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INTERNATIONAL BIAS DETECTED IN JUDGING RHYTHMIC GYMNASTICS COMPETITION AT SYDNEY-2000 OLYMPIC GAMES

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Abstract. *The purpose of this study is to determine whether the international rhythmic gymnastics judges at Sydney-2000 Olympic Games showed a pattern of bias or not. To determine whether judges were biased in favor of the rhythmic gymnasts from their own countries, and against the gymnasts from other countries in close competition with their own, the score of each individual judge was compared to the average of the remaining judges on the panel. The results of sign-test analysis (in Individual All-Around Qualification) revealed that judges were biased in their scoring of gymnasts. Judges scored rhythmic gymnasts from their own countries higher than the other members of the panels. The pattern of negative bias, when the judges scored the gymnast in close competition with their own was not shown. The analysis was made within the competition of 24 rhythmic gymnasts from 19 federations, including 4 events: Optional routines with rope, hoop, ball, and band (39 cases in panel A-2, artistic value, and 57 cases in panel B-Execution).*

Key words: *olympic games, Rhythmic Gymnastics, competition, judging, evaluation, bias*

1. INTRODUCTION

1.1. The general characteristics of Rhythmic Gymnastics

Rhythmic Gymnastics is an aesthetic event falling between art and sport. It is practiced exclusively by women and performed to music while using small hand apparatus - rope, hoop, ball, clubs, and ribbon. The spectacular appeal of Rhythmic Gymnastics with its grace, harmony and beauty is enormous.

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At the world class level the difficulty of body movements performed in combination with skillful handling of the apparatus is fascinating. However, learning and developing such skills require as much hard work as in Artistic Gymnastics, Acrobatics, Figure Skating, Sport Aerobics, and any form of artistic, or sport dance.

In order to get to the world class level, a rhythmic gymnast needs natural talent, the ability to handle hard training, which will further develop strength, flexibility, jumping abilities, spatial orientation, strength and handling skills with the apparatus. Finally, Rhythmic Gymnastics is about developing personal style and the ability to get one's own artistic message and charisma across to the audience.

1.2. Origins of Rhythmic Gymnastics

As a competitive event Rhythmic Gymnastics started in the former Soviet Union, where National Championships have been held since 1942. The FIG recognized the new event in 1961. World Individual championships have been taking place since 1963 (Budapest, Hungary), where 28 gymnasts from 10 European countries took part. The 1st World Championships for Group Exercises were held in 1967 (Copenhagen, Denmark) and the first European Championships took place in Madrid, Spain in 1978.

1.3. Rhythmic Gymnastics at the olympic games

Group exercises with small hand apparatus were included in Women's artistic gymnastics program of the 1956 Olympic Games in Melbourne, where six gymnasts performed their routines with ropes (some decorated with flowers).

The first Olympic Games to feature Rhythmic Gymnastics as an event of its own were in 1984 in Los Angeles, USA. Only individuals were allowed to participate, and the top eastern block nations boycotted the Games. The first ever-Olympic title went to Lori Fung from Vancouver, Canada.

In 1996 in Atlanta, the first Group routines were contested and Spain won the title followed by Bulgaria and Russia. In order to fulfill the Olympic requirements to be accepted as a medal sport, groups were reduced from six rhythmic gymnasts to five.

The International Gymnastics Federation (FIG) is the world's governing body for the sport, with its Rhythmic Gymnastics Technical Committee, giving requirements for its development (Code of Points, Rules, and Regulations etc), Abruzzini, (2000, 1).

2. SUBJECTS AND PROBLEM

Every active participant in sport, either as a competitor, a judge or a spectator is faced with evaluation problems. Much has been said and written about bias in sports officiating. Sports writers frequently quote coaches and athletes regarding their dissatisfaction with the way a contest was officiated or judged. One only needs to read the sports section of a newspaper to find examples of such dissatisfaction with sports officials.

Those problems often occur in individual sports of aesthetic characteristics, Rhythmic Gymnastics included. The competitors rank determining by means of a subjective estimate may always cause the doubt whether a competitor has been improper scored or not.

However, little has been done to document, through empirical, and scientific studies, the nature and extent of these alleged biases.

The effects of biased officiating are potentially the most dramatic in sports in which the officials actually score the points through judging the performances of athletes with some combination of objective and subjective criteria. Sports such as artistic gymnastics, and rhythmic gymnastics (among others) fall into this category.

2.1. The aim of the study

The basic aim of this study is the evaluation of judging objectivity in Rhythmic gymnastics at Sydney-2000 Olympic Games, held in Australia. As in these sport events rhythmic gymnasts are differentiated by points, scored of the sport judges, the question is whether the judges are able to estimate the performance quality of gymnasts objectively, precisely, and consistently. A particular purpose of this study was to determine whether or not rhythmic gymnastics judges showed a pattern of bias at the highest international level of competition (Sydney 2000 Olympic Games).

Two kinds of bias patterns were of interest:

a) Bias in favor of the rhythmic gymnasts from judges' own countries;

b) Bias against rhythmic gymnasts from countries in close competition.

2.2. Relevant findings of previous researches

Rhythmic Gymnastics is a relatively young sport branch, in which the World Championships are held since 1963, and in the family of Olympic sports is included in 1984 (Los Angeles). It is a very young scientific brunch with small number of elaborated and published professional or scientific papers as well. In the available studies only a small number of papers related to the evaluation problem in this field, including rhythmic gymnastics, have been found.

While some research has been done to describe the nature of bias in the officiating of sports involving subjective judgments, particularly Artistic and Rhythmic gymnastics, little has been done to establish the full extent of international bias in the judging of such sports.

In our home country (former Yugoslavia) the practice for analyzing the objectivity of judging after every important competition and championships has been established, simultaneously estimating the judge's objectivity, and the panels (A-Composition, and B-Execution Committees).

By the chronological order will be presented elaborated professional, and scientific-research studies, dealing with the evaluation problems in this area of interest.

Brindl (1977, 4) points out high level of judging objectivity of technical merit in Artistic Gymnastics.

Šulc (1978, 23) in his papers he gives a review of previous researches elaborated by following authors: Hlinovska (1970) using graphic method has compared individual judges rank of rhythmic gymnasts competitors, differences from the official placement, as well as the number of competitors, who are evaluated by the same scores; Petrova (1970) compared as well differences from the final score (official) and the number of judges who decline from the average in allowed range; Johnson (1971) studied interrelation of individual judges scores in Artistic Gymnastics; Smirnov-Solovljev (1975) using

test-retest method estimated objectivity of judging in Artistic Gymnastics by comparison of official score, and expert score on the base of video record analysis; Lazarenko (1980) in his study was elaborated a quantitative valorization of elements difficulty in rhythmic gymnastics (according Šulc, 1978, 23). In mentioned research study this author analyzed judging in Artistic Gymnastics as well. He used correlation method for estimation of connection between official final scores (including compulsory and optional routines) and the expert's scores given after video record analysis of the very same routines. The basic issue of this study was to determine whether all the applied methods of competitor's evaluation gave approximately the same rank. By this study it was possible to compare the correlation coefficients of experts analysis and "basic score" (.95), experts analysis and "head judge" score (.94), as well as experts analysis and "official" score (.94).

Protić (1978, 18) using factor analysis method she made classification and valorization of judges in Artistic gymnastics, who took part on particular competition for nominee in national team for Balkan Championships, held in Thessaloniki, in 1977. At this competition one judge panel (jury) had evaluated optional routines of all events. The score given by the head judge was used as the most qualified criterion.

Bala (1979, 3) gave the proposition of method for judge's selection in artistic gymnastics. This method is based on objectivity of scores and needs previous valorization of judging of every individual judge. This method analysis is appropriate for evaluation of large number of judges, including all routines, and events, and using computer for data processing. It is appropriate for all levels of judges, especially for beginners.

Ivančević, & Ivančević (1982, 7) elaborated the study in which were analyzed results of 20 best ranked rhythmic gymnasts of $10^{th\ RSG}$ World Championships, held in Munich, in 1981.

Scheer, & Ansorge (1987, 21) have presented test of a model scoring system for the self- regulation of international bias in gymnastic judging. They point out that some authors in previous studies **(**Ansorge at al, 1978, according Scheer & Ansorge, 1987, 21) documented the existence of a within-team order effect in both men's and women's gymnastics.

Hraski (1988, 6) elaborated valorization of judging in men artistic gymnastics, organized in the World Cup Gymnastics-82, held in Zagreb. Using the first main component method for the data analysis the competitors' achievements were evaluated as well.

Ansorge, & Scheer (1988, 2) estimated the international bias detected in judging Artistic gymnastics competition at the 1984 Olympic games, held in Los Angeles. The analysis results point out that judges in both gymnastics competition (Men, and Women) as well as in Team competition were biased by scoring gymnasts from their own countries ($p = .001$). The negative bias, when judges scored gymnasts in close competition was identified as well. In previous research, Ansorge & Scheer (1984) have studied some of the factors, which allegedly influence gymnastics officials. It has been said that the overall order of competition in which teams and individuals appear has an impact on the judges.

Živčić-Lanc (1989, 24) elaborated the study in which he analyzed the judging objectivity of individual judges in Women Artistic Gymnastics on uneven bars.

Popović (1990, 9) as a mentor had conducted the very first research, relating to this problem in Rhythmic Sports Gymnastics**.** In the unpublished diploma work (Stojković, 1988, 22) was analyzed "8-March RSG tournament" held traditionally in Skopje. Data from this competition were reanalyzed, using main component method as the most ap-

propriate for the evaluation of judging objectivity, including Official, Basic, and Head judge score in the analysis.

Radisavljević (1993, 20) gave the professional review on judging in Rhythmic-Sports Gymnastics at Olympic games, Barcelona 1992. In this papers were analyzed 3 best-ranked gymnasts with hoop routines, and 3 from the group of good competitors. The quality of composition was of interests, and in the authors opinion it is not possible to compare competitive routines with 5 or 9 elements of difficulty. She is hoping that the new Code of Points will consider this problem, which will be helpful for judge work.

After the 14th RSG World Championships, held in Sarajevo in 1989 (Yugoslavia), the next study was elaborated (Popović, 1995, 10). The main issue of this study was the attempt to analyze RSG judges on the world level of competition using the modern quantitative methods. Judging at this Championship was organized according to the Code of Points that integrate one judge panel for each apparatus (routines) consisting of six judges, and one head judge. The data were analyzed by the first main component method (factor analysis). Considering the correlation coefficient of judge's scores with the first main component it is possible to point out that judging at these championships fulfils high standards. The best connection to the general criterion in all competition routines was recorded by head judge (rope = .985; hoop = .982; ball = .982; band = .977).

After 15th RSG World Championships was organized in Athens (1991) applying the same method for data processing, Popović & Samuilidu (1995a, 14) have elaborated the next study. The complete results and judging assignments were obtained in Competition I (Individual All-around). Judging on this Championship was based on the new Code of Points with two judge panels for each event (Panel A–Composition, Panel B-Execution) and the Control Jury. After the factor analysis was processed it was established that the judges' scores homogeneity for all events was satisfactory. The Control Jury scores had the biggest connection to the general criterion in the majority of events. For better judging objectivity in RSG it was suggested that the official mark should consist of the all Panel judges scores, and the Control Jury scores.

A different approach to this problem solving was applied in the following study, elaborated by the same authors (Popović, & Samuilidu, 1995b, 15). The main issue of the study was to determine if a pattern of bias was evident at RSG judges, analyzing 15th RSG World Championships (Athens 1991). Two kinds of bias patterns were of interest: bias in favor of the gymnasts (teams) from judge's own countries, and bias against gymnasts (teams) from the countries in the close competition. All the judges whose country rhythmic gymnasts and teams were competing have been identified. This study reveals the evidence, which supports the existence of international bias in RSG judging. The results of four sign test analysis in Competition I (Individual All-Around and Team competition) reveal that international judges were biased in their scoring of gymnasts and teams; judges over-scored gymnasts from their own countries. The analysis in which the comparison was made between the scores of judges versus Panel, when judges scored gymnasts (and teams) from countries ranking just above their own, and from countries that were just below their own, in the individual and team competition, does not confirm this pattern of bias on the significant level.

For the 1st International Conference on Rhythmic Sport Gymnastics, held in Budapest (Hungary) Popović (1996, 11) had elaborated the scientific review article, which includes methods presentation for estimation of judging objectivity and valorization of judges in RSG.

On the very same International Conference Radisavljević et al., (1996, 20) had presented papers, refer to the tendencies in development of compositions in Rhythmic Sport Gymnastics. The analysis was made on the base of comparison of 3 best-ranked rhythmic gymnasts, and the other 3 from the group of good rhythmic gymnasts.

Dealing with the judging evaluation problems continuously, the same authors (Popović, & Samuilidu, 1997, 14) elaborated the following study, where they analyzed judging objectivity at the 20th RSG World Championships, held in Budapest (Hungary) in 1996. The judges from more than 20 countries took part in judging, and the analysis, which was applied, referred to the Group routines. Complete results, and judging scores were obtained in Competition I (All-Around General competition) in which 23 Federations were competing in two competitive events: I-Group Routines with 3 balls & 2 ribbons; II-Group Routines with 5 hoops. Each competition event was analyzed separately. All Panel-A, and Panel-B judges scores for every event, as well as the Average, and the hypothetical "Basic Marks" were used in this study as variables. All judges' scores were correlated, and the first main component was obtained, which represented the contribution percentage of the common variance of all judges. The judge homogeneity for Group routines in two competitive events was very high or satisfactory. The Average (Official Score) in all judges' panels had the biggest correlation with the general measuring criterion (first main component), which indicated a very good judging objectivity at this competition.

The 19th Rhythmic Sports Gymnastics World Championships, held in Vienna (Austria) in 1995 was analyzed from the aspect of estimation of judging objectivity in the Competition II – Individual All-Around Final (Popović, & Kocić, 1997, 13) as well as evaluation and valorization of judges referred to the Competition I-Individual All-Around Qualifications (Popović & Muratidou, 1999, 18).

For the "2000 Pre-Olympic International congress on Sport Science", held in Brisbane (Australia) Popović (2000, 12) has elaborated the scientific review article that included the evaluation of the Rhythmic Sports Gymnastics research achievements with special emphasis on the methodological problems in this area of interests.

3. METHODS

3.1. Sample and variables

This original scientific research includes complete Rhythmic Gymnastics Official Results Book. The judging assignments were obtained for the Individual All-around Qualifications at Sydney 2000 Olympic Games.

At this Competition 24 Rhythmic gymnasts from the following countries took part: Australia (AUS) Belarus (BLR) Bulgaria (BUL), Canada (CAN) China (CHN) Egypt (EGY) Spain (ESP) Finland (FIN) France (FRA) Georgia (GEO) Germany (GER) Greece (GRE) Hungary (HUN) Israel (ISR) Italy (ITA) Japan (JPN), Poland (POL) Russian Federation (RUS) and Ukraine (UKR).

Competitive sessions consisted of four events: Optional routines with rope, hoop, ball, and ribbon (band) were analyzed, while the final score is made by adding of the 4 scores, which determined official placement of 10 gymnasts for the Individual All-Around Final.

3.2. Jury composition & scoring procedure

Each Jury (Individuals and Groups) consists of 2 groups of judges:

- Jury A: Composition Jury, which is divided into 2 subgroups:
  - Jury A1: Composition Jury - Technical Value (consists of 4 Judges, evaluating the number and level of the difficulties): Max. 5.00 points.
  - Jury A2: Composition Jury-Artistic Value (consists of 4 Judges, evaluating the musical accompaniment and choreography) Max. 5.00 points.
- Jury B: Execution Jury (consist of 5 Judges; evaluating the technical faults): Max 10.00 points.

The final score is calculating by adding the 3 scores: TV + AV + EX (5.00 + 5.00 + 10.00 = 20.00/2): Max. 10.00 points. The whole score for one competitor, and 4 events is Max. 40.000 points, which is the official result for the rank of rhythmic gymnasts in Individual All-Around Qualifications (Abruzzini, 2000, 1).

For the Competition I (individual All-around qualifications) 52 judges were used (32 for Composition and 20 for Execution).

The judge scores in Rhythmic Gymnastics have many components. There are some factors, which influence the scores such as:

- The factors that depend on the competitors;
- The factors that can be ascribed to the judges;
- The factors of objective circumstances, and
- Accidental, non-systematic factors, which are estimation errors.

There is no doubt the judges should aim to eliminate as many factors as possible. In that case the rhythmic gymnast's abilities and their performance, which is the real object of estimation would exclusively influence the scores.

When the evaluation is performed by a large number of judges the following metrical characteristics are important:

- Reliability (always get to an identical or very similar scores by the same judge after consecutive performance estimation of many competitors of the same quality).
- Objectivity (that individual scores of a large number of judges are very similar or identical to the average scores).
- Validity (to estimate exactly those elements according the Code of Points, which are related to the technical accomplishment, artistic impression of gymnasts, and execution of routines).

All these characteristics require considerable experience, expertise, and continuous practice.

To determine whether judges were biased in favor of gymnasts from their own countries and against gymnasts from countries in close competition with their own, the scores of each individual judge (FED) were compared to the average of the remaining (3 or 4) judges on the panel A2, and panel B (PAN), and to the official mark (AVG).

It was hypothesized that each judge, if biased, would score gymnasts from his own country higher than the average of the other (3 or 4) judges on the panel, and that each judge would score gymnasts from the closest two countries in the competition lower than the average of the remaining judges on the same panel.

For this study it was assumed that a score for a gymnasts based on the mean of 3 (or 4) judges would be more valid indication of a rhythmic gymnasts performance than a score recorded by a single judge whose country is directly or indirectly involved. Finding a pattern where judges consistently differ from the average of the other 3 (or 4) judges would support the presence of international bias.

3.3. Data processing

All national judges from countries with competing rhythmic gymnasts were identified. To gather data for the analysis of scores assigned to gymnasts, who were from the same country as the judge, a comparison was made between each judge's score and the average of the 3 (or 4) remaining judges for every situation across all of the events (apparatus routines) where this was observed.

Our interest was in discovering whether the judge scored the gymnast from her country higher (+), lower (–), or the same (0-tie) as the mean of the remaining judges. This comparison was made in 96 cases (39 cases on Panel A-2 for Artistic Value, and 57 cases on Panel B for Execution) in Individual All-Around Qualifications.

Those rhythmic gymnasts that were in closest competition to a Federation judge were selected as the gymnasts just above and just below the judge's country gymnasts in competition. For the gymnasts in the first place, investigator arbitrarily chose the 2^{nd}, and 3^{rd} place as being closest in competition. For the last place gymnasts (24th) those gymnasts in 22^{nd} and 23^{rd} place were considered the closest.

For data processing in this study were used basic statistics methods, according Petz (1974, 8, pp. 112-114).

4. Results and Discussion

Six separate sign-test (across 4 optional routines) in Individual All-Around Qualifications (Tables 1-2) were computed to determine the tenability of null hypotheses involving the proportion of positive and negative differences for comparisons made in this study. A significant deviation from the null hypothesis would support the presence of biased scoring. For each of the test it was assumed the number of positive differences would equal the number of negative differences. The results of the sign tests analysis (Table 1) in the Panel A-2 (Artistic Value) reveal that international rhythmic judges were biased in their scoring of gymnasts. The judges' over-scored rhythmic gymnasts from their own countries in 7 of 13 cases (53.8%), but t-test of differences are not statistically significant on the conventional level ($p = 0.05$). The analysis in which comparisons were made between the individual scores of rhythmic judges versus Panel A-2 (Artistic Value) when the judges scored rhythmic gymnasts from countries ranking just above their own (5 of 13 cases, 38.4%) and from the countries that were just below their own (4 of 13 cases, 30.7%) in the Individual All-Around Qualifications, does not confirm this pattern of bias on the significant level.

Table 1. Sign test summary table for differences between scores of judges and panel means when scoring Own, Preceding, and Succeeding rhythmic gymnasts in Individual All-around Qualification (A-2 Composition Jury-Artistic value)

ROPE	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-2ESP	ESP	11	0	POL	10	-	GRE	12	+
J-2ESP	ESP	14	+	ISR	13	-	BUL	15	0
J-3JPN	JPN	19	+	CHN	18	0	CAN	20	-
HOOP	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-1GER	GER	6	0	UKR	5	+	UKR	7	0
J-1GER	GER	15	+	BUL	14	-	JPN	16	-
J-4FRA	FRA	4	0	RUS	3	0	UKR	5	-
BALL	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-1UKR	UKR	4	+	RUS	3	0	FRA	5	0
J-1UKR	UKR	11	0	GRE	10	-	ESP	12	-
J-3RUS	RUS	1	0	BLR	2	0	UKR	4	+
J-3RUS	RUS	3	0	BLR	2	0	UKR	4	+
RIBBON	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-1JPN	JPN	14	+	BUL	13	-	GER	15	0
J-2ITA	ITA	8	+	GER	7	0	ESP	9	+
J-4BUL	BUL	13	+	ESP	12	+	JPN	14	0
Proportion f/N (%)	7/13 (53.8 %)			5/13 (38.4 %)			4/13 (30.8 %)		

Table 2. Sign test summary table for differences between scores of judges and panel means when scoring Own, Preceding, and Succeeding rhythmic gymnasts in Individual All-around Qualification (B Jury-Execution)

ROPE	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-1BLR	BLR	2	+	RUS	1	-	RUS	3	0
J-1BLR	BLR	7	0	GER	6	0	ITA	8	+
J-2UKR	UKR	5	+	FRA	4	-	GER	6	0
J-2UKR	UKR	8	+	BLR	7	0	ITA	9	+
J-3CAN	CAN	20	+	JPN	19	-	GEO	21	+
J-4RUS	RUS	1	+	BLR	2	+	FRA	4	0
J-4RUS	RUS	2	0	BLR	2	+	FRA	4	0
J-5GRE	GRE	12	+	ESP	11	-	ISR	13	-
HOOP	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-2BUL	BUL	14	+	ISR	13	+	GER	15	+
J-4ITA	ITA	9	-	BLR	8	-	GRE	10	0
BALL	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-3BLR	BLR	2	-	RUS	1	0	RUS	3	-
J-3BLR	BLR	7	0	POL	6	+	ITA	8	+
J-5FRA	FRA	5	+	UKR	4	-	POL	6	+
RIBBON	OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	GYM.	RANK	SIGN	GYM.	RANK	SIGN	GYM.	RANK	SIGN
J-1GRE	GRE	10	+	ESP	9	-	UKR	10	+
J-2ESP	ESP	9	+	ITA	8	+	UKR	10	-
J-2ESP	ESP	12	+	UKR	11	-	BUL	13	-
J-3CAN	CAN	17	+	POL	16	-	ISR	18	-
J-5GER	GER	7	+	BLR	6	0	ITA	8	+
J-5GER	GER	14	+	BUL	13	+	JAP	15	0
Proportion f/N (%)	14/19 (73.7 %)			9/19 (47.4 %)			5/19 (26.3 %)		

The results of the sign tests analysis (test of proportion) given in Table 2, at the Panel B–Execution, reveal that international rhythmic judges were biased in their scoring of gymnasts as well. Judges over-scored rhythmic gymnasts from their own countries in 14 of 19 cases (73.7 %), but t-test of differences does not confirm this pattern of bias on the significant level.

The analysis in which comparisons were made between the individual scores of rhythmic judges versus Panel B (Execution) when the judges scored rhythmic gymnasts from countries ranking just above their own (9 of 19 cases, 47.4%) and from the countries that were just below their own (5 of 19 cases, 26.3%) in the individual All-Around Qualifications, does not confirm this pattern of bias on the significant level.

Table 3. Method of Differences. Summary table of individual scores awarded by judges to rhythmic gymnasts from their Own, Preceding, and Succeeding Federations (countries) versus Panel, and Official score (AVG) for Individual All-around Qualification (A2 Jury Composition - Artistic value)

ROPE		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-2	ESP	4.800	4.800	4.800	4.800	4.833	4.800	4.800	4.766	4.800
J-2	ESP	4.900	4.733	4.750	4.700	4.766	4.750	4.700	4.700	4.700
J-3	JPN	4.800	4.733	4.750	4.700	4.700	4.700	4.600	4.633	4.600
HOOP		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-1	GER	4.900	4.900	4.900	4.900	4.800	4.800	4.800	4.800	4.800
J-1	GER	4.800	4.700	4.700	4.600	4.700	4.700	4.700	4.666	4.700
J-4	FRA	5.000	5.000	5.000	5.000	5.000	5.000	4.800	4.833	4.800
BALL		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-1	UKR	5.000	4.933	4.950	5.000	5.000	5.000	4.900	4.900	4.900
J-1	UKR	4.800	4.800	4.800	4.800	4.833	4.800	4.700	4.733	4.700
J-3	RUS	5.000	5.000	5.000	5.000	5.000	5.000	5.000	4.933	4.950
J-3	RUS	5.000	5.000	5.000	5.000	5.000	5.000	5.000	4.933	4.950
RIBBON		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-1	JPN	4.800	4.700	4.700	4.700	4.766	4.750	4.700	4.700	4.700
J-2	ITA	4.900	4.800	4.800	4.900	4.900	4.900	4.900	4.800	4.800
J-4	BUL	4.800	4.733	4.750	4.800	4.733	4.750	4.700	4.700	4.700
MEAN		4.884	4.833	4.838	4.838	4.848	4.842	4.792	4.776	4.776

The central issue of this study was to discover if a pattern of bias exists in international rhythmic sports gymnastics judging. To best fulfill this purpose, it was believed that all opportunities, which judge had to display such bias should be includes in the data analysis. The presence of some dependency of scores means that the significance levels of the z-approximations may be slightly larger than those reported ($t = 2.16$; $p = 0.05$) including 13 judges (39 comparison cases) at A-2 panel (Composition-Artistic Value), or 19 judges (57 comparison cases) at B Panel-Execution ($t = 2.09$; $p = 0.05$) according Petz, 1974, 245.

Group means of scores for the optional routines All-around Qualification (A-2 Panel-Artistic value) are found in Table 3; similar information is found for optional routines All-around Qualification (Panel B-Execution) in Table 4. The mean of the judge(s) was based on the overage of all scores (4 optional routines) assigned to rhythmic gymnasts

from the same country of the judge(s), rhythmic gymnasts from countries immediately higher than the judge's country in the competition, and rhythmic gymnasts from countries just below that of the judges in the competition.

Table 4. Method of Differences. Summary table of individual scores awarded by judges to rhythmic gymnasts from their Own, Preceding, and Succeeding Federations (countries) versus Panel, and Official score (AVG) for Individual All-around Qualification (B Jury - Execution)

ROPE		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-1	BLR	9.800	9.787	9.800	9.800	9.825	9.833	9.800	9.800	9.800
J-1	BLR	9.650	9.650	9.650	9.650	9.650	9.650	9.650	9.637	9.650
J-2	UKR	9.850	9.737	9.750	9.700	9.762	9.750	9.650	9.650	9.650
J-2	UKR	9.700	9.650	9.650	9.650	9.650	9.650	9.650	9.637	9.650
J-3	CAN	9.450	9.437	9.450	9.500	9.537	9.533	9.400	9.337	9.366
J-4	RUS	9.850	9.812	9.833	9.800	9.787	9.800	9.750	9.750	9.750
J-4	RUS	9.800	9.800	9.800	9.800	9.787	9.800	9.750	9.750	9.750
J-5	GRE	9.600	9.512	9.550	9.500	9.600	9.583	9.500	9.587	9.583
HOOP		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-2	BUL	9.650	9.562	9.583	9.600	9.550	9.566	9.650	9.525	9.533
J-4	ITA	9.650	9.662	9.650	9.600	9.675	9.666	9.600	9.600	9.600
BALL		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-3	BLR	9.800	9.825	9.816	9.850	9.850	9.850	9.800	9.812	9.800
J-3	BLR	9.700	9.700	9.700	9.700	9.662	9.683	9.700	9.662	9.683
J-5	FRA	9.800	9.750	9.766	9.700	9.800	9.783	9.700	9.662	9.683
RIBBON		OWN-FEDER.			RANK ABOVE			RANK BELOW		
JUDGE	FED	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.	SCORE	PANEL	AVG.
J-1	GRE	9.650	9.612	9.616	9.550	9.650	9.633	9.650	9.612	9.616
J-2	ESP	9.700	9.612	9.633	9.700	9.662	9.666	9.600	9.625	9.616
J-2	ESP	9.700	9.637	9.650	9.600	9.625	9.616	9.500	9.525	9.533
J-3	CAN	9.550	9.437	9.450	9.450	9.525	9.500	9.350	9.512	9.500
J-5	GER	9.700	9.650	9.666	9.700	9.700	9.700	9.700	9.662	9.666
J-5	GER	9.600	9.537	9.550	9.550	9.512	9.533	9.550	9.550	9.550
MEAN		9.694	9.651	9.661	9.652	9.674	9.673	9.628	9.626	9.630

In this study the applied statistic procedure (Method of differences) in both cases (Panel A-2, and Panel B) do not confirmed those differences (evidenced in Table 3, and Table 4) as statistically significant on the conventional significant level ($p = .05$).

For the Panel A-1 (Technical Value) the sign-test analysis and t-test of differences was not appropriate for this study, while engage complete neutral mixture of international rhythmic gymnastics judges.

5. CONCLUSION

This study reveals evidence to support the existence of international bias in rhythmic gymnastics judging. International rhythmic gymnastics judges tend to overscore gymnasts from their own countries.

The Panel-A2 judges (Composition–Artistic value) and the Panel-B judges (Execution) in Individual All-Around Qualifications scored gymnasts from their own countries higher than remaining judges on Panel.

The analyses in which comparisons were made between scores of individual rhythmic judges (FED) versus Panel when judges scored gymnasts from countries ranking just above their own, and also from countries, which were just below their own, do not confirm this pattern of bias on significant level.

The presence of international bias discovered in this study (even if is not statistically significant on conventional level of $p = 0.05$) could be damaging to the credibility of Rhythmic Gymnastics as a competitive sport.

To improve the situation, the International Gymnastics Federation (FIG) is currently testing the feasibility of using five judges on Panel A-1 (Technical Value) and Panel A-2 (Artistic Value) per event in major international competitions, with the gymnast's scores being the average of the middle three judge's scores.

If such panels of five could be selected with an appropriate international mixture of judges to produce truly neutral panels, then the data from this study strongly support such a change as one way to potentially reduce the negative effects of international bias.

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INTERNACIONALNA PRISTRASNOST ZAPAŽENA KOD SUĐENJA TAKMIČENJA U RITMIČKOJ GIMNASTICI NA OLIMPIJSKIM IGRAMA "SIDNEJ 2000"

Ružena Popović

Osnovni cilj ovog istraživanja je utvrđivanje prisustva šablona pristrasnosti kod internacionalnih sudija na takmičenju u Ritmičkoj Gimnastici na Olimpijskim igrama, održanim u Sidneju, 2000. godine. Za sprovođenje ovog istraživanja ocene svake bodovne sudkinje su bile upoređivane u odnosu na srednju ocenu preostalih sudkinja sa liste, a radi utvrđivanja potencijalne pristrasnosti, u korist gimnastičarki iz sopstvenih zemalja, ili protiv gimnastičarki najbliže plasiranih. Rezultati analize, sprovedene na bazi testa proporcija (u odnosu na broj većih, manjih, ili identičnih ocena) u kvalifikacijama individualnog višeboja ukazuju na pristrasno suđenje takmičarki iz sopstvenih zemalja. Sudkinje su ocenjivale gimnastičarke iz sopstvenih federacija većom ocenom od preostalih bodovnih sudkinja sa liste. Negativna pristrasnost u odnosu na takmičarke u najužoj konkurenciji, tj. najbliže plasirane onima iz sopstvene zemlje, nije evidentirana. Analiza je bila sprovedena za kompletno takmičenje u kvalifiikacijama individualnog višeboja, na kome su učestvovale 23 takmičarke ritmičke gimnastike iz 19 zemalja u slobodnim sastavima u 4 takmičarske discipline: vijača, obruč, lopta i traka (39 slučaja u komisiji A-2 za procenu umetničke vrednosti kompozicije i 57 u komisiji B, za ocenu izvođenja sastava.

Ključne reči: *olimpijske igre, Ritmička Gimnastika, takmičenje, suđenje, evaluacija, pristrasnost*