CHANGES IN THE SITUATIONAL MOTOR ABILITIES OF KARATE ATHLETES IN THE PREPARATORY AND PRE-COMPETITION PERIOD

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ABSTRACT

The development of modern karate is associated with the growing presence of science whose research results have been widely used in the training processes of karate athletes. All this research has contributed to building the scientific basis in sports. Achieving top sports re-sults is conditioned by a number of predispositions that modern competitors should possess.

The research was conducted on a stratified sample of 16 male karate athletes, potential members of the national team of the Republic of Kosovo, in the period of preparation before participation in the World Cup for U21, juniors and cadets in Chile 2019. The main goal of the research is to determine the changes in situational-motor abilities in karate athletes after ten weeks of programmed training. The basic descriptive statistical parameters were calculated for each variable, for example: arithmetic mean (Mean), standard deviation (SD), lower (min) and upper (max) limit of the results. Multivariate analysis of variance (MANOVA) and univariate analy-sis of variance (ANOVA) were used to determine the intergroup differences in arithmetic means as well as the differences within the groups. The LSD test post hoc analysis was applied to de-termine the specific impact of each variable in the creation of group differences. The analysis of the obtained research results revealed statistically significant differences between the three time sequences in the three variables.

Keywords: training, karate, situational motor abilities

INTRODUCTION

The impact of motor abilities, such as: speed, explosiveness, agility, coordination, muscle strength, endurance, and flexibility, along with all functional abilities are certainly the priority and most important conditions for achieving top sports results. Due to its structural complexity, karate belongs to the group of polystructural acyclic sports. Kara-te as a polystructural acyclic sport dominat-ed by acyclic unpredictable movements has only a symbolic destruction of the oppo-nent. This positive

destruction the karate athlete strives to perform by delivering con-trolled blows to the head and body of the opponent, although the movements repre-sent a combination of maximum and sub-maximal intensity. It is exactly such sym-bolism that gives a special place and mean-ing to this sport. As a sport and martial art, karate encourages self-discipline and de-velops focus and awareness. (Kostovski et al., 2014).

The development of modern karate is associated with the growing presence of science, whose research results have been widely used in the training processes of karate athletes (Korpanovski, Jovanovic, Dopsaj, 2007). All this research has contrib-uted to building the scientific basis in sports. Achieving top sports results is con-ditioned by a number of predispositions that modern competitors should possess. Great importance is given to the high tech-nical performance, the performed tech-niques, motor and functional abilities, men-tal readiness, and anthropometric and mor-phological predispositions (Lehmann & Jed-liczka, 1998). Assessment of the success achieved by athletes, who participate and compete in the big competitions, can be analysed only through scientific monitoring and using the knowledge from the compre-hensive analyses of the way and time of the movements in the "kumite" - sports com-bat. In its development, karate has evolved from a traditional martial art into a modern global martial art. Karate combat consists of a number of repetitions of blows and de-fence techniques, separated by high-intensity rhythmic jumping movements during the 3-minute fight in men (Beneke et al., 2004). Thus, karate combats are clearly characterised by an alternating pat-tern of activities (Chaabene, Hachana, Franchini, et al., 2012). From the analysis of karate competitions at the national level, it has been noticed that the activity phases contain 16 ± 5 actions with high intensity after the fight, which last for 1-3 seconds each (Beneke et al., 2004), and at the in-ternational level, karate athletes perform 17 ± 7 high-intensity actions lasting 1-5 sec-onds, each using predominantly specific upper extremity techniques (76.19% of all techniques used) (Chaabene, Franchini, Miarka, et al., 2013). Athletes, coaches and scientists in sports have a great interest in monitoring and measuring the adaptations of the body produced as a result of training. Situational motor abilities in modern karate are perhaps a crucial factor in solving sports tasks and achieving sporting suc-cess. Hand and leg blows in karate are the dominant techniques by which a karate athlete gains points or fights (Kostovski, 2005).

This research is focused on the changes of the situational motor abilities in karate athletes throughout the pro-grammed training process during the pre-paratory and pre-competition period. The need to evaluate these parameters is due to the fact that they are the dominant techniques for winning a match.

MATERIALS AND METHODS

THE SAMPLE OF RESPONDENTS

The research was conducted on a stratified sample of 16 male karate athletes, potential members of the U21 category, from the Republic of Kosovo, in the period of prepa-rations before the participation in the World Cup for U21, juniors and cadets in Chile 2019. The measurement was conducted in three time sequences during the period of preparations (Initial, Control and Final).

THE SAMPLE OF VARIABLES

The sample of variables consists of:

1. Kizame cuki đodan - đako cuki đodan - mawashi geri ćudan - (KJGJCMJ)

2. Kizame cuki đodan - đako cuki ćudan - mawashi geri đodan with rear leg - (KJGJCM)

3. Kizame cuki đodan - đako cuki ćudan - ashimawashi geri đodan - (KJGJC)

- The assessment of the situational motor abilities was performed according to the methodology of Zaborski B. (2013)

STATISTICAL PROCESSING

The basic descriptive statistical pa-rameters were calculated separately for each variable; arithmetic mean (Mean), standard deviation (SD), lower (min) and upper (max) limit of the results. One-way repeated measures MANOVA/ANOVA were used to determine the intergroup differ-ences in the arithmetic means. The impact of each variable in the creation of group differences was determined by applying the LSD test post hoc analysis. The research was conducted without a control group due to the fact that we are talking about top athletes, younger seniors with an average age of 20 years, which indicates the fact that the human development curve enters a phase of stagnation, and in the men-tioned period, they did not have any other physical activities except the training pro-cess. These data are sufficient confirmation that the changes in athletes are a result of the training process.

RESULTS

The results of this study, which refer to the situational motor abilities of karate athletes in different time sequences, are shown in Table 1.

Table 1: Basic statistical indicators of variables from the situational motor abilities for the U-21 group of respondents

	N	Min	Max	Mean	SD	Skew	Kurt
KJGJMGC	16	8	14	11.31	1.66	-0.37	0.03
KJGJCMJ	16	8	13	11.63	1.41	-1.19	1.48
KJGJAMJ	16	8	10	9.00	0.73	0.00	-0.91
KJGJMGC K	16	10	14	12.31	1.08	-0.35	0.12
KJGJCMJ K	16	10	15	12.19	1.11	0.59	2.31
KJGJAMJ K	16	9	11	9.56	0.81	1.04	-0.55
KJGJMGC F	16	11	16	13.38	1.09	0.19	2.26
KJGJCMJ F	16	11	14	12.69	0.70	-0.77	1.18
KJGJAMJ F	16	10	11	10.44	0.51	0.28	-2.22
Valid N (listwise)	16						

For the purpose of this research, the following were calculated: arithmetic mean (Mean), minimum result (Min), maxi-mum result (Max), standard deviation (SD). The coefficient of asymmetry of the results (Skew) and the coefficient of elongation (flatness) of the results (Kurt) were used to test the normality of the distribution of the results.

Analysing the results of the initial measurement, it can be said that in the calculated parameters of the applied varia-bles, the standard deviation (SD) is within the limits of normal values, and no devia-tion from the normal values of the standard deviation was observed in any of the varia-bles. The maximum and minimum values are expected, i.e., the grouping of the re-sults revolves around their own arithmetic means.

From the performed analysis of the Gaussian curve (Skew), which determines the symmetry of the distribution of results, it can be concluded that the displayed coef-ficients are within the recommended values (-1 + 1) with the exception of the variable Kizame cuki đodan - đako cuki ćudan - mawashi geri đodan with rear leg - (KJGJCMJ, Skew = -1.19). From the values of the degree of curvature for the Gaussian curve (Kurt), all variables show flatness, and no statistically significant deviation is rec-orded.

By analysing the results of the con-trol measurement, it is concluded that in the calculated parameters of the applied variables, the standard deviation (SD) is within the limits of normal values, i.e., no deviation from the normal values of the standard deviation was found. Maximum and minimum values are also expected and logical, and the grouping of the results re-volves around their own arithmetic means.

Analysing the Gaussian curve (Skew), in order to determine the sym-metry of the distribution of results, it can be concluded that the displayed coefficients are within the recommended values (-1 + 1) only for the variable Kizame cuki đodan - đako cuki ćudan ashimawashi geri đodan - (KJGJAMJ, Skew = 1.04). Analysing the cur-vature of the Gaussian curve (Kurt), all vari-ables show cohesiveness, and no statisti-cally significant deviation was recorded.

By analysing the results of the final measurement, it can be concluded that in the calculated parameters from the applied variables, the standard deviation (SD) is within the limits of normal values, and no deviation from the normal values of the standard deviation was found in any of the variables. The maximum and minimum val-ues are expected and logical, i.e., the grouping of the results revolves around their own arithmetic means.

Analysing the Gaussian curve (Skew), in order to determine the sym-metry of the distribution of the results, it was concluded that the displayed coeffi-cients range within the recommended val-ues (-1 + 1). From the values of the degree of curvature for the Gaussian curve (Kurt), all variables show flatness, and no statisti-cally significant deviation is recorded.

From above presented data, it can be concluded that the karate athletes, in their programmed training process, achieved the best results in the arithmetic means of the variables for the assessment of the situational motor abilities in the third time sequence. The evident difference in the results between the initial, control and final measurement is due to

the well-programmed training in the preparatory period of the karate athletes and indicates the improvement of their situational motor readiness. If these results are compared with the results from the available litera-ture, it can be said that they move in similar frames.

From the values shown in Table No. 2, and referring to the statistically signifi-cant differences between the time se-quences of the measurements, it can be concluded that: based on the results ob-tained from the three measurements of each variable separately and from the val-ues of Rao's F approximation, there is a statistically significant difference between the three time sequences (measurements) in the three variables for the assessment of situational motor techniques at the level of p = 0.00.

Table 2: Multivariate differences of variables from the situational motor techniques for the U-21 group of respondents

U21	Initial		Control		Final		F	Sig
	Mean	SD	Mean	SD	Mean	SD		
KJGJCMJ	11.31	1.66	12.31	1.08	13.38	1.09	35.28	**0.000**
KJGJCM	11.63	1.41	12.19	1.11	12.69	0.70	12.94	**0.003**
KJGJC	9.00	0.73	9.56	0.81	10.44	0.51	83.52	**0.000**

Table 3: Univariate differences of variables from the situational motor techniques for the U-21 group of re-spondents

Pairwise Comparisons KJGJCM

(I) Time		Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	(1.000)*	.376	.018	-1.802	-.198
	3	(2.063)*	.347	.000	-2.803	-1.322
2	1	1.000*	.376	.018	.198	1.802
	3	(1.063)*	.143	.000	-1.368	-.757
3	1	2.063*	.347	.000	1.322	2.803
	2	1.063*	.143	.000	.757	1.368

KJGJCMJ

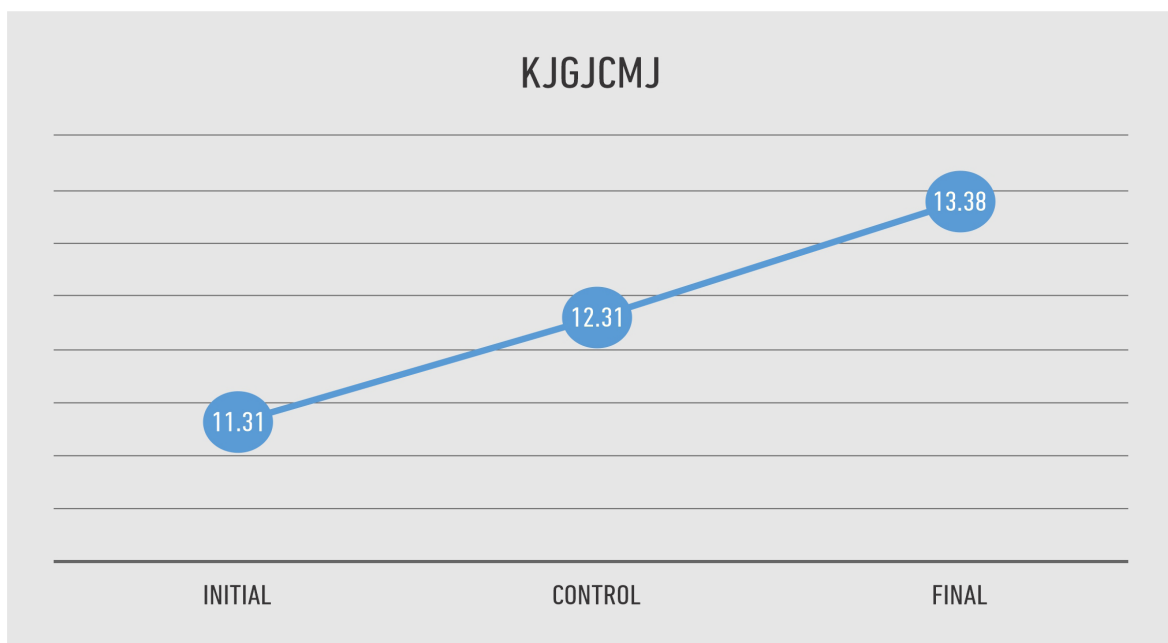INITIAL — 11.31 CONTROL — 12.31 FINAL — 13.38

Table 3 presents the differences at the univariate level, i.e., the time sequenc-es that contribute to the creation of the statistically significant difference within the measurements. From the same table, it can be seen that in the variable Kizame cuki đodan đako cuki đodan - mawashi geri ću-dan (KJGJCMJ), the determined numerical differences are also statistically significant differences in all three measurements at the level of p = 0.000 to p = 0.018. The biggest statistically significant difference is determined between the initial measure-ment and the other two (control and final) measurement at the level of p = 0.000

Table No. 4 presents the differences at the univariate level, i.e., the time se-quences that contribute to the creation of the statistically significant difference within the measurements. From the same table, it can be seen that in the variable Kizame cuki đodan - đako cuki ćudan - mawashi geri đodan with rear leg (KJGJCM), numerical differences were determined between the measurements, which are also statistically significant differences in all three meas-urements at the level of p = 0.003 to p = 0.045. The largest statistically significant difference is determined between the initial and final measurement (p = 0.003), and the control and final measurement (p = 0.015), while the smallest statistically significant difference occurs between the initial and control measurement (p = 0.045).
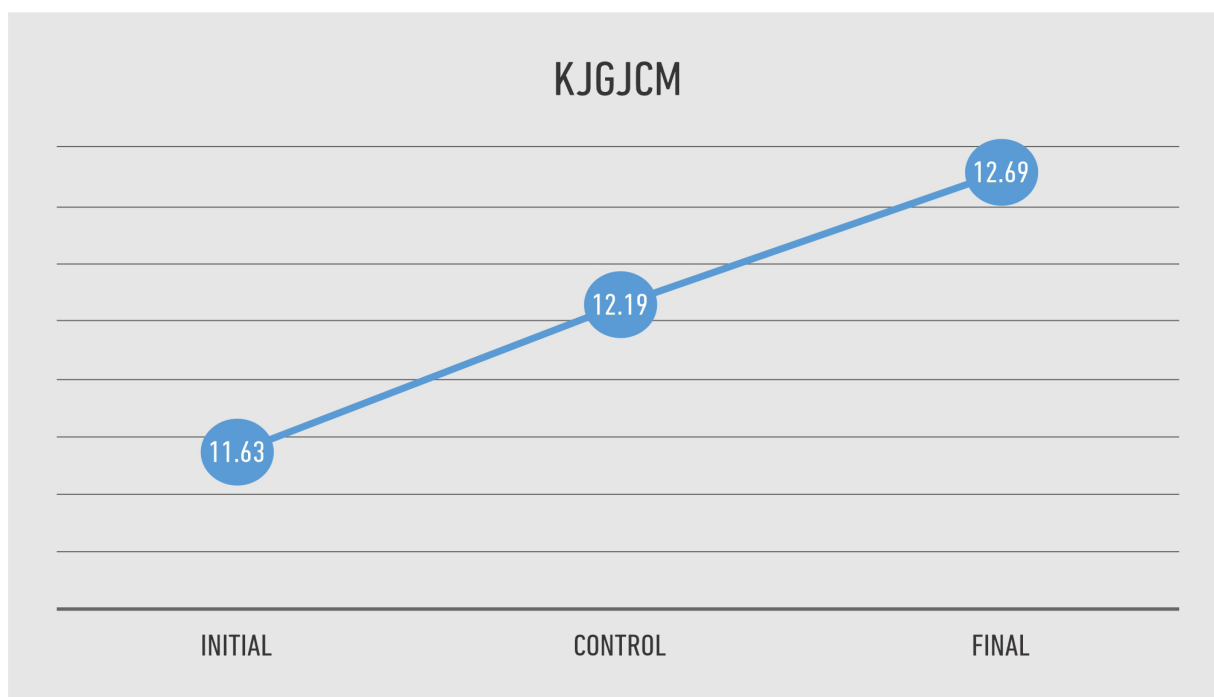
Table 4: Univariate differences of variables from the situational motor techniques for the U-21 group of re-spondents

Pairwise Comparisons KJGJCM

(I) Time		Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	(.563)*	.258	.045	-1.112	-.013
	3	(1.063)*	.295	.003	-1.692	-.433
2	1	.563*	.258	.045	.013	1.112
	3	(.500)*	.183	.015	-.889	-.111
3	1	1.063*	.295	.003	.433	1.692
	2	.500*	.183	.015	.111	.889

KJGJCM

INITIAL 11.63 — CONTROL 12.19 — FINAL 12.69

Table 5: Univariate differences of variables from the situational motor techniques for the U-21 group of respondents

Pairwise Comparisons KJGJCM

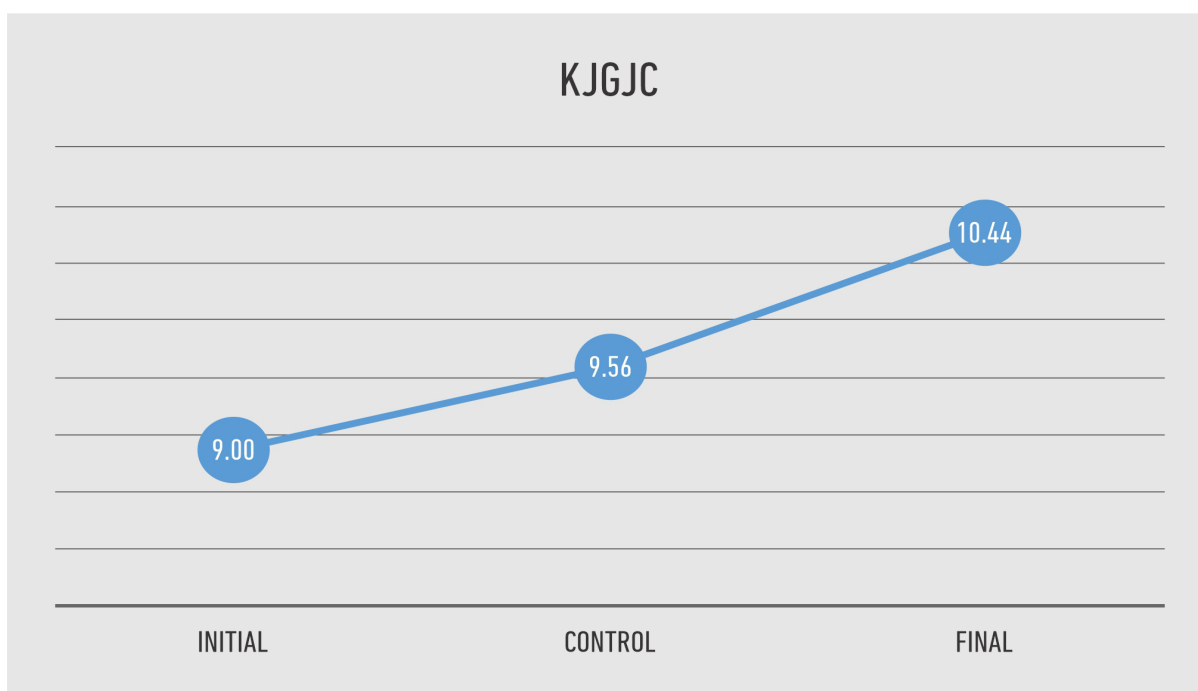| (I) Time		Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	(.563)*	.182	.007	-.950	-.175
	3	(1.438)*	.157	.000	-1.773	-1.102
2	1	.563*	.182	.007	.175	.950
	3	(.875)*	.180	.000	-1.258	-.492
3	1	1.438*	.157	.000	1.102	1.773
	2	.875*	.180	.000	.492	1.258

KJGJC

Table 5 presents the differences at the univariate level, i.e., the time sequenc-es that contribute to the creation of the statistically significant difference within the measurements. From the same table, it can be seen that in the variable Kizame cuki đodan - đako cuki ćudan - ashimawashi geri đodan (KJGJC), numerical differences were determined between the measurements, which are statistically significant differences in all three measurements at the level of p = 0.000 to p = 0.007. The largest statisti-cally significant difference is determined between the initial and final measurement (p = 0.000), and the control and final measurement (p = 0.000), while the small-est statistically significant difference occurs between the initial and control measure-ment (p = 0.007).

DISCUSSION

Due to its structural complexity, ka-rate belongs to polystructural acyclic sports, which are dominated by acyclic un-predictable movements, and has only a symbolic destruction of the opponent. This positive destruction the karate athlete strives to achieve by delivering controlled blows to the head and body of the oppo-nent, although the movements represent a combination of maximum and submaximal intensity (Kostovski, et. al., 2015), and en-ergy is drawn from both aerobic and anaer-obic metabolism. In indoor sports (gyms), the physical performance of athletes is generally determined by the duration and pace of the competition. In response to this, training programmes aim to slow down the formation of fatigue and improve en-durance (Kaya et al., 2013).

Hand and foot techniques in karate are the dominant techniques by which competitors score points or win the fight. Previous research on modern technical and tactical indices in karate fighting suggests that hand techniques have a very large im-pact (Vidranski, 2011). Also, according to Mattias (1999), one can see their connec-tion from the dominance of manual tech-niques in scoring and the blow ashi mawashi geri. Mawashi geri is a very useful shot when the fight is close range or in hand combination because it is difficult for the opponent to see the blow coming due to his roundabout. In this situation, either the front or rear leg can be used, although hitting with the front leg is faster and virtu-ally impossible for the opponent to block.

The research of Wąsik (2010), which was performed on a 17-year-old karate ath-lete, determined the blow time to be 0.75 seconds. He points out that the roundabout blow (Ashi Mawashi Gerry) is the most commonly used blow in combat.

In case there is a medium or long distance, these kicks can be easily com-bined with the hands and legs. According to the theoretical arguments taken from pre-vious research (Mattias, 1999), these tech-niques can be used as quick combinations, which is vital for sparring. Also, due to the rotation of the hip, which allows greater reach than the mae-geri, the body is well positioned in relation to the opponent, for which it will be more difficult to reach a counter-blow (which is impossible with a linear blow such as a mae-geri)

Hand blows are more natural than kicks, they are faster, easier to control and harder to block or avoid, which can easily explain why they are more commonly used in karate than kicks (Vidranski, 2011). Ac-cording to the current literature, these hand and leg techniques are one of the most commonly used when it comes to sports combat. Karate athletes used more upper limbs (76.19%) as opposed to lower limb techniques (23.80%). Kizame cuki was the most commonly used technique with 29.1% of all other techniques used accord-ing to Chaabène et al. (2014). Hence the conclusion that hand and leg blows can be easily combined including short, medium and long distance. According to the results of a study conducted by Vidranski, et al. (2015), the results in the technical and tac-tical combat concept were influenced by fast techniques that were used by the fighters as a means of tactical surprise to gain an advantage in the attack phase, i.e., karate combats were primarily won using simple techniques.

Karate competitions are character-ised by a complex technical structure and specific competitive abilities in the field of combined attack techniques (Kostovski et. al., 2013). Different techniques, such as kizame zuki and đako zuki, are the most applied competition techniques, which are structurally simple and safe movements and therefore the

most commonly used. Research results indicate that direct hand blows are the most effective attack tech-niques where blows have an advantage over leg blows. These types of attacks can be used as: one attack, counter attack or a combination of both (Vidranski, 2011).

According to the aforementioned study conducted by Kostovski et al. (2014), it can be concluded that the competitors and the winners of the competitions achieved higher values of situational effi-ciency of the mawashi geri chudan tech-nique in the attack phase. It could also be noticed that the group of winning competi-tors differed the most from the group of defeated competitors in the situational effi-ciency of the stated leg technique. It could be concluded that the winners of the com-petitions perform complex and difficult techniques, while those who were motor inferior to their opponents could not per-form these techniques. In addition to the above reasons, the "mawashi geri ćudan" technique is often used as a second and third choice technique in composite combi-nations. The reasons for such classification are: the lowest biomechanical complexity among all observed leg techniques and the transfer of the zone to achieve body points (Vidranski, 2011). Each individual variable with different intensity is related to the ob-tained factor, i.e., the grouping of the varia-bles unequally represents the obtained factor. Therefore, the variable that carries the most information about it stands out (Perić, 2001) as is the case with the ob-tained latent dimension.

The results of the research con-ducted by Kostovski Et al. (2013), regarding the measurement of the performance of the applied variable and above all, the factor of its validity, sensitivity and reliability, indi-cate that the test "Mawashi geri" is charac-terised by a high degree of sensitivity and satisfaction of the coefficients of reliability.

CONCLUSION

Specific motor abilities in modern karate sport are perhaps a crucial factor in solving sports tasks and achieving sport success. Hand and leg blows in karate are the dominant techniques by which a karate athlete gains points or fights (Kostovski, 2005). This was an additional reason to conduct the research with 16 male karate athletes, potential members of the national team of the Republic of Kosovo.

Achieving top sports results is condi-tioned by a number of predispositions that modern competitors should possess. Great importance is given to the high technical performance, given techniques, motor and functional abilities, mental readiness and

anthropometric and morphological predis-positions (Lehmann & Jedliczka, 1998). As-sessment of the success achieved by ath-letes, who participate and compete in the big competitions, can be analysed only through scientific monitoring and using the knowledge from the comprehensive anal-yses of the way and time of the move-ments in the "kumite" - sports combat. If we take into account that our study was related to karate athletes, and that the ka-rate federation of Kosovo is a member of the European and World Federation, more recently, it can be said that the results achieved by a good number of karate ath-letes are satisfactory in terms of compara-tive results from the literature. During the competition, the karate athletes do not reach the maximum level of load, and in one tournament, the karate athletes can have 4-5 fights during the day for which they need energy resources to be able to withstand at least 5 fights during the day.

Based on the well-programmed training process and its monitoring during the preparation and

pre-competition period, as well as other factors that affect the suc-cess of the athletes, the Kosovo national team at the World Cup in Chile achieved the highest results so far at this age (one fifth and two seventh places)

The main limitation of our study is the relatively small number of respondents, which reduces the power of statistics. How-ever, it should be borne in mind that this is mainly due to the specificity of the disci-pline as the number of karate athletes who make up the core of the national team, and who train under the supervision of one coach and in the same conditions, is always limited and rarely any national team as Ko-sovo (per capita) have a larger number of potential members of this age category. Therefore, it is advisable to conduct other research that will include karate athletes from other age categories, and which will be conducted according to our research methodology. This type of research is de-sirable to conduct, by expanding the seg-ments of the research, in other macro cy-cles of the training process.

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PROMJENE SITUACIONO-MOTORIČKIH SPOSOBNOSTI KARATE SPORTISTA U PRIPREMNOM I PREDTAKMIČARSKOM RAZDOBLJU

Razvoj modernog karatea je povezan sa sve većim prisustvom nauke čiji su rezultati istraživanja naširoko korišteni u trenažnim procesima karatista. Sva ova istraživanja su doprinijela izgradnji naučne osnove u sportu. Postizanje vrhunskih sportskih rezultata je uslovljeno nizom predispozicija koje bi savremeni takmičari trebalo da posjeduju. Istraživanje je provedeno na stratificiranom uzorku od 16 karatista, potencijalnih članova reprezentacije Republike Kosovo, u periodu priprema prije učešća na Svjetskom kupu za U21, juniore i kadete u Čileu 2019. Glavni cilj istraživanja je utvrditi promjene u situaciono-motoričkim sposobnostima karatista nakon deset sedmica programiranog treninga. Osnovni deskriptivni statistički parametri su izračunati za svaku varijablu, na primjer: aritmetička sredina (srednja vrijednost), standardna devijacija (SD), donja (minimalna) i gornja (maksimalna) granica rezultata. Multivarijantna analiza varijanse (MANOVA) i univarijantna analiza varijanse (ANOVA) su korištene za utvrđivanje međugrupnih razlika u artimetičkim sredinama, kao i razlike unutar grupa. Analiza post hoc LSD testa je primijenjena kako bi se utvrdio specifični uticaj svake varijable u stvaranju grupnih razlika. Analiza dobijenih rezultata istraživanja je otkrila statistički značajne razlike između tri vremenske sekvence u tri varijable.

Ključne riječi: trening, karate, situaciono-motoričke sposobnosti

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