INFLUENCE OF MOTOR ABILITIES ON THE EXECUTION SPEED OF COMPLEX KARATE COMBINATION IN RELATION TO TERRITORIAL FACTOR

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Abstract

The aim of this study is to determine the possible existence of territorial depending influence of basic motor abilities on the execution speed of complex karate combination. Sample of subjects included 115 Montenegrin male karate practitioners, aged 15 years ± 6 months, divided into three subsamples according to the corresponding territorial regions (north n=37, central n=39 and south n=39). For the purposes of this study a system of 19 variables, which are hypothesized to cover areas of basic motor abilities (18 variables) and specific motor abilities (1 variable), was used. All results have been subjected to statistical analysis, which involves regression analysis as the primary statistical operation. Insight into results relieved that in two out of three subsamples (north and south region) predictor system of basic motor abilities has a statistically significant influence on the criterion, while significant influence in central region was not found. With this it is possible to conclude that the existence of territorial factor resulted with the differences in motor abilities influence on the execution of karate techniques in three regions.

Key words: *motor abilities, karate technique, karate combination, territorial factor*

Introduction

Karate takes an important place in today's sport, not just because it is widespread, but because the organization of the competitions is at a high level. With this in mind, sport karate has become one of the most popular forms of martial arts competition (Gibson & Wallace, 2004). It allows the practitioners a safe and controlled environment in which it is possible to test their skills against various opponents, using a light contact with the appropriate points system. Karate belongs to the family of acyclic polystructural sports, in which participants aim to achieve symbolic victory over the opponent with simulated or strictly controlled techniques, either by punches or kicks, while trying to avoid penalty by striking opponent too hard. This is most crucial difference between karate and other martial arts. Because of the aforementioned system of regulations and restrictions, in today's karate kumite competitions, fight between two karatekas takes the general form of demonstrating athlete's speed, agility, strength and technical repertoire.

To achieve top results in today's karate sport it is very important to have a clearly controllable training process. Anthropological characteristics are an important factor for success in karate, where the most important role for achieving top results has speed. Taking this into account, Sertić (2004) gave a hypothetical equation of success specification in karate, which reads as follows: JSK = 25% speed + 20% coordination + 18% strength + 15% flexibility + 12 % accuracy + 10% balance. It is apparent that the largest share at the specification of performance in karate has speed with coordination and strength in all its forms. Martínez de Quel Pérez (2003) states that the most important factor in meeting today's karate competition demands are reaction speed with visual reaction speed.

In addition, Thouburn (2002) says that success in sport karate depends on explosive strength, speed and anaerobic endurance while there remains a need for aerobic endurance to maintain a high energy level throughout the competition. Special treatments that are conducted in the training karate process always strive for the establishment of such anthropological dimensions that are adequate for the implementation of strictly specific sport activities that lead to successful and high-quality sport results. Given this, only athletes who possess a high enough level of basic motor abilities will be able to perform all necessary activities for participation in top level karate. Doder et al. (2011) suggest that with greater development of karate as a sport, modern approaches, concepts, forms, activities and procedures in training technologies with young karate athletes are required. This especially concerns the structure of anthropological characteristics and specific impacts on athletic performance. In kumite fight, there are a large number of techniques that are being used in competition, most often like a combination of techniques, while some combinations are so complicated that even some top trained karate athletes are not able to respond to all requests imposed to them by this sport. For these reasons, there is a constant search for ways to apply the laws of science to improve the movement of the body, where the effectiveness of karate technique itself is a derivative of these scientific recognitions. Relations of motor abilities and specific motor abilities and karate technique effectiveness are determined in many studies (Blažević et al., 2006; Doder, et al., 2009; 2011; Mikić, et al., 2009; Roschel et al., 2009; Katić et al., 2010). However, it is not recorded that geographical features were involved into the equation.

With this in mind, it was meant to check does territorial factor represent an important characteristic while assessing influence of basic motor abilities on karate techniques, in small country like Montenegro.

Problem and aim

The main problem of this study is to identify influences of territorial factor on the influence level of basic motor abilities on the effectiveness of techniques in karate practitioners aged 15 years ± 6 months. The aim of this study is to determine the possible existence of territorial depending influence of basic motor abilities on the execution speed of complex karate combination. With this information it was meant to find out about the impact rate of the basic motor abilities on the correct performance of multiple hand and foot karate techniques.

Methods

Sample of subjects included 115 Montenegrin male karate practitioners, aged 15 years ± 6 months, divided into three subsamples according to the corresponding territorial regions (north n=37, central n=39 and south n=39). Subsample north region subjects (body height – 171.78±5.16 cm; body mass – 63.83±6.69kg) came from karate clubs "Jedinstvo" – Bijelo Polje, "Ris" – Pljevlja and "Gorštak" – Kolašin. Subsample central region subjects (body height – 172.51±6.33cm; body mass – 61.71±8.04kg) came from karate clubs "Budućnost" – Podgorica, "Onogošt" – Nikšić, "Omladinac" – Podgorica and "Nord Iskra" – Podgorica. Subsample south region subjects (body height – 170.32±4.93cm; body mass – 63.41±7.26kg) came from karate clubs "Jadran" – Herceg Novi, "Risan" – Risan, "Albulena" – Ulcinj and "Bar" – Bar. With this type of research in mind, only brown or black belt competitors in kumite fights, participated in this study. All subjects were in the systematic training process for a minimum time period of 3 years.

For the purpose of this study a system of 19 variables, which are hypothesized to cover areas of motor abilities (18 variables) and specific motor abilities (1 variable), was used. For assessment of basic motor abilities, variables: flamingo (MRFLM), Stork test with closed eyes (MRSTK), hand tapping (MBTAR), foot tapping (MBTAN), 20m running start (MBT20M), 20m shuttle run (MI20SR), standing long jump (MESDM), throwing a medicine ball from lying position (MEBML), 30s crunches (MSLS), pushups on parallel bars (MSSR), endurance on high bar (MSIV), endurance in a half squat with weight (MSIPT), side steps (MKKUS), agility in air (MKOZ), precision with long rod (MPCDS), throwing at horizontal aim (MPGHR), over-arm flip (MFIP) side-lying leg raising (MFOLB) were used. For assessing specific motor abilities, the execution speed of complex karate combination (SBIKK) variable, was used.
In assessing of this criterion, subjects were tasked to, in the shortest time possible, do 5 different "kumite" punches and kicks, while moving forward and crossing the line of 2m. A complex karate combination consists of the following techniques: kizami-zuki, djako-zuki, ashi-mawashi-geri, mae-geri, and ushiro-mawashi-geri. The results in this study were subjected to statistical analysis, which in this case includes regression analysis. With regression analysis, predictor value of selected indicators of motor abilities on established criterion, were determined. To determine the relations of predictor variables and the criterion variable, multiple correlation coefficient (R), coefficient of determination (R^2), statistical significance level of the coefficient of multiple correlation (Q), the partial regression coefficient (β) and the statistical significance level of partial regression coefficient (Q(β)), were calculated. All results were analyzed using SPSS 17.0 statistical PC software.

Results

In this part, given below are tables showing results of regression analysis of the basic motor abilities impact on execution speed of complex karate combination, as well as detailed analysis of the obtained data.

Table 1. Regression analysis of SBIKK criterion in subsample north region

Variable \ Parameter	B	Se(β)	β	Q–β
MRFLM	8.16	.02	.05	.75
MRSTK	-2.88	.01	-.07	.60
MBTAR	-3.38	.03	-.21	.31
MBTAN	-6.67	.03	-.03	.86
MBT20M	-.43	.18	-.41	.02
MI20SR	1.68	.04	.07	.70
MESDM	-1.14	.01	-.05	.83
MEBML	6.10	.01	.24	.45
MSLS	1.14	.02	.07	.69
MSSR	-2.68	.02	-.30	.25
MSIV	-3.67	.01	-.12	.57
MSIPT	3.69	.01	.19	.54
MKKUS	.26	.09	.44	.02
MKOZ	.42	.16	.61	.02
MPCDS	2.42	.02	.20	.30
MPGHR	-2.74	.01	-.33	.08
MFIP	5.40	.01	.10	.68
MFOLB	-1.21	.01	-.19	.48

R=.92, R^2=.85, Q=.00

Inspection of the values of the parameters contained in table 1, the calculated values of the multiple correlation coefficient (R=.92), in accordance with expectations, suggest that there is a statistically significant linear relationship between the predictor variable system of basic-motor abilities and criterion SBIKK, in a percentage of 92% at Q=.00 level of statistical significance. In addition to examining the determination coefficient R^2, shows that there is 85% of common variability between predictor system and criterion, for this subsample of subjects. Having demonstrated a statistically significant effect of the independent variables of the system that represents basic motor abilities to perform complex karate combination as dependent variable, it can be moved to further

analysis of the individual β coefficients. The second part of table 1 shows which of the individual variables, and on what extent, has a significant impact on dependent variable SBIKK. There are three variables that showed a statistically significant impact on criterion at Q≤.05 level. The first variable is MKKUS, where the partial regression coefficient is β=.44 (Q(β)=.02). Another dependent variable that has a statistically significant impact on criterion is MKOZ, where β=.61 at Q=.02 level of statistical significance. These variables are assessing coordination, which could lead to a conclusion that successful execution of karate combination requires an optimally developed level of coordination in karate athletes. Noticeable, a negative impact of variable for assessment of running speed (MBT20M), where the level of statistical significance is Q(β)=.02, while the partial regression coefficient is β=-.41. This negative effect can be interpreted as subjects that scored numerically lower results on test 20m flying start running, at a test execution speed of complex karate combination, scored numerically higher results. At last, it can be reported that only these three variables showed statistically significant influence of basic motor abilities on criterion in the subsample north region.

Table 2. Regression analysis of SBIKK criterion in subsample central region

Variable \ Parameter	B	Se(β)	β	Q(β)
MRFLM	1.90	.05	.10	.71
MRSTK	3.93	.01	.08	.71
MBTAR	2.33	.03	.14	.54
MBTAN	-3.27	.05	-.12	.57
MBT20M	-.13	.46	-.07	.77
MI20SR	-4.91	.06	-.01	.99
MESDM	-4.20	.01	-.19	.54
MEBML	-1.08	.01	-.04	.82
MSLS	-6.12	.03	-.36	.11
MSSR	-2.01	.03	-.16	.54
MSIV	-2.97	.01	-.06	.82
MSIPT	-4.10	.01	-.01	.94
MKKUS	-5.52	.12	-.10	.67
MKOZ	-4.76	.21	-.05	.82
MPCDS	-6.77	.04	-.38	.14
MPGHR	2.66	.02	.27	.30
MFIP	-1.11	.01	-.20	.52
MFOLB	-1.49	.02	-.20	.55

R=.76, R^2=.58, Q=.15

A review of some previous studies (D. Doder & R. Doder., 2006; Doder et al., 2009) which deal with similar problem, has not shown that in some instances a coordination test showed a statistically significant effect on the performance of karate technique, while none of these cases assessed the combination of five techniques but a single or combination of two techniques. Analysis of table 2, which carries the regression analysis information of basic motor abilities predictors on criterion SBIKK, shows that with Q=.15 level of statistical significance, there is no significant effect of the predictor system on criterion. As no statistical significance of the predictor system on criterion is found, analyzing of partial regression coefficients won't be done. Influence values of basic motor abilities predictor system on specific motor abilities criterion SBIKK in the subsample south region, are shown in table 3. Insight into the value of the multiple correlation coefficient (R=.90), shows the existence of regression relations between aforementioned variables on Q=.00 statistical significance level.

Table 3. Regression analysis of SBIKK criterion in subsample south region

Variable \ Parameter	B	Se(β)	β	Q(β)
MRFLM	-5.92	.04	-.30	.17
MRSTK	-3.70	.01	-.08	.70
MBTAR	3.59	.04	.25	.44
MBTAN	-.13	.06	-.64	.06
MBT20M	.51	.31	.52	.11
MI20SR	-1.57	.05	-.00	.99
MESDM	-3.06	.01	-.13	.65
MEBML	1.54	.01	.52	.02
MSLS	1.26	.03	.08	.65
MSSR	2.36	.03	.18	.50
MSIV	-9.05	.01	-.25	.33
MSIPT	1.09	.01	.05	.78
MKKUS	6.82	.10	.15	.00
MKOZ	-1.78	.12	-.01	.98
MPCDS	-2.70	.02	-.21	.21
MPGHR	-1.02	.01	-.10	.54
MFIP	-6.10	.01	-.01	.96
MFOLB	-5.21	.01	-.07	.67

R=.90, R^2=.82, Q=.00

Coefficient of multiple correlation explains existence of 90% relation with the independent variable. With other parameter, determination coefficient, it can be concluded that there are about 82% of mutual variability between dependent and independent variable, that shows the level of predictor system influence on criterion. Insight into individual variables and their influence on the dependent variable, it can be noticed that two variables have statistically significant on criterion. Variable MKKUS has a statistically significant influence (Q(β)=.00), where the partial regression coefficient is β=.15. Besides this, variable MEBML, also shows statistically significant influence (Q(β)=.02) with β=.52. In both cases coefficient β is positive, but it is evident that subsample south region subjects which scored better results in coordination test also scored better scores in executing complex karate combination. With these results in mind, here it could be concluded, that for quality execution of complex karate combination in the subsample south region, biggest prediction value has coordination, which in this case is expressed through test - side steps. In other hand, also, important predictive impact was shown through throwing a medicine ball from lying position assessing hand power.

Discussion and conclusion

It could be concluded that testing results of the subsample central region determined final results in differences of motor abilities influence on the execution speed of complex karate combination.

In this case subsamples north and south region are characterized by statistically significant predictor system influence on criterion at Q=.00 level. Different from these, regression analysis showed that the subsample central region did not posses statistically significant influence (Q=.15) of the predictor system on criterion, while the same subsample shows lowest values of multiple correlation and determination coefficients. The subsample north region posses highest value of the multiple correlation coefficient (R=.92), while the value of this parameter in the subsample south region is R=.90. Determination coefficient is highest in the subsample north region (R^2=.85), while in the subsample south region this parameter has value of R^2=.82. From this it could be concluded that system differences between north and south regions are very small and could be ignored. Inspecting values of partial regression coefficient, statistically significant influence in the subsample north region was seen in variables MBT20M (β=-.41; Q-β=.02), MKOZ (β=.61; Q-β=.02) and MKKUS (β=.44; Q-β=.02), while in the subsample south region these variables are MKKUS (β=.15; Q(β)=.00) and MEBML (β=.52; Q(β)=.02). In the earlier studies (Blažević et al., 2006; Katić et al., 2010) it is stated that to achieve good results when performing specific karate tests, one must have high level of explosive strength, which is accompanied with the factors of speed and coordination. In this case, primary in the subsamples north and south region, important test for predicting results in execution speed of complex karate combination is side steps, while it could be concluded that high level of agility was necessary for faster execution of techniques. Running speed and coordination were shown as significant in the subsample north region, while explosive strength of upper body was found significant in south region. In earlier studies (Mikić et al., 2009; Doder et al., 2009; Doder et al., 2011), it is noted that technical and competition karate success depends of explosive strength of lower body, while influence of upper body explosive strength was not found. With this information, it could be seen that there are differences in motor abilities influence on execution of complex karate combination between subsamples. The differences are smaller between subsamples north and south region, but the results in the subsample central region expand the gap. It could lead to a general conclusion that the existence of territorial factor resulted with the differences in motor abilities influence on the execution of karate techniques in three regions.

To achieve high sport results in competitions, a highly programmed and controlled training process, or procedure to maintain and develop many characteristics, abilities and skills in athletes, is needed. Results gained in this study, undoubtedly point to some differences in a few segments of long-term development and selection of athletes, as well as in period of starting early sport specialization. It is evident that training processes differentiate between karate clubs in three regions. Different approaches in training procedures lead to differences in karate technique learning and mastering, which, most likely, caused the occurrence of these different motor abilities influence on execution speed of complex karate combination in three geographically specific subsamples. Therefore, this study can serve as a starting point to optimize the training process in Montenegrin karateka. In order to confirm the results obtained in this study, further research with older sample of subjects is needed, while leaving room to test the impact of morphological characteristics on this criterion.

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UTJECAJ MOTORIČKIH SPOSOBNOSTI NA BRZINU IZVOĐENJA KOMPLEKSNE KARATE KOMBINACIJE U RELACIJI SA TERITORIJALNIM FAKTOROM

Sažetak

Cilj ovog istraživanja je određivanje mogućeg postojanja teritorijalno zavisnog utjecaja bazičnih motoričkih sposobnosti na brzinu izvođenja kompleksne karate kombinacije. Uzorak ispitanika podrazumijeva 115 crnogorskih karatista muškog spola, uzrasta 15 godina ± 6 mjeseci, podijeljenih u tri subuzorka prema odgovarajućim teritorijalnim obilježjima (sjeverna regija n=37, središnja regija n=39 i južna regija n=39). Za potrebe ovog istraživanja korišćen je sistem od 19 varijabli, koje hipotetski pokrivaju prostor bazičnih motoričkih sposobnosti (18 varijabli) i jedna za procjenu specifičnih motoričkih sposobnosti (1 varijabla). Svi rezultati su podvrgnuti statističkoj analizi (regresijska analizu) kao primarnoj statističkoj operaciji. Uvidom u rezultate otkriva se da kod dva od tri subuzorka (sjeverna i južna regija) prediktorski sistem bazičnih motoričkih sposobnosti ima statistički značajan utjecaj na kriterij, dok se nije otkrio statistički značajan utjecaj kod subuzorka središnja regija. Sa ovim, moguće je zaključiti da je postojanje teritorijalnog faktora uvjetovalo razlike u utjecaju motoričkih sposobnosti na izvođenje karate tehnika kod tri regije.

Ključne riječi: *motoričke sposobnosti, karate tehnika, karate kombinacija, teritorijalni faktor*

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