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Transformational Impacts of Taekwondo on Motor Abilities Asymmetries

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ABSTRACT

The aim of this research was to ascertain the transformational impacts of taekwondo practice on the decrease of motor abilities variables asymmetry coefficients.

The sample of examinees consisted of 33 attendants of Croatian taekwondo sport school, whose average chronological age was 10.54±1.46 years, average body height 142.81±9.99 cm, body mass 38.37±8.99 and average fat tissue 26.07±6.28%, divided into two groups with different quantitative organization of training processes: group with up to 100 performed trainings (n=18) and the group with more than 100 performed trainings (n=15). The sample of variables consisted of 7 motor abilities asymmetry tests coefficients measured on the dominant and non-dominant side of the body, according to the formula CA = D - ND/ D x 100 (Miletić, Čular, & Božanić, 2004). The subsamples do not statistically significantly differ in the measured anthropological characteristics.

The T-test, on the P<0.05 level of significance, determined significant difference between the groups with different quantitative training process treatment. A well planned and programmed kinesiological taekwondo activity influenced the decrease of single leg triple jump asymmetry coefficients difference, hand and foot tapping.

KEYWORDS : ambidexterity, dominant and non-dominant side

INTRODUCTION

Achieving elite results in sports requires acquaintance with the scientific cognition about the character of the sport, as well as the influence of certain factors on the sport success. The scientific approach means that following and checking the complete anthropological status of an athlete through all the stages of his sport career should be thorough and successive. The commonest tested segments of anthropological status are the motor-functional abilities and morphological characteristics of an athlete, because the measuring instruments for evaluation of these characteristics are exact and interpretable, and are of great significance for success in almost every sport (Krstulović, 2006).

The taekwondo sport success specification equation, which should indicate the hierarchical structure and mutual relations between the factors important for achieving high sport achievements in taekwondo, has not been researched so far (Čular, Munivrana, & Katić, 2013), and the collected scientific cognition cannot be used in applied in an exact way in selection and sport preparation of the taekwondo athlete.

The word *symmetry* was derived from Old Greek word *symmetria*, meaning, harmony or accurate relation. Symmetry can be defined as correspondence in size, shape and relative position of the parts of the opposite sides divided by a line or a central plane. On the other hand, asymmetry can be described as the lack or absence of symmetry (Miller, & Blackman Keane, 1987).

According to Miletić, Čular, & Božanić (2004) the relation between left and right side body side in motor performance is denoted by term *ambidexterity*. In the training process it can be defined by an equation which reflects the relation between motor performances with both sides of the body, and is called *asymmetry coefficient*. Calculation of the asymmetry coefficient in the training process enables diagnosing, following, and therefore planning and programming the training process, with the purpose of achieving the highest possible level of motor performance of both sides of the body (Miletić et al., 2004).

The basic aim of the asymmetry coefficient application in sports training is ascertaining which one, and in what degree, is the dominant side of the athlete`s body when performing certain motor tasks. Such information enables the trainer to efficiently plan and program the training process in which the check of the asymmetry coefficient would become a constant transit point, especially for those athletes who perform movements with one side of the body significantly worse, and it is known that the *weaker body side* can be significantly improved by training (Teixeira, Silva, & Carvalho, 2003).

Dana (2003) cites the significance of ambidexterity in handball, that is, equal usage of left and right arm (side) in handball game. Miletić et al. (2009) cite that the ability of good motor knowledge performance with left and right side of the body presented a representative factor of successful performance in aesthetic sports. Grouious et al. (2002) present a thesis that *ambidexterity*, in this case good performance of motor tasks with both legs in soccer players, was a good factor in increasing the individual`s level of motor skill in the soccer game. Čular et al. (2010) did not gain any statistically significant influence of asymmetry coefficient on the leg techniques technical performance level, but the authors suppose that taekwondo athletes who "trained" the weaker body side and brought it close to the dominant side technical performance, should be more successful, what should be confirmed in the future research.

On the other hand, if we accept the thesis that the basis sense and the importance of fitness training was creating body assumptions for manifestation of technical-tactical and psychological qualities in real competitive conditions (Jukić et al., 2003), the evaluation of the athlete`s coefficient of asymmetry was best to perform during creating *physical preconditions* with the aim of achieving maximum individual technical and tactical achievements of the athletes.

The aim of this research was to determine the transformational impacts of practicing taekwondo on the decrease of motor abilities variables asymmetry coefficients.

METHOD

The sample of examinees consisted of 33 attendants of Croatian taekwondo sport school, whose average chronological age was 10.54±1.46 years, average body height 142.81±9.99 cm, body mass 38.37±8.99 and average fat tissue 26.07±6.28%, divided into two groups with different quantitative organization of training processes: group with up to 100 performed trainings (n=18) and the group with more than 100 performed trainings (n=15). The sample of variables consisted of 7 motor abilities asymmetry tests coefficients measured on the dominant and non-dominant side of the body according to the formula ***CA = D - ND/ D x 100*** (Miletić, et.al., 2004), where CA = percentage of left and right and body side deviation.

The group of motor abilities tests was represented by the following tests: movement frequency evaluation (foot tapping – *f/15* sec, hand tapping – *f/15 sec*); explosive strength evaluation (triple jump - *cm*); repetitive strength evaluation (single leg squat – *f/min*); maximum strength evaluation (grip test - *kg*) and flexibility (side split and front split - *degrees*).

The first group of examinees (n=18) was checked for the asymmetry coefficient after 100 performed taekwondo trainings, where all the motor tasks with left and right body side were equally performed. The other group had a repeated measuring after more than 100 performed trainings (n=15).

The methods of data processing were included in the *asymmetry coefficient* calculation for each motor abilities variable of the dominant and non-dominant side of the body. Usage of the T-test determined the differences between the groups which had different quantitative treatment by taekwondo training processes. The data was processed by the *Statistica ver. 11.00* statistic package.

RESULTS

Table 1 Descriptive indicators of anthropological characteristics variables, for subsamples

variables	M1 n=18	M2 n=15	t-value	P
BH	140.6	145.4	-1.38	0.17
BW	38.1	38.6	-0.16	0.87
SFT	27.73	24.07	1.71	0.09

Legend: BH - body height, BW - body weight, SFT - subcutaneous fat tissue

Table 1 shows that the two analysed groups, on the P<0.05 level of significance, do not significantly differ in the measured anthropological characteristics of body weight, body height and subcutaneous fat tissue.

Table 2. Descriptive indicators of motor abilities variables and the asymmetry coefficient (CA) in the total sample (n=33)

	NON-DOMINANT		DOMINANT		CA	
Variables	M	SD	M	SD	M	SD
Single leg squat	19.09	14.28	25.12	16.79	24.44	17.25
Single leg triple jump	393.60	99.78	422.95	92.71	7.68	7.95
Dynamometer fist grip	16.51	4.02	17.97	4.15	8.10	6.41
Foot tapping	33.43	4.49	36.18	4.79	7.50	4.29
Hand tapping	27.54	6.59	32.36	4.91	15.13	6.89
Side split from lying position	76.26	9.61	80.40	10.27	5.08	3.35
Front split from lying position	46.19	4.23	90.28	9.90	48.45	5.59

Legend: M - arithmetic mean; SD - standard deviation; CA - asymmetry coefficient

Table 2 shows the area of motor abilities variables measured on the dominant and non-dominant side of the body in the total sample: asymmetry coefficients, arithmetic mean and standard deviation. Table shows that all the taekwondo school attendants achieved worse results in the non-dominant body side motor abilities (hand or leg). The descriptive parameters of motor abilities variables asymmetry coefficients for the total sample, before the influence of transformational processes, are also shown in Table 2.

Table 3 Descriptive indicators and T-test of the asymmetry coefficient differences between the groups treated differently in the taekwondo training processes

Asymmetry coefficient	n=18 <100 trainings		n=15 >100 trainings		p
	M	SD	M	SD	
Single leg squat	24.99	18.51	23.78	16.65	0.67
Single leg triple jump	9.04*	10.87	6.55*	6.32	0.00*
Dynamometer fist grip	7.95	6.22	7.29	1.17	0.77
Foot tapping	8.34*	3.05	6.24*	2.17	0.05*
Hand tapping	18.61*	9.94	10.95*	6.87	0.00*
Side split from lying position	5.13	3.41	5.01	1.01	0.99
Front split from lying position	48.99	5.68	48.00	1.02	0.97

Legend: AS - arithmetic mean, SD - standard deviation, p - level of statistical significance.
*** - statistically significant differences after applying T-test**

Table 3 shows the significant difference in the three used asymmetry coefficients variables between the groups of examines with up to 100 trainings and the group of examinees with more than 100 taekwondo trainings, determined by T-test. Statistically significant differences, that is, decrease of differences between the dominant and the non-dominant body side, in the asymmetry coefficient, is obvious in the following variables: single leg triple jump, foot and hand tapping.

CONCLUSION

There is a statistically significant difference between the subsamples in three of seven analysed motor abilities asymmetry coefficients variables.

The transformational influences of participating in more than 100 trainings influenced the decrease of asymmetry in all the measured motor abilities variables which were included in the research.

The conclusions of former researches, that the *non-dominant body side* can significantly improve with practice, were confirmed (Teixeira et al., 2003).

It is necessary to repeat the research on a larger sample, with training loads defined as precisely as possible, to bring forth high quality conclusions.

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