

Directions and Ways of Executing Judo Throws During Judo Contests as a Control Criterion of an Individual's Training Versatility

Marek Adam¹ (A, B, D, E, F, G), Radosław Laskowski² (A, C, D, F),
Mirośław Smaruj³ (A, D, E, F)

¹ Gdansk University of Physical Education and Sport, The Chair of Team Sports and Martial Arts, The Unit of Martial Arts, Poland

² Gdansk University of Physical Education and Sport, The Chair of Natural Sciences, The Unit of Physiology, Poland

³ Gdansk University of Physical Education and Sport, The Chair of Individual Sports, The Unit of the Theory of Sport and Motorics, Poland

Key words: judo, technique, attack directions, body side

Abstract

Background: Symmetry of movement actions in sport is considered as an element of versatility which enlarges an individual's technical and tactical capacity. Asymmetry usually limits this capacity and may also lead to overstrains of one side of the body and cause an injury. The research is done on health aspects and practical improvement in sport contest. Up-to-date research on judo contest effectiveness has been aimed at the ability of throwing into various directions. There is no material and data as compared to the directions of throwing and effective directions of the opponent's attack. The purpose of this research was to find relationships between the directions of the executed throws and the side of competitors' bodies used while throwing.

Material/Methods: Within 2005-2010 1,968 judo contests were recorded by means of a graphic method of recording of a judo contest during 587 domestic and international judo competitions. 12 competitors (6 men and 6 women) were subject to our observations. The effectiveness of throws performed into 4 directions and of the used body side was determined on the grounds of the average number of points won or lost during a contest.

Results: The effectiveness of judo throws performed to the left direction or by using the left side of the body is similar or higher to those performed to the other side. There is a relationship between the dominant part of the body while throwing and the directions of throwing, and the defense efficiency in relation to the directions and ways of executing throws by opponents.

Conclusions: The effectiveness of the left attack directions and using the left side of the body may result from the training practice. It seems rational to find reasons for such high effectiveness of the left attack directions and the dominance of the side of the body while throwing.

Word count: 3 594

Tables: 3

Figures: 15

References: 18

Received: May 2012

Accepted: September 2012

Published: December 2012

Corresponding author:

Mirośław Smaruj Ph.D.

Gdansk University of Physical Education and Sport, Poland. The Chair of Individual Sports, The Unit of the Theory of Sport and Motorics

Gdańsk Kazimierza Górskiego 1 str.

Phone: +4858 5547317 (316)

E-mail: mopis@awf.gda.pl

Introduction

The symmetry of movement actions in sport is considered as an element of versatility which enlarges competitors' technical and tactical capacities. Asymmetry usually limits this capacity and also may lead to overstrains of one side of the body and cause an injury [1]. Research is done on health aspects and practical improvement in sport contest.

Negative results of one-sided use of the upper limb during a sport contest have been proved by Wang and Cochrane [2]. They ascertained a significant relationship between the imbalance of arm muscle strength in the dominant arm and shoulder injuries in top English volleyball players. Idoate et al. [3], however, observed a positive effect of playing sport, which manifested in a diminished asymmetry of muscles in footballers in comparison to those who do not play sport. An analysis of the directions of performed attacks, considering upper and lower limbs, has been carried out by Sterkowicz et al. [4], who admitted that techniques executed to the left back would enhance the opportunity of winning a medal.

In observation of eminent judo competitors such as, for example, A. Parisi, T. Koga, J. Pawłowski, or U. Werbrouck [5] it has been noticed that during a contest they assumed the right or left stances. It means that they were able to execute the same throws, symmetrically to the right and the left side. On the other hand, we can see competitors such as Y. Yamashita, R. Tamura, K. Inoue, W. Niewzorow, D. Douillet, or R. Kubacki, who assuming one-sided stance could execute various throws into at least three directions, both to the right or the left side [6]. Up-to-date research [4, 7] has been aimed at the ability of executing throws into various directions. There is no data which compares the directions of execution by the opponents. Competitors fight with many opponents during judo competitions; the opponents execute techniques into many directions. Thus, the following questions arise: is there a throwing direction where they lost more points? and does their stance while executing throws leave them vulnerable to opponents' attacks. Taking all these issues into account, it transpires that the basic purpose of this research is to determine relationships between the directions of executed throws and the body side used while executing judo throws, and the directions of attacks performed by their opponents.

Material and Methods

Within 2005-2010 1,968 judo contests were recorded by means of a graphic method of recording of a judo contest [8] during 587 domestic and international judo sport tournaments. 12 competitors (6 men and 6 women) were subject to observations; they fulfilled ten-times the international sport classes, 121 times master classes and 134 times first sport classes in accordance with the Polish Judo Federation (www.pzjudo@pzjudo). The number of contests and competitions as well as the number of effective throws are presented in Table 1.

Symmetry and asymmetry of actions have been assessed by determining the right and the left side of the body (leg, arm or trunk) while executing throws e.g. *osoto gari* (leg throws) a throw executed by reaping with the right leg – using the right side of the body; reaping with the left leg – using the left side of the body. We did not consider those throws where the dominant side of the body could not be determined. They were as follows: *morote gari*, *ura nage*, *yoko guruma*, *ushiro goshi*, *uchimata sukashi*, *uki otoshi*, *sumi otoshi*, *kouchi gaeshi*, *tawara gaeshi*, *tomoe nage*, *sumi gaeshi* and the throws performed either by pulling or pushing with both hands.

Describing the directions of attack, during a judo contest, we can distinguish four basic directions:

- 1) Throws executed with breaking the opponent's balance onto his/her toes forward or forward-right (FR); these are: the right *seoi nage*, *seoi otoshi*, *tai otoshi*, *uchimata*, *harai goshi*, *hane goshi*, *oguruma*, *ashi guruma*, *ogoshi*, *uki goshi*, *koshi guruma*, *tsurikomi goshi*, *uchimata makikomi*, *harai makikomi*, *soto makikomi*; *kata guruma* with the right hand and *sukui nage* (*te guruma*), and grasping with the right hand while lying on the left side *kata otoshi*, *yoko otoshi*, *uki waza*, *hiza guruma* blocking with the left foot, *sasae tsurikomi ashi* and *harai tsurikomi ashi*.
- 2) Throws with breaking the opponent's balance onto his/her toes to the left forward (LF): these are all the mentioned above techniques but reversely performed.

- 3) Throws with breaking the opponent's balance onto his/her heels backward right (BR), which are as follows: osoto gari with the right leg, osoto otoshi, osoto guruma, osoto gaeshi, kouchi gari, kouchi gake, kouchi makikomi; kosoto gari with the left leg, and kosoto gake, ouchi gari, ouchi gaeshi, deashi barai, tsubama gaeshi; lying onto one's left side tani otoshi, yoko gake, grasping with the right hand by the right leg kuchiki taoshi and kibisu gaeshi, and grasping with the left hand by the right leg kuchiki taoshi and kibisu gaeshi.
- 4) Throws with breaking the opponent's balance onto his/her heels to the backward left (BL), which are all the above mentioned throws but reversely performed.

We should mention that there are two standing stances [9]: the right-side and the left-side. The right-side stance is when a competitor gets hold with his left hand of his/her opponent's right sleeve, and with the right hand his/her opponent's left lapel and his/her right foot is advanced, and it is vice-versa in the left-side stance. In those stances attacks can be executed into various directions using the right or the left side of the body.

The effectiveness of throw performed into 4 directions as well the used body side were determined on the grounds of the average numbers of points won or lost by competitors [10, 11].

The obtained results were analyzed by means of STATISTICA PL at the stat Soft 10 version [12]. To estimate the intensity and direction of the linear correlation between variables, the Pearson linear correlation coefficient (r) was used. Calculating determination coefficient (r²), a ratio of variability of two variables was shown.

Models of linear regression were used in order to find quantitative dependence between variables to be explained and the ones used for explanation. Data was processed by graphic models of the STATISTICA PL. The interviewed competitors were divided into two groups: the right and the left-handed ones.

Tab.1. Sport characteristic of the analyzed subjects

Competitors (women) (A, B, C, D, E, F) Competitors (men) (G, H, I, J, K, L)	Number of competitions	Number of contests	Number of effective throws*		Number of sport classes		
			Subject	Opponents	MM	M	I
[A]	51	175	108 (98)	69 (56)	4	16	5
[B]	63	181	171 (152)	72 (63)	3	26	7
[C]	46	152	116 (52)	32 (28)	1	19	10
[D]	48	152	76 (54)	31 (23)	0	14	13
[E]	44	140	109 (108)	73 (70)	0	2	9
[F]	39	115	53 (53)	41 (37)	0	1	10
[G]	56	221	125 (110)	48 (38)	2	15	18
[H]	54	171	121 (94)	37 (33)	0	14	16
[I]	55	196	187 (134)	62 (46)	0	8	18
[J]	38	143	116 (112)	45 (41)	0	3	9
[K]	39	137	85 (73)	39 (35)	0	2	8
[L]	54	185	142 (116)	62 (52)	0	1	11
TOTAL	587	1968	1409 (1156)	611 (522)	10	121	134

*All the effective throws have been shown and the analyzed throws are in brackets

Results

One competitor was left-legged and left-handed and the others were right-handed. Eight competitors assumed the right-side stance during contests and manifested the dominance of their right side of body while throwing. Four competitors were left-sided (including left-handed competitors), and the left side of their bodies dominated while executing throws. Three right-handed subjects (two women and one man) scored points by dominance of the left side of their

bodies. A half of the analyzed competitors often lost when their opponents used the left side of the body while attacking.

While performing throws into 4 directions, competitors B, D, H, I, J scored more points than they lost. Competitors C, G, K scored more points than they lost in 3 directions, and in one direction they lost more than they scored. Four competitors lost more points than they scored in two directions of attack; they had lower sport achievements in the examined group (except woman A). Five competitors (A, B, E, F, K), with one dominant side of the body, lost more points when their opponents used the other part of the body than they did, whereas the competitors performing attacks along the RF and LB lines or LF and RB lost most points along the opposing line (A, E, I, L). Significant dependencies were seen between the LB direction (left back) of executing throws and the RB directions (right back) of executing throws by their opponents. It has been ascertained that nearly 57% were affected by the examined factors, which is proved by $r^2 = 0.5773$ (Fig. 1). A significant correlation exists between the direction of throwing LB (left back) and LFo direction (left forward opponents) of throws executed by their opponents. Just 41% of the examined factors affected the results (Fig. 2). Considering the right (R) or the left (L) side of the body, we have noticed a very important relationship between using the right side by the examined competitors (R) and the left side by their opponents Lo (Fig. 3). No significant relationships have been observed between other analyzed variables (Tables 2 and 3).

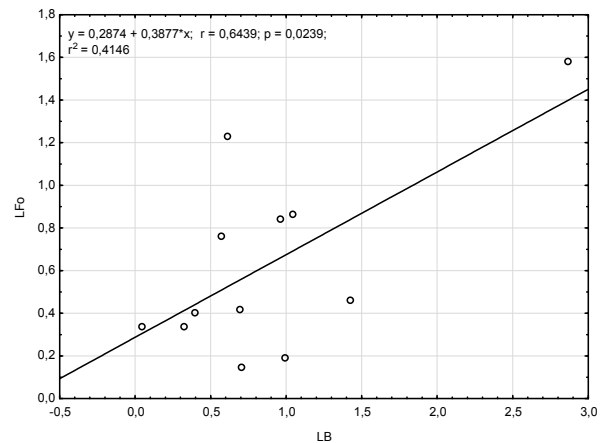
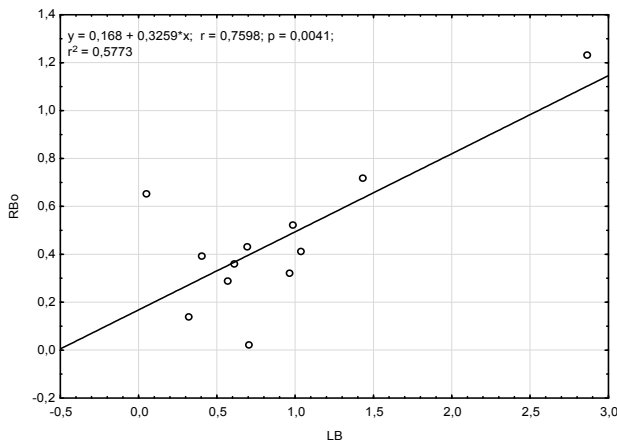


Fig. 1. The relationships between efficiency left back (LB) and right back (RBo) opponents in particular directions

Fig. 2. The relationships between efficiency left back (LB) and left forward (LF) opponents in particular directions

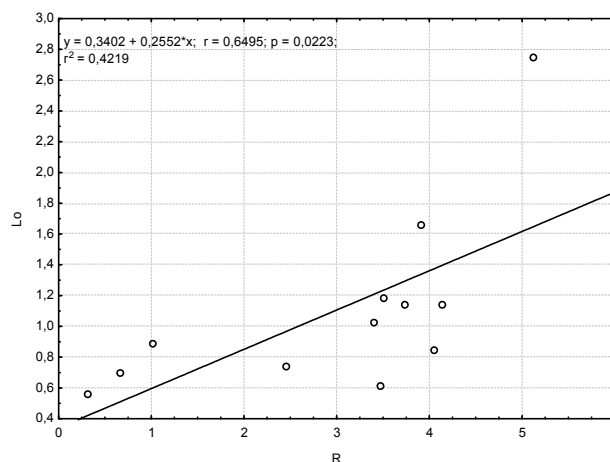


Fig. 3. The relationships between efficiency of the right side of the body (R) and left opponents (Lo)

Tab. 2. The relationships between efficiency oponents in particular directions (no breakdown by sex, statistically significant differences in red)

Variable	RF	RB	LF	LB	RFo	RBo	LFo	LBo
RF	1.0000	-.2774	-.2336	.0111	.1086	.2659	.3241	-.4281
	p = ---	p = .383	p =.465	p =.973	p =.737	p =.403	p =.304	p =.165
RB	-.2774	1.0000	.6112	-.1572	-.0944	-.4528	.0089	.3819
	p =.383	p =---	p =0.035	p =.626	p =.770	p =.139	p =.978	p =.221
LF	-.2336	.6112	1.000	-.4166	.4324	-.4266	-.4962	.3702
	p =.465	p =.035	p =---	p =.178	p =.160	p =.167	p =.101	p =.201
LB	.0111	-.1572	-.4166	1.0000	-.3387	.7598	.6439	-.3974
	p =.973	p =.626	p =.178	p =---	p =.281	p =.004	p =.024	p =.201
RFo	.1086	-.0944	.4324	-.3387	1.0000	.1236	-.1582	.0961
	p =.737	p =.770	p =.160	p =.281	p =---	p =.702	p =.623	p =.766
RBo	.2659	-.4528	-.4266	.7598	.1236	1.0000	.5424	-.5679
	p =.403	p =.139	p =.167	p =.004	p =.702	p =---	p =.068	p =.054
LFo	.3241	.0089	-.4962	.6439	-.1582	.5425	1.0000	-.3987
	p =.304	p =.978	p =.101	p =.024	p =.623	p =.068	p =---	p =.199
LBo	-.4281	.3819	.3702	-.3974	.0961	-.5679	-.3987	1.0000
	p =.165	p =.221	p =.236	p =.201	p =.766	p =.054	p =.199	p =---

(RF – right forward; RB – right back; LF – left forward; LB – left back; RFo – right forward opponents; RBo – right back opponents; LFo – left forward opponents; LBo –left back opponents)

Tab. 3. The relationships between efficiency of the body sides (no breakdown by sex, statistically significant differences in red)

Variable	R	L	Ro	Lo
R	1.0000	-.6910	-.4504	.6495
	p = ---	p = .013	p =.142	p =.022
L	-.6910	1.0000	.4738	-.4855
	p =.013	p =---	p =0.120	p =.110
Ro	-.4504	.4738	1.000	-.4698
	p =.142	p =.120	p =---	p =.123
Lo	.6495	-.4855	-.4698	1.0000
	p =.022	p =.110	p =.123	p =---

(R – right; L – left; Ro – right opponents; Lo – left opponents)

Competitors' Individual Characteristics

The right-handed woman A executed throws to the left forward (LF) and to the right back (FB), whereas her opponents performed their throws into the RF and LB directions. She often performed throws using her left side of the body. She lost points when her opponent used the right side of the body (Fig. 4).

The right-handed and right-sided woman B effectively performed throws into four directions, but most efficiently to the right forward (RF) and the left back (LB). Using her right side she was effective while throwing. She often lost points when her opponents used the left side and into LB direction (Fig. 5).

The right-handed and left-sided woman C used her left side of the body while effectively performing throws; her opponents also effectively used their left sides of the body. The highest efficiency of her throws where those performed to the right forward (RF) and the left forward (LF) directions. She was the most vulnerable to her opponents' attacks (Fig. 6).

The right-handed and right-sided woman D effectively executed throws by using her right side of the body to the left back (LB); and her opponents' most effective attacks were executed by using the right side of their bodies to the right back (RB) and the left back (LB) (Fig. 7).

The right-handed and right-sided woman E performed efficiently throws by using her right side of the body to the right forward (RF) and the left back (LB); she lost much when her opponents performed throws by the left side of the body to the left forward (LF) and the right back (RB) (Fig. 8).

The right-handed and right-sided woman F performed throws using her right side of the body mainly to the right forward (RF), and she lost more often when her opponents used the left side to the left back (LB) and the right back (RB) (Fig. 9).

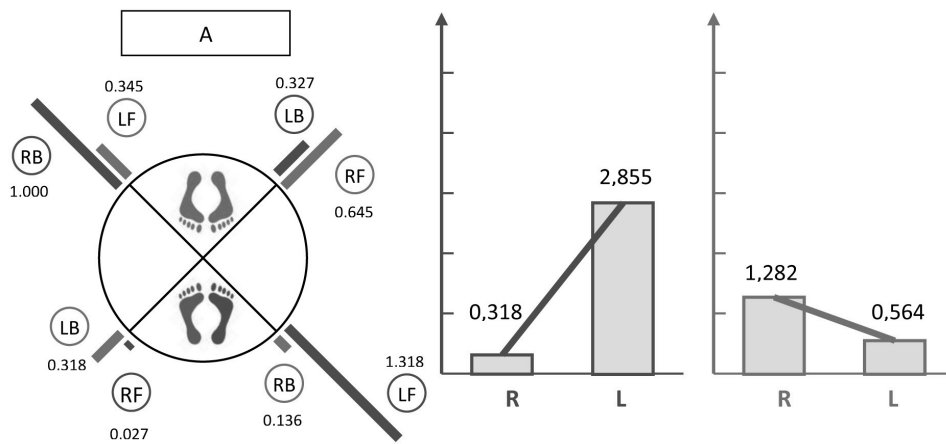


Fig. 4. Directions and sides used by woman A and her opponents

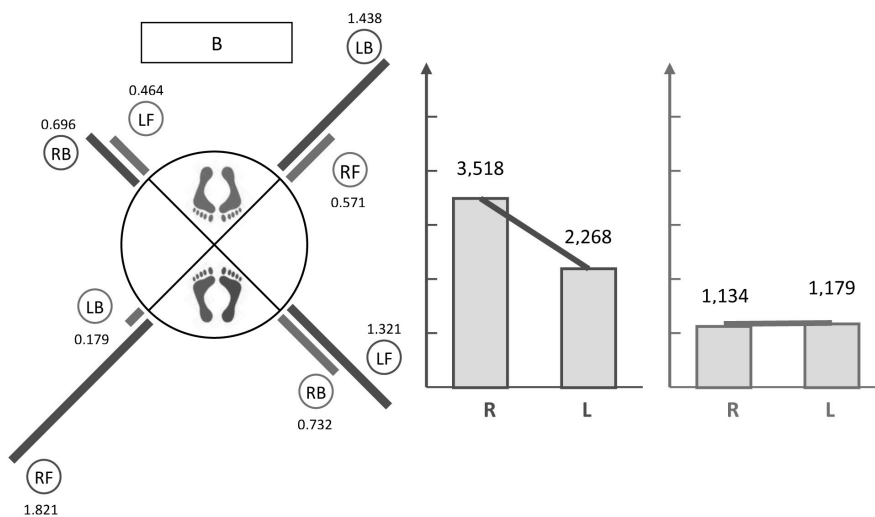


Fig. 5. Directions and sides used by woman B and her opponents

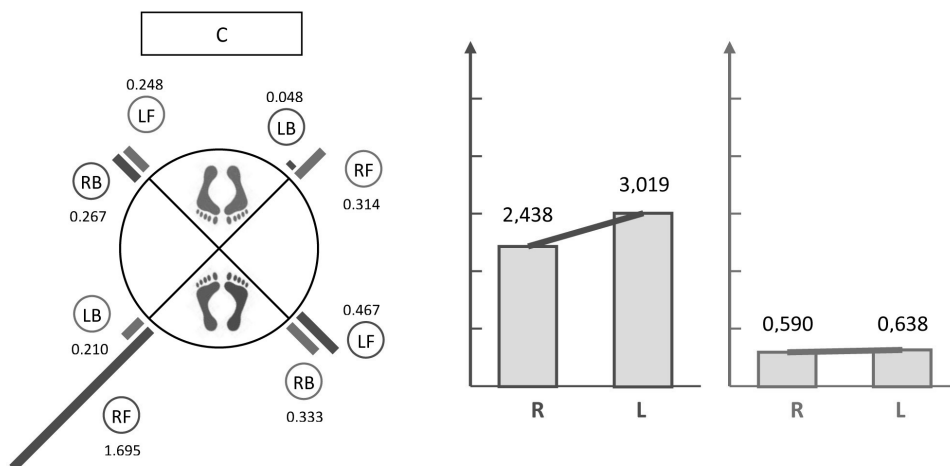


Fig. 6. Directions and sides used by woman C and her opponents

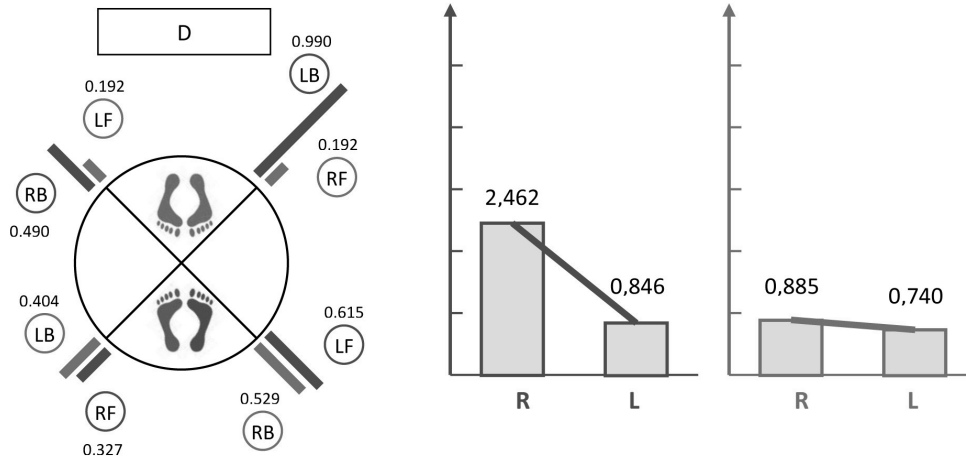


Fig. 7. Directions and sides used by woman D and her opponents

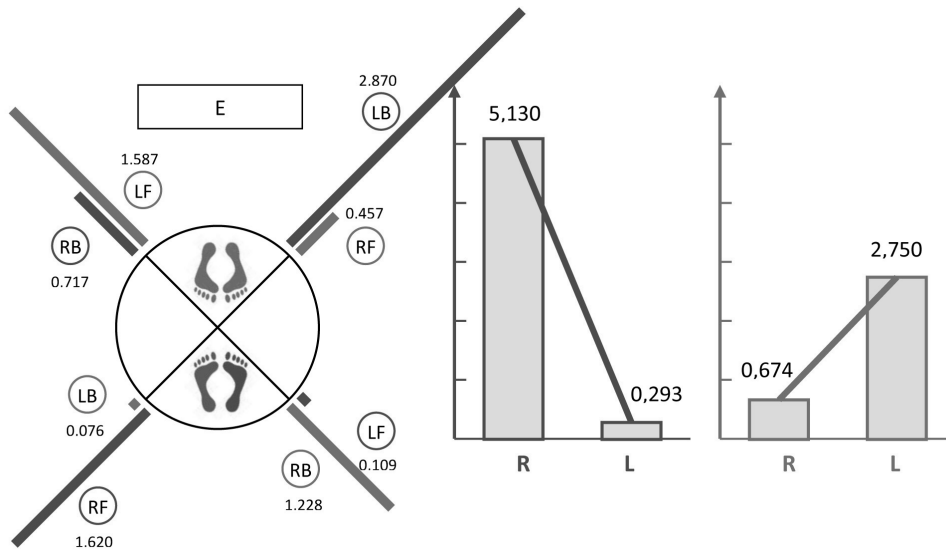


Fig. 8. Directions and sides used by woman E and her opponents

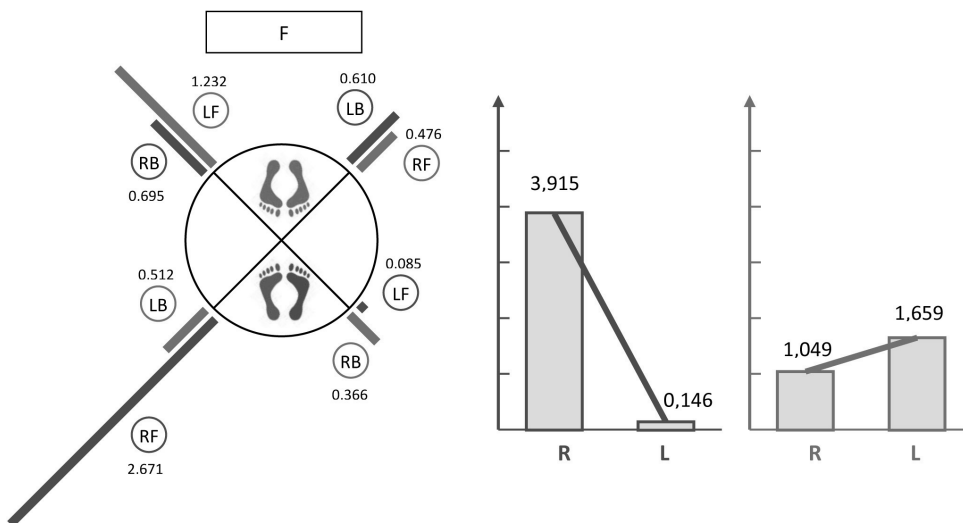


Fig. 9. Directions and sides used by woman F and her opponents

The right-handed and right-sided man G performed throws using his right side of the body gaining more points while attacking to the right forward (RF), and losing when his opponents performed throws to the right forward (RF) using the right side of the body (Fig. 10).

The right-handed and right-sided man H executed throws using his right side of the body; he attacked equally efficiently to the four analyzed directions. His opponents' attacks were also efficiently executed by using the right side of the body (Fig. 11).

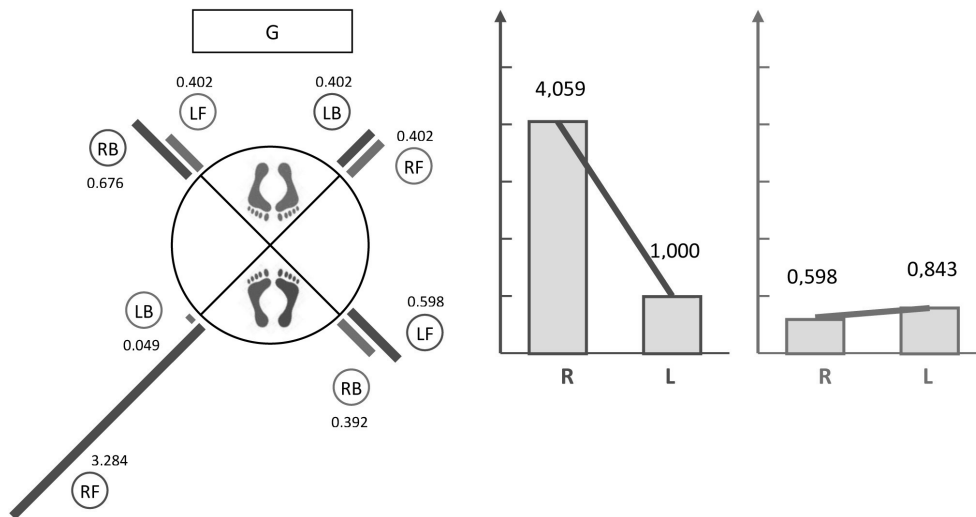


Fig. 10. Directions and sides used by man G and his opponents

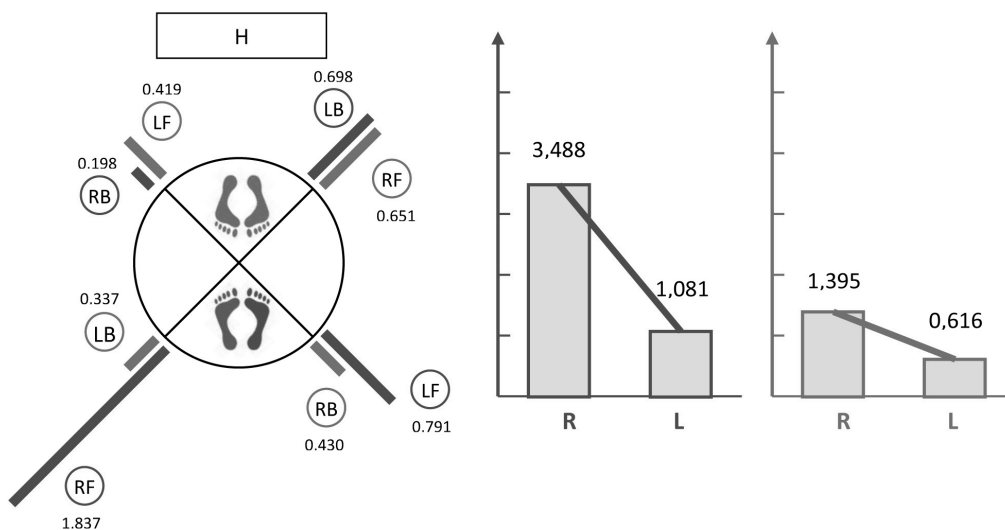


Fig. 11. Directions and sides used by man H and his opponents

The right-handed and right-sided man I executed throws most effectively using his right side of the body to the right forward (RF) and the right back (RB) directions. He lost nearly the same number of points when his opponents used both the right or the left side of the body mostly, however, to the left back (LB) (Fig. 12).

The right-handed and right-sided man J effectively performed throws using the right and left sides of his body into the 4 analyzed directions. He scored more points by using his right side of the body, whereas he lost more points when his opponents attacked using the left side to the right back direction (RB) (Fig. 13).

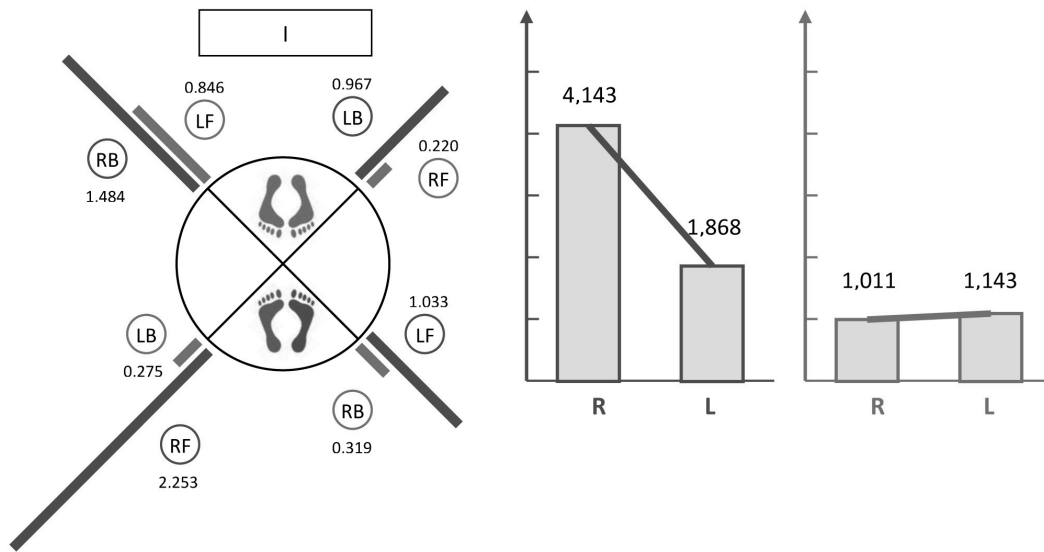


Fig. 12. Directions and sides used by man I and his opponents

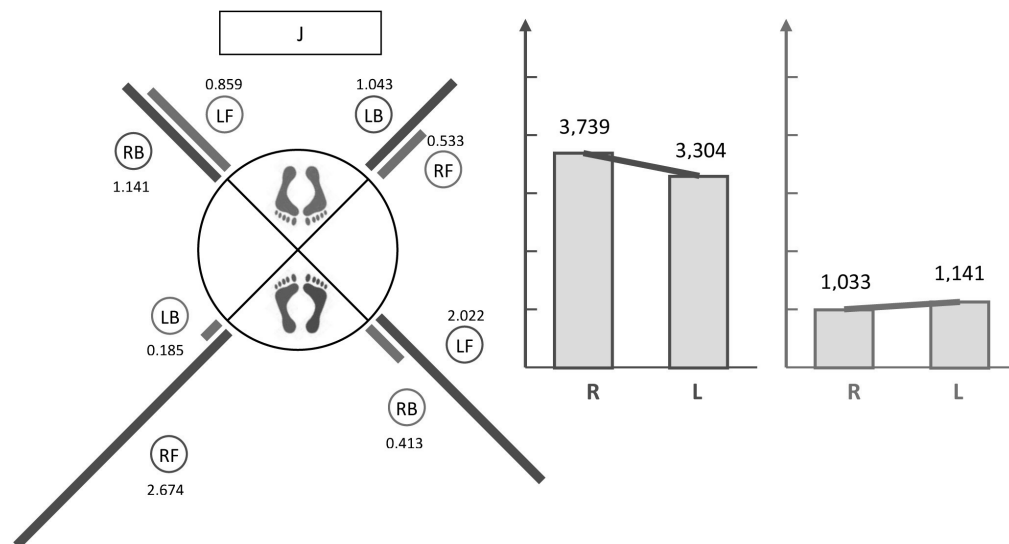


Fig. 13. Directions and sides used by man J and his opponents

The right-handed and left-sided man K was more effective in attack while using his left side, and he lost much when his opponents used the right side of the body. The left forward (LF) and the right back (RB) were the most effective directions of attacks. His opponents were effective in the left forward (LF) and the left back (LB) directions (Fig. 14).

The left-handed and left-sided man L performed throws using his left side of the body to the left forward (LF) and the right back (LB). He lost most points when his opponents attacked him to the left back (LB) and the right forward (RF) directions (Fig. 15).

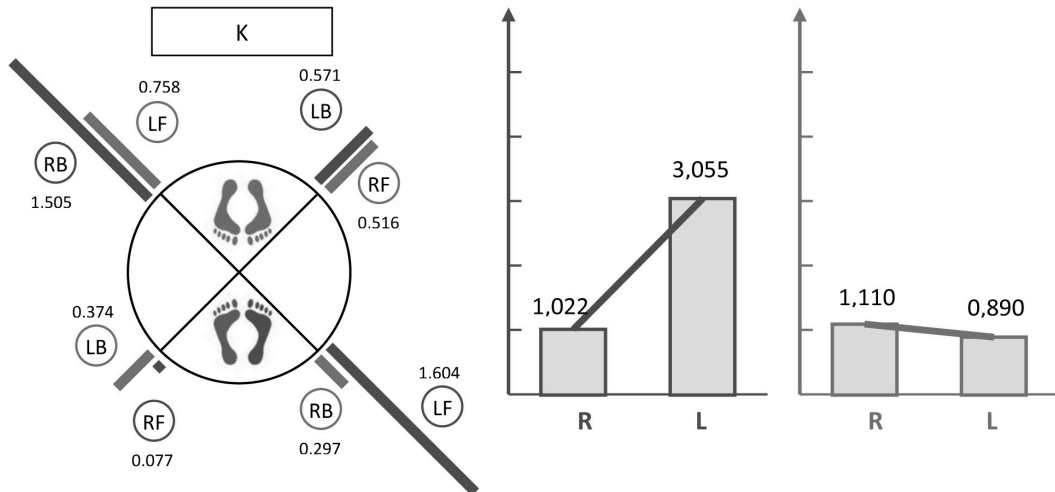


Fig. 14. Directions and sides used by man K and his opponents

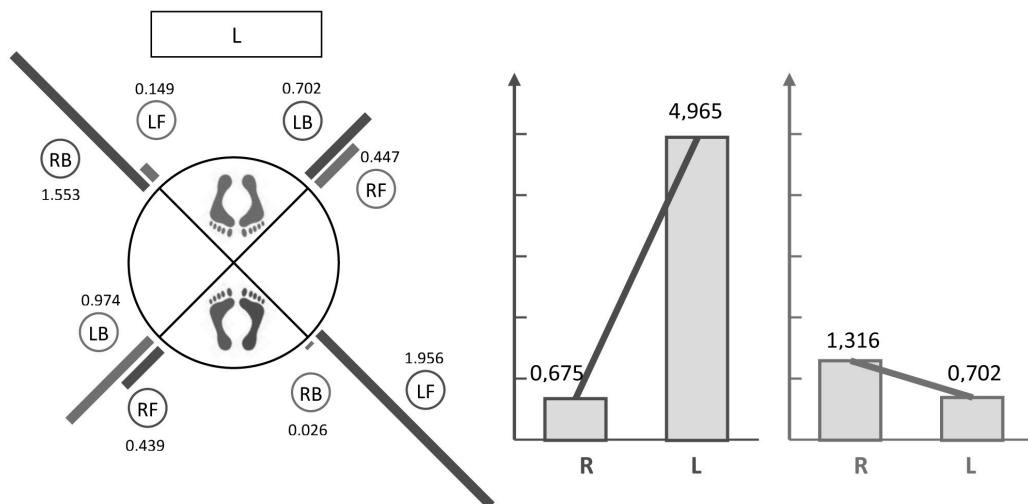


Fig. 15. Directions and sides used by man L and his opponents

Discussion

The gathered material comprises 1,968 contests played during 587 domestic and international tournaments, a number of effectively performed throws by the analyzed competitors and their opponents (Table 1). These elements allow analyzing the competitors individually as well as finding some regularities connected with a judo contest.

We assume that the majority of population are right-handed people, so the analyzed competitors fought against right-handed opponents. It seems that they lost more points due to throws executed by using the right side of the body. However, our research showed that 11 out of 12 competitors lost almost the same number of points when their opponents used the left side of the body more while executing throws. Up-to-date analysis shows that judo competitors often attack to the right side; still the effectiveness of attacks is higher to the left in three age categories [13]. It would not be strange in the case when left-handed competitors attacked to the left side. Drabik's et al. research [14] carried out in a junior group shows that the effectiveness of left-sided attacks does not refer to upper limbs laterality, whereas Sterkowicz et al. [4] ascertained relationships between left-legged people and directions of attacks to the left forward and the left back, but those relations were observed in a youth group.

The results taken from our research show that using one side of the body while performing throws makes the competitors more vulnerable to opponents' throws performed from the opposite side of the body (A, B, E, K, F); and that the competitors who attack along one line are vulnerable to attacks performed along the opposite line (A, E, I, L). All this means that opponents of the analyzed competitors, although they have various techniques and different movement abilities, attacked the weak defense of the analyzed competitors. It may indicate that judo competitors possess a wide range of flexibility in terms on physical habits. Drabik's research [15] on judo competitors with extensive sport experience shows that they perform throws into the opposite directions than their movement abilities would indicate. It means that experienced judo competitors are able to match their movement abilities to a particular situation during contests.

Considering our observations, we can assume that experienced judo competitors are able to perform throws to the directions where there is weak defense. It may indicate high adaptation capacities of the human body which are an effect of long-term judo training [16, 17, 18]. Those capacities enable competitors to perform efficiently a physical task, regardless of the dominant side of the body or movement abilities. Thus, we should notice the results of the woman with long experience and a high sports level (A), who is right-sided but during contests she assumes the left-side stance, and, among those analyzed, as the only competitor can effectively defend against attacks performed by left-sided opponents.

It does not explain reasons for the effectiveness of the left attack direction, and using the left side of the body while performing throws. But it indicates that one should search for reasons others than lateralization and movement abilities. It is confirmed by a correlation analysis between the competitors' and their opponents' side of the bodies used while throwing $r = 0.65$, but $r^2 = 0.42$ (Fig. 3). It means that if an opponent performs throws effectively using the left side of his/her body, so he/she is more vulnerable to the techniques performed by the right side of the body. Our data also indicates that an opponent performing throws effectively to the right back direction is more vulnerable to the techniques executed to the left back direction (Fig. 2). We have also noticed a significant probability that an opponent executing throws effectively to the left forward may lose a contest by falling to the left back side (Fig. 1).

The results of the conducted research are of practical utility and may be implemented in an individual approach to technical-tactical preparation. Additionally, they can be used to explain reasons for the effectiveness of the left direction attack and the training effect at using the right and the left sides of the body while throwing. That is connected with the problems of teaching and learning movement actions not only in judo. The majority of those examined were quite young competitors, so it is useful to continue observations and recordings of their contests in order to find changes in their styles of fighting with progress in their sport experience.

Conclusions

- The effectiveness of throws performed to the left attack direction by using the left side of the body in judo is similar to or higher than those performed to the right.
- There are some relationships between the dominant side of the body while throwing and the effectiveness of defense against the opponents' directions and ways of executing throws.
- One-sided stance diminishes the effectiveness of defense against attacks performed to the opposite side.
- Training experience may play an important role in using the left side of the body and its effectiveness to the left attack direction.
- It is recommended to find causes of the effectiveness of the left attack direction and using the left side of the body while attacking.

References

1. Starosta W. Stronne zróżnicowanie techniki ćwiczeń zawodników rozmaitych dyscyplin sportu [in Polish, summary in English] [The sided diversification of the exercise technique in competitors of various sports disciplines]. Warszawa – Supraśl: Międzynarodowe Stowarzyszenie Motoryki Sportowej, WSWFiT; 2008.

2. Wang HK, Cochrane T. Mobility impairment, muscle imbalance, muscle weakness, scapular asymmetry and shoulder injury in elite volleyball athletes. *J Sport Med Phys Fit* 2001;41(3):403-410.
3. Idoate F, Calbet JAL, Izquierdo M, Sanchis-Moysi J. Soccer Attenuates the Asymmetry of Rectus Abdominis Muscle Observed in Non-Athletes. *PLoS ONE* 2011;1-7 [www.plosone.org].
4. Sterkowicz S, Lech G, Blecharz J. Effects of laterality on the technical/tactical behavior in view the results of judo fights. *Archives of Budo* 2010;6:173-177.
5. Hicks S, Soames N. 50 Great Judo Champions. London: Ippon Books Ltd.; 2001
6. Adams N. Grips – judo masterclass techniques. London: Ippon Books Ltd.; 1990.
7. Smaruj M, Laskowski R, Adam M. Symmetry and asymmetry performing throws during judo combat of women. 3rd [third] International Judo Federation World Research Symposium, Osaka, Japan, 9 September 2003 .
8. Adam M, Smaruj M, Laskowski R. Graficzna metoda rejestracji walki judo [in Polish] [A graphic method of registering a judo fight]. *Sport Wyczynowy* 2005;5/6:33-43.
9. Kano J. Kodokan Judo. Edited under the supervision of the Kodokan Editorial Committee. Tokyo, New York, London: Kodansha International; 1994.
10. Adam M, Smaruj M, Tyszkowski S. The diagnosis of the technical-tactical preparation of judo competitors during the World Champions (2009 and 2010) in the light of the new judo sport rules. *Archives of Budo* 2011;7:5-9.
11. Adam M, Tyszkowski S, Smaruj M. The Contest Effectiveness of the Men's National Judo Team of Japan and Character of Their Technical-Tactical Preparation during the World Judo Championships 2010. *Baltic Journal of Health and Physical Activity* 2011;3 (1):65-74.
12. STATISTICA MANUAL version 10 (data analysis software system), Stat Soft, Inc.; 2011 [www.statsoft.com].
13. Smaruj M. Symetria i asymetria rzutów podczas walki w judo [in Polish] [Symmetry and asymmetry of throws during a judo fight]. *Rocznik Naukowy /AWF Gdańsk/* 2002;12:227-233.
14. Drabik J, Jaremczak K, Biliński A, Krysiuk M, Adam M. Symetria i asymetria działań judoka podczas walki [in Polish] [Symmetry and asymmetry of a judoka's actions during a fight]. *Kultura Fizyczna* 1978; (8):350-352.
15. Drabik J, Jaremczak K, Starosta W. Przejawy asymetrii funkcjonalnej w przygotowaniu zawodników judo [in Polish] [Symptoms of functional asymmetry in preparation of judo competitors]. *Kultura Fizyczna* 1981;(4):14-17.
16. Bompa T, Haff G. Periodization. Theory and Methodology of Training. 5th Edition. Champaign, Ill.: Human Kinetics; 2009.
17. Błach W, Migasiewicz J, Hajdrych T, Cynarski WJ. Rodzaje podejmowanych działań techniczno-taktycznych w judo na przykładzie walki w Pucharze Świata seniorów i juniorów [in Polish] [Types of undertaken technical-tactical actions in judo on the example of fights in the senior and junior world cup]. *Ido Movement for Culture* 2006;6:169-175.
18. Margnes E, Paillard T. Teaching balance for judo practitioners. *Ido Movement for Culture. Journal of Martial Arts Anthropology* 2011;11 (1):42-46.