

TRAINING OF BASKETBALL REFEREES IN BASKETBALL GAME BASED ON COMPUTER SIMULATION

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ABSTRACT

With the rapid development of our country's sports enterprise, the development of the referee training at all levels has been enrolled into the plan that will speed up the development of China's sports teaching system. In the study of basketball referee training, college education institutions have put forward a lot of teaching methods. However, there are still lacking in a set of objective, complete and unified standard to judge the referee's quality. In this article, based on the evaluation system which is constructed by the fragment of computer simulation of the basketball match, the completion degree of students, and the ability index of basketball referee on the basis of multivariate linear regression method, a targeted plan has been formulated in the usual training for the decision-making of sports colleges and evaluation mechanism to provide the scientific and reasonable theory basis.

Keywords: *Teaching and Training Methods, Computer Simulation, Evaluation System, The Degree of Completion, Multiple Regression Linear Methods*

1. INTRODUCTION

Along with the enhancement of athletes' physical quality, the offensive and defensive rhythm of modern basketball game has been quicken, and the situation in the playing field has been more and more complicated. Therefore, a lot of fouls action will easily be ignored in the rapid movement. If a referee does not have good referee skills and judgment ability, there will often appear the phenomenon of judgment of error and omission, and the referee is partial to one side. What's more, there will even appear the situation that a referee influences a game[1]. In university, the course of basketball sports has the most difficulty in the teaching and training of basketball referee, and the main difficulty lies in: Firstly, there are not enough games and students not only do not pay much attention to some games organized by themselves, but also underestimate the importance of this work. Secondly, in the traditional teaching, a written explanation has been given too much than the practice[2]. Resulting from these reasons, the students do not have a complete understanding and memory of the rules, lacking in the competition experience of high levels so that the implementation of the game is insufficient and the result is not satisfactory.

Our existing exam of referee level is divided into three degrees: the first level grade examination, secondary referee grade examination, and third

referee grade examination. The first level grade examination mainly focus on ability of spot judgment and punishment. However, secondary and third referee grade examinations give priority to professional theory. The judging process of a referee directly affects the fluent and ornamental degree of the whole game. While the judging process which seems to be very simple is the perfect embodiment of referees' ability and quality which is accumulated in the usual training. According to the research, we find that the main ability qualities which a qualified referee must have are: professional moral quality, professional quality, physical quality and psychological quality and the ability of studying and development.

2. COMPUTERS SIMULATE BASKETBALL GAMES

In order to use the computer to simulate the whole basketball game, we must have two aspects conditions, namely the software part and hardware part. The requirement for the hardware part is not demanding, that's to say, a computer need to be equipped with a big screen TV or projector. Software part mainly consists of three parts: firstly, the construction of basketball teaching resource database; secondly, the digital processing of the basketball teaching resources; thirdly, the control and use of basketball teaching resources through the computer simulation[3]. And the first step is the establishment of teaching resource database. In

order to establish it, through video, we can transform the video of important basketball games at home and abroad into the teaching resources, or burn it to a CD-ROM to storage. The second step is to finish the computer's editing processing of basketball teaching resources. When all domestic and international high-level competitions are made into slides, we can intuitively demonstrate and teach through the projector and computer. Generally, super king media player tool and the POWERPOINT are used to process and edit the basketball teaching resources .Steps are as follows: First, we use media player to edit the collected CD so as to get the game part and the referee part of the whole game, before saving, according to the time sequence, we need to edit the numbers of referee segments, and then, individually set the file name and lastly save it. Second, after completing the edition and save of CD, we are supposed to use slide tool to edit and synthesis to make out to the practical courseware which is used for playing and explaining in teaching[4]. When using slide software to edit, we should display the specific time period of the following each slide based on the time sequence of the game in the first page, set action for the first time, and then link it to the next one, attach a judgment and punishment video of basketball referee in this moment in this slide, and insert text to explain the rules of referee's spot judgment and punishment and the theoretical basis. In each slide, design a return button, and return to the first slide, so we can directly choose it [5].

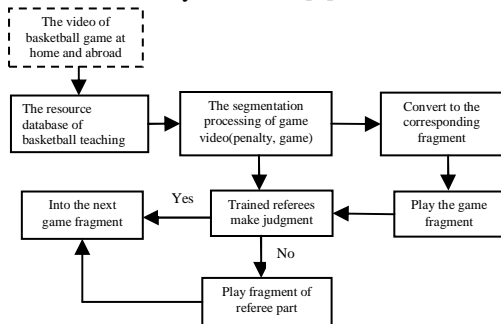


Figure 1: Based On The Evaluation System Of Computer's Simulating The Basketball Match

3. THE TRAINING MECHANISM OF TRAINING BASKETBALL REFEREE

3.1 Professional Ethics

Basketball referee should adhere to the policy of "fairness, accuracy, seriousness, earnest" to enforce game to guarantee that the game proceeds in the fair and just environment, which requires that the basketball referee must have good professional ethics.

3.2 Familiar With Professional Theory Knowledge Of Basketball Referee

The penalty standard of basketball referee is "the basketball competition rules ", "basketball competition referee law". Only by mastering the rules of the game proficiently, can the referees enforce law better.

3.3 Solid Basic Skills Of Spot Enforcement Law

With the rapid development of modern basketball, the requirements for referee are stricter, namely, standard gestures, timely whistle and agile footwork are required. Referees should not only master the rules, but also be familiar with tactics system of basketball and its development trend, so as to grasp a reasonable scale of judgment and punishment, guarantee the accuracy of decisions, and make the basketball game smooth.

3.4 Good Psychological Quality

In order to exclude the interference of various factors in the game, response to a variety of emergencies calmly, and make a fair penalty at the critical moment of the game, the referee must have good psychological quality .

3.5 Rich Experience Of Spot Penalty

A good referee should master the referee rules, improve law enforcement ability by the long-term practice, and constantly sum up experience to easily and calmly deal with all kinds of conditions on the pitch.

3.6 Good Physical Quality

In the basketball game, the characteristic of referee's spot movement is that the alternation of fast running, medium speed jogging and walking will help referee make accurate judgment. Completing a high level match, the referee need to run a distance of more than 4000 m. This requires that the referee must have good speed and endurance. If he can't keep up with the pace of the game, there may appear the situations of mistake and misjudgment, and the referee will even hinder the smooth progress of the game.

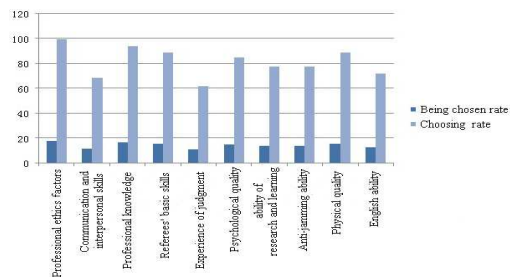


Figure 2: The Construction Of Referee Ability Factors

4. THE EVALUATION ANALYSIS ON ABILITY QUALITY OF REFEREE TRAINING

4.1 Preliminary Descriptive Statistical Analysis On The Sample Data

Using the SPSS software in the computer, we can do the multivariate regression linear analysis on the ability evaluation of referee.

In the operation, firstly, we should select DESCRIPTIVES options which in the SUMMMARIZE menu item, and then analyse the indicators[6]. The description statistics is as shown in table 2. But from the description statistics table 1, we can't very clearly see the relationship among variables so that we still need further analysis. However, statistics show that the ranges of several variables are larger, therefore in the following analysis process, we need to normally deal with the variables.

4.2 Trend Analysis On The Variable Of Original Data

Based on the differences of indicator variable's level and the unit of measurement, firstly, we normalize the capacity indicators data of the referee, and then normalize the natural logarithm of variable[7]. In the following Figure, X axis represents drawn sample, and the y - axis represents the standardized variables of referee's capacity factors digital in the practice evaluation. According to the operation of the SPSS software, it is known that the basic trend of variable is consistent, but curve fluctuation of variable X_3 is bigger, yet because of its relatively small value, it is reserved.

As shown in Figure 3, because the relationship between the variables is basically linear relationship, multiple linear regression equation can be set up.

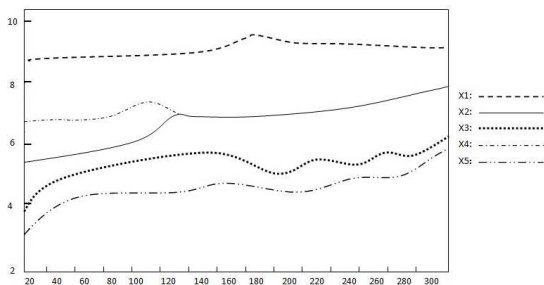


Figure 3: The Trend Analysis On The Variable Of Original Data

4.3 Regression Equations Of Solution

In the SPSS software, the linear regression analysis function provides four regression analysis methods, namely, once enter method, stepwise regression method, the forward entering method and backward excluding method. Although the principles of four kinds of methods are different from each other, all roads lead to Rome, so the conclusion is generally consistent. Therefore, here we can use the simplest once entering method to do regression analysis on the sample data in the table 1.

Average value is the main measure value of data central tendency. If the data is not finished, use the following formula to calculate[8-10]:

$$\bar{X} = \frac{X_1 + X_2 + \dots + X_n}{n} = \frac{\sum_{i=1}^n X_i}{n} \quad (1)$$

The variance is the average of the squared deviations, that is $\sigma^2 = \frac{\sum_{i=1}^N (X_i - u)^2}{N}$, and standard deviation is the positive square root of variance,

$$\text{Namely, } \sigma = \sqrt{\frac{\sum_{i=1}^N (X_i - u)^2}{N}} \text{ or } \sigma = \sqrt{\frac{\sum_{i=1}^M (X_i - u)^2 f_i}{\sum_{i=1}^M f_i}}$$

Limited by their own capacity factors, referees will affect the effect of penalty in the match, such as: professional moral quality, professional quality, physical quality, psychological quality, the capability of study and development, etc. Among them, the professional quality includes communication ability, professional theory knowledge, basic skills of penalty and penalty experience, psychological quality including ability of anti-interference, and physical quality reflecting the performance status. And the capability of study and development reflects the ability of English and the update study of referee regulations. Therefore, we consider the five variables as the explanatory variables, analyzing their influence on the ability of referees, thus as a standard to judge whether students have a qualified ability of referee in teaching and timely making up for deficiencies.

Table 1 is the three descriptive statistical information of the five variables, including standard deviation, average value, and the number of samples.



Table 1: The Basic Information Of Quality And Ability Factor Of Referee

Variable X	The number of Samples N	Average value	Standard deviation	Minimum	Maximum
Quality of professional ethics X_1	300	26.1	4.68	12	40
Quality of professional ability X_2	300	35.26	3.82	20	48
Psychological quality X_3	300	21.73	6.69	6	40
Physical quality X_4	300	18.32	3.45	7	79
The ability of learning and development X_5	300	28.53	6.1	12	43

Table 2 is the Pearson correlation coefficient, one-tailed significance level and the number of samples among the five indicator variables.

Table 2: Pearson Correlation Coefficient, One-Tailed Significance Level And The Number Of Samples Among Five Indicator Variables

Statistics		X_1	X_2	X_3	X_4	X_5
Pearson coefficient	X_1	1.000	0.992	0.985	0.612	0.605
	X_2	0.992	1.000	0.973	0.579	0.553
	X_3	0.985	0.973	1.000	0.576	0.677
	X_4	0.612	0.579	0.576	1.000	0.602
	X_5	0.605	0.553	0.677	0.602	1.000
One-tailed significance level	X_1		0.000	0.000	0.003	0.004
	X_2	0.000		0.000	0.006	0.009
	X_3	0.000	0.000		0.006	0.001
	X_4	0.003	0.006	0.006		0.004
	X_5	0.004	0.009	0.001	0.004	
The number of samples N	X_1	300	300	300	300	300
	X_2	300	300	300	300	300
	X_3	300	300	300	300	300
	X_4	300	300	300	300	300
	X_5	300	300	300	300	300

Using the once entering method, the entry order of variables are as follows as shown in Table 3 , namely, X_5, X_4, X_1, X_3, X_2 .



Table 3: The Entry Order Of Variables Using The Once Entering Method

Models	Entering variables	Deleted variables	Method
	$X_5, X_4, X_1, X_3, X_2^b$		Enter

Table 4 shows the adjustable agreed, the standard deviation of estimated value and the D.W. statistic test value of regression model.

Table 4: The Parameters Of Regression Model

	R	Coefficient of determination R^2	Adjustable coefficient of determination	The standard deviation of estimated value	D.W. statistic
1	0.997 ^b	0.993	0.991	138.8624	2.313

Table 5 shows the variance analysis table of regression model, F test value and significance level .

Table 5: Variance Analysis Table Of Regression Model

	Sum of squares	Degrees of freedom	Sum of mean square	F test value	significance level
Regression	3.7E+07	4	9161986	475.139	0.000 ^b
Residuals	250675.9	13	19282.76		
Sum	3.7E+07	17			

The parameters of the regression equation, T-test value and significance level are shown in Table 6.

Table 6: The Parameters Of The Regression Equation

	The parameters of non - standardized equation		The parameters of standardized equation		T test value	significance level
	B	standard deviation	β			
(Constant)	767.775	241.368			3.181	0.007
Quality of professional ethics X_1	5.43E-02	0.013	0.570		4.109	0.001
Quality of professional ability X_2	0.368	0.135	0.414		2.718	0.182
Psychological quality X_3	1.101	0.628	0.058		1.755	0.103
Physical quality X_4	-3.7E-03	0.007	-0.025		-0.534	0.602
The ability of Learning and development X_5	2.1E-03	0.004	0.018		0.433	0.587

Table 7: Prediction Value Of Regression Model And Its Residual Statistics

	Minimum	Maximum	Average value	The standard deviation of Samples	The numbers of samples
Prediction value	10545.031	62666.457	25595.132	14685.251	300
Residuals	-175.1748	381.9245	632E-14	121.4316	300
The standard deviation of predictive value	-1.025	2.532	0.000	1.000	300
The standard deviation of residuals	-1.261	2.750	0.000	0.874	300

From the result we can see that when all the variables once join the regression equation together for inspection, although the statistics of the test value of regression equation and the coefficient of determination have reached the standard of regression test, three vectors X_2 , X_3 , X_4 do not pass the t test, so the regression equation needs to be adjusted. And what we should explain here is that the inspection is done under the standard of 95% degree of confidence [11]. For a variable, if the possibility level of the null hypothesis of its regression coefficient reaches more than 5%, this variable should be removed from the equation. In the regression equation, the possibility level of the null hypothesis of X_2 , X_3 , X_4 's regression coefficient are 0.182, 0.103 and 0.602, which are greater than 0.05, so they can't be kept in the equation, and we should eliminate them from the equation. According to the analysis results, we can draw the conclusion that in the training of the ability and quality of referees, professional ability, psychological quality, and physical quality are the main factors in judging the quality and ability of the referees. However, quality of professional ethics and the ability of learning and development are relative to the secondary factors.

5. CONCLUSION

Due to not being able to do a system evaluation of the ability and quality of referees objectively and scientifically, the training work of referees was always being in chaos in our country. So it was very necessary to set up the evaluation of quality and ability of referees by computer simulating the game of basketball. According to the analysis, we knew that when colleges and universities trained the comprehensive ability of referees, they could use the computer test system to evaluate and examine the judgment and punishment ability of referees. At the same time, based on the multiple regression linear method, they could determine the professional ability and other qualities of students to build an evaluation model for the quality of a good referee. Through the theory and analysis of practice assessment, we were aware of that the most primary ability in the work of spot enforcement was the professional ability, including communication skills of referees, the basic skills and experience of judgment. Secondly, according to the importance, it was arranged for physical quality, psychological quality, the ability of study and development, and quality of professional ethics. Only by achieving an effective balance in a variety of capacity indicators

could the qualified referees make a more reasonable and accurate penalty for the various behaviors which violated the rules of the game.

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