

Original Article

Study regarding the prediction of medal winning in Olympic Games judo competitions

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Abstract:

Problem Statement: The Olympic Games are the lead competition for any sport, and the ultimate goal of any sportsman, national federation or coach is to obtain the Olympic medal. The analysis of the ways to attain this goal fully justifies the efforts of sports specialists around the world. This research analyzes the official interim rankings determined during the Olympic cycle and the extent to which they matched the final rankings at the London Olympic Games 2012.

Approach: The 56 Olympic medals awarded in 2012 were retrospectively analyzed in conjunction with the World Ranking List on which the qualifying for the Olympic Games (top 4 and top 8) was based, with the results of the latest World Championships (top 4 and top 2011, Paris) as well as with results in previous Olympic Games (top 4 and top 8 2008, Beijing).

Purpose: Analyze the interim rankings during an Olympic cycle in judo in order to reveal the most predictable of them with a view to obtaining medals in the Olympic Games.

Results: The results of 6 rankings were presented with statistical data support in form of frequencies and percentages, including calculations of the arithmetic means of percentages, of standard deviations and of variability coefficient. The study of distributions revealed abnormal distribution in the 2nd weight category for both men and women, which is something that requires a special scientific approach.

Conclusions: World Ranking List-Top 8 predicted best, on average, the Olympic results to an extent of 81%, and the World Championships Top 8 – 2011 to an extent of 70% without including the women's 52 kg and men's 66 kg categories, statements made with moderate reliability. The other analyzed rankings revealed a low prediction rate and too wide dispersion to be worth considering. The renewal rate of the elite echelon (new medal winners) from one Olympics to the next stands at around 80%.

Key words: judo, olympic medals, prediction, rankings, renewal rate.

Introduction

The last few decades have revealed the major role that sports play in the whole of our social life and of the world economy. The most obvious way in which sports have grown in importance is through sports competitions. These range, in terms of degree of recognition, from insignificant to paramount – the Olympic Games. Over the years sports competitions have strengthened their extrinsic status as ideal and image and the intrinsic one as a need to alternate the specific efforts made by the sportsmen.

Obtaining the Olympic champion title or at least an Olympic medal is the ultimate dream of any sportsman from any sport and any country, and the analysis of the ways to attain this goal justifies anytime the efforts of sports specialists around the world. In recent years specialists have begun to resort frequently to the prognostic analysis of the ranking dynamics for the position that a sportsman, a team or country delegation will occupy in the final ranking of an official world sports competition. Key research in this direction must be based on the analysis of the latest sports competitions in the Olympic Games in order to elaborate competition models of the most valuable sportsmen and determine the training benchmarks for the next Olympic cycle.

Judo has been an Olympic sport since 1964, having started with men's competitions and introducing women's competitions in 1988, and has had sufficient time to mature conceptually and methodologically. Despite certain common traits of the general competition model regardless of gender, weight category and even age, Olympic competitions have certain specific traits, which can be most likely explained through the importance of the event as well as through the qualification system, which is different from that of other competitions. This system enables the participation of the most valuable sportsmen worldwide, selected though within strict quotas for each continent, with national participation limited to one sportsman per weight category.

As a result, in the 2008 Olympic Games the ippon structure was about 4-9% lower than the average of 24 other major competitions (Roşu D., Ion-Ene Mircea, 2009).

All international federations use on a regular basis the value rankings of the places occupied in various competitions (Nicu A., 1993) in order to identify the most valuable sportsmen of the moment and to put together the participation lists for the major competitions (Olympic Games and World Championships). The document used in recent years by the International Judo Federation for the qualification of sportsmen for the Olympic Games and the World Championships is the World Ranking List –WRL from the official sites of judo: International Judo Federation, European Judo Union, IJF World Ranking online (IJF World Ranking n.d.). This document incorporates the results obtained by the sportsmen in previous World Cups, Grand Prix, Grand Slam, Masters, Continental Championships, World Championships and Olympic Games.

The importance of the participation of Judokas in the above mentioned competitions is defined by the WRL, which is an aspect that requires additional analysis. Sportsmen need to accrue sufficient points in order to qualify for the Olympic Games and the World Championships, points which result from valuable performance in a significant number of competitions (from the above mentioned ones). A more in-depth analysis reveals the fact that a number of points that places a sportsman in the Top 8 qualified sportsmen (with consideration given to certain regulatory limitations by continent and country) results also in a preferential draw that facilitates their rise to the top of that competition's ranking, avoiding direct matches with the other Judokas in the Top 8. The entire start list of the Olympic Games is put together based on the positions in the WRL in conjunction with the mentioned limitations.

Aside from the WRL, a small number of competitions might predict the Olympic performance to a certain extent, through their own rankings, provided they bring together the most valuable sportsmen worldwide. In judo, just like in most other sports, the World Championships represent the event where the world elite most certainly meets. It therefore stands to reason that the results of the latest world championships may reflect the chances to obtain the Olympic medal most accurately. Statistics also show, for all sports, that a relatively small number of Olympic medalists succeed in repeating the Olympic performance twice or more, which is why the previous Olympic ranking is taken into account every time the predictability of Olympic results is analyzed.

Purpose of the research

Analyze the interim rankings during an Olympic cycle in judo in order to reveal the most predictable of them with a view to obtaining medals in the Olympic Games

Method

The performance evolution of all medalist judokas from the 2012 Olympic Games was analyzed ($n=56$, $n_{male}=28$, $n_{female}=28$) based on the following 6 intermediary rankings:

1. World Ranking List -Top 4-2012-qualification list of the top 4 sportsmen entered into the 2012 Olympic Games (coded WRL-4);
2. World Ranking List Top 8-2012- qualification list of the top 8 sportsmen entered into the 2012 Olympic Games with preferential draw (coded WRL-8);
3. World Championships Paris 2011-top 4 (coded CM-4);
4. World Championships Paris 2011-top 8 (coded CM-4);
5. Olympic Games 2008-Top 4 (coded JO 08-4);
6. Olympic Games 2008-Top 8 (coded JO 08-8).

The descriptive statistics addressed the extent to which the medalists from the 2012 Olympic Games also occupied representative places in previous rankings, including the calculation of the central trend indicators (arithmetic means, standard deviation, variability coefficient).The inferential statistics aimed at elaborating estimates based on the analysis of the obtained data (Drugas M., Roşeanu G., 2010).

Results

Table 1. Correspondence between 2012 Olympic Games medals and prior rankings - women (occurrence frequency)

Weight categories women		-48kg			-52kg			-57kg			-63kg			-70kg			-78kg			+78kg			total
WRL-4	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	1	1	1	0	0	0	1	0	1	1	1	2	1	0	1	1	0	2	0	1	1	-
	Total medals/cat.	3			0			2			4			2			3			2			16
	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
WRL-8	No. of medals	1	1	2	0	0	1	1	1	1	1	1	2	1	0	1	1	0	2	1	1	1	-
	Total medals/cat.	4			1			3			4			2			3			3			20
	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	1	1	2	0	0	1	1	1	1	1	1	2	1	0	1	1	0	2	1	1	1	-
	Total medals/cat.	4			1			3			4			2			3			3			20

CM-4	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	1	0	1	0	0	0	1	1	0	1	0	2	1	0	1	1	0	2	0	1	1	-
	Total medals/categ.	2			0			2			3			2			3			2			14
CM-8	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	1	1	2	0	0	1	1	1	1	1	0	2	1	0	1	1	0	2	1	1	2	-
	Total medals/categ.	4			1			3			3			2			3			4			20
JO 08-4	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	-
	Total medals/categ.	1			1			0			0			1			0			2			5
JO 08-8	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	0	1	1	1	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	2	-
	Total medals/categ.	2			1			0			1			2			0			2			8

Table 2. Correspondence between 2012 Olympic Games medals and prior rankings – men (occurrence frequency)

Weight categories men		-60kg			-66kg			-73kg			-81kg			-90kg			-100kg			+100kg			total
WRL-4	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	1	1	1	0	0	0	1	0	1	1	1	2	1	0	1	1	0	2	0	1	1	-
	Total medals/categ.	3			0			2			4			2			3			2			16
WRL-8	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	1	1	1	0	0	2	1	1	2	1	1	1	0	1	2	1	1	1	1	1	2	-
	Total medals/categ.	3			2			4			3			3			3			4			22
CM-4	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	0	1	1	0	0	2	0	1	1	1	0	0	0	1	2	1	0	0	1	1	1	14
	Total medals/categ.	2			2			2			1			3			1			3			14
CM-8	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	1	1	1	0	0	2	1	1	1	1	0	1	0	1	2	1	0	0	1	1	1	-
	Total medals/categ.	3			2			3			2			3			1			3			17
JO 08-4	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	0	0	-
	Total medals/categ.	1			0			0			2			0			2			1			6
JO 08-8	Places in ranking	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	-
	No. of medals	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	1	0	0	-
	Total medals/categ.	1			0			0			2			0			2			1			6
Total general/cat		13			6			11			14			11			12			14			81

The results from Tables 1 and 2 were turned into percentage (%) in Tables 3 and 4 below. Tables 5 and 6 show the distribution of medals (frequency and percentage) by relevant categories.

Table 3. Percentage of the presence of female Judoka medalists from the 2012 Olympic Games in previous rankings and calculation of central trend parameters (%)

Category	-48	-52	-57	-63	-70	-78	+78	Arithm.	Standard	VC
Fem %	kg	kg	kg	kg	kg	kg	kg	mean	deviation	
WRL-4	75	0	50	100	50	75	50	57.1	31.34	54.84
WRL-8	100	25	75	100	50	75	75	71.4	26.73	26.73
CM-4	50	0	50	75	50	75	50	50	25	50

CM-8	100	25	75	75	50	75	100	71.4	26.73	37
JO08-4	25	25	0	0	25	0	50	17.9	18.90	105
JO08-8	50	25	0	25	50	0	50	28.6	22.49	78.72

Table 4. Percentage of the presence of male Judoka medalists from the 2012 Olympic Games in previous rankings and calculation of central trend parameters (%)

Category	-60	-66	-73	-81	-90	-100	+100	Arithm.	Standard	VC
Masc %	kg	kg	kg	kg	kg	kg	kg	mean	deviation	
WRL-4	75	25	50	50	50	50	75	53.6	17.25	32.2
WRL-8	75	50	100	75	75	75	100	78.6	17.25	21.9
CM-4	50	50	50	25	75	25	75	50	20.41	40.8
CM-8	75	50	75	50	75	25	75	60.7	19.67	32.3
JO08-4	25	0	0	50	0	50	25	21.4	22.49	104.9
JO08-8	25	0	0	50	0	50	25	21.4	22.49	104.9

Table 5. Overall frequencies and percentages of medals / women's weight categories

Category	-48kg	-52kg	-57kg	-63kg	-70kg	-78kg	+78kg	Total
frequency	16	4	10	15	11	12	15	83
%	19.2	4.8	12	18.1	13.3	14.5	18.1	100

Table 6. Overall frequencies and percentages of medals / men's weight categories

Category	-60kg	-66kg	-73kg	-81kg	-90kg	-100kg	+100kg	Total
frequency	13	6	11	14	11	12	14	81
%	16.1	7.4	13.5	17.3	13.6	14.8	17.3	100

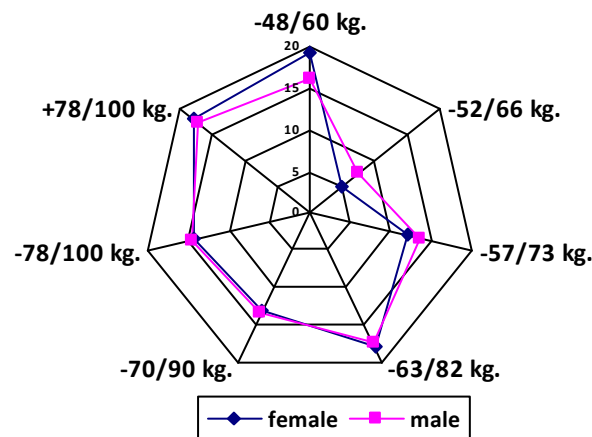


Fig.1. Comparative percentage male vs. female by medals and weigh category

Discussion

Tables 5 and 6 as well as Fig. 1 reveal an abnormal distribution of medals by weight category, i.e. abnormalities in the 2nd weight category (women's -52 kg. and men's -66 kg. categories). This abnormal distribution was revealed also by previous research (Rosu D, Ion-Ene M., 2009) with regards to the lower incidence of ippon in the 2008 Olympic Games precisely in the same weigh categories. The explanation of this abnormality eludes us at present and requires a more in-depth analysis in the future. The most plausible explanation for the two aspects taken together (low predictability in all rankings and low incidence of Ippon points) is that there is a higher concentration of sportsmen of similar value in these weight categories, which makes rankings easier to upset as it results in much more balanced matches than in any other weight category.

For these reasons we will leave out of our calculations the data pertaining to the two weight categories and will mix the data distribution as follows:

Table 7. Percentage of the presence of Judoka medalists from the 2012 Olympic Games in analyzed rankings and calculation of central trend parameters without the categories 52 kg women and 66 kg men (%)

Category	-48	-57	-63	-70	-78	+78	-60	-73	-81	-90	-100	+100	St.	VC	
F+M %	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	Mean	Dev.	
WRL-4	75	50	100	50	75	50	75	50	50	50	50	75	62.5	16.9	27.0
WRL-8	100	75	100	50	75	75	75	100	75	75	75	100	81.3	15.5	19.1
CM-4	50	50	75	50	75	50	50	50	25	75	25	75	54.2	17.9	33.1
CM-8	100	75	75	50	75	100	75	75	50	75	25	75	70.8	20.9	29.5
JO08-4	25	0	0	25	0	50	25	0	50	0	50	25	20.8	20.9	100.2
JO08-8	50	0	25	50	0	50	25	0	50	0	50	25	27.1	22.5	83.1

The extent to which the medals won in the 2012 Olympic Games had a correspondent in the analyzed rankings is represented by the arithmetic mean and can be logically assimilated with the concept of prediction or predictability. The variation coefficient (VC) values express the extent to which the arithmetic mean is representative for the analyzed set of values. Data from specialized literature shows the following interpretation stages for the VC in the recognition of the representativeness of the mean (Jaba E., 2002): 0-17% the mean is strictly representative; 17%-35% the mean is moderately representative; 35-50% the mean is representative in a broad sense; over 50% the mean is not representative.

Other authors such as Tudos S. (1993), Dragnea A (1984), characterize the variability of the data set using following brackets: 0-10% homogenous set; 10-20% relatively homogenous set; over 20% inhomogeneous set.

In the case of the 6 considered rankings (excluding the women's 52 kg and men's 66 kg categories) it is noted that: The highest prediction percentage is found in the WRL-8 ranking: 81.3% and a relatively homogenous VC (19.1%);

a. A second degree prediction is found in the CM-8 ranking: 70.8%, though with low reliability due to the VC above the homogeneity threshold (20.9%);

b. The other rankings cannot be considered predictable due to the low prediction scores as well as due to VC above 20%;

c. Taking into account the 2008 Olympic Games ranking may determine the renewal rate of the Olympic elite echelon. From the total number of 2012 Olympic Games medalists, around 20% were also medalists in the 2008 Olympic Games, while the balance of 80% represents the renewal rate for the elite echelon. Of these, only 16% (3 women and 6 men) were not listed in WRL-8 for the current or previous Olympic Games, or in CM-8.

Conclusions

1. This research provides some sports performance monitoring elements aimed at achieving successful participation (obtaining of medals) in the Judo competitions of the Olympic Games.

2. The women's 52 kg and men's 66 kg categories (the second weight category for each gender) reveal distribution abnormalities in comparison to all other competition categories, which is why they cannot be included in the statistics reports for the central trend indicators. Taking also into account the abnormal incidence of Ippon points in the same weight categories, we conclude that these competition categories require a special scientific approach.

3. The World Ranking List-Top8 (WRL-8) made before the Olympic Games represents the most accurate prediction of Olympic results. It can be estimated, based on the data calculated for the 2012 Olympic Games, that the final WRL-8 that will precede the next Olympic Games (2016) may predict the future medalists with an accuracy of 81% (excluding the two above-mentioned categories). The reliability limits for this statement are moderate. In fact, in the 2012 Olympic Games only 9 Judokas (6 men and 3 women) who were not on the WRL-8 obtained a medal (from a total number of 48 medalists; excluding the women's 52 kg and men's 66 kg category).

4. It can be estimated in a broad sense, based on the data calculated for the 2012 Olympic Games, that the CM-8 which will take place one year before the 2016 Olympic Games may predict the medalists with an accuracy of 70%, disregarding the women's 52 kg category and men's 66 kg category, also with a moderate reliability limit.

5. The medals won in previous Olympic Games provided 17.9% of medals for women and 21.4% of medals for men in the 2012 Olympic Games ranking. The renewal rate of the elite echelon in the Olympic Games (Olympic medalists) stands at around 80%, of which 16% have no outstanding international record (ranking in the Top 8 of the Olympic Games or World Championships).

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