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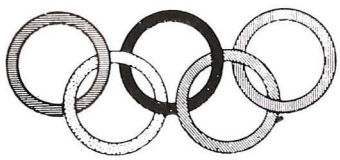
1964 OLYMPIC GYMNASTICS STATISTICS

II SOME ATTEMOTS AT TEAM EVALUATION

by Dick Criley



With all the figures and statistics available on the 1964 Olympic Games, one might think it would be easy to come up with a simple formula for selecting an Olympic team: However, if there is, statistics will have to provide only a small part of that formula.

Let us look at Table 3 for a moment. This table shows us the average scores for two of our Olympians in four meets in which the Olympic compulsories and optional routines were used. In nearly every event, these scores overestimate the actual score received in Tokyo. Could this have been predicted? To the extent that the judging in these meets was based on the international system—no; but if one considers that many other factors effect judging, the answer would be yes.

A statistical technique which we can interpret as a measure of the consistency of the performances of the individuals, the coefficient of variability (CV), was used on these scores. The greater the CV, the greater is, the variation among observations. It shows us that Weiss was likely to show greater inconsistency than Sakamoto in most events. Weiss has long been known for his discipline and consistency in gymnastics and it is not at all unlikely that these figures are of minor significance if compared with the variability of other individuals over a series of performances. We suggest, then, that the coefficient of variability may be useful in gauging the consistency of an individuals performance if there have been sufficient trials to provide a valid test.

The coefficient of variability may be applied to a team's performances as well as to an individual's. CV values have been computed for the top three teams and the USA for the optional and compulsory exercises and are presented with average team scores in Table 4 and 5. In the events where high CV values occurred there were often one, two, or more performances which received scores differing considerably from the other scores. The US men can point to such instances in the floor exercise, side horse, parallel bar, and horizontal bar events and the US women's team to the side horse vault and uneven parallels. Individuals often performed well in these events but as a team we could not meet the challenge of six good exercises.

No discernible pattern is evident in the average scores of the top three teams as to emphasis on compulsory or optional exercises. The German men and Czech women were rather consistently higher on their optional exercises while the men's and women's teams of Japan and Russia tended to excel in the excution of the compulsories. Our US teams were less consistent in their performances, doing better on some compulsories in some events and on optionals in others.

An almost obvious conclusion is that we need an overall strengthening in both compulsories and optionals of all events. A 0.15 increase in individual perfection per routine could have placed us third instead of seventh in the men's events. A 0.15 increase per performer could have placed the women sixth instead of ninth and a stronger showing on the aforementioned exercises would have been the basis for an even better placing. These conjectures are based, however, on the potential of each team member and his consistency in working up to this potential. But consistency itself will not win the Olympics unless the scores are on a high level. Thus, the ultimate criterion might be, how consistent is the individual at scoring in high figures? (See January and March issues of the MG.)

With certain reservations we ran an analysis of variance for the totals of each individual on a team in each event. The analysis of variance is strictly valid under defined conditions when the observations (in this case, the individuals' scores) are distributed normally about their mean. As pointed out earlier, (March MG) the scores

TABLE 3. Mean event score for two performers based on scores received in the 1964 North American Championships, West Point Olympic Qualifiers Meet, King's Point Olympic trials, and Olympic Final tryouts.

	EVENT						
	F. Ex.	S.H.	H.B.	L.H.V.	P.B.	S.R.	Total
Weiss	18.62	18.77	18.25	18.90	19.45	18.91	112.90
CV	4.20	2.50	6.79	0.67	0.90	4.73	
Sakamoto	19.19	18.75	19.15*	18.88*	19.15*	18.92	114.04
CV	1.47	1.57	1.04	2.94	0.55	1.13	

* Mean based on only three scores.

TABLE 4. Mean compulsory and optional scores for each event for the Japanese, Russian, German and U.S. Gymnastics teams with the Coefficient of variability for each set. Means based on all six scores.

Floor Exercise	Japan	Russia	Germany	U.S.A.
Comp.	9.56	9.55	9.36	9.03
CV	0.49	0.66	1.14	2.16
Opt.	9.56	9.52	9.40	9.24
CV	1.40	1.78	1.04	3.35
Side Horse				
Comp.	9.53	9.42	9.12	9.24
CV	0.84	0.73	1.72	0.85
Opt.	9.50	9.37	9.37	9.13
CV	2.17	1.33	1.14	2.69
Still Rings				
Comp.	9.60	9.55	9.21	9.20
CV	1.56	1.31	2.16	1.44
Opt.	9.59	9.60	9.45	9.30
CV	1.26	0.79	0.92	1.63
Long Horse Vault				
Comp.	9.61	9.59	9.47	9.30
CV	1.11	1.18	0.99	0.98
Opt.	9.65	9.63	9.56	9.47
CV	0.89	0.77	1.15	1.09
Parallel Bars				
Comp.	9.64	9.64	9.43	9.32
CV	1.17	0.76	0.49	0.80
Opt.	9.60	9.58	9.48	9.08
CV	1.68	1.11	0.89	4.54
Horizontal Bar				
Comp.	9.64	9.61	9.27	9.15
CV	0.55	0.98	1.57	2.15
Opt.	9.55	9.61	9.42	9.10
CV	1.61	1.84	0.85	1.24

actually were skewed heavily above the mean with a few exceptionally low scores dragging down the mean.

There are other assumptions which we made that may also be invalid. For instance, the assigning of a score should be independent of the team affiliation of the individual, but since teams competed on a given apparatus as a block, we may confuse the average of the team score with other effects. If the individual is truly representative of his team, and if teams differ in their level of ability, we can perhaps detect differences among teams based on an average of the scores. As Tables 6 and 7 illustrate, such differences are not as evident statistically as visual observation must have indicated. Again, it must be emphasized that these means are based on the scores of all six team members whereas the team standings are based on the top five performances only. Thus, if one individual did break, the team standing was not affected, although the measure of *team* consistency, the CV, does reflect it. Again, consistency does not alone spell the story. Some teams with low CV's did not rank high because their level of ability was not as great as other teams. On some teams, outstanding performances by a few were enough to overcome low scores of the others when the deficiencies were not of such a magnitude as to lower the team average. These teams might have had a low CV if the top score was not considered.

One must arrive at the conclusion, then, that an overall study of team statistics will not necessarily lead to a method of team selection. Greater minds than mine are struggling with the problem of fielding the best team possible while taking into consideration all the complications which can be subjected to mathematical test. A standard of excellence may be established mathematically, but thereafter the real work begins.

Another possibility was suggested. Is there an event by which one can gain an estimate of the final ranking of an individual and possibly his team? If one event could serve as an indicator and graphs drawn (such as demonstrated in the March MG), might it not serve as a valuable guideline in selecting a team? The answer, of course, would be NO if an individual were not competent on all apparatus. Still, for conjecture's sake, we present the following figures which show the number of times an individual's ranking in an event was within + or — 4 of his all-around ranking:

MEN	
Parallel bars	42
Still rings	31
Horizontal bar	30
Floor exercise	22
Side horse	21
Long horse vault	18
WOMEN	
Uneven parallels	25
Balance beam	24
Floor exercise	21
Side horse vault	17

We still have no indication that one can mathematically select a top-flight gymnastics team. Therein lies the crux of the problem. A mathematical analysis is objective and considers only those factors which can be programmed into it while gymnastics is creative and imaginative and often unpredictable. Trying to create a gymnastics model is like composing music on a computer. It can be done but the results lack the originality and spirit of the art.

TABLE 5. Mean compulsory and optional scores for each event for the Russian, Czechoslovakian, Japanese, and U.S. women's gymnastics teams with the Coefficient of Variability for each set. Means based on all six scores.

Floor Exercise	Russia	Czech.	Japan	U.S.A.
Comp.	9.499	9.338	9.377	9.205
CV	1.50	0.99	1.17	1.77
Opt.	9.577	9.460	9.466	9.277
CV	1.37	1.74	1.24	1.25
Side Horse Vault				
Comp.	9.460	9.472	9.510	9.233
CV	0.94	1.10	0.63	2.22
Opt.	9.499	9.537	9.397	9.088
CV	1.21	1.31	0.92	3.17
Balance Beam				
Comp.	9.366	9.394	9.255	8.994
CV	1.12	1.07	1.25	1.07
Opt.	9.649	9.577	9.438	9.344
CV	1.43	1.75	1.52	1.36
Uneven Parallels				
Comp.	9.505	9.449	9.366	9.094
CV	0.79	1.05	0.97	3.28
Opt.	9.260	9.477	9.472	8.572
CV	3.68	2.51	1.43	7.88

TABLE 6. Mean total score for each event for men's gymnastics teams with the Coefficient of Variability for each team. Means based on all six scores.

	Floor Exercise MEAN		CV	Side Horse MEAN		CV	Still Rings MEAN		CV
1. Japan	19.15	a	2.42	19.03	a	4.91	19.19	a	1.39
2. Russia	19.07	ab	1.35	18.80	a	0.85	19.15	a	0.98
3. Germany	18.77	abc	3.14	18.50	a	1.37	18.66	ab	1.41
4. Italy	18.43	abcde	2.52	18.45	a	1.23	18.52	ab	3.06
5. Poland	18.66	abcd	1.00	18.02	a	2.81	18.45	ab	1.10
6. Czechoslovakia	17.07	de	18.98	17.97	a	3.43	18.40	ab	1.47
7. U.S.A.	18.27	abcde	2.68	18.37	a	1.46	18.50	ab	1.39
8. Finland	18.72	abcd	0.87	18.40	a	1.32	17.82	bc	1.50
9. Hungary	18.24	abcde	1.53	17.94	a	3.04	18.20	ab	1.55
10. Bulgaria	18.17	abcde	2.45	18.25	a	0.87	18.15	ab	2.66
11. Yugoslavia	18.00	abcde	2.26	18.28	a	3.13	18.08	b	3.95
12. Rumania	18.23	abcde	2.02	17.95	a	1.24	17.93	bc	2.02
13. Korea	18.26	abcde	0.55	17.56	a	6.16	17.73	bc	2.05
14. Switzerland	17.76	abcde	3.56	18.05	a	3.23	16.97	cd	2.38
15. Cuba	17.45	bcde	12.46	15.94	b	3.03	16.74	d	5.51
16. Australia	17.12	cde	1.01	16.18	b	6.41	15.49	e	4.84
17. Taiwan	16.78	e	4.00	11.52	c	28.91	16.05	de	6.08
18. India	14.73	f	21.18	12.43	c	12.92	12.16	f	20.81
Overall mean	17.94			17.21			17.57		
F value		4.53**			21.18**			27.39**	
Overall CV			8.60			13.65			10.24

	Long Horse Vault MEAN		CV	Parallel Bars MEAN		CV	Horizontal Bar MEAN		CV
1.	19.26	a	0.79	19.25	a	1.18	19.20	a	0.91
2.	19.22	a	0.94	19.22	a	0.85	19.23	a	1.23
3.	19.04	ab	0.90	18.91	ab	0.59	18.70	ab	1.03
4.	18.74	bc	0.82	18.85	abc	2.13	18.33	ab	3.65
5.	18.84	b	1.53	18.36	abc	2.44	18.57	ab	1.91
6.	18.84	b	1.35	18.60	abc	1.61	18.35	ab	3.16
7.	18.77	bc	0.86	18.40	abc	2.35	18.20	ab	2.93
8.	18.88	b	1.51	18.56	abc	1.09	18.22	ab	2.23
9.	18.76	bc	1.61	18.59	abc	1.19	18.60	ab	2.87
10.	18.81	b	1.21	18.22	bcd	2.88	18.71	ab	1.39
11.	18.76	bc	1.00	18.56	abc	2.47	18.28	ab	3.23
12.	18.75	bc	0.69	18.47	abc	1.55	17.90	b	4.57
13.	18.46	cd	0.95	17.92	cde	5.33	18.35	ab	2.39
14.	18.97	ab	1.06	18.54	abc	1.21	17.94	b	1.79
15.	18.27	d	1.83	17.57	de	1.83	16.59	c	6.09
16.	18.18	d	1.68	17.23	e	3.46	16.52	c	5.62
17.	17.77	e	1.70	13.35	f	3.42	16.78	c	6.82
18.	17.34	f	2.37	12.73	f	17.98	9.22	d	31.13
Overall mean	18.64			18.07			17.66		
F value		32.88**			26.98**			35.97**	
Overall CV			3.35			8.63			13.36

Note: Means followed by the same letter are not significantly different at the 5% level when Duncan's Multiple Range test for mean separation is used.

**Analysis of Variance F value significant at the 1% level.

TABLE 7. Mean total score for each event for women's gymnastics teams with the Coefficient of Variability for each team. Means based on all six scores.

	Floor Exercise MEAN		CV	Side Horse Vault MEAN		CV	Balance Beam MEAN		CV	Uneven Par. Bars MEAN		CV
1. Russia	19.077	a	16.25	18.960	a	3.23	19.016	a	1.18	18.766	a	2.42
2. Czech.	18.799	a	1.36	19.010	a	1.13	18.971	a	1.40	18.927	a	1.60
3. Japan	18.844	a	1.13	18.982	a	0.68	18,693	ab	1.22	18.838	a	2.45
4. Germany	18.782	a	1.79	18.849	ab	1.77	18.585	ab	1.21	18.671	a	1.05
5. Hungary	18.799	a	1.31	18.543	bc	0.91	18.760	ab	0.67	18.727	a	1.38
6. Rumania	18.382	a	1.48	18.476	c	2.16	18.438	b	2.70	18.626	ab	1.04
7. Poland	18.554	a	1.01	18.582	bc	1.40	18.437	b	1.96	18.255	bc	2.43
8. Sweden	18.260	ab	1.67	18.515	bc	0.92	18.282	b	0.54	18.210	c	1.37
9. U.S.A.	18.482	a	1.52	18.321	c	2.55	18.338	b	1.05	17.666	d	1.96
10. Australia	17.629	b	1.00	17.332	d	2.41	17.346	c	5.32	16.139	e	3.57
Overall Mean	18.561			18.557			18.487			18.282		
F value		24.16**			17.07**			9.24**			37.66**	
Overall CV			2.50			2.99			3.21			4.84

Note: Means followed by the same letter are not significantly different at the 5% level when Duncan's Multiple Range test for mean separation is used.

**Analysis of Variance F value significant at the 1% level.