

Scientific review

ANALYSIS OF HAND TECHNIQUES IN KARATE - BLOCKS

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Abstract: The paper deals with hand block techniques used in karate. Although there is no reliable written or oral information about the earliest techniques, it can be assumed that they were block techniques, due to their self-defense nature and the character of karate skills (of course, after the stance techniques and movement stances, without which no technical upgrade would have been possible). Permanent life-threatening situations have forced man to develop the ability for any kind of defense, applying the so-called 'atavistic', uncontrolled and uncoordinated movements. Via everyday practical application, gradually perfecting above all open and closed hand techniques, the knowledge of the role and possibility of manipulating the fingers and hands, especially the thumb, man has quickly managed to articulate them and convert the movements into effective techniques. From these, original self-defense techniques, techniques and blocks in an almost unchanged form recognizable today were developed. With the skills being transformed to a sport discipline, improving the competing system primarily in fights, with a dominant role of attack and stroke techniques which win scoring points, block techniques have virtually lose their meaning and significance. In order to preserve this technique from oblivion, the former karate skills are applied in katas, some forms of prearranged kumite and kihon within the recreation and health practice mode, where the importance of therapeutic exercise is emphasized. The paper analyzes block techniques from a methodical, biomechanical, technical and tactical aspect, with a display of the scientific research results, which speak of their temporal characteristics, the significance and the role of the sports karate fights. The displayed techniques are illustrated with appropriate figures, images and tables.

Keywords: *technique, self-defense, block, structural element, kihon, kata*

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INTRODUCTION

Although karate today is known almost exclusively as a sports discipline, all available historical data from its beginnings until the beginning of the 20th century attest that it involves the art of self-defense. Only due to the appearance of some form of karate techniques in the school system of Okinawa in 1905², and especially in the thirties of the 20th century thanks to the most famous karate expert Funakoshi Gichin³, this skill began its transformation into sports karate, first across Japan and later around the world. The transformation from a skill to a sports discipline should be pointed out and emphasized, as these changes led to new teaching methods and a new training model, which required that all techniques adapt to new situations. This was particularly true for hand and foot techniques, which until the appearance of the sport were performed according to the Ikken hissatsu principle.⁴

Emphasis on “empty hand fighting” has also impacted training methodology and program content, more in the direction of hand techniques. Along with hand training, with all the striking surfaces that can be used in defense and counterattack primarily by armed attackers, special attention is paid to trainees’ development of their physical and mental status. With daily, difficult and very exhausting exercises, especially via the method of a large number of repetitions of techniques and strengthening the striking surfaces, with time, the practitioner becomes more efficient in self-defense.

Practicing in this way, which results in a highly trained fighter, has also paved the way of the skill of karate as a self-defense discipline. Upgrading training and other techniques, especially leg skills, and links with other, compatible self-defense skills (jiu-jitsu, judo, kendo, etc.), successfully completes a self-defense unit.

Hand techniques, be they blocks or strikes, once used in defending one’s life are today used in modern sports karate in order to attain a sports victory, and they have an identical role and importance.

1. THE PAPER’S THEORETICAL FOUNDATION

1.1. General concepts and hand block features

The word ‘block’ is linked with the defensive character of the techniques applied in response to an attack by an opponent. Although their function is obvious, the mere application of the corresponding block efficiently is very uncertain, delicate and requires exceptional technical tactical training.

² Anko Itosu (1831-1915), a karate expert from Okinawa, considered by many the father of modern karate, who introduced karate in the Okinawa school system in 1905.

³ Gichin Funakoshi (1871-1957), a great Okinawa karate expert known as the creator of sports karate.

⁴ Ikken hissatsu – “to annihilate at one blow”, a Japanese expression denoting the applying of techniques without any control.

Unlike strikes, which in their application (during the performance, and even during contact with the target) do not have to be fully defined, recognized or properly implemented for their final effect to be satisfactory, the use of block techniques disallows improvisation, corrections during performing, especially at the moment of making contact with the target (by the attacker's hand or foot). The consequences can be great as the first contact in defense determines the fate of the person defending himself. After a badly executed block, there is no 'remedial exam.'

Also, sometimes an apparently successfully applied block does not guarantee complete efficiency. By blocking, the body can often prevent the execution of counter-striking or maintain a safe distance from the opponent⁵ This situation can occur due to inadequate selected blocks, bad movement quality and a poor end position in relation to the opponent (a bad position, a 'closed' stance of the body and arm guards per block, which does not allow placing a counter blow or any further action, small or short distance, etc.). It should be borne in mind that it makes a great difference whether the practitioner after the performed block is located in the opponent's 'field of vision', i.e. in front of him or where he can easily thwart any continuation of the action, i.e. be at the 'rear side' of the opponent (Image 1, a and b). For this it is necessary to have a well-developed ability to assess the situation before and after blocking, the ability of quickly processing the current situation and making appropriate decisions about what to do next. Of course, in addition to these expressed cognitive skills, developed motor skills (speed, explosive strength, etc.) are also required, as well as a high level of technical training, above all, movement techniques of a stance and guard. The causes for these weaknesses should be sought primarily in a fully mastered (learned) block, untrained movements, poor assessment of the overall situation and not knowing the basic rules and laws concerning defense against an armed or unarmed attacker, as well as inadequate or poor training conditions in the situation of construction and application techniques (situational training).

Fig. 1. Block applied in two "secure" ways



a) Block on the "secure" side
- favorable



b) Block in the opponent's field
of vision - unfavorable

⁵ It implies distance as well as body position, which as such does not allow the opponent to carry out counterattacks or even any kind of movement.

Because of the possibility of recognition of these favorable or unfavorable situations for which the **intellectual skills of the practitioner** are decisive (perception, perceptual speed, perceptual reasoning, dynamic orientation in space, etc.) as well as highly developed technical and tactical skills, **karate is comparable to a chess game or snooker**, where several moves in advance need to be anticipated. Also, one should possess the ability for **anticipating** (predicting the opponent's actions based on previously presented "perceivable attack techniques").

In applying karate techniques in sports fighting, especially in real, threatening situations, man finds himself in specific psychological conditions (stress, fear), in which calm, maximum concentration and poise is decisive for an effective defense, so that the said cognitive skills can come to the fore. The speed of processing all information in a new situation plays a key role (Mudrić, 2004)⁶. This involves information processes that require high-speed processing of all available data (faster processing of all unknowns - less time required for a response - higher efficiency).

To develop these specific skills, key are certain situational methods in practice, and methods for the development of the central nervous system (hereinafter: CNS), such as:

- the iterative method for developing maximum speed CNS potential,
- the method of developing CNS movement economy,
- the method of developing quality control of efferent pathways,
- the method of improving the mobility of nervous processes,
- the method of improving the resistance of CNS to fatigue,
- reprogramming as a method for developing maximum speed CNS potential.

Although this is a very complex process which can be resolved only by long-term and vocational training, it will not in itself lead to greater efficiency if the applicable principles and rules that describe block techniques are unrecognized. Some of these important features are outlined in the following paragraphs.

More important is a timely reaction and the choice of suitable techniques in response to an opponent's attack, rather than insisting on strength and speed of the used techniques. In a timely and appropriate application of a block technique, their power should be emphasized (in the initial stage of application it is hidden) and the induced pain, which is manifested with the level of contact⁷.

Eliciting pain as much as possible upon completion of the blocking (actual direct contact of bone to bone-shot or a block strike in the muscle)

⁶ The international measuring unit is Bit/sec.

⁷ It has been proven that all information is most quickly transmitted through pain, which is very important in fighting in general. Science has isolated the gene for pain, encrypted as SCN9a.

is very important. Pain paralyzes and at least momentarily distracts and disorients the attacker (depending on pain intensity), thereby creating a possibility for setting a counterstrike and a continuation of the action to its facilitating.

“Blocks can be effective only if they are timely performed, that is, occur at a certain speed and a certain strength. Speed is the physical unit which indicates the distance traveled per unit of time. Similarly, blocks depend on the length of the lever, the mass being moved, the ability to quickly generate force, resistance in the joints of the system in action and the pathway to be traveled. The strength of the blocks is enabled by the eccentric muscle contractions of the extensors and rotators of the elbow joint, the flexors and rotators in the shoulder joint and hands. When performing blocks, the arms act as coupling forces, and, while one is carrying out a block at a certain speed the second is returning to the opposite side at the same speed. The execution of blocks is divided into three phases. The first phase occurs with the increase of speed at all points (segment speeds represented by the speed of the center of gravity of specific body segments) while, at this stage, almost all segments achieve maximum speed. The second phase is characterized by a sudden stopping of individual segments (the body’s center of gravity) and speed stability. The third phase has a relatively steady speed decline at all points” (Milošević et al., 1989).

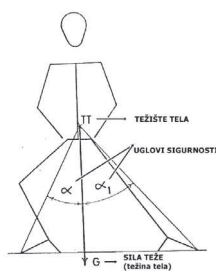
The use of block techniques, regardless of solid basic training and the possession thereof, does not only depend on the skills of a specific technique, but also on complex motor tasks, which include, inter alia, the application of the optimal position⁸ which enables an efficient movement, and which in turn can serve to neutralize an attack even without blocking.

As it is known, blocks are used to defend against attacks which are targeted at any part of the body, whether this involves an armed or unarmed attacker with the aim of destruction. In this context, such an attack is carried out at maximum power and speed. Therefore, blocks must be carried out with great force and speed or better yet, in a **timely fashion**. It is known that in the process of blocking there must be a **stability of the equilibrium position**, in order to apply defensive techniques with more or less success (although sometimes that is not enough). However, to achieve this, the minimum requirements must be met, as well as some basic biomechanical principles applied which clearly determine the notion of stability of the equilibrium position but also clarify how to counteract an unstable balance with certain external forces. Knowing these minimum guidelines gives a clear and unambiguous answer why some blocks

⁸ The basic features of an ‘optimal stance’ are the following: stability, mobility and an efficient manifesting of force during technique application (Jovanović, 1992).

cannot be successfully applied in all positions. The term ‘stability of the equilibrium position’ is defined, inter alia, by the so-called **security angle** (Figure 1). This is the angle which is led by the body’s center of gravity to the “actual border point of the area of support” (Opavsky, 1976). This was highlighted because with such an obtained angle the security situation in the unstable equilibrium type of balance is determined, but only in the direction of the current surface point of support. If the body’s center of gravity is lower and there is a larger bearing surface, then the security angle will be larger, which means that if this angle is greater, the security of the balance position will be larger. Although it appears that this “theory” is understood by all but not well known, there is no use for it in karate practice. In fact, many still apply some of the blocks (especially middle outside or secondary inside blocks - uchi ude uke, soto uchi uke, shuto uke, gedan Barai, teisho uke, tate Shuto uke), by a direct pulling back, **remaining in the direction of the attack**, although this is in stark contrast to the stated term of the safety angle.

Image 1. *The security angle in an unstable balance*

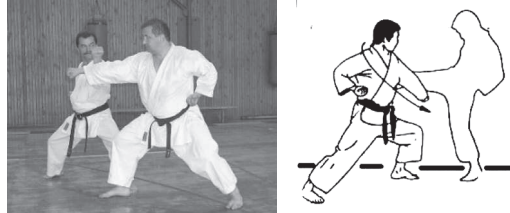


It is completely illusory to think about confronting the power of the opponent by a direct pulling back, regardless of the applied position, due to the small security angle on the sides (Fig. 2, 3 and 3a). The efficiency of blocking and stability at the time of the blocking, by applying middle blocks from ‘the inside or outside,’ can be achieved only by changing the direction of attack, on the side and at the back, and bringing the body into a position at a certain angle relative to the attacker (Fig. 4 and Image 2).

Fig. 2, 3 and 3a. *Block application by remaining in the attack direction – negative*



Fig. 4. and Image 2. Block application by moving from the attack direction – positive

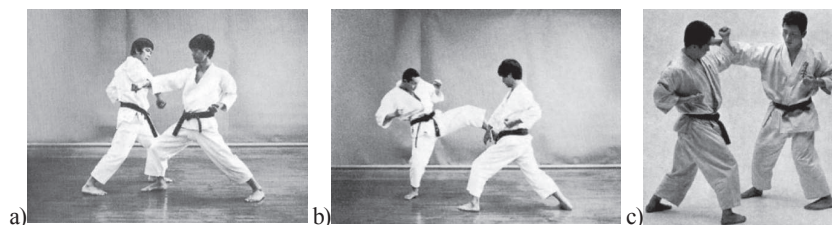


A direct movement away also helps to successfully carry out the so-called **rising blocks** which have the path ‘from the bottom upwards’ (age-uke, juji pike), and **dropping blocks** (otoshi uke, osae uke, juji uke in interception) to be applied according to the principle ‘from top to bottom.’

***Note:** In all defenses from an **unarmed attacker**, blocks and movements that allow moving away from the direction of the attack should be used by using a diverse movement. In defense against an **armed attacker**, there is an insistence on stepping out of the line of attack with any movement. If for any reason the direction of the attack is adhered to, the technique of blocks in **intercepting** the opponent and thwarting attacks in the bud should be carried out. This may be achieved by extraordinary concentration, calm and recognizing ‘a given’ time, with the application of the best trained and chosen technique, with a violent, explosive and for the opponent unexpected forward direct movement. **Intercepting techniques can be applied efficiently only by highly trained karate experts.** Errors that occur in the form of poorly performing techniques, movements, or stances appear in early, basic training and are primarily a consequence of coaches’ ignorance (**coaches without professional or inadequate skills**). Unfortunately for karate club members, karate institutions and sport in general, this situation, a legacy of the past, happens even today. Although modern sports karate is quickly approaching Olympic sports,⁹ there are an insufficient number of qualified trainers. The illusion still prevails that an instructor can be a good coach only with specific technical qualities (belt) and adequate education.*

In karate practice, a known application is also the application of reverse blocks (gyaku) with the opposite hand (e.g. front left stance - right hand block) although this is not taught as a separate technique as it involves rare and coerced situations. Such techniques are applied and used by highly trained karate masters, which are at any time aware of their situation and have complete control over all of their movements (Fig. 5a, b and c).

⁹ Karate will be a demonstration sport at the Olympic Games in Japan in 2020.

Fig. 5a, b, c. *Gyaku blocks*

As has already been said, the application of blocks and their efficiency is very much associated with the movement of applied techniques. In traditional training (karate skills) but also modern training (karate), blocks are learnt and applied by a variety of movements with rectilinear and curvilinear paths. The applied movement techniques may be the following: a direct step backward or forward (*oi coma ashi*), a step backward or forward or to the side (left or right) - diagonally in relation to the main direction of movement, a turn around the front or rear foot (about 90° , 180° or 270° - *tai sabaki*), a dragging step (*yori ashi*), one foot replacing the other (*tsugi ashi*) or various jumps - jump in and jump out (the dominant characteristic of the modern sport of karate; Gužvica, 2000). Movements in the traditional methodology of training were performed with the primary goal to oppose the attacker's high force impact, using appropriate blocks and taking a favorable position with a counter blow. Developments that characterize the modern sports of karate are aimed exclusively at a quick mastering of the distance towards the opponent in the attack, making an impact with a hand or a foot, or avoiding the attacks of the opponents, pulling away to the back or the side to a safe distance without the use of a block technique.

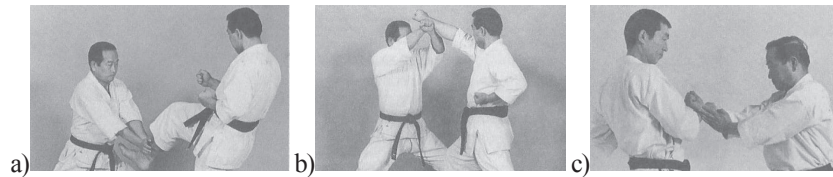
Pursuant to the foregoing, it can be concluded that there have been drastically different roles and functions of movement in the application of block techniques then and now. This knowledge attests to the changing of the methodical image and performance, the importance of development in the function of block application in self-defense as well as in sports karate fights. This imposes a different attitude in choosing the method of training.

In order for a block to be appropriate to the purpose and meet the basic function, the following information is needed:

- Type of attack,
- The strength and skills of the attacker,
- The position of the attacker,
- One's own position,
- The inclusion of all necessary muscle groups which will with their contraction (force) help carry out the block successfully (with larger strength), while the strength of the muscles of the blocking arm should not be relied on.

Blocking techniques can be performed with one or both hands. Simpler and less complex blocks are applied with one hand. This has its explanation and justification in an effective implementation of impact, with the other, free, hand, per executed block. Blocks that engage both arms in defense are mainly carried out in the interception of an opponent's attack and require a high level of technical training, courage and resourcefulness (Fig. 6a, b, c).

Fig. 6a, b, c. Block techniques with two hands



Some studies which have dealt with the different forms of block application among karate competitors claim that Japanese athletes often struggle to apply blocks with one hand while Europeans use both hands as a response to the attack of the opponent (Čorić, 1997).

Also, some results of research projects where the cinematographic method is applied, and related to the time dimension of the block techniques, by monitoring the rate of movement of all center of gravity of the blocked hands claim that blocks last at an average of 0.11 sec. - about 5 m/s (Zulić, 1987). This fact raises the following question: How is it possible at this time to block the strikes that last shorter? The answer lies in the already indicated cognitive abilities, such as, among others, perceptual speed. One answer lies in the ability of anticipation (prediction) of opponent attacks. Namely, each attack is carried out with the desire to destroy the opponent¹⁰, which requires certain motor skills such as speed or force of impact. The desire to achieve power and speed-derived techniques produces additional, so-called countervailing movements (especially 'visible' in untrained individuals), with some parts of the body that may indicate and detect the intentions of the attacker. It is necessary, with exceptional concentration, focus and composure, to spot these 'revealing' movements and promptly react to the 'recognized' technique. Of course, there are different conditions of applying blocks on armed and unarmed attackers. Although defenses from armed attackers are more complex and demanding, the so-called **situational** specific methods serve for practicing and training.

To better understand block techniques, there are sayings or instructions by renowned Japanese karate expert G. Funakoshi¹¹: "Karate is an art for defense against enemies with one strike of the fist" and "Do not make the first step in karate" (Funakoshi, 1973).

¹⁰ The level of destruction depends on whether it is a real conflict or a sport karate fight.

¹¹ Gichin Funakoshi, a Japanese karate master, the creator of sports karate.

Also, here are some instructions for blocks by Japanese instructor H. Nishiyama:

- “Make an effort to turn an opponent’s strength to your own advantage”;
- “Be sure to maintain balance and posture when blocking”;
- “Hands which block should not be preoccupied with this action, as they have to be ready for the execution of the following technique”;
- “Even during blocking you have to keep in mind the counter-attack that you will immediately carry out”;
- “At the time of blocking or later, do not let your position leave you open to the opponent” (Nishiyama, 1959).

1.2. Definitions and systematization of hand block techniques

It can be said that blocks are applied due to the following reasons:

- In order to deflect, stop, redirect an attack or render it inefficient.
- In order to repel the attack by the opponent. In order to realize this, the block must be carried out very powerfully and according to the strike principle.
- In order to unbalance the attacker. This demands a recognition of the best moment for carrying out a block.

Thus there are some definitions of block techniques:

“The defense of the impact, the so-called ‘block,’ reflects the essence of karate: defense is at the same time an attack. Thus, this involves strikes which block strikes” (Jorga, 1968).

“Blocks are movement structures that are realized with the hands and feet with the participation of other parts of the body and which are aimed at preventing the execution of the attack of the opponents in whose realization different abilities take part” (Milošević, 1991).

“The concept of a block in karate indicates a technique that is intercepted, stopped, or deflected or turns the opponent’s strike with a hand or a foot. Although it does not represent a scoring technique in karate, a block reflects the essence of this defensive skill” (Jovanović, 1992).

The very notion of a block is characterized by techniques that can be used to defend against attacks carried out by foot or by hand.

The great range of karate techniques, particularly hand techniques, can be roughly divided into block techniques and kick techniques. Both groups belong to the most important elements of karate. Unfortunately, with the transformation of karate skills into sports events, many of the hand techniques and especially kick techniques (strikes with the fingers, an open hand, elbow, head), were removed from training and almost completely ignored. This reduction of techniques was carried out in the time of a rapid expansion of

karate throughout Japan and the introduction of these skills into education – the school system, which is justified by the fact that it is a technique whose application could cause serious consequences for club members. Learning and practicing these techniques was continued through katas.

Block techniques, along with this method (kata), were trained and learned via a special method of sparring and a half-arranged sparring as well as free sparring.

A block classification can be carried out according to the following criteria:

1. Part of the body carrying out the block,
2. The level of block application,
3. The character of the blocking line,
4. The blocking surface (Image 3a, b, c, d, e, f, g).

Image 3a, b, c, d, e, f, g. Blocking surfaces



Based on the first criterion, blocks are divided into the following:

- Hand blocks (one or both),
- Foot blocks.

According to the criterion of the application level, blocks are divided into the following:

- High, low and middle.

According to the character of the blocking line criterion, blocks can be divided into the following:

- form of movement line;
- block direction.

Based on these two elements, there are the following blocks:

- upwards; downwards; rising; dropping; inside and outside.

According to the same principle as with strikes, blocks are divided into the following:

- block using the open hand (Images 3b, d, e, f, g);
- block using the forearm (Images 3a, c).

1.3. Block techniques in a sports fight

The representation of techniques in sports karate fight has been extensively written about in a master's thesis which lists some basic modality pointing in all kinds of attacks and in defense (Gužvica, 2000). As for applied and scored techniques in the defense system, these are: defense - counterattack;

one-off defense - counterattack; successive defense - counterattack; reprogrammed defense - counterattack (Tables 1 and 2; Gužvica, 2000).

Table 1. Distribution of basic pointing modality frequencies

Category	Attack			UN	Defense-counterattack			UO	Interception			UP	Total Point
	DN	PN	RN		ODN	OPN	ORN		PDN	PPN	PRN		
1	85 47.22%	23 12.77%	9 5.0%	117 65.0%	12 6.66%	3 1.66%	2 1.11%	17 9.44%	43 23.88%	3 1.66%	0 0.00%	46 25.60%	180 100%
2	81 36.7%	28 12.7%	8 3.61%	117 52.9%	33 14.9%	6 2.71%	1 0.45%	40 18.1%	60 27.14%	3 1.35%	1 0.45%	64 28.90%	221 100%
3	65 38.0%	13 7.60%	14 8.18%	92 53.8%	22 12.86%	7 4.09%	3 1.75%	32 18.7%	39 22.8%	6 3.50%	2 1.16%	47 27.50%	171 100%
4	72 35.6%	24 11.8%	13 6.4%	109 53.9%	32 15.8%	8 3.97%	3 1.48%	43 21.3%	46 22.8%	2 0.5%	2 0.50%	50 24.80%	202 100%
5	63 37.5%	14 8.33%	9 5.35%	86 51.2%	33 19.6%	6 3.57%	3 1.78%	42 25.0%	39 23.2%	1 0.59%	0 0.00%	40 23.80%	168 100%
6	72 43.9%	16 9.75%	4 2.43%	92 56.1%	35 21.34%	4 2.43%	3 1.89%	42 25.6%	28 17.07%	1 0.60%	1 0.60%	30 18.3%	164 100%
7	45 31.08%	13 8.90%	5 3.42%	63 43.15%	22 15.06%	4 2.73%	3 2.05%	29 19.9%	48 33.87%	5 3.42%	1 0.68%	54 36.9%	145 100%
Total	483 38.6%	131 10.47%	62 4.95%	676 54.03%	189 15.10%	38 3.03%	18 1.43%	245 19.58%	303 24.22%	21 1.67%	7 0.55%	291 23.26%	1251 100%

Note: Category column from 1-7: 1-Super light, to 60 kg; 2-Light, to 65 kg; 3-Light weight, to 70 kg; 4-Middle weight, do 75 kg; 5-Light heavyweight, to 80 kg; 6-Heavy, over 80 kg; 7-Absolute category, unlimited weight. Attack: DN-direct attack; PD-extended attack; RD-reprogrammed attack; UN-total attacks. Defense - Counterattack: ODN-defense and direct attack; OPN-defense from extended attack; ORN-defense from reprogrammed attack; UO-total attack. Interception: PDN-intercepting a direct attack; PPN-intercepting an extended attack; PRN-intercepting a reprogrammed attack; UP-total interceptions

Table 2. Efficiency based on basic pointing modalities
(attack, defense – counterattack and interception)

Category	Attack			Defense - counterattack			Interception			Total
	Total	Successful	Unsucces.	Total	Successful	Unsucces.	Total	Successful	Unsucces.	
1	752 1	117 0.15	635 0.84	255 1	17 0.07	238 0.93	126 1	46 0.37	80 0.63	1133
2	505 1	117 0.23	388 0.77	203 1	40 0.20	163 0.80	134 1	64 0.48	70 0.52	842
3	703 1	92 0.13	611 0.87	243 1	32 0.13	211 0.87	144 1	47 0.33	97 0.67	1090
4	805 1	109 0.13	696 0.86	272 1	43 0.16	229 0.84	123 1	50 0.41	73 0.59	1200
5	689 1	86 0.12	603 0.87	284 1	42 0.15	242 0.85	113 1	40 0.35	73 0.65	1086
6	675 1	92 0.13	583 0.86	300 1	42 0.14	258 0.86	89 1	30 0.34	59 0.66	1064
7	545 1	63 0.12	482 0.88	187 1	29 0.16	158 0.84	105 1	54 0.51	51 0.49	837
Total	4674 1	676 0.15	3998 0.85	1744 1	245 0.14	1499 0.86	834 1	291 0.37	503 0.63	7252

The small number of scores in the situations of defense and counter-attack attest to the complexity of the information processes that must be observed and solved in a short time period. Namely, it turns out that the once classical techniques of self-defense are the most complex and that for their successful implementation, in addition to high technical and tactical quality, exceptional cognitive abilities of the fighters are also required.

Defense and counter attack are types of activities in which points are made after avoiding or blocking the attacks of the opponent, which requires high levels of concentration, focus, calm and composure.

The paper shows that, regardless of the weak scores, the categories differ. Thus, the highest number of points is achieved in the most difficult categories, which is not an accident. Namely, in these categories there are fighters who, due to their weight, move in a slightly less effective manner, and more points are gained after blocking the opponent's attack, i.e. in defense.

In regards to structural and information complexity, there are three basic types of defense and counterattack:

- single,
- successive and reprogrammed defense,
- counterattack.

In regards to the part of the body blocking, a single defense with a counterattack can be the following:

- with one hand; with both the hands and the feet.

In regards to the direction of movement, a single defense and counterattack can be the following:

- forwards;
- forwards, under an angle – left and right;
- backwards;
- backwards, under an angle - left-right;
- a turn of the protruding leg;
- a turn of the opposite leg.

In regards to movement type, the defense can be the following:

- a step backwards and a drag backwards;
- dragging backwards, a double step and a rotation of the front leg;
- a double step forwards, dragging and rotating the opposite leg;
- rotating the protruding leg, to the side and dragging;
- rotating around the opposite leg, double step, step backwards and side step backwards;
- various kinds of jumps.

The results of this paper in the segment about the scoring system have unequivocally confirmed the trend of further development of this sport, where attacks have a dominant role. The attack generates the highest number of scoring points, followed by the points scored in interception, while in defense

and counterattacks a minimum number of points are attained. This phenomenon can be explained primarily by differences in the complexity of the information process, which must be resolved in order to win points. **It has turned out that winning points while attacking is the least complex, while somewhat more complex is the interception of an opponent's actions, while the most complex processes are those taking place with winning points after a defense.**

This can be further explained through the continuous improvement of the referee system. The introduction of the referee system to a three-point, and later to an eight-point difference, has accelerated the activity of competitors in the attack, unlike earlier, when the competition took place in a one-point battle where the defensive mode of combat was the most dominant.

2. METHODOLOGY OF BLOCK TECHNIQUES WITH MUSCLE ANALYSIS

The hand technique groups are the following:

- **Block techniques (Uke)**
- **Thrust techniques (Tsuki)**

2.1. Block techniques (Uke)

With the development of karate as a system of self-defense, block techniques were also improved and accelerated. A saying of one of the greatest Japanese karate experts confirms this, which in turn gives a good picture of the self-defense character of these skills and in this context, the place and role of blocks: "Start and finish with a block" (Funakoshi, 1973).

The very concept of a block is characterized by a technique which can guard against a strike with the hand or the foot.

The paper presents the most representative classic blocks, from which almost all other hand blocks derive, using the blocking surface, the forearm or the open hand with the fingers. The performance and application cover all three levels of the body, upper level (jodan), mid-level (chudan) and lower level (gedan). Karate also has foot blocks which can successfully defend the region of the chest, from the abdomen to the feet, and which are also an interesting object of attack. Foot blocks use various block surfaces, from the knees, a part of the lower leg to the soles, the side of the foot and the instep. Foot blocks are not the subject of this paper.

2.1.1. Low hand blocks

Blocks which protect the stomach (the chudan region) and below the belt (the gedan region) are called 'low' blocks in karate. These are surfaces that can

successfully defend against attacks, practically presented by all parts of the open hands and one arm (if 'one-handed blocks' are applicable). The blocks that are implemented by using both hands use the same blocking surface. The blocks carried out with both hands are used in specific, critical situations, when the force of the attack should strengthen the basic block with one hand (morote uke blocks) or prevent, intercept the opponent's attack with both hands (juji uke blocks).

Low (dropping) blocks (gedan barai)

A low block is one of the main ones in the spectrum of blocking techniques and it can be said that it is representative, not for reasons of success and features provided by its application, but because in all karate schools basic training begins with this block, according to the established heritage and tradition in training.

Defending all direct attacks which are carried out at the thorax, abdomen and below the belt (the lower part of the abdomen and the genitals) is possible with this technique because of the specific path of the arm itself, from the starting position (Fig. 7a) to the closing, oblique position of the body (Fig. 7). The technique can be successfully applied, irrespective of whether an attack is carried out by the leg (Fig. 8) or by the hand (or a fist or stabbing tool) in the indicated parts of the body.

Fig. 7a, b, c, d, e. *A low block and stages*

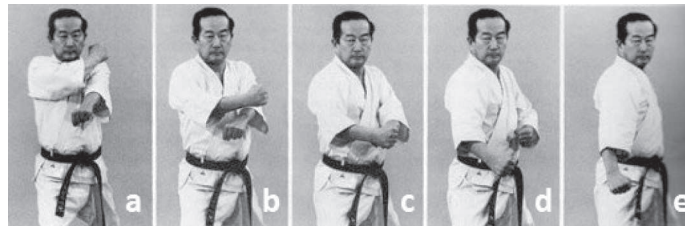
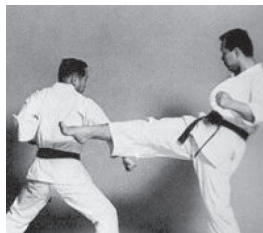


Fig. 8. *Block application*



It is performed very efficiently with the use of diverse movements¹² (steps, sliding or semicircle around the front or hind legs) and almost exclusively

¹² The application of movements depends on whether there is an armed or unarmed attacker but they can be steps, slides, or semicircles on the front and back feet.

in the back and to the side (diagonally from the attacker and at an angle), and moving away from the attack. The application of the block, moving directly in front, is carried out in situations of the so called interception of attackers (mainly blocks with both hands), with a desire to thwart the actions in the start. It can be effectively applied by moving forward at an angle in relation to the attacker (diagonally forward and to the side), using a counter block (gyaku gedan bar). This performance includes exceptional training and spotting the moment the attack began.

The block can be applied successfully in almost every stance, and in particular in the attack.

In the final phase of techniques, the hand that is blocking is stretched in front of the body. The fist is facing upwards and it is located about 20 cm above the knee of the protruding leg (Fig. 7e and 8/4). The fist of the other hand is on the hip. The elbow is maximally drawn towards the spine. The torso and head are upright. The shoulders and hips are angled, thereby reducing the body surface exposed to an attacker, and thus limiting the selection of the attack techniques of the opponent and their application. Such a stance is suitable for setting a strong counter blow, with a maximum rotation of the hips and torso forward with an efficient transmission of force.

The area which is blocked is marked by a part of the forearm from wrist to elbow - part of the forearm in the extension of the edge of the palm, from the little finger - the ulnar part (shown in Fig. 3a, 3c).

A down-block (gedan barai) in the front stance (zenkutsu dachi)

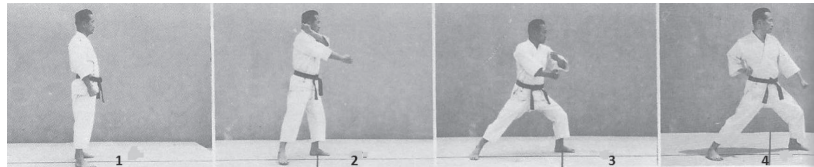
- Stage I: In the preparation stance (Heiko dachi, Fig: 9/1 and 9/2), the hands are in the initial blocking position. The blocking hand is at ear level, above the opposite shoulder (left hand – right shoulder), the fist turned outwards ‘from the head’ (Fig. 7a). The muscles which enable this movement are the following: m. biceps femoris, m. brachialis, m. brachioradialis, m. flexor carpi radialis, m. flexor carpi ulnaris, m. pronator teres. The other hand is extended forwards, in front of the body, with the fist at waist height, the fingers turned downwards, in a supine position (the following muscles take part: m. supinator, m. biceps brachii). The upper part of the body is straight, the eyes directed forwards (Fig. 9/2).
- By releasing the right leg backwards (a leg is attached to the hand that runs the block)¹³, a front stance is taken (Fig. 9/4). At the same time, the hand carrying out the block moves down and in front of

¹³ As a rule, the block is performed according to the principle - same foot-same hand. It is an exceptional situation when the block is made by the reverse hand. This is significant when we consider that the block is followed by a counter punch.

the body, Fig. 9/3 and 9/4 (m. Trapezius; m. Latissimus dorsi; m. Triceps brachii; m. Deltoideus; m. Anconeus; Abdominis obliquity, Rectus abdominis). Carrying out the movement is also supported by the contraction of the leg muscles involved in providing the forward position: for the leg – the muscles of the knee joint (m. Quadriceps femoris, gastrocnemius caputlaterale, m. Soleus) and ankle joint (m. Triceps surae, m. Plantaris, m. Peroneus longus), as well as hip joint (m. Gluteus maximus, m. Biceps femoris, m. Semitendinosus, m. Semimembranosus, m. Piriformis); and the ‘forehead’ muscles - Rectus femoris. The opposite arm at the same time begins to move towards the hip (the engaged muscles that allow the position to ‘twist’ the fingers are the muscles of the supinator muscles: the m. Supinator, the m. biceps brachii (Fig. 9/3), bending, rotating, and ending the movement at the same time). In this way, by using force, the blocking surface is successfully ejected toward the target, while the opposite hand is brought to the starting position for a possible collision.

In the final stage, the hips and shoulders are ‘optimally’ tilted, and the fist is blocked in the extension of the forearm, above the knee of the protruding leg (fixed joint, muscle stabilizers of the wrist and forearm), the torso and head are straight and the eyes are focused straight. The rotation of the forearm is fully executed¹⁴. This is carried out by twisting (pronation) the forearm (m. triceps brachii; m. pronator teres; m. Pronator quadratus - Fig. 9/4).

Fig. 9. 1–4. Blocks in stages



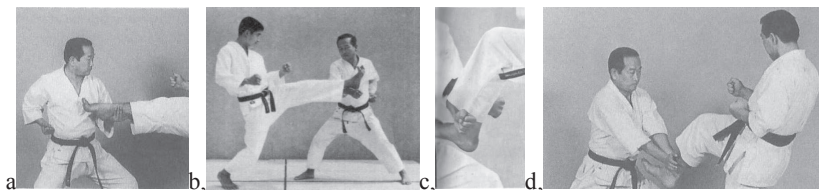
The errors which occur during training are the following:

- The body tilted towards the blocking hand. This error is the result of the conviction that such a stance has a larger blocking power, while the head is unprotected and very close to the attacker, which is very risky.

¹⁴ The pathway of the forearm which insists on rotation (from the starting position of a supine fist, to the finishing, when the fist is prone), is multi-purpose. For one, it represents the ejection of the blocking surface towards the target, and second, a brief (current) contact with the attacker’s arm is enabled (the forearm should slide on the opponent’s forearm). This is important for all block techniques, especially in the process of practicing it, which helps to avoid injuries of the bones, bone and muscle tissue and greatly reduces the sensation of pain and direct contact, i.e. bone collision.

- Raised and stiff shoulders. The shoulders can be “relaxed” so as not to create unnecessary tension.
- Closed hips and shoulders. This stance results in a bad initial position for carrying out a counterattack (a small hand pathway – small applied technique strength).
- A negative position due to a large area of the front of the opponent’s body.
- A fist “broken” in the joint (upwards, downwards or to the side – it should be in the extension of the forward, due to good stabilization and joint firmness).
- As mentioned, there are several ‘low’ blocks, which can successfully and efficiently be applied with one or both hands (unfortunately, not all can be shown here). Some of these blocks are shown in Figures 10 a, b, c, d: Sho sukui uke (Fig.10a), Uchi sukui uke (Fig.10b), Juji uke (Fig.10c), Teisho awase uke (Fig.10d).

Fig. 10a, b, c and d. *Variants of low block techniques*



2.1.2. High hand blocks

The primary function of these blocks is to protect the head, chest and neck of all attacks by opponents by using a fist, open hand or a foot. They can be effective both in the application and in the defense against an armed attacker, stabbing and various objects (knife, stick, etc.), which are carried out by a variety of strikes, mostly from top to bottom, inside and outside. This technique group includes blocks that can be applied with one or both hands, pulling at the back and to the side, but also a movement directly in front, towards the opponent, in order to thwart the attack in its infancy.

High ‘rising’ forearm block - Age uke

The application of a high or ‘rising’ block, taking into account its basic characteristics, is carried out by a variety of movements, most commonly in combat (fudo dachi), exclusively forwards or backwards, and depending on whether it is an attack by an unarmed or armed attacker. The block is applied directly when an attack is intercepted, with the corresponding upgrade of techniques from other martial systems (judo, jiu-jitsu), which represents a qualitatively higher level of

training. An opponent's attack must be fast, unanticipated and carried out in the area of the armpit (biceps femoris), in order to cause as much pain as possible, guaranteeing an undisturbed resumption of action.

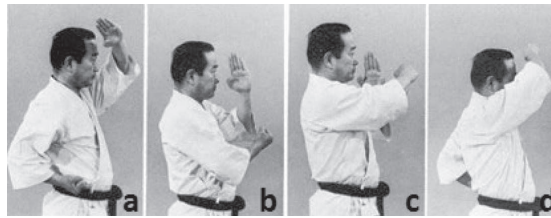
The block surface is identical to that which was applied in the low block (Image 3 - a bone forearm, ulnar axis from the side). The fist is located in the extension of the forearm and forms a tight unit. The position of the fist which blocks is significant, as the 'interrupted' wrist does not engage the necessary muscles that have to participate in moving arms for the block to be effective.

In the final stage, the hand which blocks is bent at the elbow at an angle slightly larger than 90° (upper arm and forearm make obtuse angle), whereupon the fist is in a higher position than the elbow. This position disables a possible 'sliding' of the attacker's fist to the head (one must always take into account the attacker's force). Thus the attack is diverted by the elbow, down and off the axis of the body. The arm is at a level just above the forehead (not covering the eyes), whereby the eyes can focus on the opponent. The blocking surface is about 20 cm away from the forehead, wherein the fist fingers are facing away from the head (pronated fist - Fig. 11). The other hand with the fist on the hip and with the elbow towards the spine creates a starting point for carrying out a counter blow to the front. The trunk and head are straight, the shoulder and hips tilted, while the eyes are focused in the direction of the attack (Fig. 12a, b, c, d).

Fig. 11. Block application



Fig. 12. Carrying out a block in stages



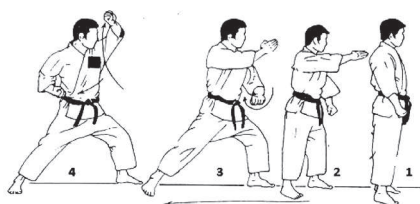
A high block (zge uke) in the front position (zenkutsu dachi)

- Preparation position: (Heiko dachi – Diagram 4/1). The blocking hand is on the hip, in the initial position, while the other is in front of the body. The initial position of the arm can also be the 'opposite hip'.
- In the first stage of the block, the fist with the forearm (blocking) is guided by a pathway in front and mid-level and upwards (Fig. 4/2 and 3). The other arm withdraws towards the hip by using the shortest pathway. At the same time, the front stance is taken by extending the appropriate leg backwards. Any stance can be taken by going backwards, in which the technique can be applied efficiently.
- In the last stage, the front stance is taken (or the chosen position, according to the situation in which the block is applied). The arms are in the position

of a block. The body and head are straight, the hips and shoulder are tilted, while the eyes are focused ahead and at eye level (Fig. 4/4).

The muscles engaged in the movement are the following: upper arm muscles - extension; m. triceps brachi, m. deltoideus, m. trapezius, m. latissimus dorsi, m. seratus anterior, abdominal muscles - m. rectus abdominis, m. obliquus abdominis, arm pronator muscles - m. pronator teres, m. pronator quadratus, m. quadriceps femoris, m. gluteus maximus, m. biceps femoris, m. semitendinosus, m. semimembranosus, m. soleus, m. gastrocnemius, and m. rectus femoris.

Fig. 4. 1-4. Block in the front position

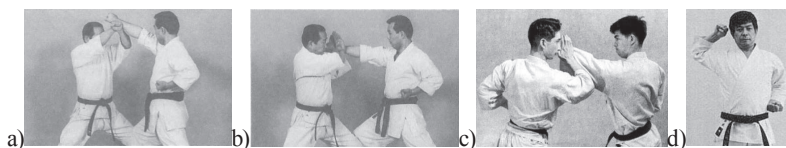


The typical errors are the following:

- The forearm is at eye level, too close to the head. This stance aggravates viewing the situation and carrying out an eventual counterattack.
- The fist and forearm do not constitute a whole (a 'broken' fist joint).
- The body is tilted forwards near the opponent's head, which is not good.
- The blocking arm's elbow is overly tilted to the side, and the fist is outside of the head axis, which opens up space and creates the possibility of receiving strikes directly on the unprotected part of the head.

There are a large number of high hand block variants. Some can be successfully applied in sports battle or a real situation in the interception of an opponent (juji uke - closed or open hands; and Image 13a te nagashi uke – Image 13c), while individual ones, despite the high master level, are more difficult to apply in real situations, but they are applied via some elementary and master katas (sokumen awase uke - Image 13b, naiwan nagashi uke - 13d).

Image 13a, b, c, d. High block variants



2.1.3. Middle hand blocks

The blocks that protect the middle region of the body (chudan region) are called middle blocks. During the application and implementation,

they are characterized by a number of possibilities of diverse motion, backwards and forwards, to the side (at an angle in relation to the attacker), a rotational movement around the protruding feet (front) and reverse (back) legs in a combat stance. Blocks can be carried out very successfully with one or both hands, an open hand, a forearm, or supported by a forearm or crossed arms. In contrast to low and high blocks, including a number of blocks which are today applied exclusively in katas, middle blocks are implemented in all forms of expression, both in real and sports fights as well as sparring and katas. Even though the first blocks learned in school in basic training are forearm blocks (median inside and outside blocks - ude uchi uke and soto uchi uke), this paper presents a palm block (tate shuto uke) because in practice it has been proved to be one of the most efficient ones.

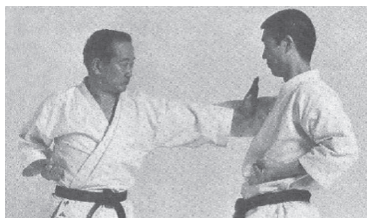
Vertical knife hand or palm block - tate shuto uke

A palm block is specific due to a specially formed blocking surface, which is used in its application. In contrast to other blocks, where the surfaces which make contact with the aim of blocking are fixed in advance and are a part of the forearm, this block specially forms the blocking surface. The formation of the blocking surface may represent a significant problem, because some practitioners have insufficient skills of handling the fingers, the thumb, and the palm. To obtain a surface which is blocked, the hands must be 'broken' in the wrist, with a protruding edge of the palm forward. The fingers are in the extension of the hand, extended and combined, with the thumb bent and close to the index finger (Fig. 3e).

The forming of the blocking surface is enabled by the following muscles: m. flexor carpi radialis, m. flexor pollicis longus; in the middle: m. palmaris longus, m. flexor digitorum superficialis, m. flexor digitorum profundus; from the inner side - m. flexor carpi ulnaris and m. flexor pollicis longus, as well as the finger extensors - m. pronator teres, m. extensor carpi radialis longus, m. extensor carpi radialis brevis, m. extensor digitorum, m. extensor carpi digiti minimi, and m. extensor carpi ulnaris.

The block is very efficient and can be applied in any position, or exclusively by removing oneself from the direction of attack, using the sliding movement, diagonally backwards and sideways (at an angle of about 45° relative to the attacker). However, the fudo dachi block has the most common use in the fighting position because of the opportunities for carrying out various counter hand or foot strikes. Also, it is applied efficiently by an interception with a strike into the muscle of the upper arm of the opponent's hand (m. biceps brachii), which causes high intensity pain, thus providing a smooth continuation of the action (Image 14).

Image 14. *The tate shuto uke block*



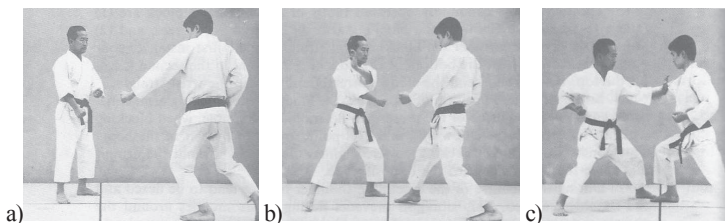
In the block, in any position, the hand which is blocking is extended to the elbow joint, with the edge of the palm towards the target, and the other hand on the hip, with a fist enclosed in a fist and in the preparatory position for performing a possible impact.

The elbow extensor muscles which enable movements are m. triceps brachi, m. deltoideus, m. trapezius, m. pectoralis major, m. rectus abdominis, m. obliquus abdominis, m. abdominis externus, and m. latissimus dorsi. The muscles which secure the front stance have been mentioned earlier.

The palm block (tate shuto uke) in the fight stance (fudo dachi)

- From the initial position (keiko dachi), the arm blocking leads towards the opposite shoulder. The hand is open with the palm towards the ear (the starting position is similar to a low block). The other arm is extended along the body forwards (Image 15a and 15b).
- The arm moves forward rectilinearly by extending and rotating in the elbow joint and the hand, in order to give the palm a blocking position. At the same time it begins with taking the front position, a movement of the appropriate leg, backwards and to the side (Image 15b).
- The front stance is taken in the final position. The arms are in the positions of a block (front arm), while the other arm, with a clenched fist, is on the hip. The body and head are straight, the hips and shoulders tilted, the eyes focused on the attacker (Image 15c).

Image 15a, b and c. *Block in the front position*



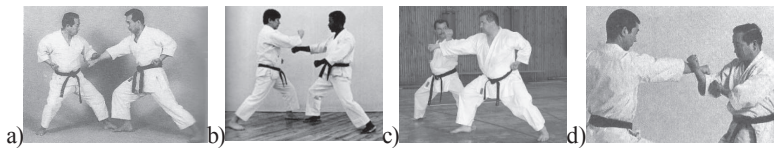
The errors are the following:

- Shoulders raised during the block,

- Slouched shoulders,
- Hand extended in the joints,
- The thumb separated from the hand (instead of joined with the forefinger and the palm).

The blocks which can be applied efficiently in defending the middle part of the body: with an open hand, Te Osae uke, Image 16a; lower arm: Otoshi ude uke, Image 16b; Soto uchi uke, Image 16c and Morote uke, Image 16d.

Image 16a, b, c, d. Variants of middle palm blocks



CONCLUSION

The paper shows block techniques from several aspects, methodical, kinematic, anatomic and biomechanical. In addition to the theoretical framework in which these techniques are formulated and defined, with a short systematization and historical review and genealogy development and application, they are also described via the results of professional and scientific research projects (master's, doctoral theses, etc.) through their time dimension as well as through technical and tactical characteristics of karate competitors, which apply these techniques of sports karate. Also, there are methodological guidelines concerning learning and training, and some of the most characteristic errors that can occur in this process are presented, which correctly round up the presentation of these basic karate techniques.

Hand techniques such as blocks are primordial techniques, which man used in his self-defense. These techniques play an important role in all forms of practicing karate, from self-defense, where these techniques were and remain dominant, through their application in a sports form, where they have a secondary role, to health and recreational forms where these techniques have a therapeutic - relaxing character.

The negative trend of an **unjustified** neglect of block techniques started with the advent of sport karate forms, continued with modern karate, expressed also by the early specialization of trainees, to competitors in fights or katas, which permanently makes irreparable damage to karate in general.

It seems that it is justified, the fear that with the further evolution of karate, nurturing and favoring only the sport forms of karate in which there is no room for blocks (and some other karate techniques) and where its own self-defense character is unrecognized, karate will drown in one of the many '**modern unrecognizable fight sports**'.

REFERENCES

1. Ćorić, M. (1997). *Komparativna analiza tehničko taktičkih karakteristika japanskih i evropskih takmičara u karateu*. Beograd: FFK.
2. Gužvica, M. (2000). *Tehničko-taktičke karakteristike težinskih kategorija u jugoslovenskom karateu*. Magistarski rad. Beograd: FFK.
3. Jorga, I., Jorga, V., Đurić, P. (1968). *Karate*. Beograd: Sportska knjiga.
4. Jovanović, S. (1992). *Karate 1 - teorijska polazišta*. Novi Sad: Sports World.
5. Milošević, M. i sar. (1989). *Specijalno fizičko obrazovanje*. Zemun: VŠUP.
6. Milošević, M. i sar. (2005). *Konstituisanje sistema za upravljanje trenutnim kumulativnim edukativnim i trenažnim efektima (upravljanje u sfou)*. Zemun: VŠUP.
7. Mudrić, M. (2016). *Brzina reagovanja vrhunskih karatista različite specijalizacije merena korišćenjem savremene video tehnologije*. Doktorska disertacija. Beograd: FSFV.
8. Mudrić, R., Milošević, M., Jovanović, S. (2004). *Napad u karateu edukacija i trening*. Zemun: VŠUP.
9. Nakayama, M. (1975). *Dynamic karate*. Tokyo: Kondansha internacional Ltd.
10. Nishiyama, H. i sar. (1959). *Karate*. Tokyo: RVCET Company.
11. Opavsky, P. (1976). *Osnovi biomehanike*. Beograd: Naučna knjiga.
12. Savić, R. (2015). *Zenkucu dači, inovacija položaja stopala zadnje noge*. Beograd: SIA.
13. Spasovski, D. (2009). *Funkcionalna anatomija čoveka*. Beograd: IGP EXCELSIOR.

INTERNET SOURCES:

1. <http://www.nantanreikan.ca/Glossary/O/otoshi%20uke%20waza/otoshi%20uke%20waza.html>
2. <http://www.nantanreikan.ca/Glossary/S/seiryuutou%20uke/seiryuutou%20uke.html>
3. <http://www.shotokankaratemechelen.be/basistechnieken>
4. <http://www.nantanreikan.ca/Glossary/G/gyaku%20uke/gyaku%20uke.html>
5. <http://www.judopourtous.com/PagesAnnexees/UkeWaza.htm>
6. <http://www.nantanreikan.ca/Glossary/T/te%20nagashi%20uke/te%20nagashi%20uke.html>
7. <http://karateyon.blogspot.rs/2010/12/techniques-wado-ryu.html?m=1>
8. <http://tkdkmajorkirjejev.wixsite.com/tekvondo-karate/-->
9. <http://klubcrvenizmaj.blogspot.rs/2009/08/udarne-povrsine.html>