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The Impact of Specific Motoricity on Karate Performance in Young Karateka

Ratko Katić, Jozefina Jukić, Ivan Glavan, Snježana Ivanišević and Ines Gudelj

Faculty of Kinesiology, University of Split, Split, Croatia

A B S T R A C T

The aim of the study was to assess interdependence of specific motor abilities (situation karate tests) and motor skills (karate techniques), and karate performance (fighting efficiency) in under-sixteen male karateka aged 11–12 and 13–14 years. A battery of 5 situation motor tests were applied and 6 basic elements of karate technique evaluated in a sample of 20 male karateka aged 11–12 and 20 male karateka aged 13–14 years. Three criterion variables were formed: 1) one factor as a factor of general technical efficiency in karate was isolated by factor analysis of 6 karate techniques; 2) cumulative evaluation of 2 kate as kate performance; and 3) total score assessment based on success achieved at national karate championships as contest efficiency (fighting efficiency). Regression analysis revealed the frequency of gedan barai blockade performance to be the superior predictor of technical efficiency, kate performance and contest success in karateka aged 11–12, whereas the speed of the gedan barai-jaku zuki (block-kick) combination performance and specific agility (sidewise mobility) were superior predictors of performance in karateka aged 13–14. Of the karate techniques (kicks) used, the quality of jaku zuki kick performance was the superior predictor of contest efficiency in karateka aged 11–12, and the quality of the jaku zuki-mawashi geri and kizame zuki-jaku zuki combination performance in karateka aged 13–14.

Key words: *specific karate motoricity, contest efficiency, under-sixteen karateka*

Introduction

Karate is defined by polystructural acyclic movements aiming at symbolic destruction of the opponent, performed by strictly upper and lower extremity kicks against the opponent's head and body. In karate fight, mutual motor communication is primarily limited by the level of motor abilities that are responsible for the motor task performance, and also by an array of technical and technical-tactical variants of fighting technique.

In order to monitor the efficiency of teaching methods and improvements in karate technique, and to achieve high-quality educational and didactic approach, karate technique has been systematically classified into movements, hand kicks, foot kicks, defense from kicks, throwing, falls, and attack and defense technique combinations. The number of individual techniques utilized in classic karate ranges between 20 and 30, however, the overall number of technical-tactic elements is several fold greater, as indicated by *kate*. In modern karate, *kate* are composed of an array of previously arranged techniques (movements) intended to demonstrate regular form on attack and defense.

In combat sports including karate, sports development of the athletes proceeds in stages, i.e. initial stage (age 6–10), athlete formation (age 11–14), specialization (age 15–18) and elite performance (age ≥19). During the first two stages, training is directed towards general multiple anthropologic development as a basis for the development of specific motor abilities, resulting in transition to the stage of specialization.

Mastering motor skills (techniques) in karate and their efficient use in fight require longstanding, strenuous training. The fight dynamics and movement frequency are especially emphasized, necessitating from a karateka a high level of motor and functional abilities, speed and strength[1], and coordination[2] in particular. Although of a relatively short duration, karate fights are characterized by maximal intensity, thus only the enti-

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ties capable of enduring these demanding conditions can hold out in elite karate contests. Quite frequently, persistent and persevering training may prove inadequate, as specific predisposition is also needed to achieve top results.

In karate, only the karateka with potentially above-average motor abilities, primarily explosive strength, speed and coordination, can achieve top results[3]; it is especially pronounced in karate blows performed in combination such as *jaku zuki-mawashi geri* and *kizame zuki-jaku zuki*[4]. It is just the speed and quality of performing these actions (techniques) that influence directly the attack efficiency in karate.

Specific agility, i.e. mobility of the karateka in various directions, is of high importance for successful fight performance in karate. Appropriate mobility enables the karateka to avoid the opponent's attacks and to assume optimal position for efficient performance of karate techniques[3,4].

Sforza *et al.*[5,6] analyzed the quality, i.e. technique efficiency on the basis of deviation-variability in the repeat technique performance monitored by a photoelectronic instrument. The method can be useful in learning, i.e. in acquiring and subsequent mastering particular karate techniques. In young karateka, karate training influences the development of flexibility, muscle strength and equilibrium[7].

Upon achievement of high quality performance in particular karate techniques, the speed of reaction and the skill of predicting the opponent's attack are crucial for success in karate[8].

The aim of the present study was to assess the impact of specific motor abilities of young karateka on their technical and fighting efficiency, and to identify the techniques that influence karate contest performance, i.e. fighting efficiency. The impact of specific motoricity on fighting efficiency was compared according to karateka age, i.e. between the groups of karateka aged 11–12 and 13–14, in order to collect information on the development of specific motor abilities and specific motor skills that determine achievement of top results in karate.

Material and Methods

The study included a sample of 40 young male karateka divided according to age into groups aged 11–12 and 13–14 years.

On choosing tests for assessment of the situation motor abilities, due care was taken to select the tests that provide best estimate of the most important factors of fight performance, i.e. specific agility-mobility and specific speed, i.e. speed of technique performance[3]:

1) Sidesteps on taking guard with hands lifted up; the test is used to estimate specific movement speed. The task was to pass the four-meter distance as fast as possible by side steps in both directions six times. The test was repeated three times with due time allowed for rest in-between, and the result was measured in tenths of second.

2) Speed of movement in a triangle; the test is used to estimate specific movement speed. The task was to move as fast as possible in fighting guard along the sides of an equilateral triangle of 3 m in dimensions, marked on the floor. The subject moved fast from one vertex along the side to another vertex, around the medicine ball placed there, then turning back sidewise towards the third vertex, again around the medicine ball placed there, to move sidewise back to the initial site. Then he had to move back sidewise, sidewise forward and sidewise back to the start position. The speed of moving along the triangle sides was measured in tenths of second, and the task was repeated three times.

3) Speed of blockade performance and hand blow as a combined technique; the task was to perform the *gedou barai-jaku zuki* combination five times consecutively at maximal speed. In order to ensure identical test conditions to all study subjects, the tall and short ones alike, the distance of the target to be hit by *jaku zuki* blow was measured by the subject's distance from the target, defined by the extended arm performing *jaku zuki*. On the sign given by the timekeeper, the subject started performing the *gedou barai-jaku zuki* combination from the fighting posture as fast as possible. The combination had to be performed five times, the last *jaku zuki* blow against the wall *makiwara* or vertically placed gym mattress denoting the task completion. The task was repeated three times, and test result was measured in tenths of second.

4) Speed of the *gedou barai* blockade technique performance. The task was to perform as many blockades during 30 seconds from the initial fighting posture as possible, in three repeats; test result was recorded as the sum of overall correctly performed blockades.

5) Speed of the *mawashi geri* foot kick technique performance; the task was to perform as many *mawashi geri* kicks against the punch bag during 30 seconds from the initial fighting posture. The kick level was determined according to the subject's body height, whereby each subject was to reach at least his own neck level. The respective level to be reached was marked by a belt above which the kick had to be performed. The task was repeated three times, and the result was recorded as the overall number of properly performed *mawashi geri* kicks against the punch bag.

Assessment of the karateka fighting efficiency and technique quality was based on the scores allocated by three independent karate experts. Three criterion variables were formed, including two variables assessing technical efficiency (through scores for performance of the basic karate techniques and *karate kata*) and one variable assessing fighting efficiency, i.e. contest efficiency in karate.

1. Technical efficiency 1 – C1TECHN was determined on the basis of subjective evaluation by three judges calculating the first main judgment component in 6 karate

techniques. The following techniques were evaluated individually: *jaku zuki, kizame zuki* and *mawashi geri*, and in combinations *jaku zuki-mawashi geri, jaku zuki-uraken* and *kizame zuki-jaku zuki.*

2. Technical efficiency 2 – KATE was determined on the basis of subjective evaluation by three judges of two *karate kate* performance. In this variable, result was determined as sum of average scores for *kate* 1 and *kate* 2; and

3. Fighting efficiency – RESULT was determined on the basis of contest results achieved at national championships of under-sixteen karateka. Based on the results achieved, the judges classified the karateka into three categories as follows: under-average, average and above--average.

Classic regression analysis was employed to determine the effect of specific motor abilities of young karateka on their technical and fighting efficiency.

The basic statistical parameters of the variables are presented in Table 1; the main score components for six karate techniques (C1TECHN) in Table 2; results of regression correlation analysis of correlation of specific motor abilities with technical efficiency (C1TECHN), *kate* performance (KATE) and contest efficiency (RESULT) in Tables 3, 4 and 5, respectively; and results of regression correlation analysis of correlation between karate techniques and contest efficiency (RESULT) in Table 6. The following coefficients were calculated: coefficients of correlation of each variable of a particular set of predictor variables with a particular criterion (r); coefficients of correlation of a particular set of predictor variables with a particular criterion (ρ, multiple correlation) with the respective determination coefficient (δ); and partial regression coefficients of a particular predictor variable and criterion (β).

Results

For better description of the specific motor characteristics of the study sample presented in Table 1, differences in the results of the specific motor ability tests and in the scores for karate technique and *kate* performance were analyzed according to age, i.e. between the karateka aged 11–12 and 13–14 years. Significant age differences were only recorded in tests of specific motor abilities that evaluate the factor of specific agility. These differences were in favor of karateka aged 13–14, as explained by T-test. Thus, in comparison with the younger group, older karateka were superior in specific agility in

TABLE 1
DESCRIPTIVE STATISTICAL VARIABLES (Mean, SD) AND T-TEST BETWEEN KARATEKA AGED 11–12 AND 13–14 YEARS

Variable	Total (N=40)		11–12 (n=20)	13–14 (n=20)	t-value	p
	Mean	SD	Mean	Mean		
Situation motor abilities						
Sidesteps (s)#	10.62	1.80	11.48	9.76	3.41	0.00
Movement in triangle (s)#	9.42	0.65	9.64	9.19	2.32	0.02
Block-blow (s)#	4.26	0.60	4.30	4.22	0.40	0.69
Gedan barai (f)	28.37	4.22	27.90	28.83	–0.69	0.49
Mawashi geri (f)	25.68	3.56	25.83	25.53	0.26	0.79
Karate techniques						
Jaku zuki	2.97	0.79	2.90	3.03	–0.53	0.60
Kizame zuki	2.67	0.71	2.60	2.73	–0.59	0.56
Mawashi geri	2.34	0.99	2.20	2.48	–0.91	0.37
Jaku zuki-mawashi geri	2.46	0,93	2.37	2.55	–0.61	0.54
Jaku zuki-uraken	2.41	0.80	2.32	2.50	–0.72	0.48
Kizame zuki-jaku zuki	2.76	0.85	2.70	2.82	–0.43	0.67
Karate kate						
Kate 1	2.74	0.79	2.75	2.73	0.07	0.95
Kate 2	2.35	0.94	2.27	2.43	–0.56	0.58
Criterion variables						
C1TECHN	0.00	1.00	0.00	1.00	0.00	1.00
KATE	5.09	1.70	5.02	5.16	–0.27	0.78
RESULT	1.70	0.65	1.70	1.70	0.00	1.00

C1TECHN – first main component of 6 karate techniques (technical efficiency 1), KATE – *Kate* 1 and *Kate* 2 (technical efficiency 2), RESULT – fighting efficiency, #variable with opposite metric orientation

TABLE 2
FACTOR ANALYSIS IN THE SPACE OF TECHNIQUE VARIABLES IN KARATE (C1TECHN)

Technique	Total (N=40) C1TECHN	11–12 (n=20) C1TECHN	13–14 (n=20) C1TECHN
Jaku zuki	0.976	0.980	0.971
Kizame zuki	0.933	0.938	0.924
Mawashi geri	0.947	0.944	0.954
Jaku zuki-mawashi geri	0.943	0.940	0.948
Jaku zuki-uraken	0.888	0.923	0.824
Kizame zuki-jaku zuki	0.949	0.954	0.941
Lambda	5.299	5.377	5.169
Variance%	88.324	89.616	86.16

C1TECHN – first main component of 6 karate techniques, Lambda – characteristic values, Variance % – percentage of variance explained by a particular factor

terms of sidewise mobility and changing movement direction in multiple directions. Older karateka also showed better performance in other variables of the specific motor space, however, these differences did not reach statistical significance. These specific abilities that were more pronounced in karateka aged 13–14 as compared with karateka aged 11–12 enable fast, strong and robust performance of karate techniques because the specific motor abilities and specific motor skills, i.e. techniques are closely related, or in other words, these abilities are highly mutually determined in karateka[3].

Factor analysis in the space of karate technique evaluation (Table 2) isolated only one factor defining performance of karate techniques both in the study sample as a whole and in the two age groups. All karate techniques applied yielded high and significant projections upon the isolated factor, indicating the performance of all karate technique elements to be closely related and the subject of measurement to be the same in all karate technique elements.

The set of tests assessing specific abilities in karate (Table 3) proved to be a good predictor of technical efficiency (C1TECHN), with multiple correlation of 0.70 for the sample as a whole, 0.77 for karateka aged 11–12 and 0.74 for karateka aged 13–14. The speed of blockade performance was found to be the best predictor of technical efficiency in total study sample and in the group of karateka aged 11–12. Specific abilities of sidewise mobility and foot kick frequency were observed to influence technical efficiency, however, without statistical significance (no significant coefficients of partial regression). The speed of the block-kick combination (*gedan barai-jaku zuki*) performance was the superior predictor of technical efficiency in karateka aged 13–14. Accordingly, technical efficiency of the karateka was predominantly determined by the specific ability of speed. In younger karateka, it was the speed of performing *gedan barai* blockade, and in older group the speed of performing the combination of *gedan barai* blockade-*jaku zuki* kick.

Latent structure, i.e. the criterion-technical efficiency complex in the space of specific motor abilities, can be established on the basis of correlation of each individual variable with the criterion. In karateka aged 11–12, the ability of technique performance frequency and specific agility exerted moderate and quite uniform contribution to the latent structure of technical efficiency. In karateka

TABLE 3
RESULTS OF REGRESSION ANALYSIS FOR TECHNICAL FIGHTING EFFICIENCY (C1TECHN) IN SPECIFIC MOTOR AREA

Variable	Total (N=40)			11–12 (n=20)			13–14 (n=20)		
	r	β	p	r	β	p	r	β	p
Sidesteps (s)#	–0.42	–0.22		–0.52	–0.36		–0.18	–0.20	
Movement in triangle (s)#	–0.39	–0.08		–0.48	–0.11		–0.22	–0.02	
Block-blow (s)#	–0.50	–0.11		–0.35	0.08		–0.72	–0.85	b
Gedan barai (f)	0.59	0.34	b	0.63	0.40		0.52	0.01	
Mawashi geri (f)	0.55	0.21		0.54	0.22		0.60	–0.17	
ρ		0.70	a		0.77	b		0.74	b
δ		0.49			0.59			0.55	

r – coefficient of correlation, β – regression coefficient, ρ – multiple correlation, δ – coefficient of determination, #variable with opposite metric orientation, $^{a}p<0.01$, $^{b}p<0.05$

TABLE 4
RESULTS OF REGRESSION ANALYSIS FOR TECHNICAL FIGHTING EFFICIENCY (KATE) IN SPECIFIC MOTOR AREA

Variable	Total (N=40)			11–12 (n=20)			13–14 (n=20)		
	r	β	p	r	β	p	r	β	p
Sidesteps (s)#	–0.38	–0.20		–0.41	–0.24		–0.45	–0.53	b
Movement in triangle (s)#	–0.38	–0.17		–0.46	–0.18		–0.30	–0.14	
Block-blow (s)#	–0.38	–0.11		–0.29	–0.01		–0.48	–0.99	a
Gedan barai (f)	0.43	0.18		0.60	0.39		0.26	–0.29	
Mawashi geri (f)	0.44	0.16		0.45	0.11		0.44	–0.42	
ρ		0.57	b		0.68	a		0.71	a
δ		0.33			0.46			0.50	

r – coefficient of correlation, β – regression coefficient, ρ – multiple correlation, δ – coefficient of determination, #variable with opposite metric orientation, [a]p<0.01, [b]p<0.05

TABLE 5
RESULTS OF REGRESSION ANALYSIS FOR FIGHTING EFFICIENCY IN SPECIFIC MOTOR AREA

Variable	Total (N=40)			11–12 (n=20)			13–14 (n=20)		
	r	β	p	r	β	p	r	β	p
Sidesteps (s)#	–0.32	–0.15		–0.40	–0.31		–0.35	–0.39	
Movement in triangle (s)#	–0.36	–0.05		–0.51	–0.13		–0.23	0.01	
Block-blow (s)#	–0.41	0.00		–0.18	0.21		–0.64	–0.85	b
Gedan barai (f)	0.53	0.32	b	0.62	0.44		0.44	–0.09	
Mawashi geri (f)	0.51	0.28		0.44	0.20		0.57	–0.19	
ρ		0.62	b		0.72	b		0.73	b
δ		0.38			0.51			0.53	

r – coefficient of correlation, β – regression coefficient, ρ – multiple correlation, δ – coefficient of determination, #variable with opposite metric orientation, [a]p<0.01, [b]p<0.05

aged 13–14, the speed of karate technique performance (block-kick combinations) showed highest contribution to the latent structure of technical efficiency, followed by the ability of technique performance frequency.

The set of tests evaluating specific abilities in karate (Table 4) proved to be a good predictor of technical efficiency in terms of karate *kate* performance (ρ, multiple correlation, and δ, determination coefficient were statistically significant at the level of $p<0.01$ in both groups of subjects). In karateka aged 11–12, the highest regression coefficient with criterion was recorded for the speed of *gedan barai* blockade frequency; however, it did not reach statistical significance. In karateka aged 13–14, the speed of performing the *gedan barai-jaku zuki* combination and test evaluating specific agility, i.e. sidewise mobility, were found to be superior predictors of the karate *kate* performance.

Results similar to those on technical efficiency were obtained for karate *kate* performance. The frequency of *gedan barai* blockade performance contributed most to the latent structure of karate *kate* performance in karateka aged 11–12, and the speed of performing *gedan barai-jaku zuki* combination in karateka aged 13–14.

The set of tests used to assess specific abilities in karate (Table 5) proved to be a good predictor of the general fighting efficiency in karate (RESULT). The speed of performing *gedan barai* blockade in terms of frequency was superior predictor of fighting efficiency in total sample and in karateka aged 11–12, whereas the speed of performing *gedan barai-jaku zuki* combination (block-kick) was the best predictor of fighting efficiency in karateka aged 13–14.

In the group of subjects aged 11–12, the speed of blockade performance was a precondition for efficient attack performance, implying the importance of defense while avoiding opponent's kicks; receiving the opponent's kick means that he has gained advantage. In the group of subjects aged 13–14, successful blockade of the opponent's kick implied an advantage only in case of fast counterattack.

Although the role of specific agility, i.e. karateka mobility, in fighting efficiency was not confirmed in the present study due to the small study sample, high mobility is known to enable the opponent's attacks to avoid and optimal position for efficient performance of one's own techniques (blockade and kicks) to assume[3,4].

TABLE 6
RESULTS OF REGRESSION ANALYSIS FOR FIGHTING EFFICIENCY IN THE SPACE OF TECHNIQUE VARIABLES IN KARATE

Technique	Total (N=40)			11–12 (n=20)			13–14 (n=20)		
	r	β	p	r	β	p	r	β	p
Jaku zuki	0.80	0.18		0.83	0.99	[a]	0.78	–0.33	
Kizame zuki	0.80	0.30		0.78	0.48		0.84	–0.21	
Mawashi geri	0.71	–0.30		0.75	–0.29		0.71	–0.71	[b]
Jaku zuki-mawashi geri	0.78	0.21		0.74	–0.26		0.85	0.99	[a]
Jaku zuki-uraken	0.63	–0.24		0.70	–0.63		0.57	0.01	
Kizame zuki-jaku zuki	0.84	0.69	[a]	0.83	0.44		0.88	0.99	[a]
ρ		0.87	[a]		0.88	[a]		0.96	[a]
δ		0.76	[a]		0.78	[a]		0.91	[a]

r – coefficient of correlation, β – regression coefficient, ρ – multiple correlation, δ – coefficient of determination, #variable with opposite metric orientation, [a]$p<0.01$, [b]$p<0.05$

Comparison of the latent structure of fighting efficiency in the space of specific motor abilities according to age produced clear difference. In the group of subjects aged 11–12, the ability of the *gedan barai* technique performance frequency showed predominant contribution to the latent structure of fighting efficiency, with a considerably less contribution from specific agility. In the group of subjects aged 13–14, the speed of performing the *gedan barai-jaku zuki* combination contributed most to the latent structure of fighting efficiency, followed by the ability of technique performance frequency.

Table 6 shows the relations established between the specific motor skills-techniques and the criterion of fighting, i.e. contest efficiency (RESULT). It should be explained that in this case motor skills refer exclusively to the kicks performed in isolation or in combination, thus providing information on the impact of particular karate kicks on fighting efficiency.

Multiple correlations were high and significant in both groups of subjects, indicating the karate kicks chosen to be good predictors of the karateka fighting efficiency. The *jaku zuki* technique was the best predictor of fighting efficiency in the group of karateka aged 11–12, whereas karate kicks performed in combination, i.e. *jaku zuki-mawashi geri* and *kizame zuki-jaku zuki*, were superior predictors of fighting efficiency in the group of karateka aged 13–14. These two combinations predominantly determined fighting efficiency in the karateka aged 13–14, whereas the quality, i.e. the level of individually performed kicks acquired had no major impact on the karateka fighting efficiency.

The correlations of almost all predictor variables (karate techniques) with the criterion (fighting efficiency at karate contest) were high and significant in both younger and older groups of karateka (aged 11–12 and 13–14 years), pointing to the high complexity of fighting efficiency in the space of specific motor skills, i.e. karate techniques.

Discussion

Mastering karate techniques is a long-term process that depends on both basic motor abilities and specific motor abilities. With time, motor skills in karate as well as general and specific motor abilities are integrated into the morphological system[9–12] through optimization of the size and relations of the karateka somatotype components.

The tests of specific, i.e. situation motoricity of the karateka are to a great extent saturated with the level of motor skill acquisition, and estimate specific speed (kick and blockade performance) and specific agility. Accordingly, specific speed is the ability of fast performance of as a rule multiple blows and blockades (in a series), whereas specific agility is the ability of using controlled explosive strength and/or force for efficient karateka mobility. These two specific abilities of the karateka also integrate all other basic abilities, explosive strength, speed and coordination in particular. Explosive strength will thereby influence performance of all tests of situation motoricity. Besides explosive strength, the speed of technique-blow performance and specific agility will also be influenced by the ability of movement frequency and coordination, respectively[4].

Technique performance is considerably saturated by cognitive abilities because a karateka has to identify current situation in the shortest time possible, and to choose the reaction that is most appropriate to achieve the objective, i.e. to defeat the opponent[4,13].

According to Katić *et al.*[4], the best predictors of general fighting efficiency are karate blows performed in combination: *jaku zuki-mawashi geri* and *kizame zuki-jaku zuki*. This means that the ability of integrating different motor skills, i.e. acquired routines, into a unique structure is the major precondition for a karateka fighting success. In contrast, fighting success is warranted by the ability to perform a combination-series of blows rather than by quality performance of individual blows. Furthermore, Katić *et al.*[4] point to *kizame zuki* as the

only one of individually performed blows that has a certain favorable impact on the fighting success. Similar to straight blow in boxing, *kizame zuki* enables control of the opponent's attack, i.e. interferes with and prevents the opponent's attack, at the same time allowing for more appropriate preparation of one's own attack or counterattack.

Literature reports indicate that integration of specific and basic motoricity in terms of respective integration of explosive strength, speed and coordination into general motor efficiency and/or appropriate motor system optimal for achievement of top results in a particular sport event occurs with training process in all combat sports[3,4,13–16].

These results obtained in studies including elite senior karateka define basic and specific motor systems that are optimal for achievement of top results in karate. The processes of selection and training in karate tend to the formation of ideal definitive conditions of basic and specific motoricity that lead to the achievement of top results. Comparison of the results obtained on the impact of specific motoricity on fighting efficiency in the karateka aged 11–12, karateka aged 13–14 and senior karateka pointed to the following stages in the development of the karateka contest efficiency:

- the 11–12 age group representing first stage in the development of the karateka contest efficiency, preceded by attendance of the initial karate school. In this stage, the specific frequency ability of the *gedan barai* blockade is essential for successful *kate* performance and contest efficiency. *Gedan barai* blockade is a technique that is acquired first, as the basis of defense actions that prevail n karate fight, while at the same time facilitating acquisition of other karate techniques, hand blow *jaku zuki* in particular, which predominantly determines contest efficiency in karateka aged 11–12;
- the 13–14 age group representing second stage in the development of the karateka contest efficiency, preceded by attendance of the advanced karate school. In this stage, the specific ability of the speed of blockade and kick performance (*gedan barai-jaku zuki*) is crucial for successful *kate* performance and contest efficiency. Integration of defense and attack actions occurs in under-sixteen karateka, which predominantly determines their contest efficiency. Specific agility in terms of sidewise mobility significantly influences *kate* performance but has no major effect on contest efficiency. Concerning karate kicks, those performed in combination, i.e. *jaku zuki-mawashi geri* and *kizame zuki-jaku zuki*, are superior predictors of contest efficiency. Accordingly, integration of different attack-kick techniques into a unique attack action predominantly determines contest efficiency in under-sixteen karateka; and
- integration of basic and specific motoricity occurs in junior karateka and senior karateka in particular. The number of predictors in determination of contest efficiency, including both specific motor abilities and specific motor skills, i.e. karate techniques, increases. Successful performance is to an even greater extent determined by the integration of defense and attack actions as well as by the ability of performing a series of different kicks (combinations). In addition, specific agility manifesting as karateka mobility in all directions has a decisive role in determination of contest efficiency in elite karate. The speed of blockade performance is the best predictor of fighting efficiency, followed by the speed of movement in multiple directions and frequency of foot kicks. Accordingly, the karateka fighting efficiency is predominantly determined by the specific abilities of speed and agility.

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R. Katić

Faculty of Kinesiology, University of Split, Teslina 6, 21000 Split, Croatia
e-mail: ratko.katic@gmail.com

UTJECAJ SPECIFIČNE MOTORIKE NA USPJEH U KARATEU MLADIH KARATISTA

S A Ž E T A K

Cilj ovog istraživanja je utvrditi međusobnu determiniranost specifičnih motoričkih sposobnosti (situacijski karate testovi) i motoričkih znanja (karate tehnike) i uspjeha u natjecanju (borbena efikasnost) kod mlađih kadeta i kadeta u dobi od 11–12 i 13–14 godina. U tu svrhu je na uzorku od 20 mlađih kadeta i uzorku od 20 kadeta primijenjen skup od 5 situacijskih motoričkih testova, te izvršeno ocjenjivanje 6 bazičnih elemenata karate tehnike. Formirane su 3 varijable kriterija: 1) faktorskom analizom 6 karate tehnika izoliran je jedan faktor kao faktor generalne tehničke efikasnosti u karateu, 2) ukupna ocjena izvedbe 2 karate kate kao uspjeh u katama i 3) procjena ukupnog rezultata na temelju postignutih plasmana na kadetskim državnim prvenstvima kao uspjeh u natjecanju (borbena efkasnost). Regresijska analiza je pokazala da je kod mlađih kadeta najbolji prediktor tehničke efikasnosti, uspjeha u realizaciji kata i uspjeha u natjecanju frekvencija izvođenja blokade gedan barai, dok je kod kadeta najbolji prediktor uspjeha brzina izvođenja kombinacije gedan barai – jaku zuki (blok-udarac), te specifična agilnost (bočna pokretljivost). Od primijenjenih karate tehnika (udaraca) najbolji prediktor natjecateljske efikasnosti je kod mlađih kadeta kvaliteta izvođenja udarca jaku zuki, a kod kadeta najbolji prediktor uspjeha je kvaliteta realizacije kombinacija: jaku zuki – mawashi geri i kizame zuki – jaku zuki.