

FACTA UNIVERSITATIS

Series: **Physical Education and Sport** Vol. 12, N° 3, 2014, pp. 227 - 239

Original research article

## DIFFERENCES BETWEEN KARATE PRACTITIONERS OF VARIED COMPETITION ORIENTATIONS IN SPECIFIC MOTOR TESTS RESULTS

UDC 796.853

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**Abstract.** *The aim of this study was to examine the difference between the karate practitioners of varied competitive orientations in the results of specific motor tests. The sample consisted of male karate practitioners, aged 12 to 14, who are engaged in a regular training process, and compete in the current system of competitions in the Karate Federation of Serbia. The study included a total of 79 karate practitioners, out of which 37 practitioners take part in fighting, 23 contestants in kata and 19 practitioners who compete in both disciplines. For the evaluation of specific motor abilities, 6 tests were applied: (Gyaku zuki, (GZ), Oi Zuki (OZ), Mae geri, (MG), Kizami-Zuki, from a guard (KZG), Gyaku zuki from a guard (GZG) and Mawashi-Geri from a guard (MVG), where the screened participants selected the representative techniques. The measurement results of the investigated competing groups were statistically analyzed to help obtain answers to the set hypothesis. The research results show that the contestants oriented towards katas scored the worst results on all tests, and that the factor competitive orientation was significant for all tests. In addition, a very important finding in the context of the studied problem is the fact that the best results in almost all of the tests were achieved by the participants not yet definitely directed towards one discipline and who compete both in katas and kumite. Overall, the obtained results confirm that there are significant differences in almost all the tests, and that they are especially important in the older age groups, based on which we conclude that the hypothesis of the existence of significant*

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Received September 09, 2014 / Accepted November 11, 2014

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*differences between the different karate competition orientations is the result of the specific motor tests is completely confirmed.*

**Key words:** karate, kata, kumite, competition selection.

## 1. INTRODUCTION

Combat sports are a group of sports which are markedly subjected to a variety of changes reflected on changing the image of the competitive activity, training technology and requirements in their scientific research treatment. These changes are primarily expressed through the emergence of a number of “new” martial arts sports with completely changed trends relating to the permissible number of techniques, limitations in the destruction control, forbidden activities and standards requirements in the competitive application of the techniques. Also, one notices the tendency relating to the occurrence of the frequent changes of competitive rules in almost all martial arts, frequent involvement of younger aged children in the training and competition processes, as well as the emergence of the growing interest of the female population in different martial arts (Jovanovic, Cirkovic and Kasum, 2001).

The programming of the training process in the individual sports in this group is still considers a particularly sensitive and delicate methodological problem in martial arts, which have several competitive disciplines. A typical example of this kind of sport can be karate, which comprises two competition disciplines: kata and kumite. Training in this sport begins by applying a joint program in the first phase, then it continues with a directed training in the two technical sub-areas (the technical basis for kata and the technical basis for the fight), and in the third phase, the training process is implemented for the separate groups of athletes selected for specific competitive disciplines (Mudrić, 2010).

Planning and programming of professional work in differentiated disciplines, as is the case in karate, represents a significant problem, because there are not enough research results which focus on different aspects, and precisely define the specifics of these two competition disciplines (Milišić 2007; Bompa & Carrera, 2005).

Success in many branches of sports and disciplines depends largely on specific motor abilities, which, in fact, represent the acquired conditioned reflexes occurring in any given sport as a result of the specific training work; however, without the basic motor abilities, which are the foundation, there will be no good results. Specific motor abilities differ in the sports games of athletes depending on their playing positions. For example, in basketball in a point guard or a center (Stojiljkovic, 2003), in gymnasts, depending on the apparatus on which they compete (floor routines, horse vault, the bar), and in martial arts on the type of technology that is applied in any given time (strikes, movement, defense).

Specific motor abilities of the karate practitioners are formed as a result of the unique training process in karate. The process insists on the adoption of the standard school technique that gives a distinctive motor image of karate stances, movements, blocks, kicks and other forms of movements adapted for competition in this sport (Jovanovic, 1988; Koropanovski, Dopsaj, & Jovanovic, 2008). At the same time, one should bear in mind the afore mentioned specificity of karate in terms of the existence of the two competition disciplines: kata and kumite. This detail is particularly important for the training process and development of the karate practitioners, as there are significant differences in the criteria for the competitive application of the techniques in these disciplines.

Different requirements of the competitive disciplines are primarily reflected in the standard school model technique for kata and fighting. Namely, the standard school technique for kata (KIHON KATA VASE) is characterized by precisely defined positions, movements, punches, blocks, and other elements of the techniques with standardized details of the technical performance, whose departure is sanctioned in assessing the competitive performance of the kata. Techniques are significantly formal, performed in a well-established order, sometimes relatively slow and in relatively low stances (Imamura, Yoshitaka, Uchida, Nishimura, & Nakazawa, 1998).

When it comes to a standard school technique for fighting (KIHON KUMITE VASE), the requirements are slightly different in terms of a somewhat freer form, with the possibility of modifying the application, depending on the changing conditions of fighting. A sporting match consists of freely chosen offensive and defensive actions that are carried out in relation to the opponent (Imamura, Yoshimura, Nishimura, & Nakazawa, 2002), and the typical feature of this kind of technique is that it is performed in a combat stance.

The subject of this research are the differences between karate practitioners of different competitive orientations in the results of specific motor tests.

The aim of the study was to determine the difference between karate practitioners of different competitive orientations in the results of specific motor tests.

In relation to the goal and purpose of the research, the hypothesis was set as follows: There are significant differences between different competition orientation karate practitioners in the results of specific motor tests.

## THE METHOD

### **The sample of participants**

The sample consisted of karate practitioners, all male, aged 12 to 14, who are engaged in a regular training process, and compete in the current system of competitions in the Karate Federation of Serbia. The study included a total of 79 karate practitioners, out of which 37 contestants participated in fighting, 23 contestants in kata and 19 participants who competed in both disciplines. Criteria for the selection of participants was their having at least 2 years of continuous training period of time, which can be considered as a minimum for the adoption of the technical basis for the competitive performance in selected competitive disciplines. The participants were active members of karate clubs from Novi Pazar, Raska, Sjenica, Kosovska Mitrovica and Zvecan. Measurement was organized in the sports hall where the karate practitioners train, on the correct surface where the training and competing in this sport take place (tatami).

### **Sample of measuring instruments**

For the evaluation of specific motor abilities, 6 tests were applied (Gyaku zuki, (GZ), Oi Zuki (OZ), Mae geri, (MG), Kizami-Zuki, from a guard (KZG), Gyaku zuki from a guard (GZG) and Mawashi-Geri from a guard (MVGG), where the screened candidates selected the representative techniques. Punches and kicks which comprised a part of the mandatory content of the basic training for all the participants were selected, with certain specific ways of performing kata and kumite in the later stages of training and development. Candidates were given the general suggestion that each technique was to be

performed with the specified standards, following the rapid transition from stance to stance, with a maximum range of expression in strength, and emphasis on the sharpness in the final strike. Each time a candidate himself determined the moment he was ready to perform the task and the length of the pause between strikes.

Applying the method of the experts' estimates, the level of the participants' specific technical abilities were determined, participants belonging to different competitive orientations, through the fulfillment of the defined elements of the selected techniques standard performance. The assessment was conducted by a three-member committee, which was composed of competent experts - karate masters with years of coaching experience in this sport. During testing, the participants displayed each technique four times. Members of the Committee had independently evaluated the performance of the techniques allotting points from 5 to 10, with an accuracy of one decimal place and the final score was derived as the mean of the three ratings. In the evaluation of the performance tests, the committee applied the following standards:

10 points – a harmonious and synchronized execution of the techniques in the optimal pace that meets the basic principles of biomechanics;

9 points – excellent execution of the techniques whereby one of the components is slightly distorted, but the performance is still safe and confident;

8 points – well execution of the techniques, the emergence of smaller faults, whereby the basic structure of the elements is not compromised;

7 points – pretty good performance of the element of the techniques, there is a slightly larger number of errors, the basic principles are not significantly disturbed and there is some uncertainty in the performance;

6 points – the basic structure of the technique is partially disrupted, and uncertain performance is noticed;

5 points – poor performance, evidence of larger defects, the structure of movement is substantially impaired, extreme uncertainty is noticed.

For the formation of the most objective assessment of specific motor abilities in the performance of standard techniques, the committee particularly took into account the following elements: standard features of stance and strikes, respecting the principle of the most rational (economic) movement, performance precision and the expression of power in the execution of the techniques. The choice of standards for the evaluation of the technique is based on the positive experience derived from the extensive studies which have applied similar tests for specific abilities in the area of karate (Gužvica, 2005).

The measurement results of the specific motor abilities of the examined competing groups were statistically processed in a way that allows us to obtain answers to the set hypothesis.

### **Methods of data processing**

*Descriptive statistical parameters* were applied to determine the level of the specific motor abilities. Arithmetic means (MEAN), standard deviation (SD) and a 95% confidence interval were calculated. In order to examine potential differences between the groups ("fighters", "Kata performers", "fighters + Kata performers ") on a multivariate level, a *multivariate analysis of variance* (MANOVA), a *multivariate analysis of covariance* (MANCOVA) were applied, and differences between the groups for each variable and

measure individually were determined by means of the *univariate analysis of variance* (ANOVA). To investigate the discrimination of the test results for the specific motor abilities (to find out whether based on the results of the tests one can separate the "fighters" from the "Kata performers"), a so called confirmative factor analysis was conducted.

## RESULTS

Descriptive statistics results for the overall sample are shown in Table 1.

**Table 1** Descriptive statistics [arithmetic mean (standard deviation), confidence interval] for the specific motor variables (total sample)

Variable	Fighters		Kata performers		Kata performers + Fighters		Total	
	AS (SD)	95% IP	AS (SD)	95% IP	AS (SD)	95% IP	AS (SD)	95% IP
GZ	7.56 (0.83)	7.51÷7.60	6.89 (1.32)	6.77÷7.01	8.35 (0.94)	8.25÷8.44	7.56 (1.13)	7.53÷7.59
OZ	7.55 (0.80)	7.50÷7.59	6.80 (1.34)	6.68÷6.92	8.29 (0.98)	8.19÷8.40	7.52 (1.14)	7.49÷7.55
MG	7.06 (0.95)	7.01÷7.11	6.54 (1.38)	6.42÷6.66	7.66 (1.34)	7.52÷7.80	7.06 (1.24)	7.03÷7.09
KZG	7.31 (0.88)	7.26÷7.36	6.50 (1.04)	6.40÷6.59	7.80 (1.17)	7.68÷7.92	7.20 (1.10)	7.17÷7.23
GZG	7.61 (0.88)	7.56÷7.66	6.51 (1.06)	6.42÷6.61	7.96 (1.00)	7.86÷8.06	7.39 (1.11)	7.36÷7.41
MVGG	7.23 (1.22)	7.17÷7.29	6.45 (1.24)	6.34÷6.56	7.52 (1.37)	7.38÷7.66	7.08 (1.31)	7.05÷7.11

AS – Arithmetic mean; SD – Standard deviation; 95% IP – Confidence interval

**Table 2** Results of multivariate analysis of variance (MANOVA) for the specific motor variables (Factors: age and competition orientation)

F values		
Age	Orientation	Age x Orientation
1.129	2.549**	1.169

\* –  $p < 0,05$ ; \*\* –  $p < 0,01$ ;

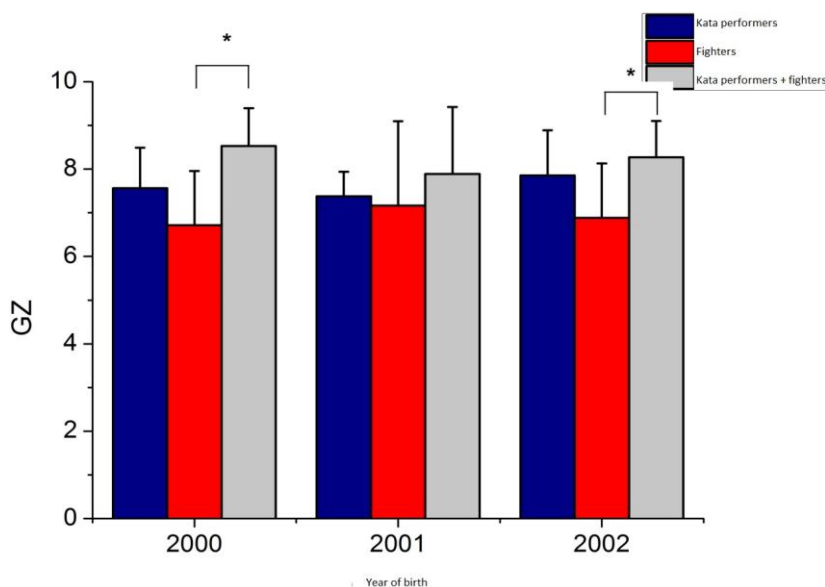
**Table 3** Results of the analysis of variance (ANOVA) for the specific motor variables (Factors: age and competition orientation).

Variable	Age F(2;81)	Orientation F(2;81)	Age x Orientation F(4;81)
GZ	0.15**	6.52**	0.47
OZ	0.10**	6.90**	0.37
MG	0.26	2.13**	1.54
KZG	3.60**	6.83**	2.13*
GZG	3.37**	10.00**	0.92*
MVGG	1.01*	2.65**	2.32

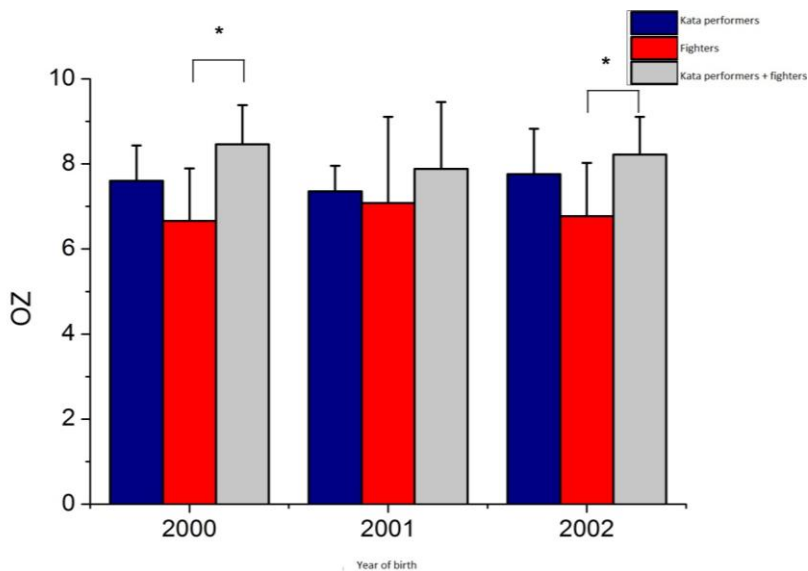
\* –  $p < 0,05$ ; \*\* –  $p < 0,01$ ;

Results of the specific motor tests [arithmetic means (standard deviation)] according to the age, i.e. competition orientation, are shown in Figures 1 to 6.

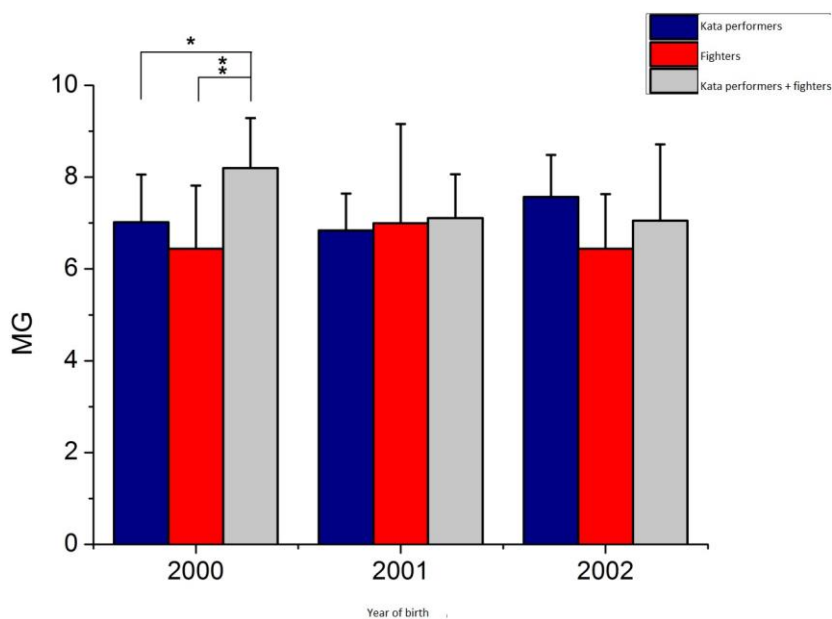
A multivariate analysis of covariance (Table 2) indicates that athletes differ in terms of age (a significant factor of age), competitive orientation (a significant factor of competitive orientation), but these differences are not the same for each age group (there is a significant interaction of the factor of age and competitive orientation). When the univariate analysis of variance was conducted, the age factor was significant in all tests, except for MG, while for all the tests a significant factor was competition orientation, mainly because the fighters and Kata performers + fighters scored better results than Kata fighters. A subsequent analysis showed that the differences were obtained mainly in the oldest age group (2000), particularly between the fighters + Kata performers and Kata performers (GZ, OZ, MG, GZG and MVGG). Similar findings were obtained by comparing the youngest participants (2002), where the fighters + Kata performers were better than Kata performers in the tests GZ, OZ, while the fighters were better than Kata performers in the tests KZG, GZG and MVGG. Of those participants born in 2001, with different competition orientation, there were no differences recorded in any of the tests.



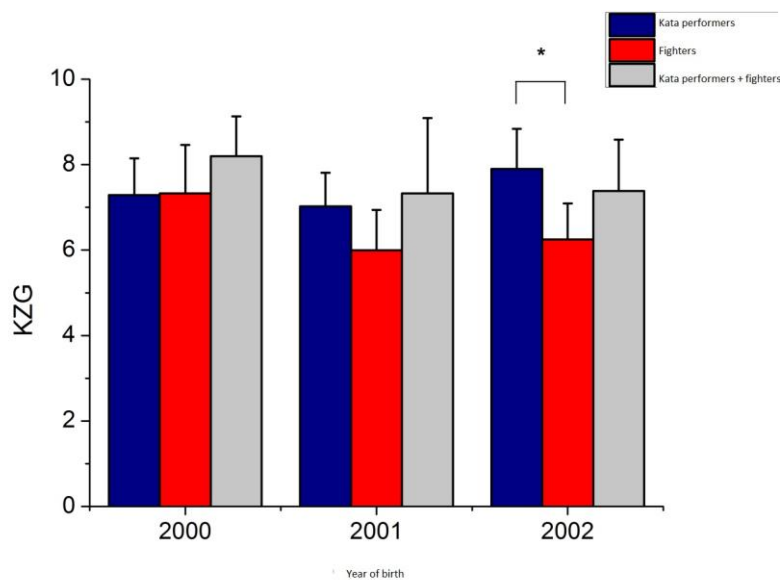
**Fig. 1** Results: Gyaku zuki (arithmetic means and standard deviation), fighters + Kata performers born in 2000, 2001 and 2002.  
\* –  $p < 0,05$ ; \*\* –  $p < 0,01$



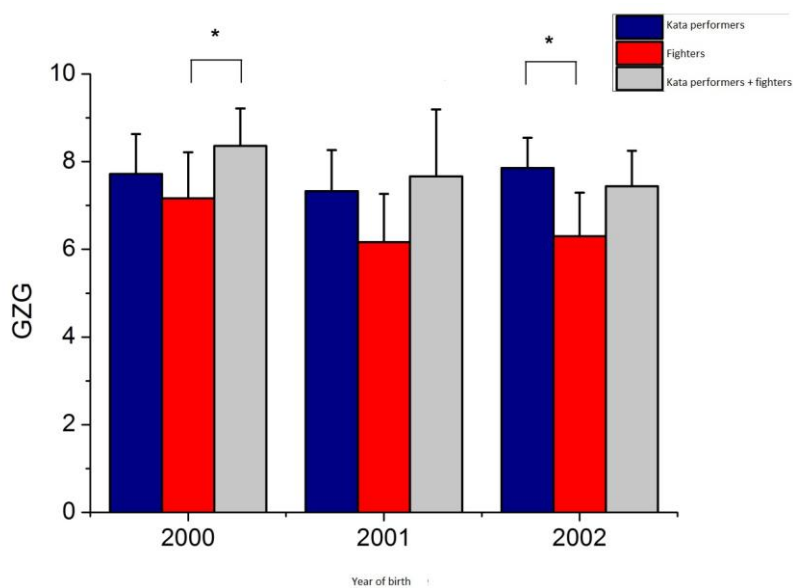
**Fig. 2** Results: Oi Zuki (arithmetic means and standard deviation), fighters + Kata performers born in 2000, 2001 and 2002.  
\* –  $p < 0,05$ ; \*\* –  $p < 0,01$



**Fig. 3** Results: Mae geri (arithmetic means and standard deviation), fighters + Kata performers born in 2000, 2001 and 2002.  
\* –  $p < 0,05$ ; \*\* –  $p < 0,01$

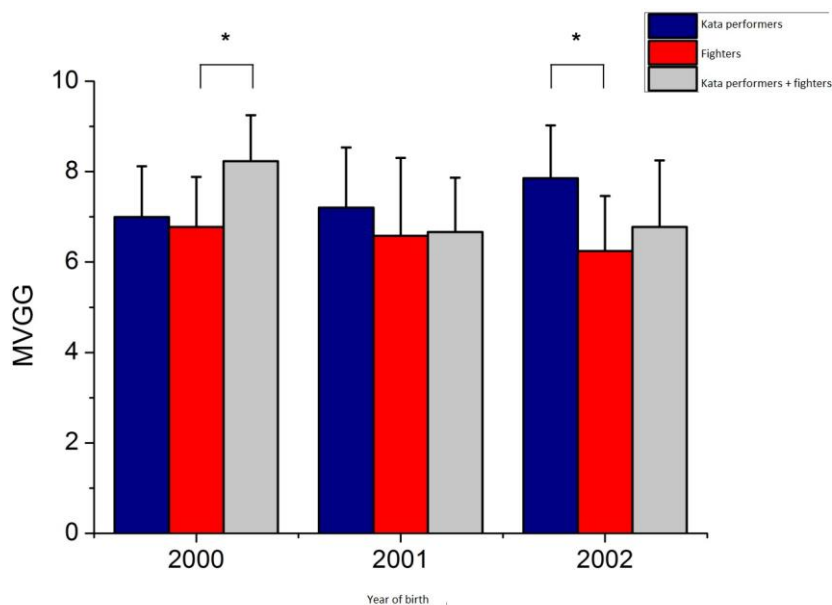


**Fig. 4** Results: Kizami-Zuki from a guard (arithmetic means and standard deviation), fighters + Kata performers born in 2000, 2001 and 2002.  
\* -  $p < 0,05$ ; \*\* -  $p < 0,01$



**Fig. 5** Results: Gyaku - Zuki from a guard (arithmetic means and standard deviation), fighters + Kata performers born in 2000, 2001 and 2002.  
\* -  $p < 0,05$ ; \*\* -  $p < 0,01$





**Fig. 6** Results: Mawashi - geri (arithmetic means and standard deviation), fighters + Kata performers born in 2000, 2001 and 2002.  
\* -  $p < 0,05$ ; \*\* -  $p < 0,01$

A factor analysis of the subsample of specific motor variables results are presented in Tables 4 and Table. By analyzing the tables, it can be seen that the two separate factors explain 89% of the variance (the factors were extracted on the basis of the graph of eigen values (screen plot) - Figure 7). Variables GZ, OZ and MG belong to one factor, which can be labeled as "**Specific technical basis for katas**"- **STOK**, whereas KZG, GZG and MVGG correspond to the second factor, "**Technical basis for fights**"- **STOB**.

**Table 4** Table of eigen values and % of variance which explain two assumed factors

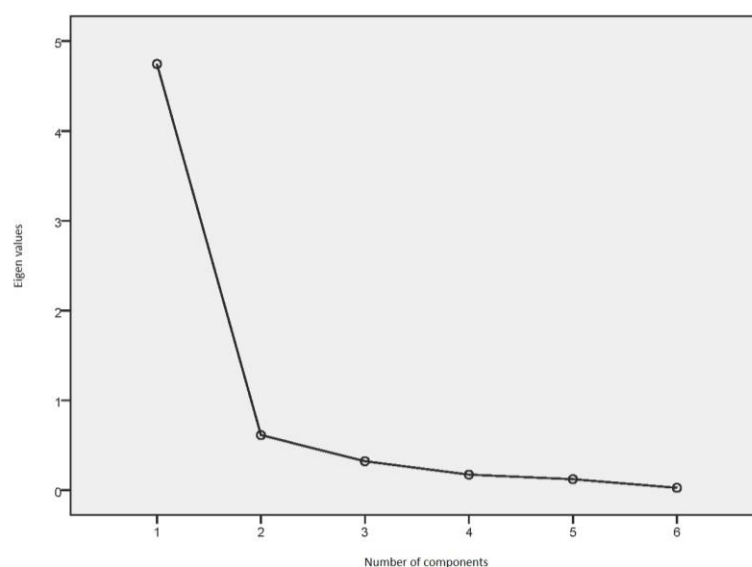
Components	Initial eigen value			Extraction Sums of Squared values			Rotation Sums of Squared values		
	Total	% variance	Cumulative %	% variance	Cumulative %	% variance	Total	% variance	Cumulative %
1	4,746	79,1	79,1	4,7	79,1	79,1	2,9	48,7	48,7
2	0,613	10,2	89,3	0,6	10,2	89,3	2,4	40,5	89,3
3	0,322	5,3	94,6						
4	0,172	2,8	97,5						
5	0,121	2,0	99,5						
6	0,025	0,42	100,0						

Method of extraction: Principal Component Analysis

**Table 5** Matrix of rotated components

Variables	Rotated Components	
	1	2
GZ	<b>0,901</b>	0,357
OZ	<b>0,884</b>	0,400
MG	<b>0,834</b>	0,399
KZG	0,346	<b>0,898</b>
GZG	0,394	<b>0,874</b>
MVGG	0,601	<b>0,646</b>

Method of extraction: Principal Component Analysis. Isolated two components

**Fig. 7** Graph of eigen values and corresponding components

## DISCUSSION

The particular focus of this study concerned the sub-area of specific motor abilities. A total of six tests were applied wherein the participants performed basic karate techniques that comprised the elementary training curricula of all karate practitioners. Three tests were notably more specific for the technical basis of katas, and three tasks were more typical for the technical basis of the sports fight.

For the interpretation of the results of this study and especially for the generalization of the obtained results, it is important to point out several significant observations made during the testing, that is, expert evaluation of the specific motor abilities of our participants.

- In various clubs, uneven methodological approaches in basic karate training of the young age karate practitioners are applied. In particular, some clubs advocate and favor the standard technique for katas, while some coaches were observed to push techniques for fighting.

- The level of the standard techniques for both competitive disciplines is relatively low. This clearly shows that the coaches do not pay enough attention to the adoption of the school model techniques, especially when it comes to the basic principles of the standard techniques for katas.
- It is notable that a significant number of participants focused too early on one discipline, which is reflected in the quality of the technical basis, in the preferred discipline and in the other disciplines as well.

The presented observations greatly help in explaining the results obtained in our study, in which it has been hypothesized that the participants of different competitive orientation will differ in the specific motor abilities tests results. At the same time, it was expected that the participants would be superior in the tests that are more specific for the technical basis of the selected competition discipline.

The overall results obtained for this sub-area confirmed that there are significant differences in almost all the tests, and these are particularly important in older ages (see Figures: Figure 1 to Figure 6). Thus, the factor of competitive orientation was significant in all the tests. In addition, a very important finding in the context of the studied problem is the fact that the best results in almost all of the tests were achieved by the participants who were not yet definitively directed towards one discipline and who competed both in katas and kumite (fights).

This result indirectly leads to the assumption that this group of participants has been involved over a longer period of time in a more complete technical training in relation to the other two groups. This fact has a great practical value because it confirms the observation that nowadays, in karate, very early competition selection in katas and kumite is practiced, which significantly shortens the first stage of the general technical training and thus leads to a narrow and insufficient technical education. This approach affects early achievement of the competitive limit and induces leaving karate at ages when really high competitive results should be achieved.

The obtained result, which showed that athletes oriented to katas had achieved the worst results on all tests, just fit in the previously proposed explanations. In fact, this discipline requires longer technical education and mastering a standard stereotypical technique based on the principles of biomechanics and functional anatomy in the performance of the defined model stances, movements, punches, blocks and other elements of the techniques that are strictly rule governed. In practice, coaches ignore the need for systematic training, pursuing the goal to create a high-quality technical basis for katas, but they cross to the contest performing kata too early (especially more complex competition katas).

This result is consistent with the observations made in the studies which have treated the issue of the training and competing tendencies of modern karate (Jovanovic and Mudrić, 1995; Mudrić, 2010). Also, in an extensive study of the kinematic and dynamic characteristics of elite competitors in katas and kumite (Koropanovski, 2012), consequences of the failures and flaws in the process of forming the technical basis for katas were highlighted. This is ultimately manifested in the adoption of the kinematic patterns which by the manner of their performance deviate from the basic biomechanical principles and thus exert impact on the competition results of the most representative karate competitors in this discipline.

For the interpretation of the obtained results, it should be kept in mind that the competition success was not included as a differentiating factor for the researched sample.

The sample is of such a kind that very few athletes have outstanding results in katas and kumite at higher levels of competition. Therefore, a majority of the research participants express a spontaneous preference for one competition discipline. Due to this fact, presumably, there is a more pronounced difference in specialized technical basis for one discipline was not obtained. However, on the whole, the results obtained are of great importance for the explanation of the selection process in karate.

#### CONCLUSION

The aim of this study was to examine the difference between the karate practitioners of varied competitive orientations in the results of the specific motor tests, that is, in their competitive orientation towards a particular discipline: for katas or fighting.

For the evaluation of specific motor abilities, 6 tests were applied where the participants performed basic karate techniques contained in all initial karate training programs: (Gyaku zuki, (GZ), Oi Zuki (OZ), Mae geri, (MG), Kizami-Zuki, from a guard (KZG), Gyaku zuki from a guard (GZG) and Mawashi-Geri from a guard (MVG)). At the same time the participants showed selected representative techniques whereby 3 tests were more specific for the technical basis of katas and three tests were more typical for the technical basis of the sports fight.

The measurement results of the investigated competing groups were statistically analyzed so as to obtain answers to the set hypothesis. The research results show that the participants oriented toward katas have the worst results in all the tests, and that the factor of competitive orientation was significant for all the tests. In addition, a very important finding in the context of the studied problem is the fact that the best results in almost all of the tests were achieved by the participants not yet definitely directed towards one discipline and who compete both in katas and kumite. The overall obtained results confirm that there are significant differences in almost all the tests, and that these are especially important in the older age groups, based on which we conclude that the hypothesis on the existence of the significant differences between the varied karate competition orientations in the results of the specific motor tests is confirmed completely.

The conducted research represents a contribution to the sport of karate since a relatively small number of studies have been devoted to examining the difference between karate practitioners' various competitive orientations, and the research results can serve both as the basis and an impetus for some further research in karate.

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## **RAZLIKE IZMEĐU KARATISTA RAZLIČITE TAKMIČARSKJE ORIJENTACIJE U REZULTATIMA SPECIFIČNIH MOTORIČKIH TESTOVA**

*Istraživanje je sprovedeno sa ciljem da se utvrde razlika između karatista različite takmičarske orijentacije u rezultatima specifičnih motoričkih testova. Uzorak ispitanika činili su karatisti muškog pola (37 u borbama, 23 u katama i 19 koji se takmiče u obe discipline, ukupno 79) hronološke starosti 12 do 14 godina. Za procenu specifičnih motoričkih sposobnosti primenjeno je 6 testova (Gjaku zuki (GZ), Oi zuki (OZ), Mae geri (MG), Kizami zuki iz garda (KZG), Gjaku zuki iz garda (GZG) i Mavaši geri iz garda (MVG)), u kojima su kandidati prikazivali izabrane reprezentativne tehnike. Prikupljeni podaci su obrađeni odgovarajućim matematičko statističkim metodama, na način da daju odgovor na postavljenu hipotezu. Dobijeni rezultati pokazuju da takmičari orijentisani na kate imaju najslabije rezultate, a da je faktor takmičarsko usmerenje bio je značajan kod svih testova. Najbolje rezultate u skoro svim testovima pokazali ispitanici koji još uvek nisu definitivno takmičarski usmereni prema jednoj disciplini i takmiče se i u katama i borbama. Rezultati obrade podataka pokazali su da postoje značajne razlike u skoro svim testovima, a posebno su značajne u starijim uzrastima, na osnovu čega konstatujemo da je hipoteza o postojanju značajne razlike između karatista različite takmičarske orijentacije u rezultatima specifičnih motoričkih testova, potvrđena u potpunosti.*

*Ključne reči: karate, kate, borbe, takmičarska selekcija.*