

ORIGINAL INVESTIGATION (ARTIGO ORIGINAL)

CHARACTERISTICS OF POINTING ACTIONS OF TOP MALE COMPETITORS IN KARATE AT WORLD AND EUROPEAN LEVEL

Nenad Koropanovski¹, Milivoj Dopsaj², Srecko Jovanovic²

¹Academy for Criminalistic and Police Studies, Belgrade, Serbia

²Faculty of Sport and Physical Education, University of Belgrade, Belgrade, Serbia.

Corresponding author:

Nenad Koropanovski (MSc)
Academy for Criminalistic and Police studies,
Cara Dusana 196 Str.
11080 Belgrade - Zemun, SERBIA
Phone: +381 11 3161 444 (office)
Fax.: +381 11 3162 150 (office)
E mail: korpan@EUnet.yu

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ABSTRACT

KOROPANOVSKI, N.; DOPSAJ, M.; JOVANOVIC, S. Characteristics of pointing actions of top male competitors in karate at world and European level. *Brazilian Journal of Biomotricity*, v. 2, n. 4, p. 241-251, 2008. Work goal is determination of quantity indicators related to pointing action at sports fights at top-level female karate competitors. Pointing actions were analyzed through basic pointing ways (attack, interception and counterattack) and pointing techniques that exist in sports fight and are defined by judging rules. Research is based on analysis of final matches at the World championships in Madrid 2002 and Monte Ray 2004, and at the European championships in Bremen 2003, Moscow 2004 and Tenerife 2005. Fifty-five fights in male competition were analyzed. Collecting of data was performed by analysis of electronic material of completely recorded fights. Methods of descriptive statistical analyse and analyses of quantity differences were used for data processing. Quantity indicators show that men have pointed dominantly from attack (52.54%) while pointing from interception (23.91%) and counterattack (23.55%) have lower frequency. Pointing techniques that have dominant frequency are gjaku tsuki cudan (34.9%), gjaku tsuki dzodan (32.0%) and kizami tsuki (16.4%). At the general level, there are statistically significant differences in the distribution of analyzed modalities of pointing way in female competitors at the level Wilks' Lambda – 0.352, $F_{\text{relation}} = 27.092$, $p=0.000$. At the general level, there are statistically significant differences in the distribution of analyzed modalities of pointing techniques in male competitors at the level of Wilks' Lambda – 0.341, $F_{\text{relation}} = 13.268$, $p=0.000$. Statistically significant difference of pointing actions between European and World championship does not exist. It can be said that obtained results are similar to the results of earlier researches with something greater frequency of attractive techniques. Also, competitors use a wide range of techniques. It can be concluded, including the level competition, that comeditors on WC use less risky techniques and easier way

of pointing way than competitors on EC.

KEY WORDS: Karate; competition; pointing actions; tactics; technique

INTRODUCTION

Sport fight in karate takes place according to the clear defined rules. In last twenty years, the rules have suffered significant changes with tendency of increasing the intensity and attractiveness of competitor's activity, with basic goal to approach karate sport to the observer's audience (JOVANOVIĆ & MUDRIĆ, 2003). Basic characteristics of karate sport, which make it clearly recognizable concerning other fighting sports, are pointing techniques (KOROPANOVSKI & JOVANOVIĆ, 2007). To award a pointing technique it is necessary to fulfill certain criteria, which are defined by the rules of sport fight (Rulebook WKF). Pointing techniques in karate are kicks and punches that can be realized through three basic ways of pointing in sport fight – attack, interception and counterattack (KOROPANOVSKI & JOVANOVIĆ, 2007).

Previous researches in the field of sport fight have been focused mostly on injuries (ARRIAZZA et al., 2005; ORTY et al., 2006; HALABCHI et al., 2007) as well as psychological (RUIZ & HANIN, 2004; THATCHER et al., 2007), physiological (IMAMURA et al., 2002; BENEKE et al., 2004; IIDE et al., 2008), morphological (KATIC et al., 2005; AIWA & PIETER, 2007; IIDE et al., 2008), motoric (BLAZEVIĆ et al., 2006; RAVIER et al., 2004), time (MUDRIĆ, 2001; MORI et al., 2002) and biomechanical aspects (NAKAYAMA, 1986; ZEHR et al., 1997; SFORZA et al., 2001; WITTE, 2008). There are very few studies which goal is to directly analyze sport fights in karate as the only specific sport situation (GUZVICA, 2001.; KOROPANOVSKI et al., 2008).

Primary condition of development in modern sport presents analysis of competitor's activity, and on basis of gained results, training technology will be created (KOROPANOVSKI, 2006; MILISIC, 2007). According to that, a need for identification of technical-tactical characteristics of competitors is forced on (OLIVA et al., 2002). Primary elements, which present clearly recognizable "exterior image" of certain competitors, are pointing actions (KOROPANOVSKI et al., 2008). In this research, pointing actions are observed through pointing techniques and ways of pointing.

Object of this work, which is related to pointing action in karate – pointing techniques and way of pointing, comes from above mentioned. The goal of this work is to determine the differences in quantity frequency of modality of pointing technique and modality of pointing ways, as structural elements of sport fight, and the difference in frequency of modality of pointing technique and modality of pointing way between World and European championships.

METHODS

Fifty-five fights in male competition, in final matches at world championships in Madrid 2002, and Monte Ray 2004, and on European championships in Bremen 2003, Moscow 2004 and Tenerife 2005, are analyzed. Data collecting was done

by analysis of videotape recording of complete recorded fights (www.kombatklub.com) using the method of analysis of competitive activities created by Zatsiorsky (1982). All data with analysed variables were noticed in special created tables for tracking sport combats (JOVANOVIĆ & KOROPANOVSKI, 2002; KOROPANOVSKI, 2006).

One hundred and ten competitors in following categories were analyzed: up to 60 kg, up to 65kg, up to 70kg, up to 75kg, up to 80kg, over 80 kg and absolute (without weight limit). Except individual matches, team matches without weight limit are analyzed.

Modalities of pointing techniques were followed in 17 different techniques (KOROPANOVSKI & JOVANOVIĆ, 2007): kizami tsuki (KZ), gjaku tsuki dzodan (GZDZ), gjaku tsuki cudan (GZC), uraken uci (UU), oi tsuki (OZ), mae geri (MG), joko geri (JG), asi joko geri (AJG), mavasi geri dzodan (MGDZ), mavasi geri cudan (MGC), asi mavasi geri (AMG), ura mavasi geri (UMG), asi ura mavasi geri (AUMG), usiro mavasi geri (UMG), ushiro geri (UG), cleaning/tsuki (CZ) and throwing/tsuki (BZ).

Modalities of pointing ways are followed through direct attack (DA), extended attack (EA), reprogrammed attack (RA), interception (I), direct counterattack (DC), direct counterattack with block (DCB), extended counterattack (EC) and extended counterattack with block (ECB).

Descriptive statistic analysis was performed by calculating of frequency of appearances from the aspect of absolute (nth number of frequency) and relative values (frequency percentage). Analysis of quantity differences was done by multivariate method, at that by General linear model with application of "Wilk's Lambda" criterion (HAIR et al., 1998).

RESULTS

POINTING TECHNIQUE

In the Table 1, numerical and percentage frequency of structural element of sport fight pointing technique is shown. We can see that modalities of structural elements of sport fight pointing technique have different frequency. According to the frequency of occurrence, the most frequent is gjaku tsuki cudan (GZC), which has total frequency of 34.9%, at the European championships it has 32.5%, and at the world championships it has 38.4%, then gjaku tsuki dzodan (GZDZ), which has total frequency of 32%, at the EC it has 30.1%, and at the WC it has 34.8%, and kizami tsuki (KZ), which total frequency was 16.4%, at the EC it was 18.4%, and at the WC it was 13.4%. Joko geri (JG), asi joko geri (AJG) and usiro geri (UG) has minimum frequency of 0.00%, which means they did not appear.

TABLE 1 - Numerical and percentage frequency of structural element of sport fight pointing technique

POINTING TECHNIQUE																		
MODALITIES	KZ	GZDZ	GZC	UU	OZ	MG	JG	AJG	MGD	MGC	AMG	UMG	AUM	USG	UG	CZ	BZ	Σ
Frequency_EC	30	49	53	0	8	1	0	0	1	5	2	3	4	1	0	1	5	163
%	18.4	30.06	32.52	0	4.91	0.61	0	0	0.61	3.07	1.23	1.84	2.45	0.61	0	0.61	3.07	100
Frequency_WC	15	39	43	3	5	0	0	0	3	1	1	0	0	1	0	1	0	112
%	13.39	34.82	38.39	2.68	4.46	0	0	0	2.68	0.89	0.89	0	0	0.89	0	0.89	0	100
Total	45	88	96	3	13	1	0	0	4	6	3	3	4	2	0	2	5	275
%	16.36	32	34.91	1.09	4.73	0.36	0	0	1.45	2.18	1.09	1.09	1.45	0.73	0	0.73	1.82	100

Table 2 shows results of multivariate statistic analysis of differences of modality of structural element of sport fight pointing technique. Based on the results from Table 2, it can be said that at the general level there is a statistically significant difference in distribution of analyzed modalities pointing technique at the level Wilk's Lambda – value 0.341, $F_{relation} = 13.268$, $p = 0.000$.

In relation to partial differences, statistically significant difference of appearance of followed pointing techniques is established: kizami tsuki, $F_{relation} = 27.642$, $p = 0.000$; gjaku tsuki dzodan, $F_{relation} = 49.958$, $p = 0.000$; gjaku tsuki cudan, $F_{relation} = 59.216$, $p = 0.000$; oi tsuki, $F_{relation} = 12.438$, $p = 0.001$; mavasi geri cudan, $F_{relation} = 4.649$, $p = 0.033$; asi ura mavasi geri, $F_{relation} = 4.113$, $p = 0.045$; throwing/tsuki, $F_{relation} = 5.190$, $p = 0.025$.

TABLE 2 - Results of multivariate statistic analysis of differences of modality of structural element of sport fight pointing technique.Multivariate Tests^b

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.659	13.268 ^a	14.000	96.000	.000
	Wilks' Lambda	.341	13.268 ^a	14.000	96.000	.000
	Hotelling's Trace	1.935	13.268 ^a	14.000	96.000	.000
	Roy's Largest Root	1.935	13.268 ^a	14.000	96.000	.000

a. Exact statistic

b. Design: Intercept

Table 3 shows the results of multivariate statistical analysis of differences of modality of structural element of sport fight pointing technique between EC and WC. Based on the results from the chart it can be said that at the general level, there is a statistically significant difference of distribution of analyzed modalities, between European and World championship it does not exist, in frame of structural element pointing technique at the level Wilk's – Lambda Value 0.866, $F_{relation} = 1.046$, $p = 0.416$. In relation to partial differences, statistically significant difference of occurrence of pointing techniques also is not established.

TABLE 3 - Results of multivariate statistical analysis of structural element pointing technique at the european and world championships.Multivariate Tests ^b

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.649	12.559 ^a	14.000	95.000	.000
	Wilks' Lambda	.351	12.559 ^a	14.000	95.000	.000
	Hotelling's Trace	1.851	12.559 ^a	14.000	95.000	.000
	Roy's Largest Root	1.851	12.559 ^a	14.000	95.000	.000
TAKMICEN	Pillai's Trace	.134	1.046 ^a	14.000	95.000	.416
	Wilks' Lambda	.866	1.046 ^a	14.000	95.000	.416
	Hotelling's Trace	.154	1.046 ^a	14.000	95.000	.416
	Roy's Largest Root	.154	1.046 ^a	14.000	95.000	.416

a. Exact statistic

b. Design: Intercept+TAKMICEN

POINTING WAY

Table 4 shows that modalities of structural element of sport fight pointing way have different frequency. As most frequent, at the one side is direct attack (DA), with total frequency of 38.8%, at the European championships 35.0% and at the world championships 44.2%, interception (I) with total frequency of 23.9%, at the EC 24.5% and at the WC 23.0%, and direct counterattack (DC) with total frequency of 16.3%, at the EC 16.6% and at the WC 15.9%. On the other hand, minimum frequency has counterattack with block, with total frequency of 0.00%, which means it did not appear.

TABLE 4 - Numerical and percentage frequency of structural element of sport fight pointing way

POINTING WAY									
MODALITIES	DA	EA	RA	I	DC	DCB	EC	ECB	Σ
Frequency_EC	57	14	6	40	27	16	3	0	163
%	34.97	8.59	3.68	24.54	16.56	9.82	1.84	0	100
Frequency_WC	50	12	6	26	18	0	1	0	113
%	44.25	10.6	5.31	23.01	15.93	0	0.88	0	100
Total	107	26	12	66	45	16	4	0	276
%	38.77	9.42	4.35	23.91	16.3	5.8	1.45	0	100

Table 5 shows the results of multivariate statistical analysis of differences of modalities of structural element of sports fight pointing way. Based on the results from Table 5, it can be said that at the general level there is a statistically significant difference of distribution of analyzed modalities pointing way, at the level Wilk's - Lambda - Value 0.352, $F_{\text{relation}} = 27.092$, $p = 0.000$.

In relation to partial differences, statistically significant difference of occurrence following pointing way was established: direct attack, $F_{\text{relation}} = 76.182$, $p = 0.000$; extended attack, $F_{\text{relation}} = 17.695$, $p = 0.000$; reprogrammed attack, $F_{\text{relation}} = 6.288$, $p = 0.014$; interception, $F_{\text{relation}} = 42.152$, $p = 0.000$; direct

counterattack, $F_{\text{relation}} = 35.458$, $p = 0.000$; direct counterattack with block, $F_{\text{relation}} = 14.354$, $p = 0.000$.

TABLE 5 - Results of multivariate statistical analysis of differences of modalities of structural element of sports fight pointing way

Multivariate Tests ^b						
Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.648	27.092 ^a	7.000	103.000	.000
	Wilks' Lambda	.352	27.092 ^a	7.000	103.000	.000
	Hotelling's Trace	1.841	27.092 ^a	7.000	103.000	.000
	Roy's Largest Root	1.841	27.092 ^a	7.000	103.000	.000

a. Exact statistic

b. Design: Intercept

Table 6 shows the results of multivariate statistical analysis of differences of modality of structural element of sports fight pointing way between EC and WC. Based on the results from Table 6, it can be said that at the general level there is no statistically significant difference of distribution of analyzed modalities, between European and World championships, in frame of structural element POINTING WAY, at the level Wilk's – Lambda — Value 0.901, $F_{\text{relation}} = 1.608$, $p = 0.142$.

In relation to partial differences, statistically significant difference of occurrence of following pointing way is established: direct counterattack with block – $p = 0.001$.

TABLE 6 - Results of multivariate statistical analysis of differences of modality of structural element of sports fight POINTING WAY between EC and WC

Multivariate Tests ^b						
Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.638	25.690 ^a	7.000	102.000	.000
	Wilks' Lambda	.362	25.690 ^a	7.000	102.000	.000
	Hotelling's Trace	1.763	25.690 ^a	7.000	102.000	.000
	Roy's Largest Root	1.763	25.690 ^a	7.000	102.000	.000
TAKMICEN	Pillai's Trace	.099	1.608 ^a	7.000	102.000	.142
	Wilks' Lambda	.901	1.608 ^a	7.000	102.000	.142
	Hotelling's Trace	.110	1.608 ^a	7.000	102.000	.142
	Roy's Largest Root	.110	1.608 ^a	7.000	102.000	.142

a. Exact statistic

b. Design: Intercept+TAKMICEN

DISCUSSION

Gained results of pointing techniques are similar to the results gained in former researches. Dominant frequency of 89.09% punches have, in relation to leg kicks, with 8.36%. Regardless rule changes, which favor leg kicks, punches

have lesser information complexity, in other words time of programming, as well as greater precision, control and characteristics of natural movements (JOVANOVIĆ & MILOSEVIĆ, 1992). Besides mentioned, kicks are less demanding from the aspect of oxygen uptake (VO₂) and heart rate (IMAMURA et al., 2002; IIDE et al., 2008). However, trend of light increasing of pointing of leg kicks is noticed in relation to results of former researches, which were occupied with quality competitors, as well as pointing after cleaning and throwing. Quoted statement is probably a consequence of rules that evaluate these techniques two or three times more than arm strokes, which cause that this problem, gets more attention in training process.

Gjaku tsuki is the most frequent with 66.91%. This punch has the shortest time of programming (MUDRIC, 2001), it is very powerful and precise, and being such it is suitable in the largest number of competitive actions (JOVANOVIĆ & MILOSEVIĆ, 1992). Besides that, the competitor that performs it is protected to a great extent, which contributes to additional security. Trend of equalizing frequency of this punch in head and body region, in relation to former periods is also noticed. Reason for that is probably a lesser demand in criteria which has to be fulfilled for assigning points in head in relation to body (except in precision) and the same point value for points with hand in head and hand in body.

The third punch per frequency is kizami tsuki, which has very short performing length. Reasons for lesser frequency of this punch in relation to gjaku tsuki have to search in dominant technical- tactical determination of competitors to use forward arm in guard to block and a relatively high risk of interception.

The previous two punches have the shortest time of performing in relation to the other ones. That way the time necessary for realizing the punch gjaku tsuki is 150 ms and kizami tsuki 110 ms (JOVANOVIĆ, 1992). It is important to emphasize that the data were obtained in a laboratory when the athletes performed the techniques themselves.

Frequency of punch oi tsuki is something greater that in relation to results of earlier researches (GUZVICA, 2000). It is expected that this punch is performed at the something greater distance in relation to gjaku tsuki and kizami tsuki and being like that is easily noticeable, which leaves enough time to opponent to react. However, by analysis of fights, greater distance during performing of punch oi tsuki is not noticed. Competitors that were performing this technique were showing great determination and enforced opponent to evade back, which has made optimum distance for realization of this punch. To get points in the described way top mastership is needed, which is a characteristic of selected examinees.

Low frequency of leg kicks can be explained by longer lane and time for execution than punches (MUDRIC, 2001). Furthermore, the sample consisting of top athletes should be taken into account. It was analysed in this research with all its characteristics of high speed of moving in multiple directions and high speed of blockade (BLAZEVIĆ et al., 2006). Among leg kicks, mavasi geri cudan distinguishes itself, which has characteristics of natural movement and lesser control degree prescriptive by rules. During performing this kick

competitor is better protected than in other leg techniques, and that is the reason why competitors freely decide to use it.

Frequency of the kick *asi ura mavasi geri*, by which it is difficult to injure opponent confirms previous statement related to kick control. Besides that, kick is performed with forward leg in position, which is safer in relation to opposite and it has path that is difficult to block.

Throwing with pointing are direct consequences of actual rules, which, in contrast to previous, allows fight in clinch and predict maximal point evaluation of these actions.

Gained results of pointing way can be more generally interpreted in following manner: pointing by attack 52.54%, pointing by counterattack 23.55% and pointing by interception 23.91%. Gained results are similar to those gained in previous researches.

There is a trend of greater pointing from attack, which can be explained by different information processes of attack (MUDRIC, 2001), interception and counter attack, at the one side, and the way of judging that facilitates attack, at the other side. Namely, actual rules that predict end of the fight in case that there is a difference of 8 points and criterion of judging that facilitate offensive activity cause greater liberty for competitors in relation to previous periods. Based on the results we can conclude that competitors at the EC more often use defensive way of pointing, which is probably a consequence of better knowing each other, taking in consideration that EC takes place every year and WC takes place every two years.

CONCLUSION

Research includes 110 competitors, in male competition, in final matches at the World championships in Madrid, 2002 and in Monte Ray, 2004, and at the European championships in Bremen, 2003, Moscow, 2004 and Tenerife, 2005.

The most frequent occurrence has punches: *gjaku tsuki cudan* (GZC), which has total frequency of 34.9%, at the EC 32.5%, and at the WC 38.4%, *gjaku tsuki dzodan* (GZDZ), with total frequency of 32.0%, at the EC 30.1%, and at the WC 34.8% and *kizami tsuki* (KZ), with total frequency of 16.4%, at the EC 18.4% and at the WC 13.4%. Other pointing techniques have lesser frequency or they did not appear at all. Generally, punches have frequency of 89.09%, leg kicks 8.36%, while cleaning and throwing with pointing have frequency of 2.55%.

By multivariate method, namely by General linear model, with usage of Wilk's Lambda criterion, at the general level was established significant difference of frequency of modalities of pointing technique, Wilk's Lambda – Value 0.341, $F_{\text{relation}} = 13.268$, $p = 0.000$, as well as modality of pointing way, Wilk's Lambda – Value 0.352, $F_{\text{relation}} = 27.092$, $p = 0.000$. In relation to partial differences, statistically significant differences of occurrence of modality of pointing technique *kizami tsuki* ($F = 4.194$, $p = 0.000$), *gjaku tsuki dzodan* ($F = 19.600$, $p = 0.000$), *gjaku tsuki cudan* ($F = 35.979$, $p = 0.000$), *oi tsuki* ($F = 2.031$, $p = 0.001$), *mavasi geri cudan* ($F = 1.000$, $p = 0.033$), *asi ura mavasi geri* ($F =$

1.000, $p = 0.045$) and throwing/tsuki ($F = 1.000$, $p = 0.025$) were established. At modalities of pointing way the following attacks stand out: direct attack ($F_{\text{relation}} = 76.182$, $p = 0.000$), extended attack ($F_{\text{relation}} = 17.695$, $p = 0.000$), reprogrammed attack ($F_{\text{relation}} = 6.288$, $p = 0.014$), interception ($F_{\text{relation}} = 42.152$, $p = 0.000$), direct counterattack ($F_{\text{relation}} = 35.458$, $p = 0.000$) and direct counterattack with block ($F_{\text{relation}} = 14.354$, $p = 0.000$).

Gained results are similar to those gained in former researches, but with a noticeable trend of somewhat greater usage of attractive techniques, which is evaluated with maximum points.

This research did not establish statistically significant difference in distribution of analyzed modalities of pointing technique between EC and WC (Wilks' Lambda = 0.866, $F_{\text{relation}} = 1.046$, $p = 0.416$), as well as modalities of pointing ways (Wilks' Lambda = Value 0.901, $F_{\text{relation}} = 1.608$, $p = 0.142$). In relation to partial differences, it is established that statistical significant difference of occurrence of pointing techniques between EC and WC does not exist, while at the pointing way the direct counterattack with block ($F = 10.834$, $p = 0.001$) stand out.

However, it can be concluded that competitors at the WC use less risky techniques and easier pointing ways in relation to EC.

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