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Characteristics of the Technical-Tactical Preparation of Male and Female Judo Competitors Participating in the Olympic Games – London 2012

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Key words: efficiency of attacks, women and men, indexes

Abstract

To participate in the Olympic games competitors both women and men, have to follow the tournament's selection requirements. By analysing the competitors' technical-tactical preparation we can determine the value of techniques executed efficiently, as well as the value of indexes obtained by the winners in the particular weight categories, and the dominant techniques used, both by men and women. It has been established that women were more efficient in leg techniques – ashi waza, than men (women's Sa = 2.930, men's Sa = 1.620). The men performed more efficient hand techniques – te waza (men's Sa = 2.352, women's Sa = 1.331). Differences between men's and women's efficiency in executing the grappling techniques – katame waza, have also been found. The same differences were found in the ways and directions of executing throwing techniques – nage waza. In the men's group a carry-back throw – seoi nage, and a variation of scarf-holding – kuzure kesa gatame were dominant techniques. Whereas, in the women's group the dominant techniques were as follows: inner thigh – uchimata and major inner reaping – ouchi gari. The indexes of technical-tactical preparation allowed us to determine the individual features of the winners from all the weight categories.

Introduction

Kano Jigoro, the creator of judo was member of the International Olympic Committee since 1909, but at that time he took no action aimed at introducing sports rivalry into martial art. Right from the beginning of that new sport – judo, both men and women have been practising judo [Cree, Jons 2011]. Acquiring skill in judo was described as an "Japanese system of physical exercises". Mastering one's own skill, overcoming weakness are the features of judo practised by men and women [Hancock 1907, 1908]. Jigoro Kano died during his voyage (on the "Hikawa Maru" board) from the IOC meeting, which was held in Cairo in 1938. Was it his dream to make judo part of the Olympic Games...? Were judo competitors to begin judo sports rivalry during the planned Olympics in Tokyo in 1940...? We will never find answers to these questions [Stevens 1995; Watson 2000]. Only after World War 2 did the sport rivalry start to develop in Europe and around the world: continental championships (the first European Championships in 1951 – Paris), the World Championships (the first World Championships in 1956 – Tokyo) and a number of international championships. Judo is a sports discipline which was introduced into the programme of the Olympic Games in Tokyo in 1964 – men, and in Barcelona in 1992 – women [Yeon 1993]. In men's Olympic rivalry representatives of Japan, Korea, France and Russia clearly dominated; in women's rivalry representatives of Japan, Cuba, China, Korea and France dominated, and they were the most often at the top of the starting efficiency classification of national teams during the Olympic Games. Qualifications for the Olympic Games in London in 2012 were conducted from May 2009 to April 2012. They included: the World

Championships (twice), continental championships (twice), two "Masters" tournaments as well as eight "Grand Slam" tournaments, ten "Grand Prix" tournaments and thirty-two World Cups. The conducted preliminaries allowed appointing the most efficient athletes [www.ijf.org]. The subject of the analysis conducted in the present paper was to determine the value of efficiently used technical-tactical actions performed by male and female judo competitors during the Olympic Games in London.

Material/method

During the Olympic Games in London 233 judo competitors from 109 countries had 254 fights (250 fights were subjected to analysis – 98%). 256 efficient attacks made with 37 judo techniques were registered, for which competitors received 1924 auxiliary referee's points which assess the efficiency of the techniques applied. However, amongst women 154 competitors from 64 countries had 175 fights (157 fights were analysed – 88%) 175 efficient attacks made with 41 judo techniques were registered, for which competitors received 1263 auxiliary points from referees.

Fights were recorded by means of standard audio-visual techniques, and then every performed technical element was copied after many-time reviews of each contest, carried out by two researchers help of graphic markings [Adam *et al.* 2005]. The applied techniques were classified on the basis on Kodokan Judo [Kano 1986; Daigo 2005], and the terms and the spelling were presented according to the Japanese-English dictionary [Kawamura, Daigo 2000].

The starting efficiency of national teams participating in the Olympic Games in 2012 was determined on the basis of three criteria [Adam *et al.* 2011]:

$$k = k1 + k2 + k3$$

1. values of won medals;
2. sums of points granted for the taken places (1st pl.-9, 2nd pl.-5, 3rd pl.-3, 5th pl.-1pkt);
3. numbers of points falling to one representative.

Dominating techniques were determined on the basis of three criteria [Adam *et al.* 2011]:

$$K = K1 + K2 + K3$$

1. numbers of attacks judged as ippon;
2. numbers of all efficient attacks which received referee's evaluation
3. average of the number auxiliary referee's points (*ippon=10pkt, waza arI=7 pkt, yuko=5pkt*) received for efficiently executed technique.

Determining indices of versatility

Embarking on an individual assessment of technical-tactical preparation during sports contests, the scope (volume) of the applied techniques was determined by marking indices of general, effective and seeming versatility. In the present paper the range of analysed techniques was limited to fifty, and this value constituted a fixed denominator of the denoted versatility indices. Values of versatility indices were calculated on the basis of formulas:

$$Vg = Xo/X \ (x\ 100\ \%)$$

and:

$$Ve = Xs/X \ (x\ 100\%)$$

$$Vse = Vg - Ve$$

where:

Vg - index of general versatility
Ve - index of effective versatility
Vse - index of seeming versatility
Xo - number of used techniques (such actions can be named a technique or techniques which follows or follow the way of executions in accordance with Kodokan Judo classification) [Kano 1986; Daigo 2005].
Xs - number of efficiently used techniques (assessed by a referee)
X - number of feasible techniques (in the paper fifty techniques were assumed)

Determining indices of activity

Activity was the next analysed index, letting describe differences in the frequency of attacks performed by the analysed competitor and his/her opponents. The activity index was determined on the basis of formulas:

$$Aa = \text{sum } A / n,$$
$$Ad = \text{sum } A / n,$$
$$A = Aa - Ad,$$

where:

Aa - activity of attack index
Sum A - number of registered attacks of a competitor
n - number of analysed fights
Ad – activity of defence index (opponents' activity)
Sum a - number of registered attacks performed by opponents
A - activity index

Determining indices of effectiveness

The frequency of efficiently performed techniques can be assessed by applying other technical-tactical preparation (TTP) indices. Proportions between undertaken attempts to perform a technique and efficient attacks were defined as the effectiveness of attack and the effectiveness of defence. One should mark the values of these parameters by analysing

Table 1. Competition effectiveness of the men's judo teams during the Olympic Games (1964-2012)

K	1	2	3	3	5	6
k1-k2-k3	1-1-1	2-3-4	4-5-2	4-5-2	6-2-4	3-4-6
OG 1964	***JPN***	***NED***	***CAN***	***SUI***	***URS***	***FRG***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	2-3-2	3-2-3	4-4-4	5-4-4	8-6-6
OG 1972	***JPN***	***NED***	***URS***	***GBR***	***FRG***	***FRA***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	2-2-2	3-5-3	4-3-4	5-4-5	6-6-7
OG 1976	***JPN***	***URS***	***CUB***	***KOR***	***GBR***	***FRG***
K	1	2	3	4	5	6
k1-k2-k3	1-1-2	2-2-3	3-3-4	4-6-1	4-6-5	4-6-7
OG 1980	***URS***	***FRA***	***GDR***	***ITA***	***BEL***	***SUI***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	2-2-2	3-3-5	4-6-3	5-3-5	5-5-7
OG 1984	***JPN***	***KOR***	***FRG***	***AUT***	***FRA***	***GBR***
K	1	2	3	4	5	6
k1-k2-k3	1-1-2	3-2-4	2-4-5	7-6-1	4-4-7	5-8-2
OG 1988	***KOR***	***JPN***	***POL***	***GER***	***FRA***	***AUT***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	3-2-2	2-3-3	6-4-4	4-6-5	6-5-6
OG 1992	***JPN***	***HUN***	***EUN***	***FRA***	***POL***	***KOR***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	2-2-3	3-3-2	4-4-4	5-5-7	6-7-8
OG 1996	***JPN***	***FRA***	***KOR***	***GER***	***POL***	***ESP***
K	1	2	3	4	5	6
k1-k2-k3	1-1-2	2-2-3	4-5-1	3-3-7	4-5-8	6-4-9
OG 2000	***JPN***	***FRA***	***TUR***	***ITA***	***NED***	***KOR***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	2-2-3	6-2-4	3-4-7	4-6-10	4-5-11
OG 2004	***JPN***	***KOR***	***RUS***	***GEO***	***BLR***	***GRE***
K	1	2	3	4	5	6
k1-k2-k3	2-1-3	1-2-4	3-3-5	4-4-8	4-5-7	4-6-6
OG 2008	***KOR***	***JPN***	***AZE***	***GEO***	***MGL***	***GER***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	2-2-2	5-3-4	3-4-6	6-5-7	4-6-9
OG 2012	***RUS***	***KOR***	***JPN***	***FRA***	***GER***	***GEO***

actions in attack and in defence, applying the following formulas:

Ea = sum AS / sum AP (x 100%)

where:

Ea – index of the effectiveness of attack,
Sum AS – sum of efficient attacks performed by the analysed competitor
Sum AP – sum of all attacks performed by the examined competitor (an attempted attack it is the action which follows the movement structure of the Kodokan Judo classification groups, making it possible to determine judo techniques).,

and:

Ed = 1 (100 %) - sum As / sum Ap (x 100%),

where:

Ed – index of the effectiveness of defence,
1 (100%) – value of defence before commencing fights,
sum As – sum of efficient attacks performed by the observed competitor's opponents,
sum Ap – sum of all attacks performed by opponents of the examined competitors.

Determining indices of efficiency

Indices of efficiency are determined by analysing referee's points received for efficient performance of techniques and lost points (the ones received by opponents) calculated per one fight. The calculations are made in the following way:

Sa = 5 x M + 7 x M + 10 x M / n
Sd = 5 x m + 7 x m + 10 x m / n

Table 2. Competition effectiveness of the women's judo teams during the Olympic Games (1992-2012)

K	1	2	3	4	5	6
k1-k2-k3	1-1-2	3-3-4	2-4-5	6-2-3	4-5-6	8-9-1
OG 1992	***FRA***	***CUB***	***ESP***	***JPN***	***CHN***	***ISR***
K	1	2	3	4	5	6
k1-k2-k3	1-2-2	1-2-5	3-1-4	4-4-3	7-7-1	5-5-6
OG 1996	***KOR***	***JPN***	***CUB***	***BEL***	***PRK***	***FRA***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	3-2-2	2-3-3	4-4-4	5-5-7	8-6-6
OG 2000	***CUB***	***JPN***	***CHN***	***FRA***	***ESP***	***KOR***
K	1	2	3	4	5	6
k1-k2-k3	1-1-1	2-2-3	4-3-5	3-4-6	5-5-7	6-7-2
OG 2004	***JPN***	***CHN***	***CUB***	***GER***	***NED***	***AUT***
K	1	2	3	4	5	6
k1-k2-k3	1-1-2	2-2-3	3-5-1	5-3-5	3-5-6	6-4-4
OG 2008	***CHN***	***JPN***	***ROU***	***CUB***	***ITA***	***NED***
K	1	2	3	4	5	6
k1-k2-k3	1-2-5	3-1-4	2-3-6	4-5-2	6-7-1	4-4-8
OG 2012	***JPN***	***FRA***	***CUB***	***USA***	***PRK***	***BRA***

$$S = Sa - Sd$$

where:
Sa – index of the efficiency of attack,
5, 7, 10 – point values of efficient attacks (*yuko, waza ari, ippon*),
M – number of efficiently performed attacks by the examined competitors,
n – number of analysed fights,
Sd – index of the efficiency of defence (efficiency of opponents' attacks),
m – number of efficiently performed attacks by the examined competitors' opponents,
S – efficiency index (the final efficiency).

It is not only an ability to efficiently perform throws and grips that decides about the sports result in judo. It can also be determined by referee's penalties for violating the rules determined by sports regulations.

The efficiency of referee's penalties administered during sports contests was defined just as the efficiency of the attack (Sa) replacing efficient attacks with negative values of the received referee's penalties: 0 pt (reprimand) = 1 shido, -5 pts = 2 shido, -7 pts = 3 shido, -10 pts = 4 shido (*hansoku make* – disqualification).

Results

In the group of male judo representatives participating in the Olympic Games Japanese competitors fought the most efficiently; however, they demonstrated a certain slump of results during the two last Olympic starts. Also competitors from Korea, Russia and France should be ranked among leading male national teams (Table 1). In the group of women one should rank competitors of Japan, Cuba, China, France and Korea among the most efficient national teams (Table 2).

In an assessment of the technical-tactical efficiency during the Olympic Games in London it was found that:

Female competitors executed foot throws, *ashi waza,* much more efficiently than male competitors (Fig. 2):
— female competitors *ashi waza* Sa = 2.930
— male competitors *ashi waza* Sa = 1.620;

Male competitors were characterized by higher efficiency of using hand throws, *te waza*, than female competitors (Fig. 2):
— male competitors *te waza* Sa = 2.352
— female competitors *te waza* Sa = 1.331

Female competitors exhibited higher efficiency of executing techniques of stangling and locking techniques, *shime* and *kansetsu waza*, than male competitors (Fig. 3):
— female competitors *shime waza* Sa = 0.446, *kansetsu waza* Sa = 0.573
— male competitors *shime waza* Sa = 0.360, *kansetsu waza* Sa = 0.360

Male competitors much more efficiently executed pinning techniques, *osaekomi waza*, than female competitors (Fig. 3):
— male competitors *osaekomi waza* Sa = 1.016
— female competitors *osaekomi waza* Sa = 0.573

Female competitors were characterized by a greater efficiency of executing throws without body rotation, while male competitors executed throws with body rotation more efficiently (Fig. 4):
— female competitors throws *without rotation* Sa = 3.803; throws *with rotation* Sa = 2.650

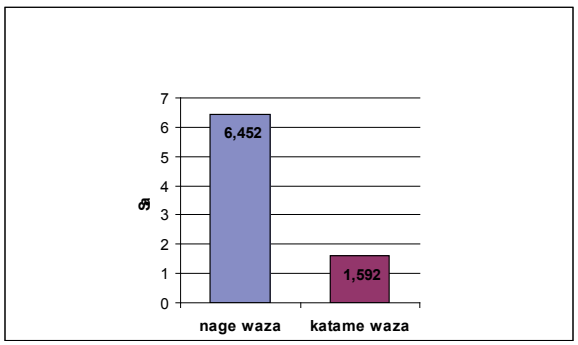

Fig. 1. Efficiency of attacks in the throws and grappling groups (*nage* and *katame waza*) – women

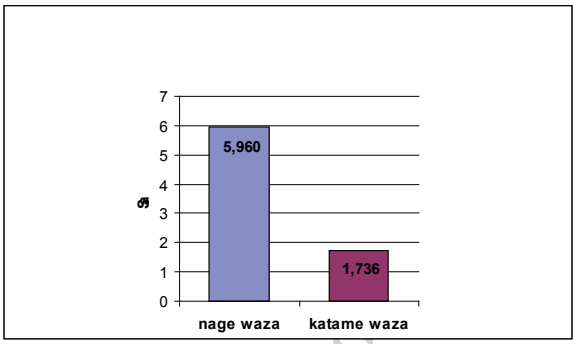

Fig. 2. Efficiency of attacks in the throws and grappling groups (*nage* and *katame waza*) – men

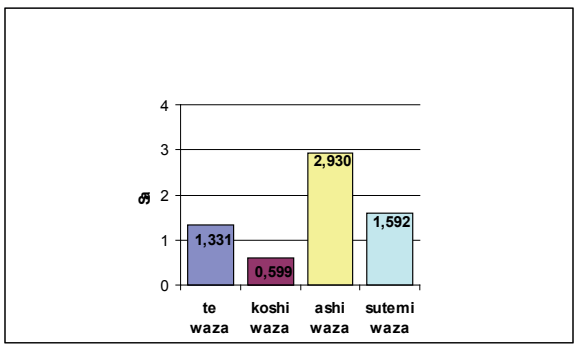

Fig. 3. Efficiency of hand, hip, leg and „sacrifice" throws (*te, koshi, ashi* and *sutemi waza*) – women

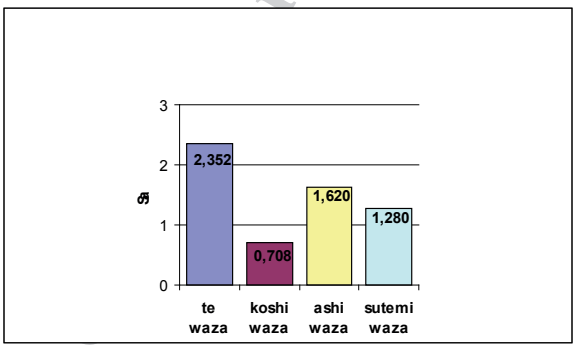

Fig. 4. Efficiency of hand, hip, leg and "sacrifice" throws (*te, koshi, ashi* and *sutemi waza*) – men

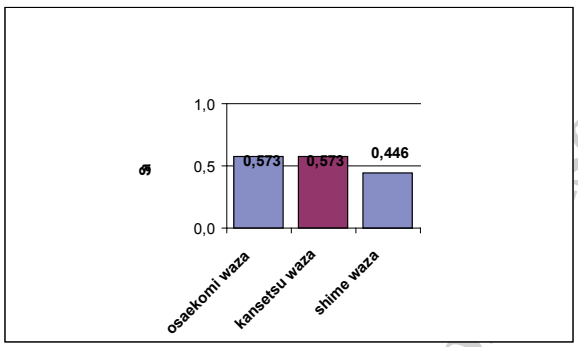

Fig. 5. Efficiency of grappling techniques: holdings, arm-lock and strangulations (*osaekomi*, *kansetsu* and *shime waza*) - women

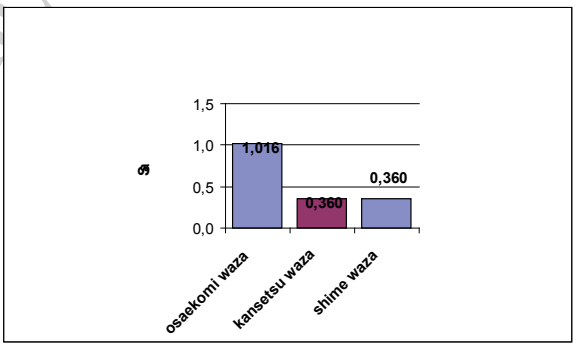

Fig. 6. Efficiency of grappling techniques: holdings, arm-lock and strangulations (*osaekomi, kansetsu* and *shime waza*) - men

— male competitors throws *without rotation* Sa = 2.668; throws *with rotation* Sa = 3.292

Male competitors were more efficient in performing throws with leaning the opponent forwards to toes, and female competitors were efficient in leaning the opponents backwards to heels (Fig. 5):

— male competitors throws with *leaning forwards* Sa = 4.392; throws with *leaning backwards* Sa = 1.568
— female competitors throws with *leaning forwards* Sa = 3.369; throws with *leaning backwards* Sa = 3.083

Female competitors more efficiently executed throws requiring the involvement of the left side of the body, while male competitors more efficiently executed throws involving the right side of the body (Fig. 6):

— female competitors throws involving *the left* side Sa = 3.242; *the right* side Sa = 2.803
— male competitors throws involving *the left* side Sa = 2.472; the *right side* Sa = 3.124

The most dominating techniques performed by female competitors were (Table 3): *uchimata, ouchi gari, juji gatame, kuzure kesa gatame* and *seoi nage.*

The techniques which dominated amongst male competitors were: *seoi nage, kuzure kesa gatame, tai otoshi, juji gatame* and *okuri eri jime.*

Table 3. Dominating techniques of female and male competitors during the Olympic Games in London in 2012

K	Women's dominating techniques	K1	K2	K3	*K*	Men's dominating techniques	K1	K2	K3
1	**Uchimata**	2	1	1	**1**	**Seoi nage**	1	1	1
2	*Ouchi gari*	9	1	2	**2**	*Kuzure kesa gatame*	2	2	2
3	*Juji gatame*	1	9	6	**3**	*Tai otoshi*	5	4	3
4	*Kuzure kesa gatame*	3	9	8	**4**	*Juji gatame*	3	8	6
5	*Seoi nage*	14	3	3	**5**	*Okuri eri jime*	3	8	6
6	*Kuchiki taoshi*	5	8	9	**6**	*Uchimata*	8	5	4
7	*Tai otoshi*	10	6	7	**7**	*Sukui nage*	6	7	9
8	*Tani otoshi*	15	4	4	**8**	*Sode tsurikomi goshi*	10	5	8
9	*Ogoshi*	6	9	10	**9**	*Osoto gari*	7	12	10
10	*Kouchi gari*	16	4	5	**10**	*Uki waza*	11	11	11
11	*Okuri eri jime*	4	15	12	**11**	*Tani otoshi*	29	3	5
12	*Kosoto gari*	7	15	14	**12**	*Kouchi gari*	14	12	12
13	*Kosoto gake*	11	13	13	**13**	*Tate shiho gatame*	9	18	16
14	*Ura nage*	12	15	15	**14**	*Ura nage*	15	15	14
15	*Sumi gaeshi*	28	6	11	**15**	*Kosoto gari*	16	15	15
Female competitors efficiently performed 41 techniques					**Male competitors efficiently performed 37 techniques**				

Table 4. Opponents and time of contests of the London men and women Olympic champions in the particular weight categories

contest	***Opponents of Galstian A. RUS – 60kg***			***Opponents of Menezes S. BRA –48kg***		
	Name and surname	country	time	Name and surname	country	time
1	Gourouza Zakari	NIG	0'55"	Van Ngoc Tu	VIE	5'00"
2	Siccardi Yann	MON	1'27"	Payet Laetitia	FRA	5'00"
3	Choi Gwang-Hyeon	KOR	8'00"	Wu Shugen	CHN	5'00"
4	Sobirov Rishod	UZB	7'08"	Van Snick Charline	BEL	5'00"
5	Hiraoka Hiroaki	JPN	0'40"	Dumitru Aliona	BEL	5'00"
Total time of Galstian's contests			***18'10"***	Total time of Menezes's contests		***25'00"***
contest	***Opponents of Shavdatuashvili L. GEO-66kg***			***Opponents of An K.A. PRK –52kg***		
	Name and surname	country	time	Name and surname	country	time
1	Zuniga Alejandro	CHI	1'49"	Cox Sophie	GBR	5'00"
2	Larose David	FRA	6'06"	Nakamura Misato	JPN	5'00"
3	Oaties Colin	GBR	6'36"	Gneto Priscilla	FRA	5'00"
4	Ebinuma Masashi	JPN	2'11"	Forciniti Rosabla	ITA	2'27"
5	Ungvari Miklos	HUN	5'00"	Bermoy Acosta Yanet	CUB	5'58"
Total time of Shavdatuashvili's contests			***26'42"***	Total time of An's contests		***23'25"***
contest	***Opponents of Isaev M. RUS –73kg***			***Opponents of Matsumoto K. JPN-57kg***		
	Name and surname	country	time	Name and surname	country	time
1	Uematsu Kyoshi	ESP	6'46"	Dzukic Vesna	SLO	5'00"
2	Orujov Ruslam	AZE	2'42"	Gasimova Kifayat	AZE	5'00"
3	Sainjargal Nyam-Ochir	MGL	2'38"	Quintavella Giulia	ITA	5'00"
4	Wang Ki-Chun	KOR	5'00"	Pavia Automme	FRA	5'44"
5	Nakaya Riki	JPN	5'00"	Caprioriu Corina	ROU	5'17"
Total time of Isaev's contests			***22'06"***	Total time of Matsumoto's contests		***26'01"***
contest	***Opponents of Kim J.-B. KOR –81kg***			***Opponents of Zolnir U. SLO – 63 kg***		
	Name and surname	country	time	Name and surname	country	time
1	Imamov Yakhyo	UZB	5'00"	Malzahn Claudia	GER	2'08"
2	Csoknyai Laszlo	HUN	5'00"	Garcia Estefania	ECU	1'17"
3	Lucenti Emmanuel	ARG	5'00"	Schlesinger Alice	ISR	3'50"
4	Nifontov Ivan	RUS	5'00"	Tsedevsuren Munkhzaya	MGL	2'18"
5	Bischof Ole	GER	5'00"	Xu Lili	CHN	5'00"
Total time of Kim's contests			***25'00"***	Total time of Zolnir's contests		***14'33"***

contest	***Opponents of Song D.-N. KOR –90kg***			***Opponents of Decosse L. FRA –70 kg***		
	Name and surname	country	time	Name and surname	country	time
1	Romero Juan	URU	3'12"	Zupancic Kalita	CAN	4'30"
2	Mammadov Elkhan	AZE	5'00"	Alvear Yuri	COL	0'09"
3	Nishiyama Masashi	JPN	5'00"	Hwang Ye-Sul	KOR	6'48"
4	Camilo Tiago	BRA	5'00"	Thiele Kerstin	GER	5'00"
5	Gonzalez Asley	CUB	5'09"	X	X	X
Total time of Song's contests			***23'21"***	Total time of Decosse's contests		***16'27"***

contest	***Opponents of Khaibulaev T. RUS 100kg***			***Opponents of Harrison K. USA 78kg***		
	Name and surname	country	time	Name and surname	country	time
1	Van Der Geest Elco	BEL	1'45"	Moskalyuk Vera	RUS	0'56"
2	Biadulin Yauhen	BLR	5'00"	Joo Abigel	HUN	3'07"
3	Krpalek Lukas	CZE	4'34"	Aguiar Mayra	BRA	4'46"
4	Peters Dmitri	GER	8'00"	Gibbons Gemma	GBR	5'00"
5	Naidan Tuvshinbayar	MGL	2'12"	X	X	X
Total time of Khaibulaev's contests			***21'31"***	Total time of Harrison's contests		***13'49"***
contest	***Opponents of Riner T. FRA +100kg***			***Opponents of Ortiz I. CUB +78 kg***		
	Name and surname	country	time	Name and surname	country	time
1	Wojnarowicz Janusz	POL	5'00"	Moniz Adysangela	CPV	1'54"
2	Jaballah Faicel	TUN	4'48"	Ivashchenko Elena	RUS	5'00"
3	Branson Oscar	CUB	4'31"	Tong Wen	CHN	5'00"
4	Kim Sung-Min	KOR	5'00"	Sugimoto Mika	JPN	8'00"
5	Mikhaylin Alexander	RUS	5'00"	X	X	X
Total time of Riner's contests			***24'19"***	Total time of Ortiz's contests		***19'54"***

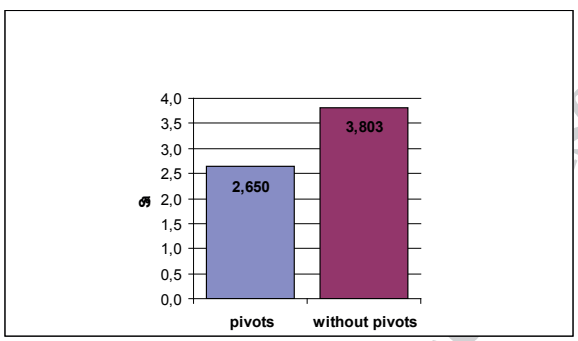

Fig. 7. Efficiency of throws performed by pivots and without pivots of the body - women

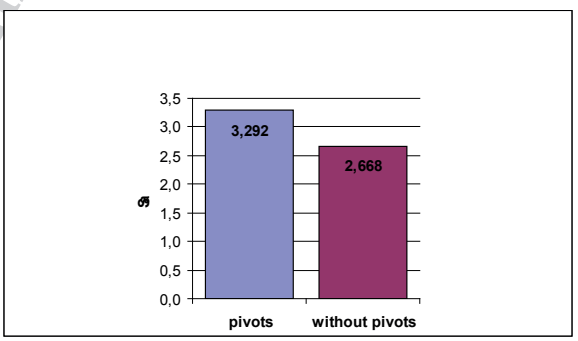

Fig. 8. Efficiency of throws performed by pivots and without pivots of the body - men

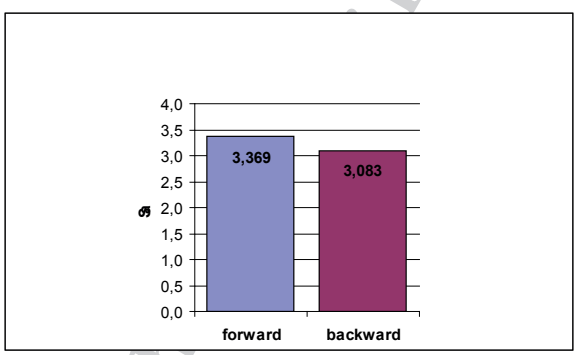

Fig. 9. Efficiency of throws performed by breaking balance forward (on the toes) and by breaking balance backward (on the heels) - women

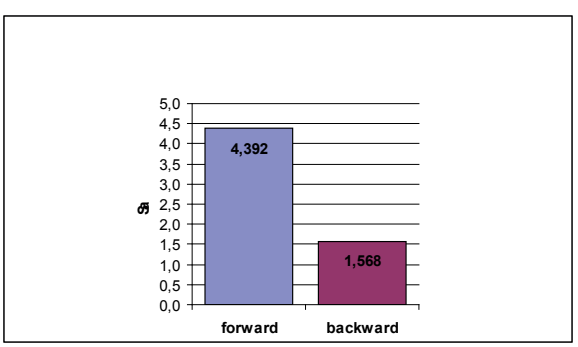

Fig. 10. Efficiency of throws performed by breaking balance forward (on the toes) and by breaking balance backward (on the heels) – men

Each of the winners of successive weight categories won five fights during the Olympics in London, and their total time took from 18 minutes and 10 seconds (Galstyan - winner in the 60 kg weight category) to 26 minutes 42 seconds (Shavdatuashvili - winner in the 66 kg weight category).

In the group of women, competitors in weight categories of 48 kg, 52 kg, 57 kg and 63 kg won five successive fights each, and in categories of 70 kg, 78 kg and +78 kg four fights each.

The female champion in the of 63 kg weight category, Zolnir, defeated her opponents in the total time of 14 minutes and 33 seconds, but the winner of the first place in the 78 kg weight category, Harrison, ended her fights in the total time of 13 minutes and 49 seconds. Matsumoto, who won the 57 kg weight category, needed the most time to defeat her opponents – 26 minutes and 1 second (Table 4).

The values of technical-tactical indices of male and female competitors who won the Olympic Games in London allowed determining their technical-tactical profile.

The "versatility of attack" was an index determining the scope of applied techniques.

The greatest range of techniques efficiently executed by female competitors (Ve) characterised Olympic champions in the categories of 48 kg, 63 kg, 70 kg and 78 kg.

The lowest values of this index were obtained by competitors of the 57 kg and +78 kg weight categories.

The greatest range of techniques which were not judged by referees, but still competitors tried to perform them (Vse), characterized champions of the 57 kg category and the 78 kg one; the lowest values of this index was received by competitors of the 78 kg and +78 kg categories (Fig. 7).

In the group of male competitors the highest values of Ve were received by the winner of the 66 kg category and the lowest ones by the winner of the +100 kg category. Winners of the 81 kg and 60 kg categories obtained the highest values of the Vse index, and the winner of the 90 kg category the lowest ones (Fig. 7).

The highest values of the activity index (**A**) were achieved by a female competitor in the weight category of 57 kg and male competitors in the +100 kg and 81 kg categories. Female competitors in the categories of 52 kg and 70 kg and male competitors in categories of 100 kg and 90 kg received the lowest values of this index (Fig. 8).

The highest values of the efficiency of attack index (**Ea**) were obtained by a competitor of the 90 kg category and female competitors of the 70 kg and 63 kg categories. The lowest values of this index were achieved by female competitors in +78 kg and 57 kg categories and a competitor of the +100 kg category. Male competitors were characterized by a higher effectiveness of defence than female competitors (**Ed**) (Fig. 9).

Female competitors of the 63 kg and 78 kg categories and a male competitor of the 90 kg category were distinguished by the greatest efficiency of performing attacks (**Sa**), and the lowest efficiency of performed attacks characterised a female competitor of the +78 kg category and a competitor the +100 kg category, whose opponents received the most penalty points (Fig. 10).

Discussion

The achieved results allow stating certain diversity in the efficiency of technical-tactical preparation between male and female judo competitors participating in the Olympic Games in London. In particular, differences in the efficiency of two basic groups of throws are visible: foot (*ashi waza*) and hand ones (*te waza*). Similar differences, consisting in greater effectiveness of foot throws in the group of females and greater efficiency of hand throws in the group of males, were noticed by Nakamura *et al.* [2002], who conducted observations during the World Championships in 1995-1999. Also a German author, Klocke [2000], while analysing the technical-tactical preparation during the World Championships in 1999, noticed a certain advantage of female competitors over the male ones in the effectiveness of executing grappling techniques – especially strangling ones (*shime waza*). Also Sterkowicz [1999] states certain differences between male and female competitors in the efficiency of techniques applied during the Olympic Games in Atlanta in 1996. The author found that female competitors more efficiently had executed techniques of pinning (*osaekomi waza*) and received fewer penalties during the fight. Yet, male competitors who participated in this competition more efficiently performed "sacrifice" throws (*sutemi waza*). However, the period of conducting observations by both by Japanese and German researchers does not allow for comparing these results directly, as since 2010 amendments to regulations of a judo contest have been implemented consisting, among others, on limiting immediate attacks of opponents' legs with hands. These rules significantly have reduced the efficiency of the group of hand throws (*te waza*); they have limited a direct performance of such popular techniques as: shoulder wheel (*kata guruma*), scooping throw (*sukui nage*) and single leg takedown (*kuchiki taoshi*) [Adam 2011; Boguszewski 2011].

The stated differences between male and female competitors, resulting from the way of executing techniques (with leaning to toes or heels, with or without body rotation), are a consequence of techniques dominating in both the examined groups. Female competitors more efficiently executed such throws as *ouchi gari*, *kuchiki taoshi* and *kosoto gake* – techniques which require leaning backwards to heels and do not require body rotation from the attacking competitor. On the other hand, male competitors much more efficiently could apply such throws as: *seoi nage*, *tai otoshi* and *sode tsurikomi goshi* – i.e. throws which require leaning the opponent forwards to toes and rotating the body by the attacking competitor [Kano 1986] (Table 3).

Values of individual TTP indices of male and female competitors who won subsequent weight categories allowed noticing certain diversification of their values in both the examined groups.

It appeared that female competitors used a greater range of techniques than male competitors. This concerned both efficient techniques and techniques which did not bring point values Ve, Vse. Also these differences were noticed, to the benefit of female competitors, during the assessment of all competitors participating in the Olympic Games, who used 37 techniques classified by Kodokan Judo and female competitors who were able to efficiently execute 41 techniques (Table 3). One should also notice that a smaller total number of female competitors participating in this competition than male ones and a smaller number of their fights were an objective factor limiting the abilities of this group to perform a more diverse range of techniques. Indicating the scope of the analysed techniques which would be a denominator for the presented models had a true significance for the value of this index.

According to the techniques classification of Kodokan Judo, it is possible to enumerate 94 techniques (67 throws and 27 grips). However, sports rules and practical application during fights

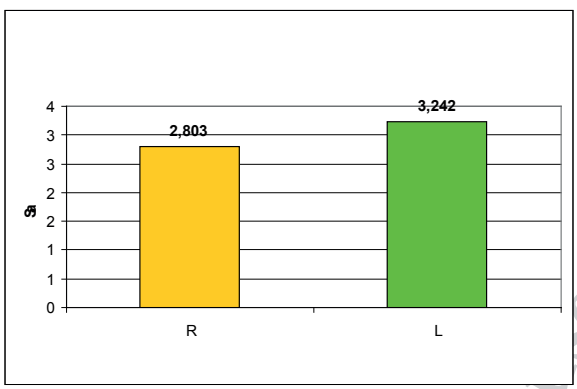

Fig. 11. Efficiency of throws performed by right or left dominance of a body - women

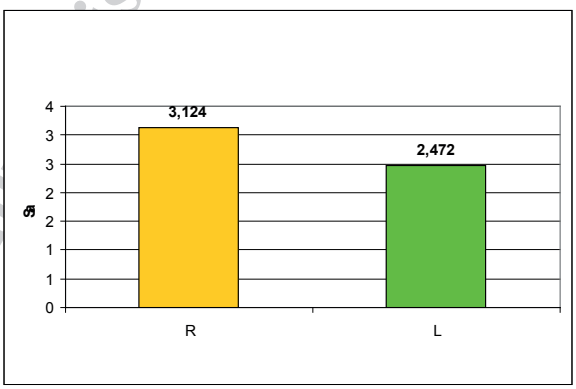

Fig. 12. Efficiency of throws performed by right or left dominance of a body - men

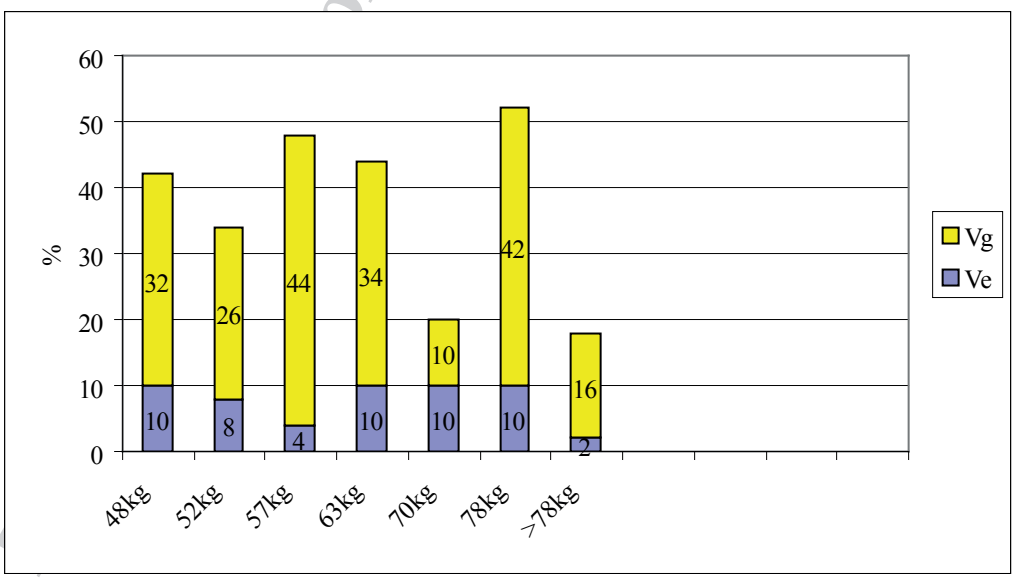

Fig. 13. Versatility of attacks performed by the London Olympic women champions

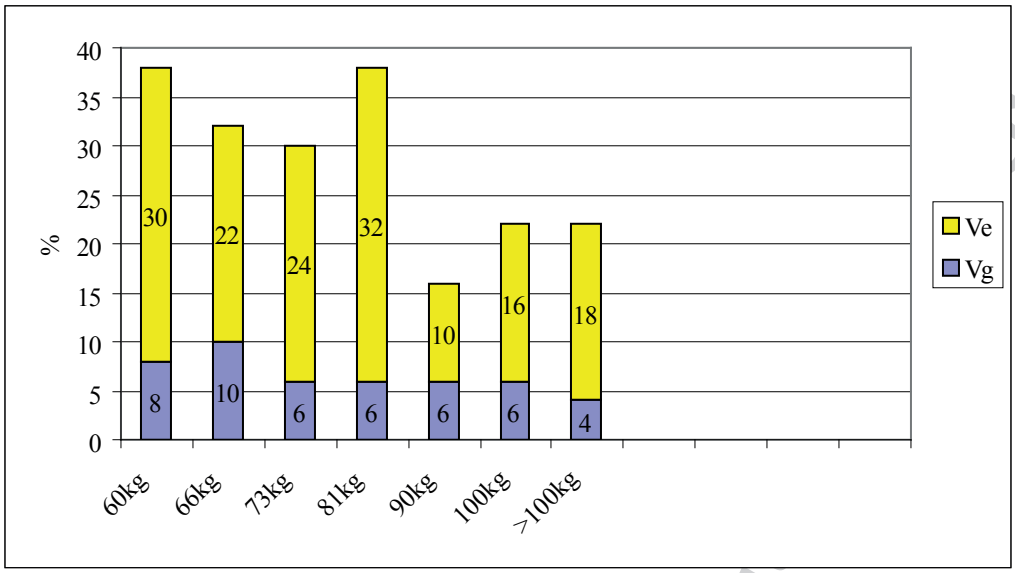

Fig. 14. Versatility of attacks performed by the London Olympic men champions

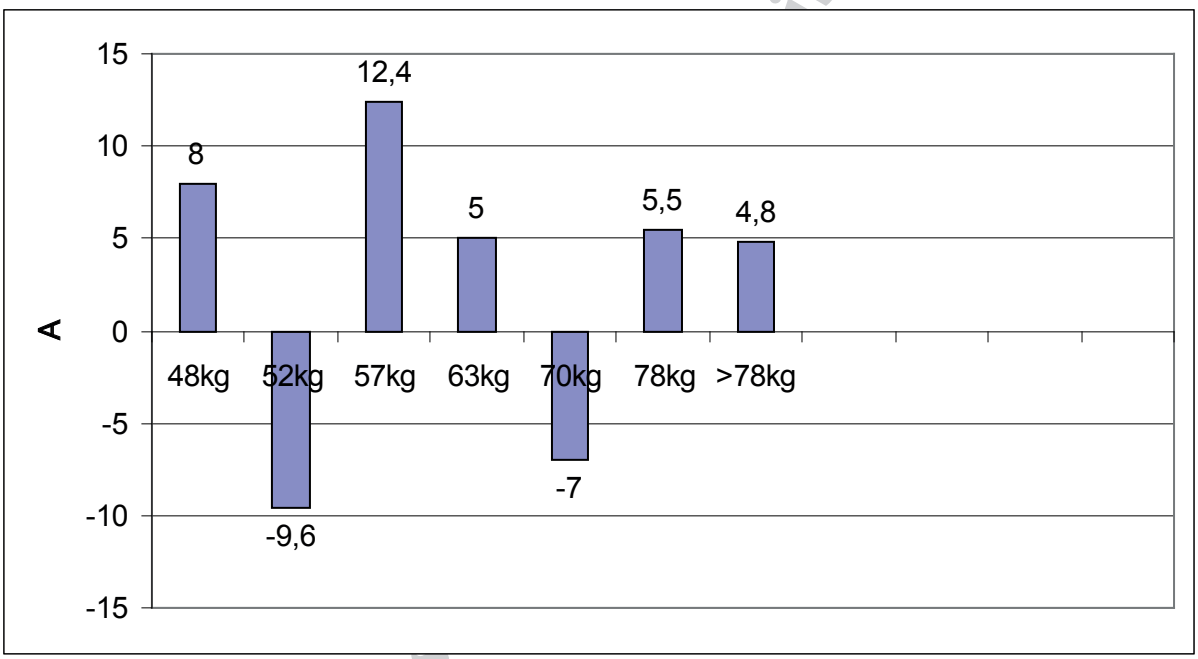

Fig. 15. Activities of the London Olympic women champions

reduces the number of techniques used during sports contests, e.g. – there is a ban on executing such techniques as: *kani basami, kawazu gake, daki age, dojime*; there is a limited form of executing techniques: *morote gari, kuchiki taoshi, kibisu gaeshi, kata guruma, sukui nage*; and such techniques as: *yama arashi, obi otoshi, tawara gaeshi* and others appear occasionally. Female competitors Menezes S. (BRA) -48 kg, Zolnir U. (SLO) -63 kg, Decosse L. (FRA) -70 kg, and male competitor Shavdatuashvili L. (GEO) -66 kg efficiently used five different techniques (Ve). Competitors Matsumoto K. (JPN) -57 kg and Harrison K. (USA) -78 kg were characterized by the greatest scope of applied techniques (Vse), which, however, did not bring the point value for their efficient execution (Fig. 13).

The frequency of performed attacks in the group of female competitors was more stratified than in the group of male competitors, which may testify to greater polarization of the effort capabilities amongst women participating in this competition. In the frequency of undertaken attacks, competitors Matsumoto K. (JAP) -57 kg and Menezes S. (BRA) -48 kg had the biggest advantage over their opponents, while competitors An K.A. (PRK) -52 kg and Decosse L. (FRA) -70 kg, getting the lowest negative values of the index of activity, allowed their opponents to try to conduct attacks. In the group of men competitors Riner T. (FRA) and Kim J-B. (KOR) were able to dominate their

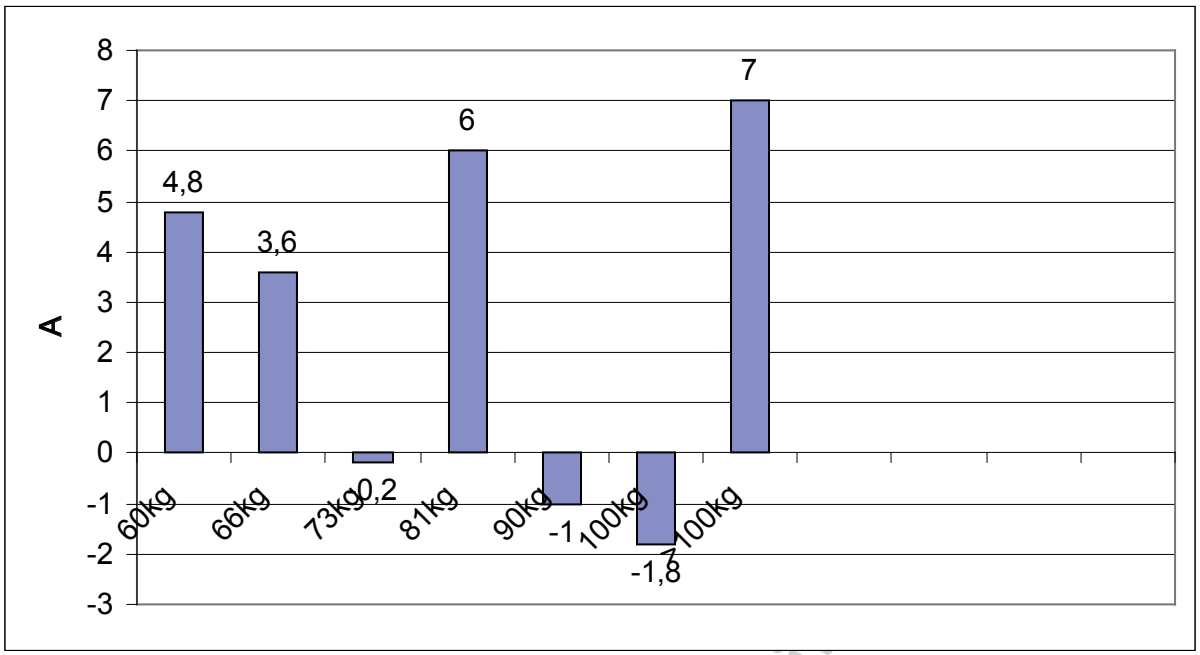

Fig. 16. Activities of the London Olympic men champions

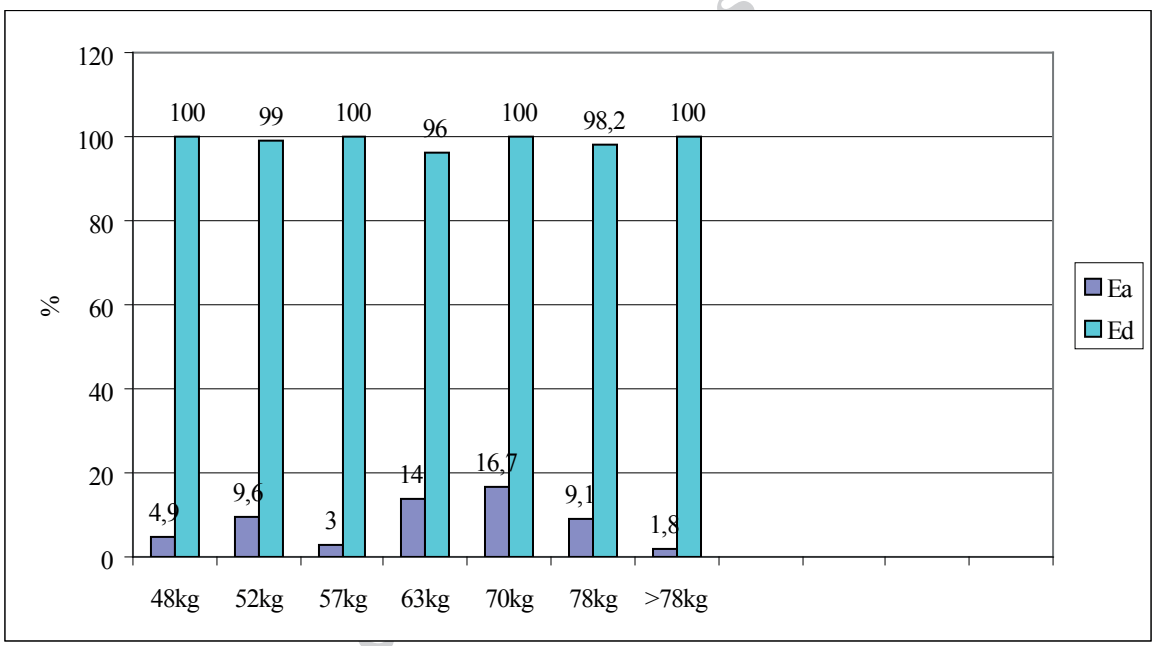

Fig. 17. Effectiveness of attack and defense of the London Olympic women champions

opponents with the frequency of undertaken attacks (Fig. 16).

In the groups of both female and male competitors who won successive weight categories, the effectiveness of defence (Ed) was more significant than the effectiveness of attack (Ea). Champions of the Olympic Games in London did not demonstrate a high frequency of efficiently performed attacks during the analysed fights; however, they were characterized by high effectiveness of defensive actions. Considering all attempts of attacks taken in fights, male competitor Song D-N (KOR) -90 kg and female competitor Decosse L. (FRA) -70 kg attacked the most often efficiently scoring every 5-6 attempt to execute a technique (Fig. 17,18).

Female competitors Decosse L. (FRA) -70 kg and Harrison K. (USA) -78 kg as well as male competitors Song D-N (KOR) -90 kg and Savdatuashvili L. (GEO) -66 kg executed throwing techniques (*nage waza*) most efficiently, while female competitors Zolnir U. (SLO) -63 kg and Harrison K. (USA) -78 kg and male competitor Galstian A. (RUS) -60 kg were characterized by high efficiency of grappling techniques (*katame waza*). An American competitor, Harrison, excelled in high efficiency of both grappling and throwing

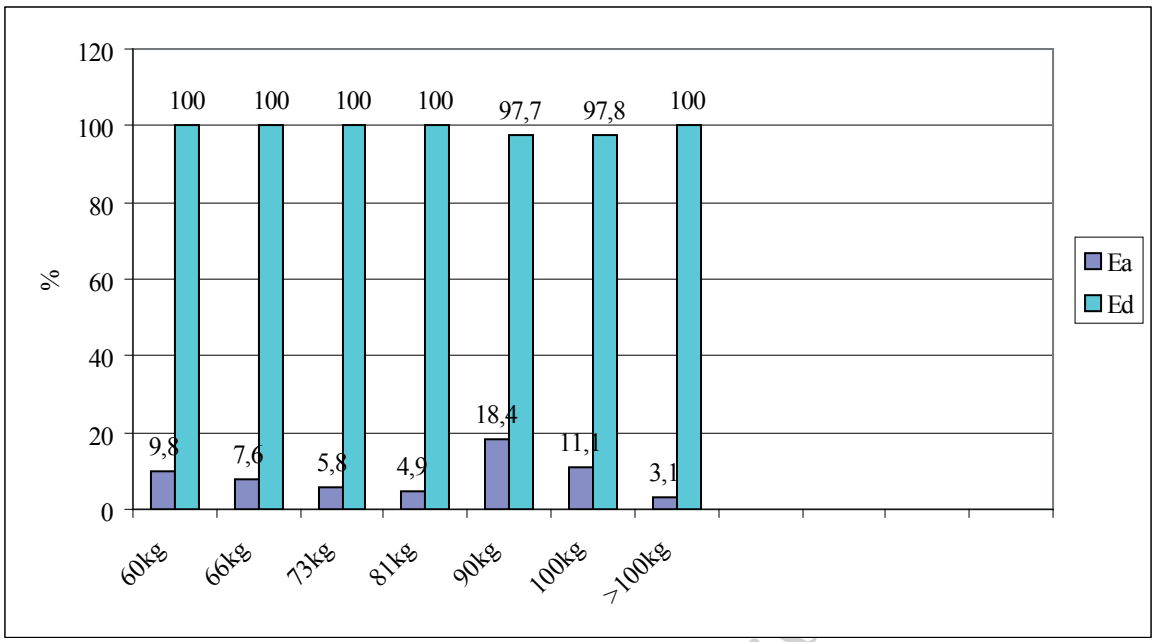

Fig. 18. Effectiveness of attack and defense of the London Olympic men champions

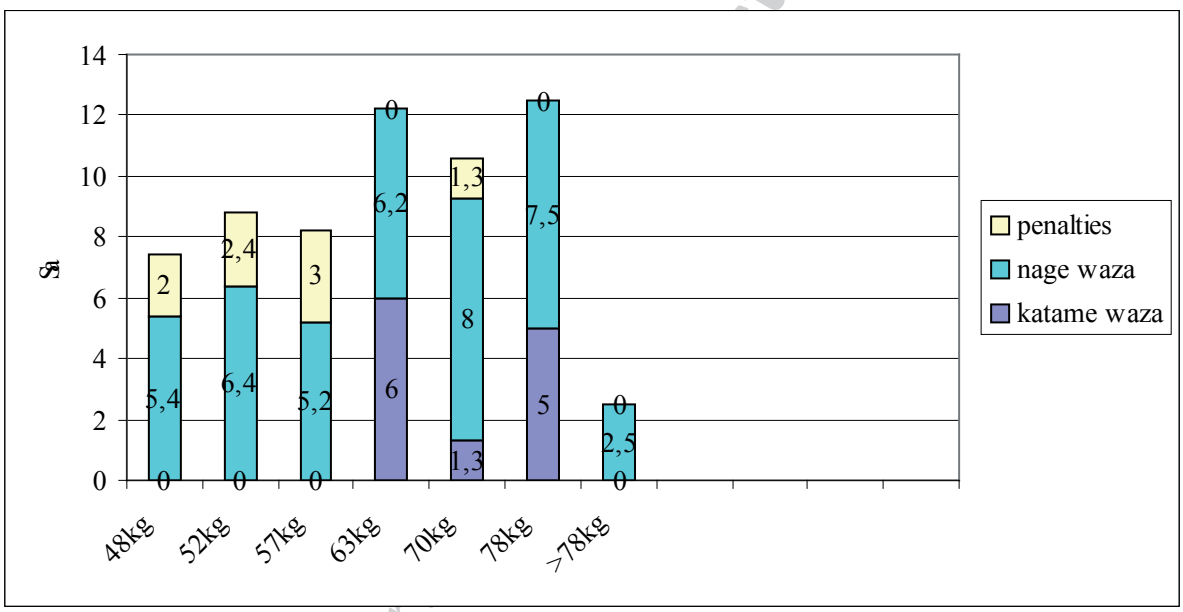

Fig. 19. Efficiency of the London Olympic women champions

techniques. Riner's opponents (+100 kg) lost the most points for judicial penalties. Riner, who won the gold medal during the Olympics in London in the +100 kg category, obtained much lower values of effective attacks than during the World Championships in 2010 and in 2011 [Adam *et al.* 2012]. It may be then that the superiority of a top sports event, such as the Olympic Games, did reduce the number of efficient attacks. The same opponents, who Riner strikingly defeated during the World Championships in 2010 and 2011 performing efficient and diverse attacks, during the Olympics in London were more difficult to win with.

On the basis of gathered material it is not obvious whether this competitor's opponents were better prepared for the competition, or whether Riner was in a worse disposition during the Olympics in London. But since the French competitor during the World Championships (in 2010 and 2011) defeated strikingly many of the same opponents with whom he fought during the Olympic Games in London in 2012, demonstrating much higher efficiency of performed attacks, one should state that he was not in the highest disposition of technical-tactical preparation [Adam *et al.* 2012].

The analysis of the gathered material, which has been presented in this work, allows to characterize the judo techniques applied by the men's as well as the women's competitors during the Olympic Games in London. Moreover, it also allows to determine the

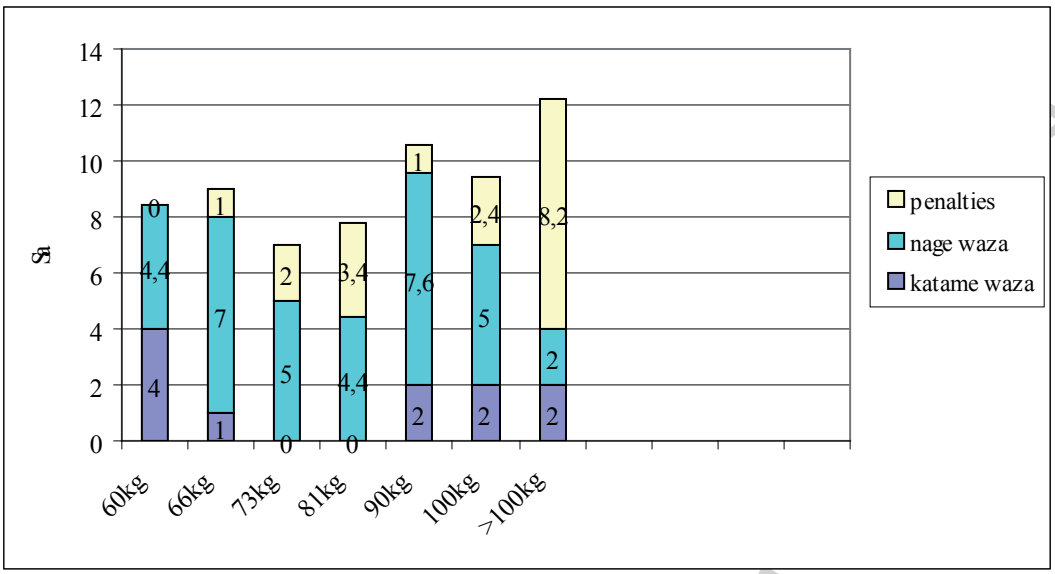

Fig. 20. Efficiency of the London Olympic men champions

individual features of technical-tactical preparation of those who were the winners at the particular weight categories. The diagnosis shows the value of the indexes, and makes it possible to find optimum training decisions while carrying on the further preparations to sport competitions.

Conclusions

1. 1. For judo tournament at the London 2012 Olympic Games the most effectively prepared were the competitors from Korea and Russia and the female competitors from Japan and France
2. 2. The differences between the female and male competitors in their contest effectiveness ought to be considered during judo training. These difference are as follow:
   a. female competitors more efficiently executed foot throws, and male competitors more efficiently executed hand throws;
   b. male competitors more efficiently executed pinning, and female competitors joints and strangling;
   c. female competitors more efficiently executed throws without body rotation with leaning the opponent backwards (to heels), and male competitors more efficiently executed throws with rotation with leaning forwards (to toes);
   d. female and male competitors were characterized by high efficiency of throws performed with the left side of the body;
   e. female competitors were characterized by a greater scope of applied techniques than male competitors.
3. Indices of technical-tactical preparation allowed identifying individual characteristics features in the men's and the women's competitors who won successive weight categories. Values of these indices allow predicting the way of conducting the fight and individual assessment of preparation for sport competitions.

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Charakterystyka przygotowania techniczno-taktyczne zawodników i zawodniczek uczestniczących w Igrzyskach) limpijskich w judo – Londyn 2012

Słowa kluczowe: skuteczność ataków, kobiety i mężczyźni, wskaźniki

Streszczenie

Aby uczestniczyć w Igrzyskach Olimpijskich zawodnicy i zawodniczki muszą pokonać wymogi zawodów selekcyjnych. Dokonując analizy przygotowania techniczno-taktycznego uczestników igrzysk możemy określić wartości skutecznie wykonywanych grup technik, wartości wskaźników, które osiągnęli zwycięzcy kolejnych kategorii wagowych oraz techniki, które dominowały zarówno w rywalizacji kobiet jak i mężczyzn. Stwierdzono, że z większą skutecznością rzuty nożne – *ashi waza* wykonywały kobiety niż mężczyźni (kobiety Sa = 2.930 a mężczyźni Sa = 1.620). Zawodnicy charakteryzowali się większą od zawodniczek skutecznością wykonywania rzutów ręcznych – *te waza* (mężczyźni Sa = 2.352, kobiety Sa = 1.331). Stwierdzono też zróżnicowanie pomiędzy zawodnikami i zawodniczkami w skuteczności stosowania chwytów *katame waza* oraz w sposobach i kierunkach wykonywanych rzutów *nage waza*. W grupie mężczyzn dominowały techniki: rzut przez plecy - *seoi nage* i odmiana trzymania opasującego - *kuzure kesa gatame* a w grupie kobiet rzut przez podcięcie udem od wewnątrz - *uchimata* i duże wewnętrzne podcięcie - *ouchi gari.* Wskaźniki przygotowania techniczno taktycznego pozwoliły scharakteryzować indywidualne cechy zwycięzców kolejnych kategorii wagowych.