

THE DIFFERENCES IN THE MOVEMENT STRUCTURES OF KATA, FIGHTS AND MENTAL POTENTIALS BETWEEN BOYS AND GIRLS WHO TRAIN KARATE

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Abstract

The goal of research was to evaluate the movement structures of kata, fights and mental potentials from CRD series (attention distribution, operational thinking and psychomotor reactions) of 32 young karate students (17 boys and 15 girls). Next task was to determine differences in the arithmetic mean between boys and girls, aging between 10 to 14 years, by applying multivariate statistical methods and significant univariate analysis of variance. The results of applied multivariate analysis of variance (MANOVA) showed no statistically significant relationship in the entire system of variables ($p=.09$). However, univariate procedures (ANOVA) obtained statistical significance only in DPUKPTM or total time ($p=.01$), DPMINTM or minimum time of correct reaction ($p=.01$), DPMAXTM or maximum time of correct reaction ($p=.04$) and OMMINN or minimum time of correct reaction ($p=.00$) variables all in favor of the boys. In variables with no statistically significant differences, boys had a longer path of training and were better in sports fight, while the girls were better in performing kata. In the space of attention distribution, operational thinking and psychomotor reactions, boys had better results in all applied variables except for total time variables – OMMUKPTM and average time of all reactions in the test – OMTAVRM. The research showed that the differences in favor of boys are a result of innate capabilities, functioning of CNS mechanisms and synaptic barriers within the neuromuscular system. The significant differences were recorded because the boys are much better in some perceptive abilities than girls are at that age. Individual experiences, gained through development and effect of training process in karate, have a certain positive effect on shaping the form of situational behaviour.

Key words: kata and fights, SRD series, boys and girls, age from 10 to 14 years, differences

Introduction

Interest in the existence of individual differences in the speed and accuracy of implementing mental activities is as old as the research of reactions and their time. The problem of defining structural elements and functioning of mental process mechanisms in the range of complex mental activities (from percept, as the simplest form of perception to solving problems, as the most complex form of processing stimulating content) requests knowing several terms. Some of those terms are the neural morphology, function of physiological mechanisms in neurological substratum, inner organization of keeping and actualization of permanent memory as a whole and specialized formation of central nervous system. In addition, one must be familiar with the indicators of formation functions, characteristics of functions and indicators of efficiency of cognitive components (emotional reaction to stimulant, focus and mobility of attention, fatigue and so on). Interest in chronometry of cognitive processes functioning resulted in appearance of valid and precise methods for establishing the relationship between physiological and cognitive phenomena manifested by time of reaction (Drenovac, 1994). Children, aging from 10 to 14, are in the transition from the period of concrete operations to the period of formal operations. Within that age, on the level of concrete operations, the ability to determine the relationship between stimulants and logical combination of those relationships in order to reach

some conclusions is developing quite successfully (Vojinovic, Doder, D & Doder, R., 2007). Transitivity also appears here. The operations here represent the diversity in mental actions, which older children use to solve problems and conclude in logical way. Another term is connected to the operations – reversibility, which is the ability to correct or reverse possible interferences or disturbances while solving the problem. The greatest limit is the fact that operational thinking on this level is greatly concentrated on concrete actions and perceptions. Some operational structures that are used for one area are not simply transferred to another area. That transfer happens within temporal distance (from 2 to 4 years on average). Therefore, operational structure is still determined by its concrete content. The period of formal operations is the final period in development of children's cognitive abilities. Once established, formal operations last forever. In this age, the opinion develops from concrete – real to abstract which is without concrete content. One of the main characteristics is hypothetical – deductive reasoning. This involves solving the problem by creating and testing the hypothesis, and reaching logical conclusions according to the results of this testing. On the level of formal operations, children start considering different possibilities, creating different hypothesis and finding the right solution for the problem (Piaget & Inhelder, 1978).

Problem and aim

In attempts to determine the specific personalities of a sportsman, it is accessing to research programs in order to determine which psychological abilities prevail in the population of sportsmen in general and in specific sports. The aim is to determine the significant differences in personalities between genders, which is the problem of our research. The goal of the research is to determine the differences in movement structures of kata, fights and mental potentials from CRD series (attention distribution, operational thinking and psychomotor reactions) between boys and girls training karate.

Methods

Sample of entities

The sample included 32 young karate students (17 boys and 15 girls) from Novi Sad, in the age from 10 to 14 years.

Sample of variables

The sample of variables consisted of 15 variables, three of which were used to evaluate the movement structures of kata and fights, and 12 were used for evaluating mental potential from CRD series (attention distribution, operational thinking and psychomotor reactions). For evaluating the movement structures of kata and fights, following variables were applied: 1. training length (DUZTREN), 2. evaluation of the efficiency in performing kata (OCEKATA) – speed and strength demonstration, good balance, proper breathing, timeliness, steady and calm transition with feet firmly on the ground, proper tension, precision, focus, understanding of kata, contraction, contrast in tension, breathing, movement and rhythm of kata, 3. evaluation of efficiency in fight (OCBORBE) – fighting with proper form (fighting stance, moving, manifestation of strength, proper distance) and zanshin (self-control, focus, serenity and poise). Assessment of situational moving structure was measured with the average grade from 1 to 5 given by 3 examiners per each examinee (Doder, 1998; Doder, 2000). For evaluating mental potential, CRD series was used. It consists of 38 standard tests, which are used for testing perceptive abilities of thinking, memory and different types of psychomotor reactions (Drenovac, 1994; Zivicnjak, Zebec, Franke, Filler, Szirovica, Haffner, Querfeld, Enrich & Rudan, 2001). 1. CRD 2-41 is a test of identifying progressive series of numbers – attention distribution: total time (DPUKPTM), minimum time of correct reaction (DPMINTM), maximum time of correct reaction (DPMAXTM) and average time of all reactions in the test - the total time of correct and incorrect reactions divided with the number of reactions (DPTAVRM). CRD 2-41 test was made according to the tests called "numeric box" where three-digit numbers from 101 to 140, which form an appropriate continuum, are randomly distributed in a number of squares. Examinee must find the numbers in ascending order, and mark the position

of a certain number by clicking the button, placed under or above that number. When the examinee marks the correct position of a certain number, he gets a back tone, while a skipped number and all the following numbers are treated as incorrect. CRD 2-41 test is used for measuring the scope, or in other words the distribution of attention. 2. CRD 4-11 is an operational thinking test: total time (OMUKPTM), minimum time of correct reaction (OMMINTM), maximum time of correct reaction (OMMAXTM) and the average time of all reaction in the test – the total time of correct and incorrect reactions divided with the number of reactions (OMTAVRM). CRD 4-11 test contains a signal circuit of four indicator lights and lit light shows which limb should react. In the tests, 1, 2 or 3 lights turn on and the examinee must respond by pressing the button with one or more limbs. The test consists of 35 tasks and it examines the speed and accuracy of operational thinking while managing synchronized movement of arms and legs. 3. CRD 4-33 is simple psychomotor reaction test: total time (PRUKPTM), minimum time of correct reaction (PRMINTM), maximum time of correct reaction (PRMAXTM) and average time of all reactions in the test – total time of correct and incorrect reactions divided with the number of reactions (PRTAVRM). CRD 4-33 test contains a signal circuit with one lamp and one button for responding. The task of the examinee is to press as fast as possible the button for respond when the light signal appears, while pressing the button before the signal appears is considered as a mistake. The test contains 35 tasks and it measures the speed of simple psychomotor reaction.

Data processing method

For every applied variable, the following statistical, central and dispersion parameters have been calculated: M- arithmetic mean, min- minimum value, max-maximum value and standard deviation. Normal distribution of variables was tested using Sk - skewness. For determining the difference in arithmetic mean of applied variables between boys and girls, a multivariate statistical methods and univariate analysis of variance (MANOVA/ANOVA) were used. Multivariate testing of null hypothesis, where the group centroids are equal to the common centroid (GENERAL MANOVA), was carried out with λ - Wilks' lambda test, F-test and p - statistic significance <.05. Univariate statistic significance in differences between arithmetic mean of the variables was calculated with the help of F-test and p - statistic significance <.05. The data were processed by software package STATISTICA 8.

Results

Chart one clearly shows that applied variables do not significantly deviate from normal distribution (Sk) which proves that the calculations have been correct and precise. The majority of applied variables at boys do not deviate from normal distribution, because the Sk values do not exceed one standard deviation (marked *).

So the gained discriminant results are satisfactory, except for PRMINTM variable or minimum time of correct reaction (Sk=-1.63), which negative measures of asymmetry indicate a number of higher values. At girls, the majority of applied variables also do not deviate from normal

distribution, except in OMMAXTM or maximum time of correct reaction (Sk=1.46), PRUKPTM or total time (Sk=1.52), PRMAXTM or maximum time of correct reaction (Sk=2.56) and PRTAVRM or average time of all reactions in the test (Sk=1.17).

Table 1: The basic statistical parameters and testing the normality of their distribution

Varijable	M		SD		min		max		Sk	
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
MOVEMENT STRUKTURES OF KATA AND FIGHTS										
DUŽTREN	5	4.4	1.6	2.1	2	1	7	8	-.46*	-.02*
OCEKATA	3.1	3.1	1.5	1.6	1	1	5	5	-.09*	-.12*
OCBORBE	3.6	2.6	1.5	1.72	1	1	5	5	-.59*	.43*
MENTAL POTENTIAL										
CRD 2-41 - test attention distribution										
DPUKPTM	38228.4	46261.3	6507.8	10048	27514	31445	48185	67565	-.08*	-.24*
DPMINTM	482.1	556.7	51	111.8	406	349	573	706	.06*	-.37*
DPMAXTM	1956.5	2420.6	544.2	694.9	1220	1273	3015	3749	.53*	.43*
DPTAVRM	857.1	965.2	151.6	191.9	632.6	666.7	1175.1	1318	.95*	.38*
CRD 4-11 - operational thinking test										
OMUKPTM	304790	292970	92671	53666	173361	207369	521228	389212	.65*	.43*
OMMINTM	571.9	757.1	184.8	116.9	326	514	901	914	.67*	-.45*
OMMAXTM	33498.1	37189.3	13505	14441	13375	17770	67869	72868	.77*	1.46
OMTAVRM	7221	7133.2	1846.5	1210.1	4334	4937.3	10092	9085.4	-.04*	.12*
CRD 4 -33 - psychomotor reaction test										
PRUKPTM	10467	10815.1	2346.3	3102.3	7663	7688	16241	19359	.90*	1.52
PRMINTM	184.6	191.7	27.1	32.1	102	112	227	246	-1.63	.63*
PRMAXTM	375.2	484.5	77.1	267.1	269	276	531	1334	.93*	2.56
PRTAVRM	287.8	299.9	55.1	76.2	218.9	216.5	427.3	496.4	.91*	1.17

M - arithmetic mean, SD - standard deviation, min - minimum value, max - maximum value, Sk - skewness, * - normal distribution, ♂- boys ♀- girls.

Table two shows the gained multivariate statistic significance in arithmetic mean of boys and girls on the level .09 (p=.09), which is not statistically significant. Univariate procedures (ANOVA) obtained statistical significance only in DPUKPTM or total time (p=.01), DPMINTM or minimum time of correct reaction (p=.01), DPMAXTM or maximum time of correct reaction (p=.04) and OMMINN or minimum time of correct reaction (p=.00) variants, all in favor of the boys. In variables with no statistically significant differences, boys had a longer path of training and were better in sports fight, while the girls were better in performing kata. In the area of attention distribution, boys had better results in all applied variables (total time or DPUKPTM, minimum time of correct reaction or DPMINTM, maximum time of correct reaction or DPMAXTM and average time of all reactions in the test or OMTAVRM) because they had shorter minimum time of correct reaction. In operational thinking, boys had reactions that were more correct in minimum time of correct reaction or DPMINTM and in maximum time of correct reaction or DPMAXTM variables. The girls were better in total time or OMUKPTM and average time of all reactions in the test or OMTAVRM variables. In psychomotor test, boys had better results in all applied variables (total time or PRUKPTM, minimum time of correct reaction or PRMINTM, maximum time of correct reaction or DPMAXTM and average time of all reactions in the test or PRTAVRM).

Table 2: Statistical parameters univariate and multivariate analysis of variance (ANOVA/MANOVA)

Variable	M♂	M♀	F	p
MOVEMENT STRUKTURES OF KATA AND FIGHTS				
DUŽTREN	5.00*	4.4	0.81	0.4
OCEKATA	3.11	3.13*	0	1
OCBORBE	3.58*	2.6	2.92	0.1
MENTAL POTENTIAL				
CRD 2-41 - test attention distribution				
DPUKPTM	38228.35*	46261.27	7.37	.01*
DPMINTM	482.05*	556.73	6.14	.01*
DPMAXTM	1956.52*	2420.6	4.47	.04*
DPTAVRM	857.10*	965.24	3.16	0.1
CRD 4-11 - operational thinking test				
OMUKPTM	304789.5	292969.70*	0.18	0.7
OMMINTM	571.88*	757.13	11.1	.00*
OMMAXTM	33498.06*	37189.33	0.55	0.5
OMTAVRM	7221.01	7133.23*	0.02	0.9
CRD 4 -33 - psychomotor reaction test				
PRUKPTM	10467.00*	10815.07	0.13	0.7
PRMINTM	184.64*	191.66	0.44	0.5
PRMAXTM	375.17*	484.46	2.6	0.1
PRTAVRM	287.84*	299.93	0.26	0.6

λ = .35 F = 1.96 p = .09

M♂- boys, M♀- girls

ANOVA: F - test; p- statistic significance < .05
MANOVA: λ - Wilk's lambda; F - test; p- statistic significance < .05

Discussion and conclusion

Boys differ from girls in reactions and individual efficiency in performing certain mental and motor activities because of genetic potentials and functioning of mechanisms in psychoneural system, and because of individual experience, gained through anthropological development and the impact of sports on shaping the situational conduct (Malacko, 2009). Sports coaches, pedagogues, psychologists and sportsmen consider the question whether there is a specific psychological structure of sportsmen personality or a special organization of personal dispositions. The most acceptable answer is given based on the results of the researches (Dempster, 1985; Dempster, 1993; Enns & Girgus 1986; Platsidou, Demetriou & Kui 1997; Hale, 1990; Malacko & Doder, 2008) which show that sportsmen differ in the level of expressing individual dispositions or groups of personality dispositions. Interest in individual differences in the speed and accuracy of implementing mental activities is as old as the research of reactions and their time. This question has been seriously taken into consideration because of the increased interest for knowing the nature, structure and singularity of individual perception, so called the personal equation of the perceiver. However, which factors determine individual personalities and inter - individual differences in reactions, as well as how much those differences in individual efficiency in performing certain mental activities are a result of innate abilities and functioning of mechanisms in psycho neural system are yet to be answered. Also the questions how much are those differences determined by individual experiences gained through development and by effect of social impact on shaping the forms of situational conduct in some environmental situations still cannot be integrally answered. Considering all this questions (according to Drenovac, www.crd.hr) Lange discovered that time of simple reaction is dependent on the object where the examinee directs his attention: sensor-perceptive or motor component of the task. Based on the knowledge from these researches Lange differentiated two types or forms of simple reaction – sensor type, where the attention is focused on the stimulant, and muscular type where the attention is focused on the performing the

movement. Therefore, one can assume that boys are type that is more muscular and the girls are more sensor type. Austrian physiologist Eksner (www.crd.hr) (who introduced the term "time of reaction" used for marking the necessary time for conscious reply to a certain sensor stimulation) asks a very current question –time of reaction dependency on different subjective and objective factors, individual characteristics (gender, age...), characteristics of examinee, modality of the stimulation, conditions in which the experiment is taking place, etc. Eksner was the first to describe the state of examinee in his expectation and his readiness in preparatory period, between the pre-signal and stimulant, as well as the influence of supporting and inadequate stimulants on the time of a simple reaction. Review of available literature, about reactions and time of reactions as well as about the correlation between chronometrical indicators of efficiency in implementing cognitive functions and those significances in individual mental potentials, measured by classical paper-pen ability tests, proved that certain aspects of that problems are unequally represented. They have been studied in different degrees and they occasionally give contradictory conclusions about the factors that determine characteristics of components, structure and manifestations of different kinds of reactions (Drenovac, www.crd.hr). Based on the literature and relevant authors, our research has shown that boys and girls, aging from 10 to 14, do not significantly differ in the whole system of applied variables (multivariant). However, considering univariate analysis, boys had better results in DPUKPTM or total time ($p=.01$), DPMINTM or minimum time of correct reaction ($p=.01$), DPMAXTM or maximum time of correct reaction ($p=.04$) and OMMINN or minimum time of correct reaction ($p=.00$) variables. The research showed that the differences in favor of the boys are a result of innate capabilities, functioning of CNS mechanisms and synaptic barriers within the neuromuscular system. The significant differences were recorded because the boys are much better in some perceptive abilities than girls are at that age. Individual experiences, gained through development and effect of training process in karate, also have a certain positive effect on shaping the situational conduct.

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RAZLIKE U KRETNIM STRUKTURAMA KATA, BORBI I MENTALNIM POTENCIJALIMA IZMEĐU DJEČAKA I DJEVOJČICA U KARATEU

Sažetak

Cilj istraživanja je bio da se na uzorku 32 mlada karatista (17 dječaka i 15 djevojčica) izvrši procjena kretnih struktura kate, borbi i mentalnog potencijala iz CRD serije (distribuciji pažnje, operativnog mišljenja i psihomotorne reakcije), a zatim primjenom statističke metode multivarijantne i univarijantne analize varijance (MANOVA/ANOVA) utvrde statistički značajne razlike između dječaka i djevojčica, uzrasta 10 do 14 godina, koji se bave karateom. Rezultati analizom multivarijantne statističke značajnosti između aritmetičkih sredina dječaka i djevojčica pokazali su da ne postoji statistički značajna korelacija u cijelom sustavu primjenjenih varijabli ($p=.09$), dok je univarijantnim postupcima statistička značajnost dobivena samo u varijabli DPUKPTM - ukupno vrijeme ($p=.01$), DPMINTM - najkraće vrijeme točne reakcije ($p=.01$), DPMAXTM - najduže vrijeme ispravne reakcije ($p=.04$) i OMMINTM - najkraće vrijeme točne reakcije ($p=.00$) i to u korist dječaka. U varijablama kod kojih nisu postojale statistički značajne razlike dječaci su u odnosu na djevojčice imali duži staž treniranja i bili uspješniji u sportskoj borbi, dok su djevojčice bile uspješnije u izvođenju kata. U prostoru distribucije pažnje, operativnom mišljenju i psihomotornoj reakciji dječaci su, osim u varijablama ukupnog vremena - OMKPTM i prosječnom vremenu svih reakcija u testu - OMTAVRM, imali bolje vrednosti u svim primjenjenim varijablama. Istraživanje je pokazalo da su razlike u prilog dječaka više rezultat urođenih sposobnosti i funkcioniranja mehanizama CNS i sinaptičkih barijera u okviru neuromuskulatornog sustava. Značajne razlike evidentirane su zbog činjenice da su dječaci u pogledu nekih perceptivnih sposobnosti značajno bolji od djevojčica u tom uzrastu. I individualna iskustva stečena kroz razvoj i djelovanje trenažnih procesa u karate sportu na oblikovanje formi situacijskog ponašanja ima u tom smislu određeni pozitivni utjecaj.

Ključne riječi: kata i borbe, SRD serija, dječaci i djevojčice, uzrast 10-14 godina, razlike

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