

Original scientific paper

MOTOR ABILITIES AND MORPHOLOGICAL CHARACTERISTICS OF COMPETITIVE BOXERS AND RECREATIONAL BOXERS

UDK 796.83.012.1
796.035.012.1/2
796.83.015:572.7.087

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Abstract: When it comes to a sport such as boxing, motor abilities are often in significant correlation with the morphological status of a competitive or recreational boxer. All the factors that affect the result of motor abilities in boxing are directed, in great deal, towards morphological status (with an aspiration to achieve an ideal boxing category in case of competitive boxers). The main aim of this research was to examine the differences in the motor abilities and morphological characteristics between competitive boxers and recreational boxers. The sample of respondents consisted of 10 senior boxers from the BC ‘Crvena Zvezda’. The assessment of motor abilities of competitive boxers and recreational boxers was made using five tests from the Eurofit battery of tests and with one test for coordination assessment. Data were processed by means of descriptive statistical analysis, as well as the Mann Whitney U test which was used to test the difference of group respondents on the level of statistical significance $p < 0.05$. The results of this research showed that competitive boxers achieved significantly better results on three out of six tests for the assessment of motor abilities. When it comes to morphological characteristics of competitive boxers and recreational boxers, there were no significant differences. The results of the research show that more intense boxing training contributes to better manifestation of certain motor skills.

Key words: *motor abilities, morphological characteristics, competitive boxers, recreational boxers*

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INTRODUCTION

Combat sports, physical fitness of athletes in combat sports, as well as outdoing the current boundaries in combats, all of these are occupying the attention of different experts and researchers. New possibilities are sought in order to reach higher levels and even better results.

Combat sports are human creations, but many forms of combat and competitions could be noticed even before the emergence of the human kind. So, it can be justifiably said that combat sports arose from a natural order of evolutionary development. The urge to fight that all species possess, can be seen as humans' natural characteristic. In old civilizations, martial arts had the role of preparation for the war, as well as exercise and as a part of entertainment, religious and other rituals (Jajčević, 2010).

Of all combat sports, boxing stands out as a fundamental way of combat with arms and it originated in ancient civilizations. It seems that boxing has always been present in the human history. The first traces of this sport were found carved in stones in ancient Mesopotamia at the end of the fourth millennium BC (Boddy, 2008). Since then and up to now, boxing has been developing continuously and it has a tendency of further development and improvement. The greatest role in the development and improvement of boxing belongs to the coach who handles training sessions and can be the leader which requires great knowledge and skills. Motor abilities significantly affect success in boxing (Blažević, Ćirić and Matas, 2008). It can be said that motor abilities represent a new basis for the manifestation of rational techniques of movement execution (Gadžić, 2019).

In this work, we examined the differences in morphological characteristics and motor abilities between competitive boxers and recreational boxers at the age of 18 and above (senior age).

METHOD

The sample of respondents

The sample of respondents consisted of 10 boxers from the BC 'Crvena Zvezda', athletes at the average age of 18.6, senior age. It is a sample of good quality. Boxers were tested individually and they were divided into two groups of 5 boxers each. One group consisted of competitive boxers from the 1st League (A-league) and the other one consisted of recreational boxers.

Measuring instruments

For the assessment of the respondents' motor abilities, a selection of tests from the Eurofit battery of tests was used (Eurofit, 1993), as well as

one test for coordination assessment: drumming of hands and feet (Metikoš i Hošek, 1972). The battery consisted of 6 tests:

- sit-and-reach
- plate tapping
- standing long jump
- sit-ups for 30 seconds
- flexed arm hangs
- drumming of hands and feet for 20 seconds

Methods for data processing

For all the tested variables the following parameters were calculated:

- arithmetic mean
- standard deviation
- minimum value
- maximum value
- range

The results of motor tests were further processed using appropriate statistical procedures. Since it was a small and quality sample of respondents where we could expect a normal distribution, the Mann-Whitney U test was used, as a test of nonparametric statistics in order to determine the differences between the respondents with the level of statistical significance which was set at $p < 0.05$.

RESULTS

Table 1. *Descriptive analysis of morphological characteristics of competitive boxers and recreational boxers*

Variable	N	Range	Minimum	Maximum	Arithmetic mean	Standard deviation
Height of competitive boxer	5	31	160	191	180.40	12.502
Height of recreational boxer	5	16	170	186	180.00	13.846
Weight of competitive boxer	5	32	50	82	70.20	13.755
Weight of recreational boxer	5	37	58	95	74.80	13.846

Body mass index – competitive boxer	5	7.4	19.3	23.2	21.320	1.7978
Body mass index – recreational boxer	5	7.4	20.0	27.4	22.900	2.9774

Considering that this is a small sample of respondents from different weight categories, it was not realistic to expect greater homogeneity of results which is confirmed by the values of range and standard deviation that are more homogeneous only in variables of body mass index for both groups of respondents. Additionally, the results from Table 1 evidently show that both groups of respondents belong to a category of normal nutrition according to the classification of the World Health Organization. It can be noticed that the average values of the body mass index variables are slightly higher for recreational boxers than for competitive boxers. The difference based on the values of arithmetic mean of body mass index is not big, but it is enough to underline the difference between the groups of recreational boxers and competitive boxers.

Table 2. *Descriptive analysis of variables of motor skills of competitive boxers and recreational boxers*

Variable	N	Range	Minimum	Maximum	Arithmetic mean	Standard deviation
Drumming of hands and feet for 20 seconds – competitive boxers	5	5	10	15	12.60	1.817
Drumming of hands and feet for 20 seconds – recreational boxers	5	8	6	14	10.80	3.114
Sit and reach – competitive boxers	5	4	27	31	29.00	1.581
Sit and reach – recreational boxers	5	12	27	39	30.80	4.817
Standing long jump – competitive boxers	5	25	190	215	207.60	10.065
Standing long jump – recreational boxers	5	68	144	212	187.00	26.458

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Sit-ups for 30 seconds – competitive boxers	5	11	24	35	31.20	4.550
Sit-ups for 30 seconds – recreational boxers	5	11	17	28	22.60	4.219
Flexed arm hang – competitive boxers	5	79	28	107	58.20	29.227
Flexed arm hang – recreational boxers	5	27	1	28	21.20	11.367
Plate tapping – competitive boxers	5	2	12	14	13.00	0.707
Plate tapping – recreational boxers	5	7	6	13	9.80	2.775

The results of the drumming with hands and feet for 20 seconds test show that the group of competitors had better average result than the group of recreational boxers. The group of recreational boxers had slightly better results on the sit and reach test. When it comes to the evaluation of the explosive power of the leg extensor muscles and standing long jump, competitive boxers had significantly better results. It is interesting that recreational boxers were very uneven in this test because the value of range was 68 cm. On the example of the sit-ups for 30 seconds test, it can be noticed that the competitive boxers achieved better result. And when it comes to the strength endurance test, that is, static strength, the results are on the side of competitive boxers. Namely, the average result of a competitive boxer was 58.2 seconds while the result of a recreational boxer was 21.20 seconds.

It is interesting that the values of results range (the difference between minimum and maximum) were high among both competitive and recreational boxers. Based on the results of the plate tapping test, the noted differences are in favour of competitive boxers.

Table 3 *Results of Mann-Whitney U morphological characteristics of competitive boxers and recreational boxers*

Variable	Mann-Whitney U	Z	P	Average value of ranks	
				Recreational boxers	Competitive boxers
Body height	11.000	-0.315	0.841	5.20	5.80
Body weight	11.500	-0.210	0.841	5.70	5.30
Body mass index	7.000	-1.149	0.310	6.60	4.40

Based on the results (Table 3) one can clearly see that there are no statistically significant differences in the morphological characteristics between competitive and recreational boxers.

Table 4. Results of Mann-Whitney U test of morphological characteristics of competitive boxers and recreational boxers

Variable	Mann-Whitney U	Z	P	Average value of ranks	
				Recreational Boxers	Competitive boxers
Drumming of hands and feet	8.500	-0.849	0.421	4.70	6.30
Sit and reach	11.000	-0.317	0.841	5.80	5.20
Standing long jump	5.000	-1.571	0.151	4.00	7.00
Sit-ups for 30 sec.	2.000	-2.227	0.032	3.40	7.60
Flexed arm hang	0.500	-2.522	0.008	3.10	7.90
Plate tapping	2.500	-2.162	0.032	3.50	7.50

Based on the analysis of the results (Table 4), it can be stated that competitive boxers achieved significantly better results in the following tests: sit-ups for 30 seconds, flexed arm hang and plate tapping. Significant statistical differences in these tests were expected since competitive boxers spent more time training strength, explosiveness and endurance, especially in the periods when they were preparing for competitions. The testing was conducted during their competition cycle, so these results were expected to be in favour of competitive boxers when it comes to strength, endurance and coordination.

DISCUSSION

This research examined the differences in the morphological characteristics and motor abilities between competitive boxers and recreational boxers at the age of 18 or above (senior age).

When it comes to basic morphological characteristics, it can be stated that no significant differences were perceived between competitive and recreational boxers. Body mass index was compared to the table of the World Health Organization and based on those values, the respondents were classified into groups according to the degree of nutrition. The average value

of body mass index of competitive boxer is 21.3 and of recreational boxer is 22.9 which means that both are in the group of normal nutrition.

In a research conducted by Blažević (2007), 12 morphological and 8 specific variables were tested on 92 boxers aged between 22 and 29. The author examined the correlations between the above mentioned spaces and based on results it was established that there are significant correlations between the canonical factor from the system of variables of specific motor abilities and all of the tested morphological characteristics. The author points out that apart from the optimal specific motor abilities of boxers, important optimal morphological development is based on integral-interactive grounds, i.e. that motor abilities should be consistent with morphological development. All of these statements were confirmed in great deal by this research because the competitive boxers have more optimal values of body mass index which probably contributed to better results on three important tests for the assessment of motor abilities.

The connection between morphological characteristics and the level of motor abilities of boxers which was determined in this research has similarities with the results of a research conducted by Širić, Blažević and Dautbašić (2008) who examined the impact of certain morphological characteristics on the performance of specific movements of boxers. The authors concluded that a system of 8 criterion variables which were very specific variables of movement structures, has significant impact on all 12 variables which were implemented for the assessment of the morphological characteristics of the sample of 92 boxers from Croatia.

The results of an earlier research on the population of kickboxers with different levels of success at competitions, from medal winners at the world or European championships (1st category), medal winners at international tournaments (2nd category), medal winners at national championships (3rd category) to athletes who did not achieve any significant sport results (4th category), it was shown that the competitors from 'better' categories had better results in most of the tested motor variables (Ljubisavljević, Jotić and Kilibarda, 2012). Such results are in great extent in accordance with this research study.

When the results of the current research are compared to the earlier research results from similar comparative studies between top and average kickboxers (Ljubisavljević, Amanović, Bunčić and Simić, 2015), it can be said that the sample of respondents in those research studies was much higher than in this paper and that after the assessment of seven morphological parameters, the only determined difference was in body height where top kickboxers had higher values. Beside the morphological abilities, differences were examined and determined in variables for the assessment of functional abilities. That is, top kickboxers had significantly better results on the tests of

functional abilities and on the Conconi test for the assessment of anaerobic threshold.

CONCLUSION

After conducting the research on the connection of the morphological characteristics and motor abilities of boxers who had different levels of engagement in training, it can be concluded that no significant statistical differences were found in terms of morphological characteristics between competitive and recreational boxers.

On the other hand, when it comes to motor abilities, competitive boxers achieved statistically and significantly better results in the following tests: sit-ups for 30 seconds, flexed arm hand and plate tapping. Significant differences in the results of these tests were expected since the competitive boxers dedicated more time to training of strength, explosiveness and endurance, especially during periods of preparation for competitions.

We must point out that during the period of preparation and generally during training sessions, loads vary depending on the categories of boxers. So, the effect on testing is different within 'light' and 'heavy' categories in different motor tests. When we would test boxers of each category, depending on the similar weight of recreational boxers, we could state with greater certainty if there is and what the extent is of the difference in motor abilities between competitive and recreational boxers

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