%). In the third level (Above Average), their percentage was (40%), which is higher than the percentage in a normal distribution of (15.73%). Therefore, based on the results achieved by first-class basketball referees, it is imperative that we work more precisely and extensively to develop and enhance these legal cases by organizing workshops and continuous training sessions aimed at acquiring new experiences that can lead to better performance (Shabba, JARO, & mahmood, 2016). This is confirmed by (Kadhim Habib Abbas, 2015), who states that the success of the officiating process is one of the important dimensions that depend on a good and deep understanding of the rules of the game by the referee. Referees need more training courses to reach a level that qualifies them for international certification to avoid some of the problems that occur during matches, and referees must keep pace with the developments happening in the game.(Mondil et al., 2023)

Moreover, following the updates from the websites affiliated with the International Basketball Federation (FIBA) and international referees, who act as a link to convey and interpret the recent updates in making positions, movements, and specific duties during the game, is crucial. Referees must be fully aware of these aspects, as they assist in making the correct decision in appropriate situations. This was also emphasized in the study by (Sabag, Lidor , & Arnon , 2023, p. 21), which states that basketball referees benefit from international referees, as the latter can elevate the former's level. Additionally, there should be a focus on the training and preparation programs for basketball referees.

There should be an emphasis on preventing cognitive interference among the three referees and ensuring that each referee can make decisions within their area of responsibility. Consequently, referees should be aware of blowing their whistles in the correct positions, which

improves the accuracy of immediate decisions. (Nizar Ali Jabar, 2007) asserts that the referee's decision-making during a match, as well as the correctness and strength of that decision to address the situation requiring that decision, depends on the referee's presence in a position that allows them to gain a clear view of that situation, distinguishing right from wrong. Thus, a referee's decisions become very good when the referee has the necessary components for making correct decisions, which arise from the position the referee takes to monitor the situations.(Kadhim, 2024)

Researchers note that electronic testing is entirely different from theoretical testing, as it has significantly enhanced the acceptance of referees due to its alignment with the advancements in modern technology. Furthermore, it contributes to opening broad horizons for researchers to find new information (Abd & Shabba, 2021). Therefore, the test of certain legal cases for first-class basketball referees is a valid tool for evaluation. This is supported by (Kittel, Larkina, Elsworthyc, & Spittlea, 2019), who found that video-based testing is a valid measure for assessing decision-making skills among referees in an off-court environment subjected to evaluation. Additionally, such electronic tests assist referees in evaluating and assessing each referee's errors and making appropriate decisions when reviewing video cases to avoid mistakes during matches, which is a major problem affecting officiating levels.

(García-Santos et al., 2020) confirmed that referees must make the best possible decision within a limited timeframe, and it is recommended to consider this in distant practice when time is limited, as the situation becomes more realistic for the referee. There are also results supporting the use of video clips in assessing referees' decision-making skills in the study by (Sobko et al., 2021).

Conclusions:

1. The design and standardization of the electronic test for certain legal cases for first-class basketball referees in Iraq is a pioneering effort within the Iraqi context.
2. The establishment of reference standards will serve as a benchmark for evaluation, comparison, and selection in the future.
3. The determination of standard levels for the results of the electronic test for certain legal cases among first-class basketball referees in Iraq has been successfully achieved.

Recommendations:

1. Adopt the electronic test for certain legal cases for first-class referees in Iraq as part of the continuous evaluation process to identify performance levels within the Iraqi Basketball Federation.

2. Utilize the research-related standards as reference criteria for the selection of first-class basketball referees in Iraq.
3. Employ the designed electronic test as a tool for preparing cognitive assessments for national and international basketball federations.
4. Develop programs aimed at enhancing the cognitive performance of first-class basketball referees in Iraq concerning legal cases.
5. Implement a similar model for the electronic test in the preparation of legal assessments for other sports disciplines.

Appendices:

Appendix (1): Final Condition Preference Questionnaire

No.	Selected Condition	Unselected Condition	Textual Question and Displayed Cases
1	B	A	
2	A	B	
3	B	A	

4	A	B	
5	A	B	
6	A	B	
7	B	A	

8	B	A		
9	A	B		
10	B	A		
11	A	B		

12	B	A	
13	A	B	
14	B	A	
15	A	B	

16	A	B	
17	B	A	
18	B	A	
19	A	B	

20	A	B	
21	A	B	
22	B	A	
23	A	B	

24	B	A	
25	A	B	

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