HK.NCCP
International Journal of Intelligent Information and Management Science
ISSN: 2307-0692 *Volume 2, Issue 3, March 2013*

Research on Application of Computer Network Technology in Sports Competition Evaluation

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Abstract: Aerobics is a sport belongs to subjective assessment classification, in accordance with the content and spirit of relevant rules of aerobics, rule-based fair judge can be achieved in a greater degree. Undeniably, there are differences in the aesthetic tastes of judge performers, i.e. referees, and the understandings and the use of the competition rules etc., resulting in similarities and differences in the final score. Whether international or national competitions, or provincial, prefectural and municipal events or internal competitions in units, industries, institutions, there are judging controversies in varying degrees, which is a major feature of sports in subjective assessment classification. Select several operable and more practical methods of scoring tests, use computer network technology of numerical analysis, establish the conventional test procedure of score data of sports competition, provide data support for objective score of sports competition, and provide auxiliary reference for the results appeal and the game arbitration.

Keywords: Aerobics; Computer Network Technology; Sports Competition Evaluation

1. Introduction

Aerobic athlete's academic strength is positively correlated with his actual performance and the judgment goes through many stages (see Fig. 1). Chinese scholars have done some research on procedural justice and data reasonableness [1] at data checking stage for athlete's final scoring, thus reflecting the objectivity of competition scoring [2].

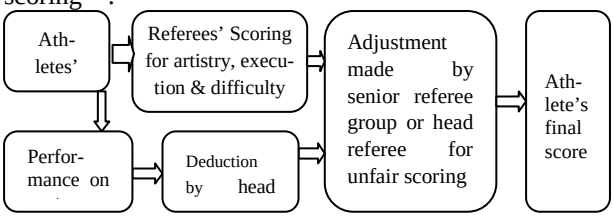

Figure 1. Affinity Diagram between Athlete's Academic Strength & Actual Performance

Some operable and practical checking methods are selected in this paper, establishing routine inspection procedures for aerobics competition scores, so as to provide data support for objective scoring for all levels of aerobics competition and reference for complaint and arbitration.

2. Object and Methods

The 16th University Games of Hebei Province, hosted by Hebei Education Department, was held in Hebei Polytechnic University from 4th May to 9th May 2010. There are 3 groups during competition, of which Group C includes high-level athletes recruited under special policy and students from different sports schools and colleges [3]. This research mainly focuses on aerobics competition of this provincial sports meeting in Group C [4], meanwhile takes into consideration the scoring performance between high and low competitive levels and checks referees' scoring by applying consistency check, range and variance analysis methods, providing with detailed algorithm data of trio. As difficulty referees E1 and E2 only provides a final score, it is difficult to make data comparison, and analysis is merely based on artistic and execution scores of the two groups.

3. Discussion and Analysis

Use CORREL function in Excel to calculate the correlation coefficient r (consistency coefficient) between each artistic referee and execution referee in Group C's trio competition, and make correlation analysis between referees' scoring and athletes' final score (see Table 1). When correlation coefficient between all referees' scores and athletes' final scores is greater than r=0.765 and P value is less than 0.01, it means that they are highly correlated with high linear relationship. But generally speak-

ing, execution referee's scoring is relatively more reliable than artistic referees'.

Figures in Table 1 show that score difference of the referees is insignificant. Import CORREL function in Excel to calculate the correlation coefficient between artistic referees and execution referees respectively and make correlation analysis between artistic scores and execution scores (see Table 2). As per analysis data, the consistency coefficient for artistic scores ranked top 8 is higher that of execution scores and consistency coefficient for execution scores ranked top 9 and top 10 is higher than artistic scores. The overall data shows little difference for scores, which indicates that the score results for trio competition in Group C is highly reliable.

Below is the analysis of consistency coefficient for single referee's scoring and athlete's score (see Table 3). The data shows little difference in scoring and there is no abnormality in single data of the two groups, indicating that the scoring for all individual games of the two groups is highly reliable.

Range refers to the difference between the maximum and minimum values, which reflects the discrete trends of the sample. Data in Table 4 shows referees' scoring range in Group C's trio competition fluctuates between 0.1 and 0.5 with maximum range of 0.5 occurred for once and an average value of 0.28. Range for execution scores is between 0.2 and 0.6, with maximum range of 0.6 appeared for once and an average value of 0.29. It is consistent with the analysis of consistency coefficient, namely both artistic and execution scores are highly reliable.

Table 1. Correlation Analysis of Referees' and Athletes' Scores for Group C Trio Aerobics Competition on 16th University Games of Hebei Province

Index	A1	A2	A3	A4	B1	B2	B3	B4
Correlation Coefficient	0.817	0.914	0.823	0.905	0.929	0.894	0.950	0.922
p	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sequence	8	4	7	5	2	6	1	3

Remark: $r^{0.01(8)}$ =0.765

Table 2. Correlation Analysis of Referees' and Athletes' Scores for Group C Trio Aerobics Competition on 16th University Games of Hebei Province

	A1	A2	A3	A4	B1	B2	B3	B4
Top 8	0.880	0.879	0.834	0.851	0.790	0.760	0.859	0.774
Top 9	0.814	0.906	0.806	0.900	0.923	0.910	0.945	0.917
Top 10	0.817	0.914	0.823	0.905	0.929	0.894	0.950	0.922

Table 3. Correlation Coefficient of Referees' and Athletes' Scores For Group C Individual Aerobics Competition on 16th University Games of Hebei Province

Item	No. of Groups	Referee's score	Consistency coefficient	Standard value
Women's singles	10	A1/A2/A3/A4	0.890 0.819 0.871 0.879	0.05（8） =0.632
		B1/B2/B3/B4	0.965 0.955 0.956 0.956	0.01（8） =0.765
Mixd-double	10	A1/A2/A3/A4	0.946 0.929 0.938 0.945	0.05（8） =0.632
		A1/A2/A3/A4	0.945 0.937 0.923 0.963	0.01（8） =0.765
Men's singles	10	A1/A2/A3/A4	0.931 0.778 0.910 0.889	0.05（8） =0.632
		B1/B2/B3/B4	0.936 0.875 0.914 0.865	0.01（8） =0.765
Trio	10	A1/A2/A3/A4	0.817 0.914 0.823 0.905	0.05（8） =0.632
		B1/B2/B3/B4	0.929 0.894 0.950 0.922	0.01（8） =0.765
game for six	10	A1/A2/A3/A4	0.902 0.885 0.911 0.882	0.05（8） =0.632
		B1/B2/B3/B4	0.939 0.936 0.951 0.974	0.01（8） =0.765
Gymnastics	10	A1/A2/A3/A4	0.927 0.980 0.988 0.976	0.05（8） =0.632
		B1/B2/B3/B4	0.867 0.905 0.927 0.865	0.01（8） =0.765

Table 4. 16th University Games of Hebei Province Range Analysis for Referees' Scoring for Group C's Trio Competition

rank	A1	A2	A3	A4	range	B1	B2	B3	B4	Range
1	7.8	8.2	8.1	8.1	0.40	7.7	7.8	8.0	7.8	0.30
2	7.8	7.9	7.8	7.9	0.10	7.6	7.6	7.9	7.7	0.30
3	7.0	7.2	6.8	7.1	0.40	7.4	7.6	7.3	7.3	0.30
4	7.3	7.3	7.5	7.5	0.20	7.5	7.5	7.3	7.4	0.20
5	6.8	6.8	6.7	7.0	0.30	7.6	7.7	7.8	7.8	0.20
6	6.9	7.0	6.9	6.9	0.10	7.3	7.4	6.8	7.0	0.60
7	7.0	7.2	7.0	7.3	0.30	7.2	7.3	7.1	7.3	0.20

8	6.3	6.3	6.5	6.3	0.20	6.5	6.5	6.7	6.7	0.20
9	6.0	6.2	6.1	6.1	0.20	6.3	6.0	6.3	6.3	0.30
10	6.5	6.0	6.4	6.0	0.50	5.7	5.9	5.6	5.8	0.30

Table 5. Score Range Analysis for Group C Individual Aerobic Competition on 16th University Games of Hebei Provinc

Item	Artistic Referees			Execution Referees		
	Range	Times for max. range	Average range	Range	Times for max. range	Average range
Women’s singles	0.0~0.7	1	0.31	0.1~0.6	1	0.34
Mixd-double	0.1~0.6	3	0.36	0.1~0.8	1	0.43
Men’s singles	0.2~0.8	1	0.39	0.1~0.6	1	0.30
Trio	0.1~0.5	1	0.28	0.2~0.6	1	0.29
game for six	0.2~0.4	2	0.31	0.1~0.4	2	0.24
Gymnastics	0.1~0.5	3	0.40	0.1~0.4	1	0.21

Table 5. Variance Analysis of Artistic and Execution Scores for Group C Trio Aerobics on 16th University Games of Hebei Province

Referee	Source of variation	Sum of deviate squares	Degree of freedom	Average variance	F	P
Artistic referee	Between groups	0.04	3	0.0129	0.03	>0.05
	Within group	16.05	36	0.45		
	Total	16.08	71	/		
Execution referee	Between groups	0.02	3	0.0060	0.01	>0.05
	Within group	17.92	36	0.50		
	Total	17.94	39	/		

Remark: $F_{0.05(3,36)} = 2.87$

Below is a range analysis of referees’ scoring for individual items between two groups. Data in Table 5 shows that the range value for Group C’s all individual competitions are acceptable, that the scoring by artistic referees and execution referees is relatively consistent. The average range value for Group C’s artistic scores and execution scores is 0.342 and 0.302 respectively, which means execution referees performs slightly better than the artistic referees and the overall scoring results are highly dependable. However, the average range values of artistic scores for aerobics and execution scores for Group C’s mixed-double exceed 0.4. And according to Aerobics Competition Rules 2005-2008 set up by FIG, the allowed score difference for the two effective points amid artistic and execution scores should not exceed 0.3 (10.00-8.00) , 0.4(7.99~7.00), 0.5(6.99~6.00), 0.6(5.99~0.00). But as the academic level of different teams in Group C is uneven, the artistic and execution points for most teams are within 6.99-6.00, which makes the average value of referees’ scores in acceptable range.

Variance analysis can be used to test if the overall scoring criterion taken by the referees is consistent. Data in Table 6 shows that, artistic and execution referees’ variance value is P>0.05, indicating that despite of the score difference in Group C trio competition, the scoring criteria taken by the referees is quite consistent. Variance analysis of all individual scores in the two groups shows, F values are less than the corresponding F values in the table and P values are all over 0.05. Scoring difference between artistic and execution referees is insignificant. From sum of deviate squares within the group, its average value is relatively high, indicating the noticeable difference among the teams. According to the above analysis, it is believed that referees’ scoring is quite justified and the referees are able to separate competitive level of each team.

4. Conclusion

The above analysis shows that referees’ overall rating scales in Group C’s aerobic competition during this provincial university games is relatively consistent and execution referees performs better than artistic referees. Establishment and application of the inspection procedures for score objectivity is mainly for three core aspects during scoring: first, inspection for inspection for effective score difference, which can be used as an auxiliary reference for scoring inspection when implementing Aerobics Competition Rules 2005-2008; second, inspection for score difference for each individual game, which can be made from local and global, micro and macro point of view and can be used as a reference for selecting excellent referees; third, comparative analysis between referee’s scores and athletes’ final scores. For some extent, the relation between referee’s score and athlete’s score can be verified by applying correlation analysis. With the premise of justified procedure and scoring, it is suggested that routine checking procedure should be established for objective scoring during aerobics competitions. By importing or “cut and paste” referee’s scores into preset Excel program, the results will be calculated directly. This checking procedure is both time and energy saving and practical for providing data support for objective scoring, result complaint and arbitration for all kinds of aerobics competitions.

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