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MODEL CHARACTERISTICS OF COMBAT AT ELITE MALE KARATE COMPETITORS

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Abstract In karate, so far, nobody has set any serious completed system of following and analyzing of sports competitions, which would enable a complete review of technical and tactical features of contestants. We could search for the reason in the objective complexity of sports competitions, in identifications of technical and tactical elements, as well as in the way of their utilization for the analysis of competitive activity. The problem of this work deals with research in competitive activity of karate competitors. The orientation for this research problem took rise from the assumption that results of research in competitive activity are important for planning and programming of training process because sports change intensively under the influence of modification of competitive rules. Research subject refers to technical and tactical characteristics of sports competition in karate. Research objective is determining of model characteristics of sports competitions by the analyses of a certain number of fights at high-quality European and world competitions in the past few years. The sample for analysis consists of 55 final competitions, i.e., 110 contestants in man competition at European championships in Bremen (Germany) 2003, Moscow (Russia) 2004, Tenerife (Spain) 2005, and at World championships in Madrid (Spain) 2002 and Monte Ray (Mexico) 2004. Based on descriptive statistical analysis, gained from the measuring of frequency of occurrence which is expressed from the aspect of relative and absolute value, and also by analyzing of quantitative differences, by using of individual and collective method – General Linear Model (GLA), we came to the conclusion that there is statistically significant difference in quantitative frequency of structural elements of sports competitions.

Key words: karate, competition, model characteristics of combat

INTRODUCTION

Much research in the past years indicate that mutual relationship of accomplishments in science and technical progress is a trend in the development of elite sport. High efficiency of this relationship is determined by many components [23]:

- strengthening of relationships and mutual permeation of social and natural sciences and disciplines;
- intensive introduction of modern technologies – training equipment, telemetric equipment, computer technologies, etc.;
- universality of scientific methods;
- methodological role of integral sciences – cybernetics, system theory, information theory etc.;
- mutual increasing and advancement of theory and practice in top sport.

Analyses of leading training systems show that the following factors, which are very important for success, dominate in the field of elite sport:

- the importance of systemic and specialized work for maximum development of total functional capacity of human body grows, as well as the importance of methods and technologies for its effective realization in the field of a given sports discipline,
- the importance of permanent control of basic factors which determine successfulness of sports result increases

Karate takes a significant place in sport today, not only for being so widespread but also because of the organization of its system of competition and the high level of accomplishments [3, 5, 6, 8, 18]. The development of modern karate is characterized by intense presence of science, whose results are implemented to a greater and greater extent in learning and training process of karateists [19, 21]. Among other things, there is a growing need for research in competitive activity of karateists, with the aim of getting basic model characteristics, relevant for planning and programming of training process in this sport [13, 20].

Examination of competitive activity in karate means the defining of elements that make the structure of sports fight, their frequency and interconnection. This is the basic prerequisite for all further research and analyses. Complex rules of sports fight in karate are certainly an important reason why researchers have been reluctant and careful when approaching problems of sports fight.

The problem of successful modeling in training and competition technology in karate sport cannot be solved without detailed analysis of competitive activity [11, 13]. Besides theoretical importance, which is reflected in defining of structural characteristics, these studies have large applicable value in modernization and advancement of practice in sports karate.

Familiarizing with the structure of competitive activity can promote training work with karate athletes by directed work on the development of the characteristics necessary for success at competitions.

The importance of research can be reflected also in a contribution to the methodology of collecting of information about competitive activity. In other words, it will help in setting of the most important elements which provide success in sports fight.

In karate so far there has not been any serious, consistent, defined system for observing and analysis of sport fights which could provide complete recognizing of technical-tactical characteristics of competitors. The reason for that could be found in the complexity of sports fight, identification of technical-tactical elements, but also in their utilization for analysing of competitive activity.

The problem of this work is connected with exploring of competitive activity of karate competitors. In determining of this research problem, the starting assumption was that research results of competitive activity in sport are highly significant for planning and programming of training process, especially because sports change very intensively under the influence of changes in competitive rules.

The subject of research is related to technical-tactical characteristics of sports fight in karate.

The objective of the research is determining of structural characteristics of sports fight based on the analyses of large number of fights at high-quality European and world competitions in the past few years.

MATERIAL AND METHODS

THEORETIC FRAMEWORKS

Sports fight in karate is performed according to the clearly set rules between two contestants [22, 24]. Fight result is quantified by the number of achieved points and could have the following outcomes: triumph, defeat or stand-off.

Basic elements that define sports fight in karate are fight duration and time of registered activity, points value, type of scored points, pointing technique, technique in pointing attempts, type and value of penalty, pointing modalities, modalities of fight outcome, dominant characteristic of guard, dominant characteristic of stance, dominant motion type [12].

Related to this, additional elements that provide perceiving of technical-tactical characteristics of contestants in sports fight are the following: selection of technical elements and their combination, characteristic ways of pointing, dominant activity zone, typical activity depending on time interval of fight, typical activity depending on result relation, typical activity depending on injuries and typical behavior in relation to certain characteristics of the rival [12].

FIGHT DURATION AND TIME OF REGISTERED ACTIVITY

Sports fight for seniors last effectively for three minutes (180 sec) for men. In case of tied result, fight is going on and overtime lasts for one minute. In team matches, fight ends in regular (or before the end of regular time), without overtime, by noting of scored result: triumph, defeat or stand-off. Time of sport fight duration, after which the result is declared, could have the following modalities: before the end of regular time, regular time and overtime.

Time of registered activity implies activity registration at a certain moment, measured from the beginning of the fight. At the judge's sign, when there is a situation for assigning points (but that does not mean that the point will be adjudicated), warning or penalty, or if there is a particular reason for stopping (bleeding of contestants, repairing of equipment...), the fight stops.

POINT VALUES

Sports fight rules in karate set the following point values: SANBON (3 points), NIHON (2 points) and IPON (1 point). SANBON is adjudicated for leg kicks into head and techniques of cleaning and throwing, which resulted in absolute fall of rival and final kick. NIHON is adjudicated for leg kicks into body, two connected arm kicks, arm kick into back or opponent's lateral side and techniques of cleaning and throwing, which resulted in imbalance of rival and final kick. IPON is adjudicated for single arm kicks into head and body [22, 24].

TYPES OF SCORED POINT

There are two types of points: action (points that are assigned after successfully performed action) and counter penalty (points that are assigned based on rival penalty).

POINTING TECHNIQUES

There is a large numbers of techniques in sports fight that make a cognizable mobility picture of karate as sport. The only techniques that make points in sports fights are kicks. According to the rules in sports fight, the following kicks are allowed [22, 24]: kizami zuki (kick with forward "anterior" hand), gjaku zuki dzodan (kick with opposite "back" hand pointed to head), gjaku zuki cudan (kick with opposite "back" hand pointed to the body), uraken uci (circled hand kick), oi zuki (direct step kick), mae geri (direct leg kick forward), joko geri (leg kick in lateral direction), mavasi geri dzodan (circled "exterior" leg kick pointed to the head), mavasi geri cudan (circled "exterior" leg kick pointed to the body), ura mavasi geri (circled "interior" leg kick pointed to the head), usiro mavasi geri (circled leg kick from turn in the back direction) and usiro geri (direct leg kick from turn in back direction)¹.

TYPES AND VALUES OF PENALTIES

Judging rules in karate sport define forbidden behavior for which certain penalties are assigned [22, 24]. There are two categories of penalties: penalties in category 1 and penalties in category 2.

The first category of penalties: techniques with too strong contact – C1K; attack to legs, arms, genitals, joints or foot vaults – C1Z; attack to face with techniques of open hand – C1 O; dangerous or forbidden throwing techniques – C1B.

This classification of the first category penalties emphasizes uncontrolled kicks at pointing zone and tendency of intentional injuring and incapacitating of the opponent.

¹ Beside basic strikes and punches their variations can appear in fight

The second category of penalties: simulation and exaggerating of injury – C2S; repeated comings from competition area – dzogai – C2J (main judge indicates coming out by showing with his index finger to the border of competition area at the side of offender); exposing to injuries by coming to dangerous situations or by not undertaking any security measures for self-defense – mubobi – C2M (main judge touches his face and after that, while turning his hand he pushes it forward, moving it in front of his face, in one and in the other side, wanting to show to linesmen that the contestant is exposing himself to danger); avoiding of fight – C2I; capture and attempting to throw or overturn the opponent, without previous accomplishment of real attack by karate technique, performing of throwing techniques, where the center of rotation is above the hip level, unnecessary wrestling, clinch, capture without any attempt to point – C2K; techniques that, by its own nature, could not be performed with control and safety of the opponent and dangerous uncontrolled attacks, attacks by head, knees and elbows – C2N; conversation or provoking of rival, disrespect of judges and other officials and other violations of sport codex – C2R.

Penalties can have direct influence on the match outcome. As it was already said, forbidden behaviors are classified in two categories, and according to that, penalties for fouls from the same category are adding up.

If it is the first case of a smaller foul, contestant is only warned – CUKOKU. The opponent does not get a point.

KEIKOKU is given for smaller fouls from the same category, for which warning has already been given, or for fouls that are not serious enough for high level of penalty. This is the penalty where the opponent gets IPON. The opponent gets IPON.

HANSOKU CUI is usually assigned for fouls from the same category, for which KEIKOKU has already been given, or directly for a foul which is not serious enough for disqualification. The opponent gets NIHON for that penalty.

HANSOKU is assigned for very serious fouls or when HANSOKU CUI has already been given in the same category of penalties. Its result is disqualification of contestant. The opponent is proclaimed as the winner.

SIKAKU is the disqualification from actual tournament, competition or match. It is assigned when a competitor neglects judge's rules, his behavior is malicious, and by that, he is causing damage to honor and reputation of karate sport or for other actions that are damaging rules and competitive spirit, and its consequence is assigning victory to the opponent.

KIKEN is given to a contestant who cannot continue fighting, or is taken back from the competition by the main judge. The reason for leaving can be injury that is not caused by opponent's action. By assigning of KIKEN to one of the contestants, the opponent is declared the winner.

POINTING

In sports fight, pointing could be achieved in three basic ways: by attack, interception and counterattack (after defense or attack avoiding) [9, 16, 17]. From basic ways of pointing, the following pointing modalities could be defined: direct attack, extended attack, reprogrammed attack, direct counterattack, counterattack with block, extended counterattack, extended counterattack with block and interception.

FIGHT OUTCOME

Fight outcome has the following modalities: triumph/defeat before the end of regular time, triumph/defeat, stand-off after expiration of regular fight duration, triumph/defeat by getting points in overtime, triumph/defeat by explanation and triumph/defeat without fight (when one of the contestants do not appear or gives up).

DOMINANT CHARACTERISTICS OF GUARD

Guard presents position of arms that a contestant takes during the fight. It should provide optimal conditions for fight activity. In relation to height of arm position, it can be low, middle and high guard. In relation to width of arm position (i.e. body coverage), it can be open and closed guard.

DOMINANT CHARACTERISTICS OF STANCE

Stance presents leg position that a competitor takes during the fight. In relation to forward leg, it can be left or right. In relation to height of body focus, it can be low, high and middle. In relation to stance width, it can be linear and diagonal. Latest rules allow fight in clinch in a shorter period. In karate, clinch position could be observed more flexible in relation to box. Clinch means any contact between the contestants if there is holding.

DOMINANT TYPES OF MOTION

Motion in sports fight means a change of location in the fighting space. If we observe motion by linear principle, we recognize straight and circled motions.

Shortening of distance in sports fight, with the goal to achieve pointing technique, could be accomplished in four ways: slip, double step, jump and step.

The distance at which the fight is performed can be short, middle and large. Short distance is the distance at which it is possible to perform pointing technique by posture extension. Middle distance is the distance at which it is possible to point by one introductory motion. Large distance is the distance at which it is possible to perform pointing after at least two introductory motions.

In modern karate, contestants are moving during most of the active time of sports fight. For the requirements of this work, we will analyze motion in preparation for pointing or attempt at pointing.

SELECTION OF TECHNICAL ELEMENTS AND THEIR COMBINATION

Tactics is in close connection with technique. First criterion in tactical identification of contestants in sports fight in karate is selection of technical elements and their combination [19]. In sports fight, technique could be classified: stance and guard, kicks, blocks, cleaning and throwing, motion and distance.

Sports fight rules envisage obtaining of points by kicks. Another way of obtaining points could be through opponent's forbidden activities. Rules prescribe that activities of contestants should be dominantly directed to delivering blows or eliminating the rival out of the competition area, and any other action can be only support to this achievement. From the above mentioned a conclusion can be drawn that winning of points in sports fight is the primary task, but depends on certain factors, tactical contestant activity can be organized in a different way.

Contestant is identified, from the aspect of pointing techniques, with the most common technique. It can be several techniques.

Some preliminary techniques with the aim to enable successful placing of the final kick very often precede the pointing technique. There is a range of possibilities in preliminary techniques. Preliminary techniques that contestants use fall in the domain of tactical space and these techniques are directly restricted by the opponent's behavior. Identification of preliminary techniques is very complicated, from the aspect of the most different possibilities and it is attainable after systematic tracking of a certain contestant. A contestant can have one, two, three or more preliminary techniques.

Depending on tactical plan, stance and guard change and adapt to the task that needs to be carried out. Guard and posture can also be changed in relation to some other factors, for example, strong kick that can cause relaxation of guard. Posture is in close connection to segments of technique that includes motion and distance.

Blocks in sports fight in karate mainly appear in defensive tasks. From the aspect of tactical activity, the way of blocking should get special attention. There is a difference between active and passive blocking. Active blocking is obstruction of opponent's kick with the aim to protect one's own vital points and sides. Passive blocks are directed to blocking of particular sides of the body (front or lateral side forward to the rival), without the intention to obstruct certain kick. Blocks in sports fight depend on posture, motion and distance. From the tactical aspect, posture changes, which a competitor performs during blocking and motion that follows blocking, are very important.

Cleaning and throwing are techniques which do not bring points, but they present a preparation for the largest point (sanbon).

Motion capability and distance control largely define competitor's activity in modern karate. Leading European and world karate schools (French, Spanish, English, Japanese...) dedicate great attention in training to these technique elements.

Inductive technical elements give many opportunities of combining. Given partition of technical elements should not be understood literally, because their overlapping is evident in practice.

CHARACTERISTIC POINTING WAYS

Pointing in sports fight can be achieved in three characteristic ways: by attack, interception and counterattack (after defense or avoiding of attack). Dominant way for pointing a score defines tactical profile of the contestant. Two typical ways of tactical behavior that result from this criterion are offensive type of contestant and defensive type of contestant. The offensive type performs pointing by attack, while the defensive type performs his activity as an "answer" to the opponent's activity. We should not understand the definition of the defensive type literally. When he performs active way of fight, a contestant often puts the opponent into such a situation that enables him to score a point by interception or counterattack.

Offensive scoring of points can be achieved in several ways: by single attack, extended attack or reprogrammed attack.

Besides interception, defensive activities can have the following forms: *direct counterattack* (type of defensive activity that neutralizes the opponent's direct attack, after which pointing follows), *direct counterattack with block* (type of defensive activity that neutralizes the opponent's direct attack by block, after which pointing follows), *extended counterattack* (type of defensive activity that neutralizes the opponent's direct attack, followed by several techniques, one of which is pointing) and *extended counterattack with block* (type of defensive activity that neutralizes the opponent's direct attack by block, after what follow several techniques, and one of them is pointing).

DOMINANT ACTIVITY ZONE

The zone in which a contestant starts and finishes his actions shows, to a great extent, his tactical behavior. Although the competition area is not strictly segmented, in observing of sports fights, the square area of some 4 x 4m in the centre is treated as central zone and other space is peripheral zone.

As regards the zone in the competition area, there are two characteristic types: competitors that perform their activity in the central zone and competitors that perform their activity in the peripheral zone. If we regard kicks as pointing techniques in sports fight, then in relation to the center of competition area, we can register points whose paths extend in the direction center – periphery and in the direction periphery – center. The analysis of the activity zone in which realization of particular technical elements is carried out gives a picture of tactical activity in space.

PROCEDURE AND MEASUREMENTS

SUBJECT'S SAMPLE

Final matches for male and female seniors at three European and two world championships were analyzed:

- World Senior Championship - Madrid, 2002. and Monte Ray, 2004.
- European Senior Championship - Bremen, 2003, Moscow, 2004. and Tenerife, 2005.

The sample for analysis at one championship includes seniors' matches. Matches in male competition were analyzed. Men compete in the following categories: up to 60kg, up to 65kg, up to 70kg, up to 80kg, over 80kg and in absolute category (without weight limit). Besides these matches, team matches without weight limit were analyzed. Fifty-five fights were analyzed, that is one hundred and ten contestants in male competition.

VARIABLES SAMPLE

In accordance with the research objective, variables that enable identification of structural characteristics of sports fight in karate were chosen: posture guard, motion, pointing way, pointing technique, technique in pointing attempt, activity zone, point's value, type of points, penalties, way of pointing attempt and outcome of the fight.

Stances were analyzed immediately before pointing or pointing attempts, that is, stance at the beginning of action is registered through the following modalities: high line left (HLL), high line right (HLR), high diagonal left (HDL), high diagonal right (HDR), middle line left (MLL), middle line right (MLR), middle diagonal left (MDL), middle diagonal right (MDR), low line left (LLL), low line right (LLR), low diagonal left (LDL) and low diagonal right (LDR).

Guard was analyzed immediately before pointing or pointing attempt, that is, it was observed at the same moment as posture through the following modalities: high open (HO), high close (HC), middle open (MO), middle close (MC), low open (LO) and low close (LC).

Motions in preparation to pointing or pointing attempt were analyzed. When several techniques were performed, motion that preceded the first technique through the following modalities was registered: slip (SL), step (ST), jump (JM) and double step (DS).

Pointing way was analyzed through the following modalities: direct attack (DA), extended attack (EA), reprogrammed attack (RA), interception (IC), direct counterattack (DC), direct counterattack with block (DCB), extended counterattack (EC) and extended counterattack with block (ECB).

When several techniques were performed, the technique by which pointing was carried out was registered, and pointing technique was observed through the following modalities: kizami zuki (KZ), gjaku zuki dzodan (GZDZ), gjaku zuki cudan (GZC), uraken uci (UU), oi zuki (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/zuki (CZ) and throwing/zuki (TZ).

When several techniques were performed, the technique that was the most approximate to the criteria for assigning points was registered. Technique in pointing attempt was observed through the following modalities: kizami zuki (KZa), gjaku zuki dzodan (GZDZa), gjaku zuki cudan (GZCa), uraken uci (UUa), oi zuki (OZa), mae geri (MGa), joko geri (JGa), asi joko geri (AJGa), mavasi geri dzodan (MGDZa), mavasi geri cudan (MGCa), asi mavasi geri (AMGa), ura mavasi geri (UMGa), asi ura mavasi geri (AUMGa), usiro mavasi geri (UMGa), ushiro geri (UGa), cleaning/zuki (CZa), throwing/zuki (TZa), clening (CL) and throwing (TH).

Activity zone was analyzed at the moment of beginning of the activity whose result was pointing or pointing attempt, through the following modalities: central (C) and peripheral (P).

Point values have the following modalities: ipon (I), nihon (N) and sanbon (S).

Type of scored point was followed through the following modalities: action (A) and penal (P).

Penalties were followed through two modalities: penalty in category 1 (P1) and in category 2 (P2).

Attempt way of pointing was analyzed through the following modalities: direct attack (DAa), extended attack (EAa), reprogrammed attack (RAa), interception (ICa), direct counterattack (DCa), direct counterattack with block (DCBa), extended counterattack (ECa) and extended counterattack with block (ECBa).

Fight outcome was observed through the following modalities: triumph/defeat before the end of regular time (TDBRT), triumph/defeat after expiration of the regular time (TDART), stand-off after expiration of the regular time (SART), triumph/defeat in overtime (TDOT), triumph/defeat by explanation (TDE) and triumph/defeat without fight (TDWF).

Collecting of data was performed by analysis of electronic material of completely recorded final fights from the mentioned championships. Expert evaluation of every registered modality was recorded in special constructed evidence list [10].

STATISTICAL ANALYSIS

Descriptive statistical analysis was done by calculating of the occurrence, expressed from the aspect of relative and absolute values, i.e., as n-th number of frequency (absolute value) and as the percent of the occurrence in the function of the observed modality (relative value).

Analysis of quantity differences was done by application of univariant and multivariant methods, using General Linear Model (GLA), analysis of result variance was done for discovering of the existence of significant differences of middle values and the corresponding variances among sub-samples of subjects included in the research in variables whose results are shown at proportional scale. For defining of the significance of the differences, which are registered in variables that have nominal character Wilks' Lambda was used [2].

RESULTS AND DISCUSSION

STRUCTURAL ELEMENTS OF SPORTS FIGHT

Analysis of numerical and percentual incidence of the modality was presented for every structural element of sports fight. Results were shown in charts and graphs. After that, results of multivariant statistical analysis of modality differences of structural elements of sports fight were shown.

Table 1. Results of multivariant analysis of modalities of sport fight structural elements (Wilks' Lambda).

N	MODALITETY	Value	F	Sig
1	stance	0.095	77.842	0.000
2	guard	0.094	141.572	0.000
3	motion	0.107	222.181	0.000
4	pointing way	0.352	27.092	0.000
5	pointing technique	0.341	13.268	0.000
6	technique in pointing attempt	0.096	44.988	0.000
7	zone	0.099	491.616	0.000
8	points	0.328	107.000	0.000
9	type of points	0.323	108.000	0.000
10	penalties	0.521	108.000	0.000
11	pointing attempt	0.109	102.000	0.000

STANCE

At Figure 1 the results of numerical and percentual incidence of modalities of structural element STANCE are shown.

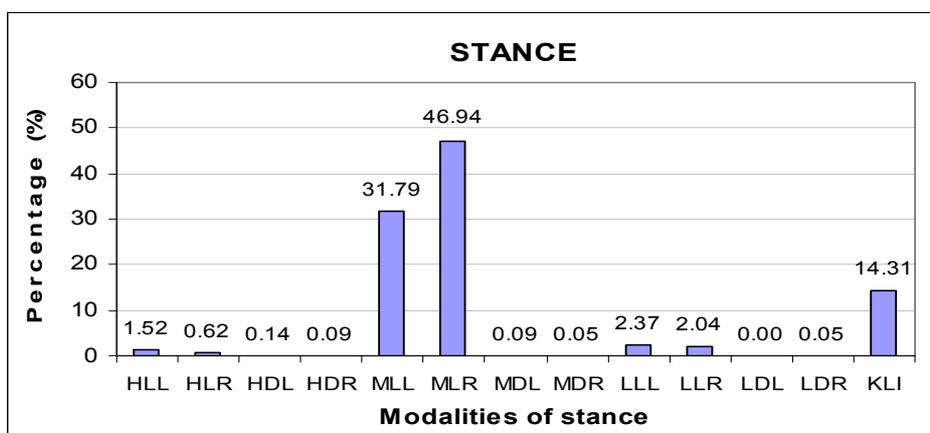


Figure 1. Distribution of modality frequencies of structural element STANCE

Figure 1 shows that the incidence of modalities of the structural element of sports fight STANCE varies. By the frequency of occurrence, middle line right stance (MLR) with 46.9% and middle line left stance (MLL) with 31.8% stand out at one side as the most frequently present and, on the other, there is low diagonal left stance (LDL) that is the least frequent (0.00%), i.e., did not occur.

Based on the distribution of modality frequencies of structural element STANCE, middle line stances have maximum frequency. Having in mind biomechanical characteristics of stances and the observed sample of elite contestants, the occurrence of these modalities can be considered expected. Middle line stance is optimal for tactical actions which imply the possibility to move fast in forward-back direction. In modern karate, activities in this direction are dominant, but line stances enable efficient utilizing of extended arm and leg in pointing and in preparation for pointing [9].

Apart from the fact that left stances are more natural for the right-handed and are favored in school training, using of right stances can be considered as searching for atypical solutions in order to be successful in sports fight. The statement has been confirmed in some previous studies.

The latest rules have led to relatively high incidence of clinch which did not use to be a characteristic of sports fight in karate. Additional reasons for this can be found in the possibility to realize techniques that can bring maximum number of points (points after throwing) and also in the fact that clinch is the easiest way to obstruct the opponent's activity.

Based on the results from Table 1, it can be said that, at the general level, there is statistically significant difference in the distribution of the analyzed modalities STANCE at the level Wilks' Lambda – Value 0.095, $F_{\text{relation}} = 77.842$, $p = 0.000$.

In relation to partial differences, statistically significant difference of appearance of the following postures was defined: high line left (HLL) – $p = 0.003$, high line right (HLR) – $p = 0.019$, middle line left (MLL) – $p = 0.000$, middle line right (MLR) – $p = 0.000$, low line left (LLL) – $p = 0.001$, low line right (LLR) – $p = 0.001$ and clinch posture (KLI) – $p = 0.000$.

GUARD

Figure 2 shows numerical and percentual incidence of sports fight structural element GUARD.

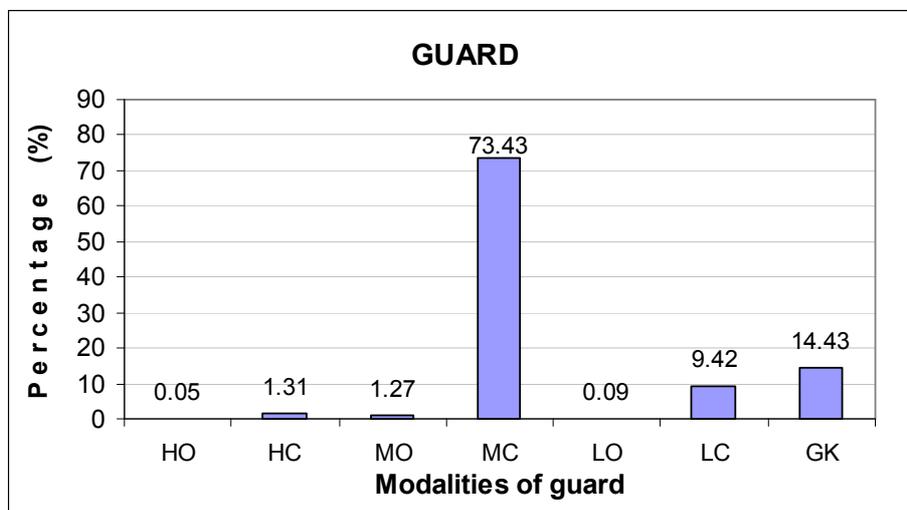


Figure 2. Distribution of modality frequencies of structural element GUARD

Figure 2 shows that modalities of structural element of sports fight GUARD have different frequency. Middle close guard has maximum frequency of 73.4%. Minimum frequency was found in high open guard (0.05%) and low open guard (0.09%).

Dominant frequency of middle close guard is expected, taking in consideration that, from the tactical aspect, this guard is the most appropriate.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference of distribution of analyzed modalities GUARD at the level Wilks' Lambda – Value 0.094, $F_{\text{relation}} = 141.572$, $p = 0.000$.

In relation to partial differences, statistically significant difference of appearance of the following guards is defined: middle close guard (MC) – $p = 0.000$, low close guard (LC) – $p = 0.000$ and clinch guard (GK) – $p = 0.000$.

MOTION

Figure 3 shows numerical and proportional incidence of structural element of sports fight MOTION.

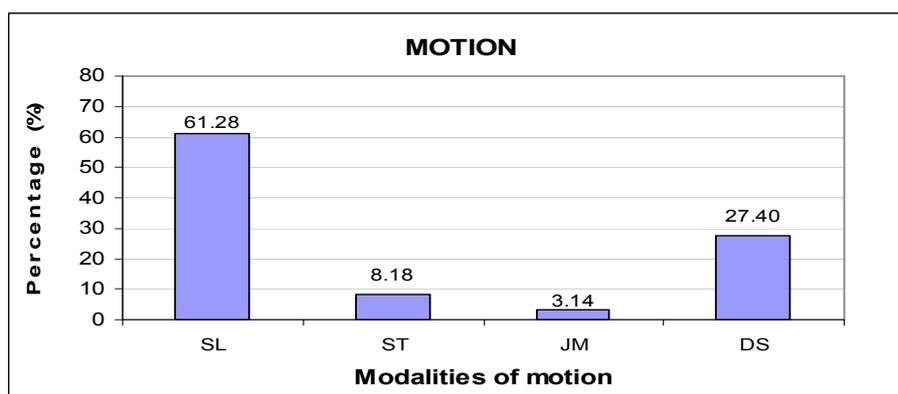


Figure 3. Distribution of modality frequency of structural element MOTION

Figure 3 shows that modalities of structural element of sports fight MOTION differ in incidence. Slip (SL) has maximum frequency – 61.3%. Motion by jump (JM) has minimum frequency – 3.14%.

Motion that is used in preparation for pointing is in close connection to distance. Motion by slip, which has maximum frequency, points to shorter distance from which the fight is led, i.e., from which the pointing or pointing attempt is done. Fighting at shorter distance is very risky and requires exceptional psychophysical readiness of contestants. Motion by slip is more complex in relation to other motions from the biomechanical aspect, and as the sample of elite contestants was observed, dominant incidence was expected.

The distance from which the fight is led and the choice of motion are very important tactical elements that have a great influence on the fight outcome. The statement is verified by the fact that the most successful countries are developing a recognizable school that relies on motion quality and distance control. European contestants are better acquainted with each other's performance, the result of which is a bit higher frequency of using motion by step, jump and double step at the European championships than at the world championships. The reason for this could be searching for new tactical solutions for scoring points.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference in the distribution of the analyzed modalities MOTION at the level Wilks' Lambda – Value 0.107, $F_{\text{relation}} = 222.181$, $p = 0.000$.

In relation to partial differences, statistically significant difference of occurrence of the following motions is defined: slip (SL) – $p = 0.000$, step (ST) – $p = 0.000$, jump (JM) – $p = 0.001$ and double step (DS) – $p = 0.000$.

POINTING WAY

Figure 4 shows numerical and proportional incidence of structural element of sports fight POINTING WAY. Figure 4 shows that modalities of structural element of sports fight POINTING WAY have different frequency. Maximum frequencies were found in direct attack (DA) with frequency of 38.8%,

interception (IC) 23.9% and direct counterattack (CA) 16.3%. Extended counterattack with block (ECB) has minimum frequency 0.00%.

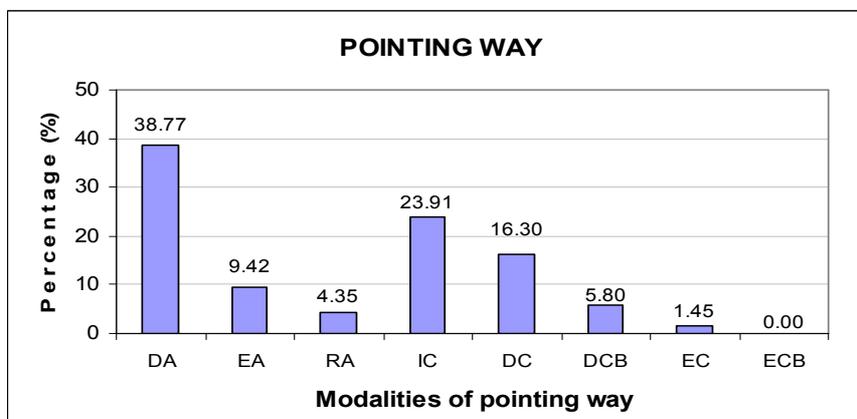


Figure 4. Distribution of modality frequencies of structural element POINTING WAY

Pointing way could be observed more generally than it is interpreted in this research. Characteristic traits of sports fight in karate are three groups of pointing: attack, counterattack and interception. From that aspect, the gained results can be interpreted in the following ways: pointing by attack 52.54%, pointing by counterattack 23.55% and pointing by interception 23.91%. The gained results are very similar to those from previous researches. Trend of bigger pointing from attack is noticed, which could be explained by different informational processes of attack, counterattack and interception [14,15], at one side, and way of judging that favors attack, at the other side. Namely, current rules that envisage the end of fight in case of difference of eight points and judging criterion that favors forward activity resulted in greater freedom of competitors than they used to have [8].

Based on the results from Table 1, it can be said that, at general level, there is statistically significant difference of distribution of analyzed modalities POINTING WAY at the level Wilks' Lambda – Value 0.352, $F_{\text{relation}} = 27.092$, $p = 0.000$.

In relation to partial differences, statistically significant difference in the incidence of the following pointing ways is defined: direct attack (DA) – $p = 0.000$, extended attack (EA) – $p = 0.000$, reprogrammed attack (RA) – $p = 0.014$, interception (IC) – $p = 0.000$, direct counterattack (DC) – $p = 0.000$ and extended counterattack with block (ECB) – $p = 0.000$.

POINTING TECHNIQUE

Figure 5 shows numerical and proportional frequency of structural element of sport fight POINTING TECHNIQUE.

Figure 5 shows that modalities of structural element POINTING TECHNIQUE have different frequency. Maximum frequencies were found in *gjaku zuki cudan* (GZC) with frequency of 34.9%, *gjaku zuki dzodan* (GZDZ) with frequency of 32.0% and *kizami zuki* (KZ) with frequency of 16.4%. At the other side, minimum frequencies were found in *joko geri* (JG), *asi joko geri* (AJG) and *usiro geri* (UG) with total frequency of 0.00%, i.e., they were not present.

The gained results are very similar to those accomplished in former researches. Arm kicks have dominant frequency of 89.09%, in relation to leg kicks with frequency of 8.36%. Disregarding rule changes that favor leg kicks, arm kicks have smaller informational complexity, that is time of programming, as well as better precision, control and characteristics of natural movements [4, 15, 16, 17]. However, trend of light increasing of pointing by leg kicks in relation to results from previous researches, which dealt with high-quality contestants, as well as pointing after cleaning and throwing, was noticed. The above stated is probably the consequence of current rules that evaluate

these techniques two or three times more in relation to arm kicks, and because of that this problem gets more attention in training process.

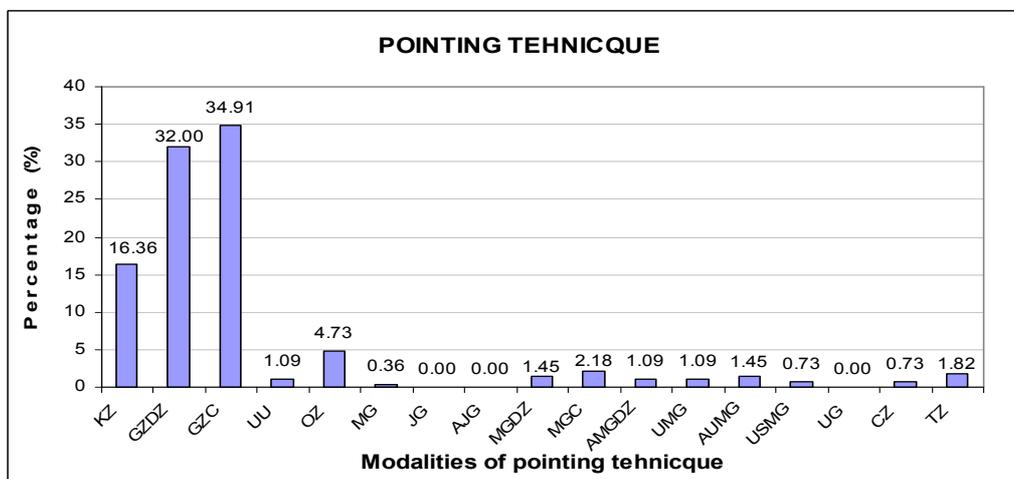


Figure 5. Distribution of modality frequencies of structural element POINTING TECHNIQUE

Kick gjaku zuki has maximum frequency of 66.91%. This kick has the shortest programming time, it is very powerful and precise and being like that it is very suitable in the large number of tactical actions [4, 7]. Besides that, contestant that performs this kick remains protected largely, and that contributes to additional safety. Trend of equalizing of frequency of kicks in head and body, in relation to previous periods is also noticed. The reason for this is probably fewer requirements in criteria that need to be satisfied for assigning points in head in relation to body (except in preciseness) and the same point value for points with hand in head and hand in body.

The third per frequency is kick kizami zuki that has characteristics of natural movement and very short performance duration [17]. Reasons for lesser frequency of this kick in relation to previously analyzed kick (gjaku zuki), we should search in dominant tactical-technical determination of contestant to use forward hand in guard for blocking and relatively high risk of interception.

Frequency of kick oi zuki is something higher in relation to results from previous researches. It is expected that this kick is performed at a somewhat bigger distance in relation to gjaku zuki and kizami zuki, and being like that, it is very easily visible, so the opponent has enough time to react. However, by analysis of fight, bigger distance during performance of oi zuki is not noticed. Contestants that performed this technique, showed great decisiveness and forced the opponent to take back, and so optimal distance for realization of this kick was made. To get a point in the described way, top skill is necessary, which is characteristic of selected sample.

Lower frequency of leg kick is explained in several previous researches [4, 7, 17]. Among leg kick, mavasi geri cudan distinguishes itself, because it has characteristics of natural movement and, by rules designed, lesser control level. During performance of this kick, contestant is better protected than at the other leg techniques and because of that, contestants freely decide to use it.

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

Throwing with pointing presents direct consequence of current rules that, in contrast to earlier, allow fight in clinch and predict maximal appraisal of these actions.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference of distribution of analyzed modalities POINTING TECHNIQUE at the level Wilks' Lambda – Value 0.341, $F_{\text{relation}} = 13.268$, $p = 0.000$.

In relation to partial differences statistically significant difference of occurrence of the following pointing techniques was defined: kizami zuki (KZ) – $p = 0.000$, gjaku zuki dzodan (GZDZ) – $p = 0.000$, gjaku zuki cudan (GZC) – $p = 0.000$, oi zuki (OZ) – $p = 0.001$, mavasi geri cudan (MGC) – $p = 0.033$, asi ura mavasi geri (AUMG) – $p = 0.045$ i throwing/zuki (TZ) – $p = 0.025$.

TECHNIQUE IN POINTING ATTEMPT

Figure 6 shows numerical and proportional frequency of structural element of sport fight TECHNIQUE IN POINTING ATTEMPT.

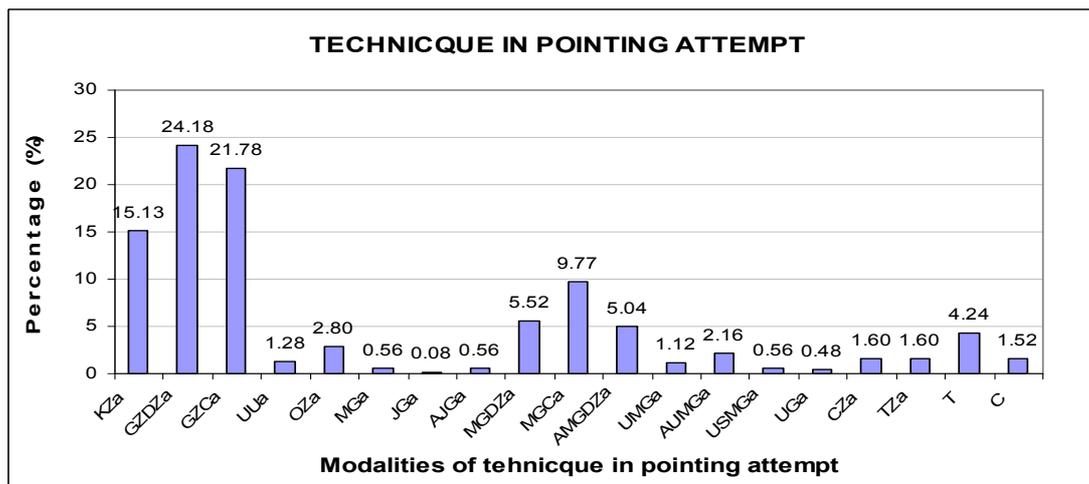


Figure 6. Distribution of modality frequencies of structural element TECHNIQUE IN POINTING ATTEMPT

Figure 6 shows that in pointing attempt, similar configuration of techniques incidence appears like in the pointing techniques. Namely, the highest frequencies were found in: gjaku zuki and kizami zuki, therewith leg techniques in pointing attempt appear in larger percentage than in successful pointing actions.

Frequency of hand kicks in attempt to point is 65.17%, leg kicks 25.85%, throwing and cleaning with pointing attempt 8.96%. The gained data confirm earlier presented statement that leg kicks demand high precision and control level [1] and beside relatively large number of attempts, they result in point.

Based on the results from Table 1, it can be said that, at the general level, there is statistically significant difference of distribution of analyzed modalities TECHNIQUE IN POINTING ATTEMPT at the level Wilks' Lambda – Value 0.096, $F_{relation} = 44.988$, $p = 0.000$.

In relation to partial differences, statistically significant difference of occurrence of the following techniques is defined: kizami zuki (KZa) – $p = 0.000$, gjaku zuki dzodan (GZDZa) – $p = 0.000$, gjaku zuki cudan (GZCa) – $p = 0.000$, uraken uci (UJa) – $p = 0.001$, oi zuki (OZa) – $p = 0.003$, asi joko geri (AJGa) – $p = 0.034$, mavasi geri dzodan (MGDZa) – $p = 0.000$, mavasi geri cudan (MGCa) – $p = 0.000$, asi mavasi geri (AMGa) – $p = 0.000$, ura mavasi geri (UMGa) – $p = 0.004$, asi ura mavasi geri (AUMGa) – $p = 0.000$, usiro mavasi geri (UMGa) – $p = 0.034$, usiro geri (UGa) – $p = 0.014$, cleaning/zuki (CZa) – $p = 0.000$, throwing/zuki (TZa) – $p = 0.000$, clening (CL) – $p = 0.000$ and throwing (TH) – $p = 0.000$.

ZONE

Figure 7 shows numerical and percentual incidence of structural element of sports fight ZONE.

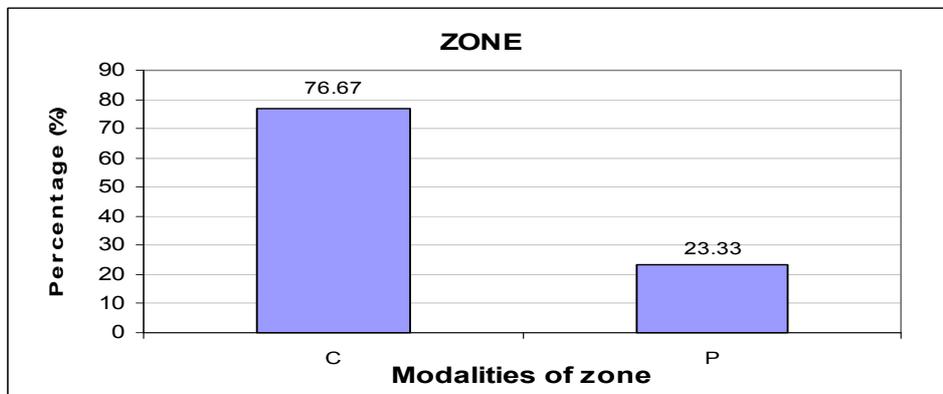


Figure 7. Distribution of modality frequencies of structural element ZONE

Figure 7 shows that the modalities of structural element of sports fight ZONE have different frequency. Central zone (C) has frequency of 76.7% and peripheral zone (P) has frequency of 23.3%.

The analyzed sample of final fights and contestants striving for achievement of better position to pointing and fight control presents basic reasons of dominant frequency of central zone in relation to peripheral.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference of distribution of the analyzed modalities ZONE at the level Wilks' Lambda – Value 0.099, $F_{relation} = 491.616$, $p = 0.000$.

In relation to partial differences, statistically significant difference of occurrence of the following modalities ZONE is defined: central zone (C) – $p = 0.000$ and peripheral zone (P) – $p = 0.000$.

POINTS

Figure 8 shows numerical and percentual incidence of structural element of sport fight POINTS.

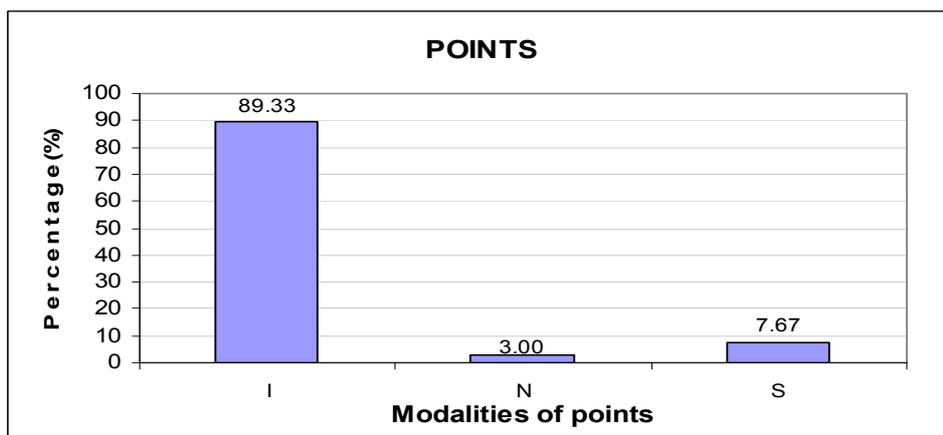


Figure 8. Distribution of modality frequencies of structural element POINTS

Figure 8 shows that the modalities of structural element of sports fight POINTS have different frequencies. Ipon (I) has frequency of 89.3%, nihon (N) has frequency of 3.00% and sanbon (S) has frequency of 7.67%.

If, while discussing point scoring we keep in mind pointing techniques and techniques in pointing attempt, we can conclude that the judging criteria are very strict. Besides, top contestants of similar quality present the tested sample, and because of that it is difficult to expect high occurrence of successful actions that are getting nihon or sanbon.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference of distribution of the analyzed modalities POINTS at the level Wilks' Lambda – Value 0.328, $F_{\text{relation}} = 73.107$, $p = 0.000$.

In relation to partial differences, statistically significant difference of occurrence of the following points is defined: Ipon (I) – $p = 0.000$, nihon (N) – $p = 0.000$ and sanbon (S) – $p = 0.000$.

TYPE OF POINTS

Figure 9 shows statistical and proportional frequency of structural element of sport fight TYPE OF POINTS.

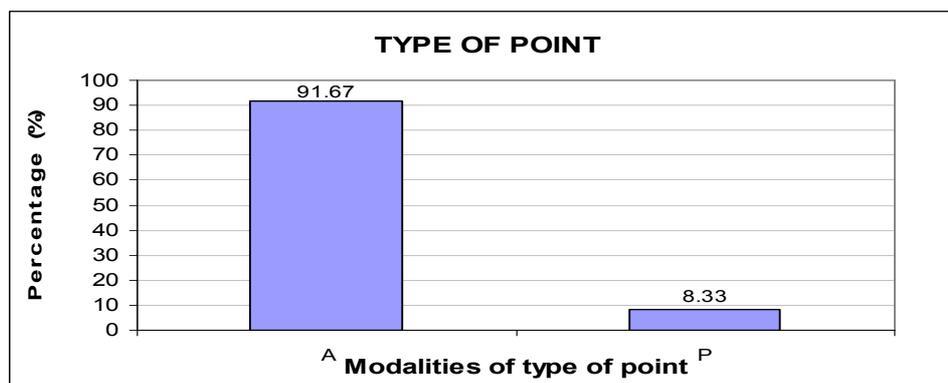


Figure 9. Distribution of modality frequencies of structural element TYPE OF POINTS

Figure 9 shows that the modalities of structural element of sport fight TYPE OF POINTS have different frequencies. Action point (A) has frequency of 91.7%, while penalty point has frequency of 7.3%.

Frequency of penalty points is a little bit lower than in former researches. By analyzing fights it is defined that large number of penalty points is not the consequence of injuring of the rival but presents the result of tactical acting. From this, top quality of analyzed contestants is confirmed.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference of distribution of analyzed modalities TYPE OF POINTS at the level Wilks' Lambda – Value 0.323, $F_{\text{relation}} = 113.349$, $p = 0.000$.

In relation to partial differences, statistically significant difference of occurrence of the following types of points is defined: action (A) – $p = 0.000$ and penalty (P) – $p = 0.000$.

PENALTIES

Figure 10 shows numerical and percentual incidence of structural element of sport fight PENALTIES.

Figure 10 shows that the modalities of structural element of sport fight PENALTIES, for male sample, have different frequencies. Penalties from category 1 have frequency of 58.9%, while penalties from category 2 have frequency of 41.1%.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference of distribution of the analyzed modalities PENALTIES at the level Wilks' Lambda – Value 0.521, $F_{relation} = 49.695$, $p = 0.000$.

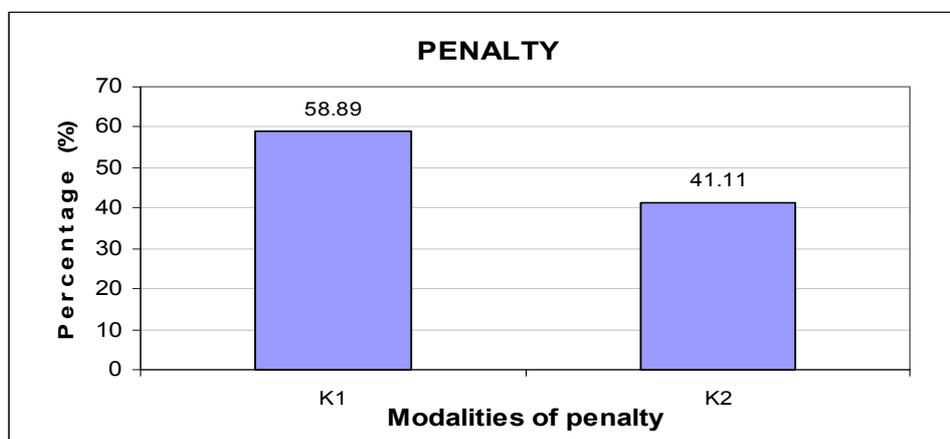


Figure 10. Distribution of modality frequencies of structural element PENALTIES

In relation to partial differences, statistically significant difference of occurrence of the following penalties is defined: penalties from category 1 (K1) – $p = 0.000$ and penalties from category 2 (K2) – $p = 0.000$.

POINTING ATTEMPT

Figure 11 shows numerical and proportional frequency of structural element of sport fight POINTING ATTEMPT.

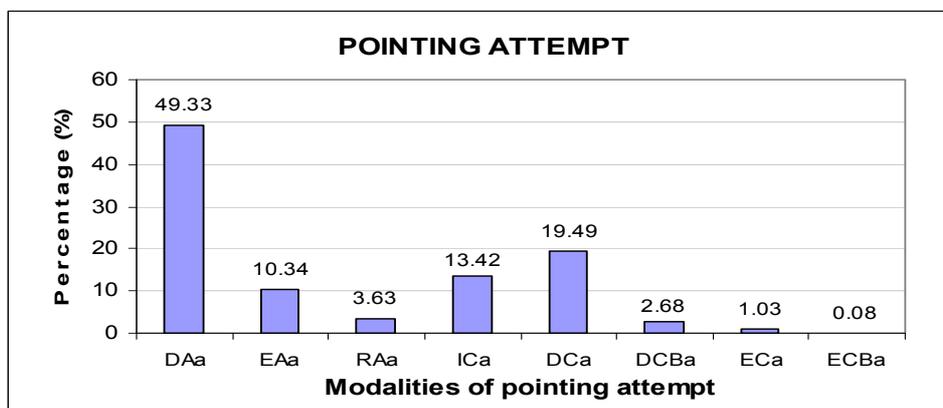


Figure 11. Distribution of modality frequencies of structural element POINTING ATTEMPT

Figure 11 shows that the modalities of structural element of sport fight POINTING ATTEMPT have different frequencies. At one side, maximum frequencies have direct attack (DAa) with frequency of 49.3% and direct counterattack (DCa) with frequency of 19.5%. At the other side, minimum frequency has extended counterattack with block (ECBa) with frequency of 0.08%.

The obtained results can be generalized in the following manner: pointing attempt by attack 63.3%, pointing attempt by counterattack 23.28% and pointing attempt by interception 13.42%. If we compare the obtained results with successful pointing attempt then we can state that pointing in attack modalities has the lowest efficiency, while pointing by interception is highly effective.

Based on the results from Table 1, it can be said that at the general level there is statistically significant difference of distribution of the analyzed modalities POINTING ATTEMPT at the level Wilks' Lambda – Value 0.109, $F_{relation} = 104.290$, $p = 0.000$.

In relation to partial differences statistically significant difference of occurrence of the following pointing attempts is defined: Direct attack (DAa) – $p = 0.000$, extended attack (EAa) – $p = 0.000$, reprogrammed attack (RAa) – $p = 0.000$, interception (ICa) – $p = 0.000$, direct counterattack (DCa) – $p = 0.000$, direct counterattack with block (DCBa) – $p = 0.000$, extended counterattack (ECa) and extended counterattack with block (ECBa) – $p = 0.000$

FIGHT OUTCOME

Figure 12 shows numerical and proportional frequency of structural element FIGHT OUTCOME.

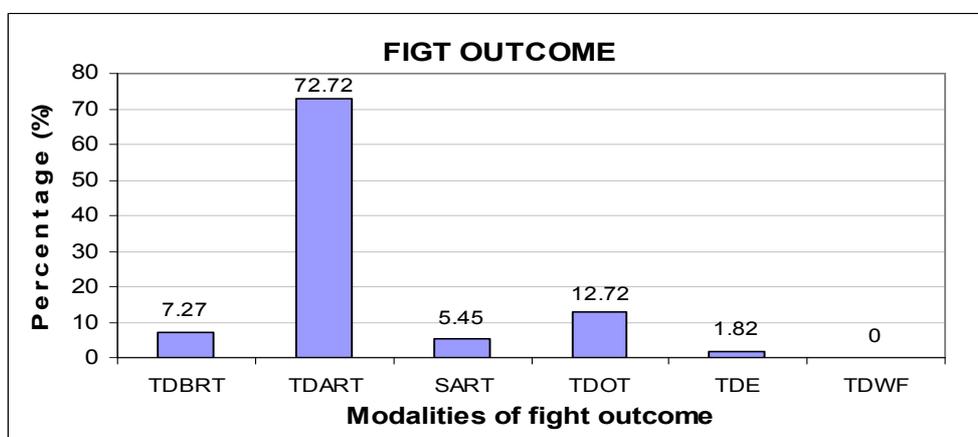


Figure 12. Distribution of modality frequencies of structural element FIGHT OUTCOME

Figure 12 shows that the modalities of structural element FIGHT OUTCOME have different frequencies. At one side, the most frequent is triumph/defeat after expiration of regular time (TDART), with frequency of 72.72%. At the other side, the least frequent is triumph/defeat without fight (TDWF), with frequency of 0.00%, i.e., it did not show up.

Table 2 shows the results of multivariate statistical analysis of modality differences of structural element FIGHT OUTCOME (in particular case because of variable nature, multivariate analysis is used as univariate – two-dimensional).

Table 2. Results of multivariate statistical analysis of structural element FIGHT OUTCOME

Tests of Between-Subjects Effects

Dependent Variable: ISHOD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.000 ^a	0	.	.	.
Intercept	586.509	1	586.509	846.850	.000
Error	75.491	109	.693		
Total	662.000	110			
Corrected Total	75.491	109			

a. R Squared = .000 (Adjusted R Squared = .000)

Based on the results from Table 2, it can be said that at the general level there is statistically significant difference of analyzed modalities occurrence FIGHT OUTCOME, $F = 846.850$, $p = 0.000$.

CONCLUSION

Fifty-five final fights in senior competition at the World championship in Madrid 2002, European championship in Bremen 2003, European championship in Moscow 2004, World championship in Monte Ray 2004 and European championship in Tenerife 2005 were analyzed, with the aim to define structural characteristics of sports fight in karate. Fifty-five matches in male competition were analyzed.

Every fight is analyzed in functional dependence of twelve variables, as follows: posture, guard, motion, pointing way, pointing technique, technique in pointing attempt, zone, points, and type of point, penalties, pointing attempt and fight outcome.

By analysis of sports fight at the observed sample, different quantity values for modality of structural elements are gained. For structural element STANCE, maximum frequencies have modalities: middle line right (MLR) with frequency of 46.9% and middle line left (MLL) with frequency of 31.8%, while low diagonal left (LDL) was not showing up at all. Modality of structural element GUARD, middle close (MC) appears with frequency of 73.4%, high open (HO) with 0.05% and low open (LO) with 0.09%. At the element MOTION, dominant frequency of motion by slip is noticed, with frequency of 61.3%, while motion by jump has the minimum frequency of 3.14%. For structural element POINTING WAY, modality frequency goes from 0% for extended counterattack with block (ECB) to 23.9% for interception (I) and 38.8% for direct attack (DA). In large number of modalities of element POINTING TECHNIQUE, hand kicks gjaku zuki cudan (GZC) with 34.9%, gjaku zuki dzodan (GZDZ) with 32.00% and kizami zuki (KZ) with 16.4% have maximum frequencies, while joko geri (JG), asi joko geri (AJG) and usiro geri (UG) are not used at all. Distribution of modality frequency TECHNIQUE IN POINTING ATTEMPT is different in relation to pointing techniques. Hand kicks in pointing attempt have frequencies of 65.17%, leg kicks 25.85% and cleaning and throwing with pointing attempt 8.96%. Gained results of observed contestant activity, in relation to structural element ZONE, point to dominant fight in central zone (C) with frequency of 76.7%, while peripheral zone (P) has actions frequency of 23.3%. Modalities of structural element POINTS have different frequencies: ipon (I) 89.3%, nihon (N) 3.00% and sanbon (S) 7.67%. Tested element TYPE OF POINT appears as action point (A) in 91.7% of cases, while penalty point appears in 8.33%. PENALTIES are arranged: penalty in category 1 (P1) include 58.9%, while penalties in category 2 (P2) include 41.1%. For structural element POINTING ATTEMPT, the highest frequencies have direct attack (DAa) 49.3% and direct counterattack (DCa) 19.5%. At the other side, the lowest frequency has extended counterattack with block (ECBa) 0.08%. The most frequent fight end at observed element FIGHT OUTCOME was realized through modality triumph/defeat after expiration of regular time, whose frequency is 72.72%, while modality triumph/defeat without fight was not showing up. By analysis of modality differences of sport fight structural elements, statistically significant differences were defined.

PRACTICAL APPLICATION

One of the most important factors for success in sport is knowledge about contestant activity. This research can serve to coaches as an indicator of structural elements of sports fight that need to be observed. Based on the results of this work, training process in accordance with model characteristics of top contestants can be created.

Besides the mentioned, structural elements of sports fight that were analyzed in this work can serve as a basis for creating of a software package for observing and analyzing of sports fight in karate.

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