

# Statistical Analysis of Volley Ball Tournament at the Olympic Games Sydney' 2000

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The unique character of statistical analysis of volleyball matches is made difficult if a fifth set is played as a result of a 2:2 draw. These sets are played to 15 points (S-15 sets) which differentiates them from sets played earlier to 25 points (S-25 sets). Thus S-25 and S-15 sets are not directly comparable. Another circumstance is the fact that in each match minimum three sets are played, and that means that the results of the first three sets are comparable. The study deals mainly with the analysis of these three sets.

Tournament volleyball of women became played of boundary strip 12 with teams, divided on two groups. Twelve teams took part in the Olympic tournament: from Europe – 4 teams (CRO, RUS, GER, ITA), from America – 4 teams (USA, BRA, PER, CUB), from Asia – 2 teams (CHI, KOR), from Africa – 1 team (KEN) and the host of the games – AUS.

The fragment of prepared database in accordance in paper **Wagner** (2001) for leading team CUB is given in table 1.

**Table 1.** Data base of team Cuba

No	Country	No country	Name	Age	Height (cm)	Weight (cm)	Spike (cm)	Block (cm)
1	Cuba	1	Aguero Taimaris	23	175	71	320	315
2	Cuba	2	Barros Zoila	24	188	76	325	312
3	Cuba	3	Bell Regla	29	180	75	326	320
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Of the matches that finished with a result 3:0, it appears that the most even match in terms of points scored in sets was RUS-CHI (27:25, 25:23, 27:25). In total 152 points were scored, which is 25.3 point per set for each team. A large disparity between the level of teams can be noted in matches which finished with a result 3:0 as follows: BRA-KEN (25:8, 25:11, 25:13) and USA-AUS (25:11, 25:17, 25:10). Matches which finished with a result 3:1 suggest a significantly greater level of competition. A very close match was CRO-CHI (25:23, 26:28, 25:20, 25:15), in which 187 points were scored in total, on average 23.4 points per team. Other such matches included CHI-KOR (23:25, 25:19, 25:23, 25:19, in total 184, on average 23.0) and RUS-ITA (29:31, 25:18, 25:21, 25:19, 193 in total, on average 24.1). Of the matches which finished with a result 3:2, the final match CUB-RUS is worth mentioning (25:27, 32:34, 25:19, 25:18, 15:7, in total 205 points for sets 1-4, on average 25.6 points). All semi-final matches finished with a result 3:2.

The qualification round consisted of 15 matches in each group, which is 30 matches in total. Due to the numerical data the analysis of the results of the matches is discussed here in three parts: (a) analysis of group A, (b) analysis of group B, and (c) comparison between groups A and B.

In group A the following teams played: CRO, AUS, BRA, KEN, CHI and USA. For these matches the number of points scored (W) by each team in the S-I, S-II and S-III sets were calculated statistics: sum of won points, average, standard deviation, coefficient of variation expressed in % (tab 2). Averages for teams CRO, BRA, CHI and USA are very high but none of them exceeds 25 points. BRA in S-I and S-II and USA in S-III have averages of 25 points. The teams of USA, AUS and KEN have high coefficients of variation (USA 17.6% in S-I), (AUS 25.1% in S-I, 34.2% on S-

III), (KEN 48.8% in S-I, 39.4% in S-II). KEN and AUS had a very low scoring effectiveness: 53.6% in S-II, 64.0% in S-III and 63.2% in S-I, 64.8% in S-III, respectively.

**Table 2.** Statistics of select features from group A

Sets	Statistics	CRO	AUS	BRA	KEN	CHI	USA	Total
<i>S-I</i>	sum	108	79	125	89	112	111	624
	average	21,6	15,8	25,0	17,8	22,4	22,2	20,8
	stand. dev.	3,3	4,0	0,0	7,3	4,8	3,9	5,1
	coef. var.	15,2	25,1	0,0	48,8	21,3	17,6	24,4
	%	86,4	63,2	100,0	71,2	89,6	88,8	83,2
<i>S-II</i>	sum	114	99	120	67	120	125	645
	average	22,8	19,8	24,0	13,4	24,0	25,0	21,5
	stand. dev.	3,1	5,0	2,2	5,3	3,0	0,0	5,2
	coef. var.	13,7	25,1	9,	39,4	12,5	0,0	24,1
	%	91,2	79,2	96	53,6	96,0	100,0	86,0
<i>S-III</i>	sum	114	81	125	80	100	115	615
	average	22,8	16,2	25,0	16,0	20,0	23,0	20,5
	stand. dev.	3,9	5,5	0,0	2,1	5,4	4,5	5,1
	coef. var.	17,1	34,2	0,0	13,4	27,1	19,4	24,9
	%	91,2	64,8	100	64	80	92	82
<i>Total</i>	sum	336	259	370	236	332	351	1884
	average	22,4	17,3	24,7	15,7	22,1	23,4	20,9
	stand. dev.	3,2	4,9	1,3	5,3	4,5	3,4	---
	coef. var.	14,4	28,2	5,2	33,5	20,4	14,5	---

For the simultaneous examine averages of W points between teams (group A) and parts of game the two-factor analysis of variance is done. In the work of **Wagner** (2001) the manner of hypothesis verification  $H_0^A, H_0^B, H_0^{AB}$  is present in table 3.

**Table 3.** Two-way analysis of variance from group A

Source of variation	SS	df	MS	F	Test F
Sets	15,800	2	7,9	0,485	3,124
Teams	961,467	5	192,293	11,801	2,342
Interaction	151,133	10	15,113	0,928	1,965
Error	1173,200	72	16,294		
Total	2301,600	89	231,601		

The F test does not lead to the rejection of null hypotheses for sets and interactions. Diversity between the countries turned out not to be the only significant factor, as AUS and KEN were on a similar low level, CHI (22.1), CRO (22.4), and USA (23.4) were on a higher level with BRA (23.4) on the highest level.

To compare the sports level of the S-I, S-II and S-III sets played in groups A and B the analysis of the so called set point differences (SPD) was performed. These values are calculated on the basis of the difference between the number of points of the winning and the losing teams. To compare the average SPD values between groups for S-I, S-II, S-III, Student's t test was used. It followed the F-Fisher's test of comparison of group variances. The results of the calculations are presented in tab 4.

**Table 4.** Result of tests F-Fisher and t-Student for SPD

Statistics	Set I		Set II		Set III	
	A	B	A	B	A	B
<i>Mean</i>	8,4	5,9	7,4	7,0	9,0	6,1
<i>Variance</i>	16,0	8,9	22,8	12,7	10,4	8,2
<i>Test F-Fisher</i>	1,79		1,79		1,27	
<i>Test t-Student</i>	1,91		0,26		2,63*	

## REFERENCES

**Wagner W. (2001):** *The basis of comprehensive statistical analysis of the Sydney' 2000 Olympic Games basketball and volleyball tournaments (in press).*