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Standard Scores for Selected Mechanical Officiating Situations in Basketball Among Fourth-Year Female Students at the College of Physical Education and Sports Sciences, University of Baghdad

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Abstrak

The study aimed to design officiating situations based on the three-person officiating mechanics (3PO) system and to assess the cognitive officiating abilities of fourth-year female students in basketball. The research population consisted of 166 fourth-year female students from the College of Physical Education and Sports Sciences. A total of 62 students were excluded due to absence during the study or because they were active basketball players. Consequently, the final sample comprised 99 female students selected to participate in the study. The researcher adopted the descriptive research method because it was considered the most appropriate approach for identifying and evaluating students' cognitive understanding of basketball officiating mechanics. A cognitive test was developed based on the official three-person officiating mechanics system. Each officiating situation included three response options presented in different colors: blue, red, and black. The blue option represented the most appropriate officiating decision and was assigned three points, the red option represented a partially correct decision and received two points, while the black option represented the least appropriate decision and was awarded one point. This scoring system enabled the differentiation of participants according to their level of officiating knowledge and decision-making ability. The obtained data were initially expressed as raw scores, representing the original results achieved by each participant before statistical analysis. Since raw scores alone provide limited interpretive value, they were statistically analyzed to determine score distributions and establish performance levels. The analysis also examined the psychometric properties of the test, including validity, reliability, item difficulty, and discrimination indices, ensuring that the developed instrument was suitable for evaluating cognitive competence in basketball officiating.

Keywords: Mechanical Officiating Situations, Basketball, Female Students, University of Baghdad

INTRODUCTION

Basketball is considered one of the most popular sports worldwide, and developed countries have devoted significant attention to the continuous improvement of the game, particularly in the area of officiating. Enhancing the standard of basketball officiating requires keeping pace with the latest developments in the sport, especially the amendments and official interpretations issued by the International Basketball Federation (FIBA). These developments must be consistent with the characteristics and demands of

basketball, including the physical, psychological, and cognitive components that collectively contribute to the comprehensive preparation of basketball referees (Uday, 2012; International Basketball Federation, 2024). Any deficiency in one of these aspects inevitably affects the others and ultimately influences officiating performance.

The rapid evolution of basketball over recent years has led to significant changes in playing style, characterized by faster game tempo, diversified offensive and defensive strategies, and increased physical and technical demands. These developments have placed greater responsibilities on referees, who must maintain high levels of concentration while processing multiple sources of information and making accurate decisions within fractions of a second (MacMahon et al., 2015; Plessner & Haar, 2006). Consequently, referees are expected to possess not only comprehensive knowledge of the rules but also advanced perceptual-cognitive abilities and effective decision-making skills.

As a consequence of the continuous amendments to the rules and the implementation of the three-person officiating mechanics system, it has become essential for each official, according to their court position and area of responsibility, to make appropriate decisions. Officiating situations, together with comprehensive knowledge of the rules, represent one of the most important aspects of basketball refereeing because they enable officials to manage games with the fewest possible errors (FIBA, 2024). Referees with well-developed cognitive abilities are better able to establish effective perceptual and motor programs that facilitate rapid decision-making and improve overall officiating performance. Moreover, strong personality traits, confidence, communication skills, and emotional control are fundamental characteristics contributing to successful game management (Mascarenhas et al., 2005).

The importance of this research lies in its contribution to the development of fourth-year female students at the College of Physical Education and Sports Sciences in the field of basketball officiating. Specifically, it seeks to enhance their cognitive officiating abilities through practical game officiating and the identification of fouls and violations occurring during play. A referee's mastery of movement mechanics from one position to another ensures appropriate court positioning, thereby increasing the likelihood of making accurate officiating decisions (FIBA, 2024; Sampaio et al., 2014).

The research problem stems from the limited number of studies addressing

cognitive assessment related to the three-person officiating mechanics system, particularly among undergraduate students preparing for officiating roles. Furthermore, there is a lack of standardized cognitive tests designed to evaluate students' abilities in officiating situations. Therefore, there is a need to develop valid, reliable, and objective assessment tools, as well as normative performance standards, to accurately determine referees' cognitive competency levels (Plessner & Haar, 2006; MacMahon et al., 2015). The research problem is further emphasized by the continuous technical, physical, and tactical development of basketball, which has compelled officiating organizations to modify their officiating mechanics and technical procedures accordingly. Greater emphasis has therefore been placed on the cognitive competencies that enable referees to make the most appropriate decisions during dynamic game situations. Since referees are solely responsible for enforcing the rules and communicating their decisions to players, coaches, and spectators through official signals, cognitive performance has become an essential component of officiating quality (FIBA, 2024; Guillén & Feltz, 2011).

The relatively limited playing area in basketball and the presence of ten players on the court require referees to maintain optimal positioning to ensure correct decision-making. This demands sustained concentration, efficient movement mechanics, and proximity to critical game situations. Based on the researcher's experience as a certified referee in the Iraqi Basketball Federation and observations of numerous competitive games, it was noted that fourth-year female students demonstrate weaknesses in certain officiating situations related to three-person officiating mechanics. These deficiencies indicate the need for systematic evaluation and training to improve cognitive officiating performance. Therefore, the aim of this research was to identify selected officiating mechanics situations in basketball among fourth-year female students at the College of Physical Education and Sports Sciences. The researcher hypothesized that statistically significant relationships would exist among selected officiating mechanics situations.

RESEARCH METHODOLOGY

The researcher adopted the descriptive method using the survey approach with correlational relationships, as this method allows the study of causes in order to reach better plans aimed at improving cognitive performance within the surveyed population (Rubhi, 2000, p.53). The selection of the research sample, in terms of both the sampling method and sample size, is considered one of the highly important aspects of research.

"The population should be described accurately with all its specific characteristics" (Amer, 1993, p.85). The total research population consisted of (166) female students distributed among five sections (M, T, Y, H, and L). The sample consisted of (104) female students after excluding active players and absent students, whose number reached (62). In addition, (5) female students from Section (L) were selected for the pilot experiment and were later excluded. Therefore, the final research sample consisted of (99) female students from the research population.

By using a lottery method, Sections (M) and (T) were selected in order to achieve the scientific foundations and requirements of the study.

Table 1. Shows the distribution of the research population and sample

No.	Population Sections	Sample	Pilot Study Sample	Scientific Foundations Sample	Application & Standardization Sample
1	**M**	**20**	**-**	**20**	**20**
2	**T**	**22**	**-**	**22**	**22**
3	**Y**	**21**	**-**	**-**	**21**
4	**H**	**20**	**-**	**-**	**20**
5	**L**	**21**	**5**	**-**	**16**
6		**104**	**5**	**42**	**99**

The scientific foundations for testing certain mechanical refereeing situations: two sections (M, T) were selected by lottery, with a total of (42) participants.

The researcher utilized all necessary resources—whether data, samples, or equipment—ensuring they were properly prepared, organized, and structured to be effectively employed in the research process with high efficiency and accuracy, and with minimal effort and in the shortest possible time (Wajih, 2003, p. 163). Through these means, the results were obtained, namely data collection tools, including Arabic and foreign sources. Electronic information networks, observation and experimentation, personal interviews (*), and data coding/entry forms (**). The researcher also conducted a pilot study on a sample of section (L) students, numbering (5) students. This is defined as "a preliminary experimental study conducted by the researcher on a small sample prior to carrying out the main research, in order to test research methods and tools" (Dictionary, 1984, p. 79).

Accordingly, the researcher conducted the pilot experiment on Sunday, 2/10/2025, with (5) students from section (L), at 11:00 a.m., drawn from the original research population. The purpose of the pilot study was to identify and avoid potential errors that may occur during test implementation, determine the suitability of the tests to the level of the research sample, and assess the adequacy and understanding of the assistant team regarding the testing procedures (*).

As for the scientific criteria of the test, they were as follows: validity. The researcher used discriminant validity (one of the components of validity, defined as the ability of a test to distinguish between different levels of ability) (Marwan, 1999, p. 140). Accordingly, test scores were arranged in ascending order from the lowest to the highest, and the upper 27% and the lower 27% of the scores were extracted for comparison.

Table 2. Discriminant Validity of the Upper and Lower Groups for the Test Results of Selected Basketball Officiating Mechanics Situations

Assessment of Selected Mechanical Refereeing Situations	Unit of measurement	Upper group (High group)		Lower group (Low group)		Calculated t-value	Sig *	Significance
		M.	St.d	M.	St.d			
	Score	29.55	0.688	26	0.775	11.353	0.00	Significant

*** Significant at the 0.05 level when the p-value is less than 0.05. (N = 42; Degrees of Freedom = 11 + 11 − 2 = 20).**

Reliability refers to the degree of accuracy, precision, and consistency with which a test measures the attribute for which it was designed (Imad, 2007, p. 75). The split-half method was used to determine reliability. The correlation coefficient between the two halves of the test was (0.697), and after applying the Spearman–Brown formula, the reliability coefficient reached (0.821).

Objectivity: The test was considered objective because it was easy to administer and score. In addition, its instructions were clear, and the work team demonstrated efficiency in the recording and scoring procedures (Mohammed Hassan & Mohammed Radwan, 1983, p. 379).

Distribution of the Sample.

Main Experiment: The program was implemented using a set of officiating situations consisting of (14) refereeing scenarios. These scenarios were presented to fourth-year female students, who were asked to analyze each situation and select the most appropriate officiating decision based on the three-person officiating mechanics system. Three models were presented for each refereeing scenario, distinguished by the following colors: blue, red, and black. A score of (3) was given to the blue color as the most correct, (2) to the red color, and (1) to the black color as the least correct. The responses were then scored according to the predetermined evaluation criteria and statistically analyzed to determine the effectiveness of the proposed officiating situations. The table of sample homogeneity was as follows.

Table 3. Homogeneity of the Results of the Test of Selected Basketball Officiating Mechanics Scenarios

Test of Some Officiating Mechanics Situations	Unit of Measurement	Mean	Median	St.d	Skewness Coefficient*
	Score	27.86	28	1.507	0.104-

- Skewness is considered normal (indicating homogeneity) when its values fall within the range of ±1.
- (N = 42).

The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) to process, organize, and analyze the collected data. Descriptive and inferential statistical techniques were employed to achieve the study objectives and verify the research hypotheses. Descriptive statistics included the arithmetic mean and standard deviation to summarize the participants' performance, while the skewness coefficient was calculated to examine the normality of the data distribution. The independent samples *t*-test was used to determine statistically significant differences between groups. Pearson's correlation coefficient was applied to assess the validity of the measurement instrument, whereas the Spearman–Brown formula was used to

estimate the reliability of the test through split-half reliability analysis. In addition, percentile ranking of standard scores using the sequential method was employed to classify participants' performance levels and facilitate the interpretation of the obtained scores. The level of statistical significance was set at ($p \leq 0.05$) for all analyses.

RESULTS

Table 4. Raw Scores Corresponding to Standard Score Distribution Using the Sequential Method for the Results of the Test of Selected Basketball Officiating Mechanics Scenarios for ourth-Year Female Students

Unit of Measurement: Score | Sample Size: 99 | Maximum Score: 33 | Minimum Score: 21

Sequential Method	Situational Score	Sequential Method	Situational Score	Sequential Method	Sequential Method	Sequential Method	Sequential Method
100	42.000	74	31.080	48	20.160	22	9.240
99	41.580	73	30.660	47	19.740	21	8.820
98	41.160	72	30.240	46	19.320	20	8.400
97	40.740	71	29.820	45	18.900	19	7.980
96	40.320	70	29.400	44	18.480	18	7.560
95	39.900	69	28.980	43	18.060	17	7.140
94	39.480	68	28.560	42	17.640	16	6.720
93	39.060	67	28.140	41	17.220	15	6.300
92	38.640	66	27.720	40	16.800	14	5.880
91	38.220	65	27.300	39	16.380	13	5.460
90	37.800	64	26.880	38	15.960	12	5.040
89	37.380	63	26.460	37	15.540	11	4.620
88	36.960	62	26.040	36	15.120	10	4.200
87	36.540	61	25.620	35	14.700	09	3.780
86	36.120	60	25.200	34	14.280	08	3.360
85	35.700	59	24.780	33	13.860	07	2.940
84	35.280	58	24.360	32	13.440	06	2.520
83	34.860	57	23.940	31	13.020	05	2.100
82	34.440	56	23.520	30	12.600	04	1.680

81	34.020	55	23.100	29	12.180	03	1.260
80	33.600	54	22.680	28	11.760	02	-
79	33.180	53	22.260	27	11.340	01	-
78	32.760	52	21.840	26	10.920	-	-
77	32.340	51	21.420	25	10.500	-	-
76	31.920	50	21.000	24	10.080	-	-
75	31.500	49	20.580	23	9.660	22	-

After applying the officiating scenarios prepared by the researcher to the fourth-year female students, the results were obtained in the form of raw scores, which represent the original scores derived from the application of tests or any other measurement tool before being statistically processed (p. 40:22). The difficulty lies in interpreting these scores, as their meaning and significance are not easily understood without further analysis (p. 193:18). Standard scores, on the other hand, are a means of determining the relative position of raw scores, and they can be interpreted and evaluated more effectively (p. 194:18). Among these methods is the modified standard score using the sequential method, which is considered one of the standard procedures for evaluating the scores recorded by the students (p. 36:18). The values of these scores range from (0–100). These scores increase as their level rises above the arithmetic mean, since the unit of measurement in the tests was the score. The highest score in the sample was (33) and the lowest score was (21).

Standards are considered one of the main foundations targeted in the process of test standardization (Mohammed, 1999, p. 40). Good tests include standards or levels, as they represent fixed elements and an essential complement to the evaluation process in order to reach objective and reliable results (Mohammed, 1999, p. 79). In addition, the students' interest and inclination toward basketball officiating had a significant effect on their understanding of referees' movements on the court and their positioning during officiating situations. The researcher also believes that the role of the curriculum used in the College of Physical Education and Sport Sciences,

University of Baghdad, along with the teaching methods and the use of modern instructional aids during lectures, had a positive impact on increasing the students' motivation and improving their understanding of both the theoretical and practical aspects of the course.

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