BIOMECHANICAL ANALYSIS OF
KARATE POSTURE  KOKUTSU DACHI

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Was born on 8th of Nov in 1953 in Mitrovica Gradinska, municipality of Virovitica, Republic of Croatia. In Novi Sad, at the Faculty of Sport and Physical Education, on 20th of Sep in 2000 got a scientific degree of a Doctor of Science in Physical Education, (Ph.D) and in 2006 a scientific title – a scientific associate. He has trained karate since 1969, he was a member of a karate national team of Croatia (1974-1988) and Yugoslavia (1981/1982). He is the winner of about fifty domestic and international tournaments. The greatest success he achieved in Toronto, Canada (1987) on The 4th World Cup (IKA), and in Turin, Italy (1988) on The 3rd Champion Cup (IKF) when he was the first. He has worked in a Provincial institution for sport in Novi Sad since 2000 as a manager of a Diagnostic centre and a lecturer on courses for a vocational training of trainers. Dragan Doder has published three books and over 60 scientific papers which are published in scientific magazines, collections and various thematic publications.
Radivoj Vasiljev, PhD

Was born on 25th of Oct in 1966 in Novi Sad. His basic studies he began and finished in a period from 1987 till 1991 on a Training Faculty of a State central institute for the Faculty of Sport and Physical Education in Moscow (GCOLIFK - with honor), M.Ed.1991. Doctorial studies from the area of biomechanics he enrolled in 1991 at the University in Moscow and he finished it with a great success and retained doctorial dissertation from a narrower scientific area, the area of BIOMECHANICS in 1995. Since 2000 he has worked as a senior lecturer on the subject of biomechanics, at the Faculty of Sport and Physical Education in Novi Sad. He is the author of two university textbooks, practicums and over 40 author’s headings. He is the member of an international society of biochemists ISB, a member of section of biomechanics of Russian Academy of Science, a member of a society of sports medicine of Serbia.

Ljubo Javoršek

PRU TV, a master of karate the 7th Dan, a coach of the first class. In 70’s he decided for karate. He established a karate club Shotokan Maribor, which later renamed into the karate club Boris Kidrič. From 1976 till 1986 he was a standard member of Yugoslav karate national team. He won republic championships in a heavy and absolute category. As a member of a national team of Yugoslavia in 1978 he won a gold medal on a European championship, in summer 1979, in Brussels a bronze, in summer 1980 in Bregenz a bronze, in summer 1981 in Manchester a bronze and in summer later in Zurich a silver medal. At the beginning of 80’s he participated on European and world club competitions throughout Europe. He won eight medals at all in kumite. From the disintegration of Yugoslavia, he has worked as a trainer of a Slovenian karate national team. He achieved the first European Youth in the first world spiritual member’s for a separate Slovenia. Because of its aims it couldn’t participate in a roof karate association, Karate Club Boris Kidrič in 1991 was renamed in World Karate-till Shotokan Academy Maribor.

Stevan Pujić

Was born on 5th August, 1948, with residence in Pančevo, Ive Kurjačkog 67b, 26000 Pančevo, is employed at School for Mechanical Engineering "Pančevo", in Pančevo. He specializes in Mathematics and works as a teacher of Mathematics, as well as a karate coach, referee etc. He was the chairman of scientific-expertise symposium in martial arts. He has been practicing karate since 1966, and has participated as a Referee in National, European and World karate championships. He has published a certain number of scientific papers (as an author and co-author) concerning karate, basketball, as well as Information Technology and Mathematics. He lives with his wife and his two sons in Pančevo. Through his work coaching children he has accomplished European and world results in karate.
BIOMECHANICAL ANALYSIS OF KARATE POSTURE KOKUTSU DACHI

(Review article)

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Abstract: In the wide spectrum of technical elements which we encounter in karate as a martial art, very often we encounter with initial points – initial positions which we consider as basic and call them postures. A posture is a taken (fixed) body position in some moment of time, from which it is allowed the most optimal accomplishing of given motoric action (defence or attack). At every posture we differ a static position, which task is to preserve a taken body position and a dynamic start implies a change of that position through its movement. A set task in the paper contains the description of a position Kokutsu dachi through its biomechanical analysis. In our case it was analyzed a dynamic start that means taken initial position after which it comes a movement. Besides, one crossing from a position into a position with a change of a position of torso and extremities was followed. It was noted a structure of a change and crossing from a position into a position through three steps: position capturing, step of movement and position capturing. Karate attitude kokutsu dachi belongs to the category of basic and martial positions. The head is straightened and mildly rotated. Torso, shoulders and a rib cage are in a vertical position, a chest is hurled out, abdominal press is tight, a spinal column is straight. A pelvis is mildly rotated and raised upwards. A front upper leg is bent in a hip at an angle of 30º related to the horizontal line drawn from a joint of a hip. It carries 30% from a total body weight. A longitudinal axis of a lower leg is placed exactly above a longitudinal axis of toes and the centre of gravity is transmitted from a knee a bit before an anklebone. A front lower leg is bent in a knee at the angle of 145-150º and it is placed straight ahead in the direction of movement. Front foot is bent in a knee joint at the angle of 110º and it is placed straight ahead in the direction of a coming movement. Back upper leg is bent, taken and rotated in field in a joint of a hip. Back lower leg is rather bent in a knee joint and it holds the body weight of 70%. Back foot is bent in an anklebone and related to the direction at the angle of 85-90º. At the movement in this position the most important is the pressure on the front foot, in view of the base responds with the same pressure directed to upwards; that is the energetic potential which should be gathered through knees in the lower part of a stomach and then transform it into the movement by moving the focus in all directions. It is important the stability in the position but as well as flexibility in knees during the contact with the base and the rotation of heel of a front leg.

Key words: a basic position, capture, movement, characteristic mistakes.
INTRODUCTION

Karate, as a martial art, consists of a very wide range of technical elements. One of the basic elements of karate which is responsible for the correct performance of a technique is positions. In the research it is being observed a basic posture Kokutsu dachi, by the analysis of the literature and defining the problems which encounter in work with beginners through its anatomic-morphological analysis, as a static-dynamic posture.

Postures which are present in karate practice appeared by the performance from natural postures (Jovanović, 1992), and each of the postures has a lot of variations of performances (Okuyama, 1997). The posture in karate technique implies a specific position of a body (Jovanović, 1992), and conditions for a good position and a kick depend on a constructed powerful and stable base, from which all parts of a body must together influence harmonically as one totality (Mudrić, 1991). There are clear expressed technical differences at postures in karate (Strićević, 1997), as well as at the existence of mutual characteristics such as:

- The purpose of a posture
- The base of a posture (defined by the area of a support)
- The depth of a posture (the distance between the foot in a front and back surface of a posture)
- The width of a posture (the distance between the foot in a front-lateral surface)
- The height of a posture
- The direction of a posture (it determines if the posture is front or back)
- The position of a foot (the position of a foot has an important role because it is often changed from one posture into the other with the change of a foot position)
- Bending in knees (it depends on the height of a posture, the position of a body focus is changing, and posture is moving by a simple movement and a change of a degree of knees' bending)
- The focus of a posture (the moment when the posture is in a final phase with all attributes of a relaxation)
- The interior state of a regularity of a captured posture (biomechanic, mental, energetic aspect)

Speaking about the role of a position for the kick and a posture (Šumar, 1984) points at the fact that the posture for the kick in karate is mostly related to the position of lower parts of a body. Powerfully, fast, irreproachably and smoothly the technique could be performed only if it has a powerful and stable base. The upper part of a body must be firmly placed in that powerful base and the lower part of a body upright to be vertical related to the base.
The posture could be defined by the following elements (Jovanović, 1992):

- The posture of a foot (the distance, the angle of a longitudinal axis)
- Mutual relation of feet segments
- The posture of a projection of a body focus related to the surface of a support
- The posture of hips, torso and shoulders

Postures besides have a multifunctional importance for the efficient application of a technique of a defence and an attack (Doder, 1983, Jovanović, 1992). That is first of all manifested in providing:

- Stability;
- Mobility;
- Optimal anatomic-biomechanic conditions for the demonstration of maximal muscular power.

During defining of postures (Jovanović, 1992) introduces a new term, an immediate support which content is not clearly defined related to fixed terms in biomechanics such as the surface of a support and a criterion for the evaluation of a stability (Donskoy, 1971; Donskoy & Zatciorsky, 1979; Vasiljev, 2001).

During the analysis, the posture is necessary to describe, observing from the point of view of biomechanics and anatomic-morphological features of a human constitution. The suggested algorithm (Vasiljev, 2001) body posture and the activity of powers on it describe the position of a body and its segments in the space (picture 1 and picture 2). For the model of a description of a human body it is considering the model (Zatciorsky et. al. 1981) of 15 segments where is observing the position for each of the segments.

![Picture 1. Definition of place of body in space (Vasiljev, 2001)](image)
In order to perform analyzed techniques better and to study the body position, it is necessary to resort to the visualisation that means to the description in pictures and that do if it is possible at various angles, in order that specific characteristics connected with the body position and segments would be noticed better and studied more.

![Diagram of External and Internal Forces](Vasiljev, 2001)

**OUTGOING RESEARCHES AND ANALYSES OF A POSTURE KOKUTSU-DACHI**

Karate posture kokutsu dachi belongs to the category of basic and martial postures and the group of kihon kumite burui (Strišević, 1997b). The posture Kokutsu dachi is also called a back posture (Doder, 1983; Božić & Slović, 1984; Vračar 1997; I. Jorga, V. Jorga & Đurić, 1968; Mudrić; 1991). The body in Kokutsu dachi is in an asymmetric position, and we differ two types of this position: left and right kokutsu dachi. The posture got its name according to the foot in a back position of a posture which carries a bigger part of a body weight (Strišević, 1997). Because the body focus is placed a little bit backwards (Vračar, 1997) this posture is suitable for the attack, defence (Jorga, et. al. 1968: Božić et. al. 1984) and for the counterattack (Nakayama, 1966; Vračar 1997). In the counterattack it is going from the blockade, by the crossing in the front posture zenkutsu dachi (Nakayama, 1966; Modrić, 1968), from where counterhits of hands or kicks are successfully applied (Mudrić, 1991). Kokutsu dachi posture is suitable for blocking of hits as well as an attack with a forward leg (Modrić, 1968; Javoršek, 2008), and from this posture it can move fast backwards. In kokutsu dachi the most often is practising the exercise shuto-uke technique which symbolizes karate, as well as the other blocks and hits of hands and kicks (Vračar, 1997). The old masters on this posture checked how much the participant conquered the basic technique (Jorga, et. al. 1968) and give it a great importance (Doder, 1983). Kokutsu dachi is a hard posture for learning and it is one of two the most hardest postures in a traditional karate (Strišević, 1997b). By stretching out of the back leg and surpassing of the body weight on a front leg, from this posture it can easily come in zenkutsu and vice versa (Modrić, 1968). Zenkutsu dachi and kokutsu dachi are real tests of such hard learning and bringing of a skill till the perfection and it is a
challenge for karatists on all levels, how for beginners as well as for experienced pupils (Stričević, 1997a). When it is performed as a part of a kata, a completely adopted kokutsu dachi makes a good impression of a stability during moving forward (Stričević, 1997b). This posture is present in pupil's and master's katas so it should make an effort that sportsmen learn it well and improve it (Vračar, 1997; Javoršek, 2008). No matter on an early application in a kata, kokutsu dachi is not suitable for confrontation with a real opponent. Its combat version of kokutsu kumite dachi is used more often in a fight than kokutsu dachi (Stričević, 1997). When a martial posture is concerned, it could be said that the posture of kokutsu kumite dachi is suitable for situations from which are performed mae geri, yoko geri and mavashi geri. Because of a higher focus, kokutsu kumite dachi has a bigger mobility forward and backward. In order to practise correctly performing of kokutsu kumite dachi you should strike a basic kokutsu dachi and a leg in a front position of a posture puts closer to the leg on which you are leaning on, at the same time stretchening out the knee (Stričević, 1997b).

CHARACTERISTICS OF KOKUTSU DACHI POSTURE

During the description of a posture Kokutsu dachi, a body is upright (Oyama, 1997) and turned half-lateral (Jorga, et. al. 1968) or lateral for ¾ toward the opponent (Donovan,1991). Torso and a head are upright, the view in the height of eyes is directed to the direction of moving (Mudrić, 1991). During capturing this posture both legs are bent in knees (Donovan,1991). A front leg is a little bit bent in a knee (Stričević, 1997a; Vračar, 1997; Jorga, et. al.1968), so that a lower leg makes an angle of 60 degrees with the base (Božić & Slović 1984). This leg cannot be stretched out because in a real fight it could be broken (Vračar, 1997). The foot of a front leg is directed forward (Nakayama, 1966; Božić & Slović 1984; Donovan, 1991) much more to the opponent (Jorga, 1968), and the same we can say for the knee (Mudrić, 1991). A back leg, with a maximum bent-prominent knee aside (Mudrić, 1991), is turned (Jorga, et. al. 1968), and in a field (Gigov & Ilić, 1979), so that a knee is placed vertically below the peak of a big toe or toes (Vračar, 1997). Toes of a front foot are tightened (Oyama, 1997). The foot of a back leg is slightly strained forward and inside (Nakayama, 1966), simultaneously a knee is straining as much as it is possible in order to get a strength-a stability of a posture and on it are deceased considerably more than the half of a body weight (Jorga, 1968). A higher and a lower leg of a forward leg mutually make an angle bigger than 90° (Mudrić, 1991). From the level of knee bending of both legs it will depend how much is the weight arranged on them and as well how much is the height of a posture (Stričević,1997b). Pelvis with the line of a forward leg forms an angle from about 45°, while the shoulders are turned more forward (Mudrić,1991). Knees, also, make a mutual angle from 80°-90°, while shoulders and a pelvis should be as much as possible in the line of a forward leg (Doder 1983).
The joint of foot of a back leg bears great tightening and that's why it is necessary to make an effort to capture the correct posture (Jorga, et. al. 1968), and knees bear great tightening, how the posture would be conexal (coherent) (Pujić, et. al. 2003). When a distribution of a load under the foot of a front and a back leg is concerned, expressed in (%), we find that there are various opinions at recognized karate masters. In a table 1 there are presented the values of the relation of a load of a back-front leg in a posture Kokutsu dachi expressed in (%) at different authors.

**Table 1**: The relation of a load a back-front leg

<table>
<thead>
<tr>
<th>Authors</th>
<th>A front-back leg (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Stričević, 1997&lt;sup&gt;th&lt;/sup&gt;</td>
<td>70 : 30</td>
</tr>
<tr>
<td>2 Modrić, 1968.</td>
<td>70 : 30</td>
</tr>
<tr>
<td>3 Oyama, 1977.</td>
<td>70 : 30</td>
</tr>
<tr>
<td>4 Jorga, et. al. 1968.</td>
<td>More than 50%</td>
</tr>
<tr>
<td>5 Pflüger, 1988.</td>
<td>70 : 30</td>
</tr>
<tr>
<td>6 Božić &amp; Slović, 1984.</td>
<td>75 : 25</td>
</tr>
<tr>
<td>7 Vračar, 1997.</td>
<td>70 : 30</td>
</tr>
<tr>
<td>8 Nakayama, 1966.</td>
<td>70 : 30</td>
</tr>
<tr>
<td>9 Mudrić, 1991.</td>
<td>75 : 25</td>
</tr>
<tr>
<td>10 Donovan, 1991.</td>
<td>60 : 40</td>
</tr>
<tr>
<td>11 Doder, 1983.</td>
<td>70:30</td>
</tr>
<tr>
<td>12 Kajtazi, 1997.</td>
<td>70:30</td>
</tr>
<tr>
<td>13 Pujić et. al. 2003.</td>
<td>75 : 25</td>
</tr>
</tbody>
</table>
The posture of legs and their relation is such that heels are in the same line (Doder, 1983; Vračar, 1997; Donovan, 1991), so that heels cut the line which is conducted through the middle of a front foot (Nakayama, 1966) and they make a determined angle which values differ at various authors (table 2).

**Table 2:** The angle which feet make in a posture Kokutsu dachi according to the various authors

<table>
<thead>
<tr>
<th>Authors</th>
<th>A back-front leg (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Stričević, 1997b.</td>
<td>80-90°</td>
</tr>
<tr>
<td>3  Jorga, et. al. 1968.</td>
<td>Back aside, front directed to the opponent</td>
</tr>
<tr>
<td>4  Nakayama, 1966.</td>
<td>90°</td>
</tr>
<tr>
<td>5  Božić &amp; Slović, 1984.</td>
<td>90°</td>
</tr>
<tr>
<td>6  Vračar, 1997.</td>
<td>80-90°</td>
</tr>
<tr>
<td>7  Mudrić, 1991.</td>
<td>90°</td>
</tr>
<tr>
<td>8  Donovan, 1991.</td>
<td>More than 90°</td>
</tr>
<tr>
<td>9  Doder, 1993.</td>
<td>90°</td>
</tr>
</tbody>
</table>

When a length of a posture is concerned and its values there are also different opinions. The values from various authors are shown in the table 3.

**Table 3:** The values of a length of a posture Kokutsu dachi according to the various authors

<table>
<thead>
<tr>
<th>Authors</th>
<th>The length of a posture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Stričević, 1997b.</td>
<td>2 widths of shoulders</td>
</tr>
<tr>
<td>3  Jorga et. al. 1968.</td>
<td>Something narrower than 2 widths</td>
</tr>
<tr>
<td>4  Nakayama, 1966.</td>
<td>80 cm</td>
</tr>
<tr>
<td>5  Božić &amp; Slović, 1984.</td>
<td>2-3 hip widths</td>
</tr>
<tr>
<td>6  Vračar, 1997.</td>
<td>2 shoulder widths</td>
</tr>
<tr>
<td>7  Mudrić, 1968.</td>
<td>2 foot widths</td>
</tr>
<tr>
<td>8  Doder, 1983.</td>
<td>2 shoulder widths</td>
</tr>
<tr>
<td>9  Pujić et. al. 2003.</td>
<td>3 foot lengths</td>
</tr>
</tbody>
</table>

The base of kokutsu kumite dachi is similar to the base of kokutsu dachi, but it is much less compared with it, from which we can conclude that this is more unstable posture. The stability is weakened in order to increase the mobility and the progression of a body. This is in compliance with basic principles of a fight where the mobility is the most important. Therefore, kokutsu kumite dachi in its physical form under different names is often seen in a practice in karate styles which are oriented to self-defence. This
posture originally was a part of a kata of older karate styles, but in the late 1930' it was replaced with its basic variant in order to get more workout effects from practising of a kata (Stričević, 1997b).

In the text of his book, the master Okuyama, 1997, puts the question: „How would we know which of them is the correct position?“ At the same we get the answer: „That during the work, the teacher-the master supervises the pupils during the movement in katas and gives corrections for strengthening (stabilization) of a position.‟

A good posture helps the maintaining of the balance and it is the base of all techniques. The loss of a balance is one of the causes of a defeat, and learning of the maintenance of the balance through the good posture helps and leads to the victories on competitions (Toguchi, 1987).

The conditions for a good posture and a kick will depend on the progress in learning. An irregular posture influences on the work of unnecessary muscles and such which decreases the speed and the power of the movement, as well in the case of one specific position there is the difference in a form in different moments. The form of a specific position is different in a preliminary stage and is different in the moment when the technique is applying (Šumar, 1984).

Some methods of a training are useful for learning the position (Šumar, 1984), also, there are possible some auxiliary exercises in order to provide easier overcoming of a basic technique (Mudrić, 1991).

Capturing the posture

From the posture Hachi dachi

In order to capture kokutsu dachi as an initial position you can use the posture "L". Capture the posture "L", turn the toes of a leg on which you are leaning several degrees inside, easily bend a knee and move 70% of a body weight on a leg in the back position of a posture, and the other leg move straight forward (Mudrić, 1991; Stričević, 1997). The leg which is not the support moves forward for two widths of
shoulders (Mudrić, 1991). From the degree of knee bending of both legs it will depend which weight is arranged on them and which is the height of the posture (Stričević, 1997).

From the posture Heiko dachi
Step out from heiko dachi. The shoulders are straight while they are moving forward. In the last 25-30cm of a length of a posture it is necessary to rotate torso. This exercise should be repeated several times in order to achieve a high level of practice because this technique can be used as an efficient way of defense. (Stričević, 1997).

![Picture 5. Capturing the posture]

Kokutsu dachi posture is most often being performed from heiko dachi in that way that a left leg is moving straight forward capturing the position of a front leg kokutsu dachi. The back leg stays in the same place, only the foot is rotating in the field, forming with the front leg kokutsu dachi (Gigov & Ilić, 1979).

**MOVEMENT IN KOKUTSU — DACHI**

There are different ways of movement in karate, and the basic are **horizontal** (sliding in, sliding out, steping across to steping, from steping and moving of the focus of the body), **vertical** (moving of the focus of the body upwards and downwards), **cyclic** (15º-30º, 30º-45º, 45º-60º, 90º, 180º, 270º and 360º) and **diagonal** (15º-30º, 30º-45º), (Dačić, 1998).

Steping out in kokutsu dachi (picture 6): an important rotation of a heel of a front foot must be well in synch with moving of the weight (the centre of the focus of the body). A significant effort and
coordination are necessary to move fast the whole weight forward on a controlled way and to stop immediately.

The movement of a foot (rotation) of a pivot-leg is already finished while the centre of the focus of the body is moved in the position which is being searched, and the other leg stops the movement of a body when it is made the contact with the ground.

A step backwards in Kokutsu dachi (picture 6): because the body weight is already significantly supported by the back leg / foot, transmission of the centre of the focus of the body is happening almost immediately. In the moment of a more stable position, it is easy to make a rotation (now) of a front foot because now there is only a small weight left.

Also, exercise slowly these steps in order to achieve a complete control during all movements.

![Picture 6. Steping in kokutsu dachi](image)

It must be mentioned that the other types of stepping out (which include transmission of the other complex simultaneous movements) possible on a high level of a technique (Kljenak, 2004).

We pull a back leg, bent in a knee, forwards. In the transitional phase, feet are joined and knees contorted, the back leg by the rotation of hips extends the movement forwards for two lengths of shoulders while the back leg is only rotating. A front foot related to the back makes a right angle. During the movement it is necessary not to change the height, pull the hips forwards and not to separate feet from the ground (Doder, 1983).
A back leg directly and in a linear way comes to the front, feet are parallel, and knees bent and without a delay directly and in a linear way goes forward, becoming the front leg kokutsu dachi. Here it is also important not to change the height and movement does in a linear way - without a delay (Gigov & Ilić, 1979).

**Shortening of a lateral distance by the change of the posture**

The simpliest way to shorten a lateral distance and to come closer to the target is to move from one posture into the the other. In one situation that is achieved by the movement from kokutsu dachi into kiba dachi. When you do this, the focus is slightly moving forward in a lateral level, enough to be in a correct position for the attack on the desired target. All the time, guard and a correct body position should be maintained. The head holds upright, the view is directed to the direction of an action, parallel with the ground.

![Picture 6. Shortening of a lateral distance by the change of the posture](image)

When you take that new position you should strike a balance fast. If you are not able to set up a complete balance, that will reflect on the result of a technique which you perform with a new posture (Stričević, 1997b)

**Shortening of a horisontal distance**

On the picture 7 it is shown the example of shortening of a horisontal distance by lengthening of kokutsu dachi in a deep zenkiitsu dachi. In order to perform this combination, you must practise not only flexibility and the depth of zenkutsu dachi but a skill of a need for fast removal from one posture into the other and developing of a necessary body progression. Here is also the best way for the development of this skill a repetition of a desired combination with the opponent and without him.
Increasing of a horizontal distance

On the picture 8 it is shown the example of increasing of the horizontal distance by applying of one posture into the other and by avoiding of the opponent's attack. The crossing from a front into the back posture would be enough for avoiding of the attack which is small in depth. The best way of a self-defence is an efficiently fast body progression. During crossing from one posture into the other, first we do the pressure on the front foot, lower part of a stomach, in order to perform pre-step later. It is important the stability in the posture but also the flexibility in knees.

CHARACTERISTIC MISTAKES

It is easy to capture the wrong posture. Because of that pay attention on the following: don't bend the neck or stick out the chin forward. Stick out chests, don't let them sneak in. Lift hips and push forward. Don't let your behind stick out backwards. Direct your view to the object in the height of eyes. Try not to look to the ground (Toguchi, 1987).

According to Donovan 1991, it is necessary to pay attention on the following details: Back should be upright and without the inclinations in any direction, hips must be turned laterally for ¾ and both legs bent in knees.

The focus of the body is moved in the direction of a prominent leg. This mistake often appears because the beginners have already overcome „a front posture“, that means because of a difficult adoption of a movement of knee opening of a back leg in the final phase of a movement (Mudrić, 1991).
Too wide posture. Desiring to achieve a bigger stability, beginners in practicing of this complex posture move a prominent leg aside, outside, giving to the posture an irregular width. Fundamentally it is allowed that feet are in the same line, the most for one foot length, and the stability of the posture is accomplished by the contraction of engaged muscles. A prominent hip backwards. The mistake is most often the result of a weak mobility of a hip or irregularly captured (Mudrić 1991).

'A hollow' knee of a 'back' leg. The mistake can be the result of a weak mobility of an anklebone and a knee joint, or what is the most often case, of the irregular position of a foot of a 'back' leg (when it with the foot of a prominent leg makes an angle less than 90°), because of the wish to reduce the effort in the posture. The reason is for sure weak bands of an anklebone.

An extended 'front' leg. This mistake appears because of the complete surpassing of a body weight on the back leg, and it is connected with an often appearance of lifting of the focus of the body with the aim to lighten the endurance in the posture (Mudrić 1991).

The greatest attention on trainings is given the training and practising of postures. During all the classes of a karate school, it is demanding from the beginners to capture technically correct posture not only during practising, but also when in these postures is done training of the other techniques. It is necessary to insist constantly on the body descending in the posture, by which it is provided the necessary stability for the later work on the training, in sparing and in a sports fight.

Besides, a constant endurance in a correct posture has a positive influence on strengthening of all engaged, and especially leg muscles and jointed bands (Mudrić 1991).

**PRACTISING OF THE POSTURE**

A left and right version of Kokutsu dachi should be practiced in sequence but also individually. If you want to develop dynamics and a mobility of Kokutsu dachi we recommend you for that to use a karategram of basic techniques. As a load necessary for the development of an explosive power and a stability it can be used an elastic rubber. When it is performed as a part of a kata, a completely adopted Kokutsu dachi makes a good impression of stability while moving backwards (Strićević, 1997).

In order to practice correctly performing of Kokutsu kumite dachi you should capture a basic Kokutsu dachi and a leg in a front position of a posture put closer to the leg which you are leaning on, at the same time stretching the knee. Moving of the focus of the body beneath is present during passing from martial postures of kumite dachi in fundamental postures (Dačić, 1998).

In order to give a practice a specific sports level it is recommended to use a guard while performing a posture. A middle guard in Oi position is the best combination for Kokutsu dachi (Strićević, 1997)

After short meeting with basic parts you begin with the training of a correct posture. The best is to capture one posture and after that to go on the other posture, turning without lifting the foot. Of course,
upper legs must not be lifted or lowered while passing from one posture into the other. Hold the hands on the upper leg while performing these movements (Nakayama, 1966).

Capturing and practicing of a back posture from a previous captured riding posture.

1. From a riding posture a foot and a knee of a left and a right leg is rotating outside for 90° related to the other leg (a foot and a knee).

2. By moving of the focus of the body toward a 'back' leg it is performed a slightly overthrowing of a body weight, with a simultaneous maximum opening of a knee of a ‘back’ leg outside and bringing (slipping under) a pelvis under the torso.

3. By the rotation of feet and knees of a prominent leg and hips, it is easily returning into an initial, riding posture.

In the next phase it is exercising by turns capturing of a left and a right posture. When capturing of a correct posture is practised, the movement is practising as a unique totality (Mudrić 1991).

Capturing and practising of the back posture from a previously captured posture of parallel feet (a heiko posture)

1. A foot of a right (or left) leg is pulled to the foot of the other leg and it is in a linear way stucked out forward for two widths of shoulders (Mudrić 1991).

2. When a foot of a prominent leg reaches the length of a posture, there is a rotation of a foot and a knee of a 'back' leg outside for 90°. During sticking out of a foot, the body weight is naturally moving with one part on a 'back' leg, so in this exercise it is necessary to pay attention on a length of a posture and a position of a focus.


Because a movement is being performed in phases, it is practising as a unique totality (Mudrić 1991).

**Subsidiary exercises**

Practicing of a movement forward and backwards of Kokutsu dachi. An elastic band is put below the gi and it is tightened around the hips in order not to fall. The resistance should be like that it develops an explosive power during the progression (Stričević, 1997b; Dačić, 1998).

- Staying in a correct posture with a maximum contraction of all engaged muscles.
- Fast capturing of a correct posture with a maximum contraction of all engaged muscles and opening of a knee of a 'back' leg in a final phase of a movement.
In a preparation for practising of a back posture and during the training, beside exercises for the power of abdominal, leg and back muscles, there are also applied exercises 'groin sitting' and determined exercises in 'pairs' (Mudrić 1991).

The description of a position of specific segments – moving from a basic posture

It is necessary to emphasize that a body in a phase of moving is the least stable and in that moment it is very easy to perform it from a balance position, and its position can be defined as a limited stable way of a balance.

The description with the help of a segment and algorithm model of a body posture

The position of a body during capturing of a posture Kokutsu dachi could be described by the application of algorithm (picture 9) on the following way: Depending on the load on a left and right half of a body, a posture Kokutsu dachi is *asymmetrical*, and according to the relation of a body with a support it is *a posture of a body with a lower support* which is performed via both feet. Analysing the position of a body in a space we notice that it is *vertical*, while according to the shape of a balance it is *stable*, which can be confirmed through projections of a position of a general centre of a focus of a body which is placed closer to the back leg, while the angles of safety in a front and back part of a posture which characterize stability along a sagittal axis, are significantly big and approximately equal. From outer powers which influence on a body are a gravitation and a power of a reaction of a support which is expressed through feet with surfaces of a support. These two powers are mutually balancing because on a captured attitude doesn’t influence powers of an environment in which the body is placed (in our case they are neglected). From inner powers there are muscular powers which are active in a collusion with passive powers which are formed in ligaments and joints. On a picture 9, it is presented a computer model, a multi segmental model of a posture monitored from different angles.

![Picture 9: A computer model of a posture Kokutsu dachi with a different angle of monitoring (sagittal up left and down right, transversal up right and frontal down left)]
The description of a position of specific segments – a basic posture

- A head is upright and slightly moved aside because of a torso rotation and it is a result of an asymmetrical position.
- A position of a torso - it is in a vertical position, chests are hurled out, abdominal press is tightened, a spinal column is in the position of a double «S».
- A rib cage with a shoulder zone – is in a vertical position but only more rotated
- A pelvis is slightly rotated backwards of that side where the leg is back, a little bit drawn in (flexed) because of a mutual relation of muscles of a torso of a front (m. rectus abdominis i m. obliquis ext. et int.) and back side (m. ext.torso). A pelvis is lifted by the power of a lower part of an abdominal press.
- A left upper leg (front) – a leg is bent in a hip at the angle of 30° related to the horizontal line pulled from a joint of a hip. Because it carries 30% of a total body weight, muscles of a front part of a leg, m. quadriceps fem. bear less load, so that a knee is in a correct position ( turned forward). A side axis of a lower leg is placed exactly below a side axis of toes and a focus is transmitted from a knee somewhere in front of an anklebone, and more on toes of a front carrying leg.
- A left lower leg (front) – a leg is bent in a knee at the angle of 145-150° and it is straight forward, in the direction of a movement, no way aside.
- A left foot (front) – a leg bent in an anklebone at the angle of 110° and it is straight forward, in the direction of a future movement.
- A right upper leg (back) – a back leg is bent (extended), taken (abduced) and rotated in a field in the joint of a hip, so that muscles stabilizers maintain that position and during setting up of a movement firstly influence by their power of elasticity. An active participation in a motion takes m. gluteus max.
- A right lower leg (back) – a back leg is very bent (flexed) in a joint of a knee (art. genus) and it carries a body weight of 70% with the help of m. Quadriceps of a front part of a leg, and completely in an anklebone (art. talocruralis), so that on the tension and lengthening of stabilizers from a back side of an anklebone at the moment when it is setting up a motion influences a power of elasticity of Achilles' heel on muscles of a back part of a leg of a lower leg (m. triceps surae) which performs a movement of stretching of an anklebone (planto flexion), transmitting the movement on the whole leg via a knee and a joint of a hip (art. coxae). There also participate muscles of a back part of a leg (m. biceps femoris, m. semitendinosus, m. semimembranosus) and a front part of a leg (m. quadriceps femoris).
A right foot (back) – is completely bent (flexed) in an anklebone (art. talocruralis), and related to the direction of movement at the angle of 85-90°.

The description of a position of determined segments – movement from a basic posture

It is necessary to emphasize that a body in a phase of passing is the least stable and at that moment it is very easy to perform it from a balance position, and its position can be defined as a definite stable way of a balance.

Dimitrijević (1998) emphasizes: „that it is necessary to practise transferring of a body weight and a focus itself in the same level at capturing of the other postures, first of all Zenkutsu dachi, then Kokutsu dachi and finally Fudo dachi as a final posture which itself contains elements of all, and as well as on the flexibility of passing from one into the other. It is very important a concentration on one support which is mostly placed in the contact of a foot, more precisely a heel with a ground, at the preparation for passing from one posture into the other or during performing of a movement such as Yori ashi and Kae ashi.

Controlling of the muscles which are not loaded with the body weight in postures, because by their contraction in fact we get an exceptional impulsive contraction which multifunctionally increases effect of postures and movements as well as the other techniques. First of all, it should always have in mind the pressure which should perform via a foot in a contact with a ground. As regards that a ground returns by the same pressure but only directed up, that is an energetic potential which should be gathered through knees in a lower part of a stomach and then transform in a power of a kick, a block etc. Secondly, every pressure that means contraction and relaxation is followed by analogous breathing, tightening and relaxing of a stomach.

DISCUSSION

In parts which are related to the values of angles and positions of body segments, we notice that in texts of Japanese authors we do not encounter with the values of angles in joints and precisely defined criteria which those who exercise should satisfy. So for example, Okuyama, (1997) and Oyama, (1997), lean more on the view that means the demonstration of a technique at the same time leaving the reader to conclude by himself about the values of angles. Okuyama, (1997) especially emphasizes that a criterion for a regularity of a posture which is being performed gives a master during his work with a pupil. Through that approach in work is noticeable a great influence of Eastern philosophy: that teaching and master’s position cannot be taught through letters, words and formulae but only through a direct energetic-information method of giving a knowledge on the relation a teacher-master pupil. West
pragmatists in the analysis of a posture try that strictly limited (what we can notice by reading and comparing the values of angles for some segments and a posture of a segment itself) define something which belongs to the inner state of a person who practises. If we capture the correct posture (what is being talked about in the text of Oyama in 1977) with our inner state and a physical body we fell the regularity of a captured posture. That’s why we can conclude that the regularity of a posture, not only in the posture Zenkutsu dachi, is defined with the ratio between segments and an inner state which confirm it. It is necessary to have in mind that for a physically regular posture it is very important factor a type of a constitution (Rajšić, 1995), its morphological characteristics, on which individual characteristics of a posture are defined for everybody independently.

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