STUDY OF THE RELIABILITY OF THREE AGILITY TEST IN BOXERS AND KICK BOXERS

(Original scientific paper)

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Abstract

This study aims at determining the reliability of three tests for control of agility in contestants in boxing and kickboxing. It featured 31 sportsmen, 16 boxers aged 21±10 years and 15 kick boxers aged 22±16 years. Tests, used in the study are „Compass-2" from the site http://www.topendsports.com/testing/tests/agility-cone-drill.htm, „Stork" by Brian McKenzie - 2011. „Davis" - https: / /www.sharecare.com/health/types-exercise/how-do-i-perform-the-davies-test. All are similar in nature of competitive activity of boxer and kick boxers. By the method test-retest, we determined which of them are with satisfying reliability. It turned out that the highest reliability (the value of the coefficient r = 0,83 and r = 0,90) in both groups showed the „Davis" test. The reliability of the „Stork" test is unsatisfactory and this test is not suitable for control of agility.

Keywords: „Compass-2", „Davis" test, „Stork" test, test-retest, specialized physical training, motor agility control, elite athletes, boxing and kickboxing training, Questionnaire, pedagogical experiment, Rtt correlation coefficient

INTRODUCTION

has been defined as an ability to quickly change the direction (Bloomfield, Ackland, & Elliot, 1994; Clarke, 1959; Mathews 1973), but also the ability to change direction quickly and accurately (Barrow & McGee, 1971; Johnson & Nelson, 1969). In more recent publications, some authors have identified agility to involve the whole body, the change of direction, and the rapid movement and changing the direction of the limbs (Baechle, 1994; Draper & Lancaster, 1985).

Contemporary opinion is that agility is motor quality associated with the body's ability to agree (coordinate) individual movements and actions in time, space and effort, adequate to the motor task. By its nature it is immanent (functional) property of the central nervous system through which different types of locomotion are managed and the operation of the motor apparatus is optimized (Zheliazkov & Dasheva (Желязков & Даше-ва), 2011).

Agility depends on the degree of physical culture, of the diverse motor experience - typical for the specific sport that the athlete practiced. All this requires increase of the volume of motor habits and skills from an early age, which means to increase the optimal conditions for increased agility.

Agility is the basis of mastering the complex technical and tactical actions in terms of coordination and synchronization. It is connected with the speed, endurance and flexibility (Lefterov, (Лефтеров, 2006). An athlete who shows good agility most likely has other qualities as a dynamic balance, spatial orientation, rhythm and visual processing (Ellis, et al., 2000). Quality control of agility requires measuring the time of going through specialized tests and subsequent quantification.

What does reliability mean as an informative criterion?

The concept of reliability is defined as a degree of matching the measured result when tested with the actual state of the researched characteristic or degree of matching results in repeated testing of the same athletes in the same conditions (Bachev, (Бачев), 2011). With this regard, the methodological approaches for its valuation are determined - namely, the method of re-testing (test-retest) and the method of half-testing. In a series of tests applied to control athletes in boxing and kickboxing, it has not been studied. This applies to tests „Kompas-2", „Stork" and „Davis", which determines the content of our experiments.

The study *aims* to improve the control process of specialized physical training by establishing statistical reliability of the three tests for quality control of motor agility in elite athletes in boxing and kickboxing.

The *object* of study: the process of control of agility in boxing and kickboxing athletes;

The *subject* of study: the reliability of tests „Compass-2", „Stork," „Davis"; variability of results in the application of these control tests; characteristics of the distribution of the data; regulatory scoreboard.

The contingent of the study: elite athletes, male persons, training in the clubs of boxing and kickboxing

Table 1. Contingent-athletes in boxing and kickboxing

Participants	Veriables							
	Age (years)		Height (cm)		Wight (kg)		Sports experience (years)	
	X	S	X	S	X	S	X	S
Boxers	21	2,87	177	8,52	72	10,74	6	3,59
Kick boxers	22	4,25	175	9,51	72	13,65	8	4,14

at the NSA, 16 of them are boxers and 15 kickboxers, a total of 31 athletes (Table. 1.).

METHODS

In our study we used the following research methods:

• **Information study**, which aimed to introduce us with sports boxing, kickboxing, what the motor quality agility means and with the term reliability testing.

• **Poll,** related to the discipline of the contestant, weight category, won awards, etc.

QUESTIONNAIRE

Name:..
Sports discipline:...............................
Sports experience:.............................
Sports qalification :...........................
Age: .... Kilograms: ....Height:
Gender: A) Male B) Female

• **Testing and pedagogical findings experiment:** conducted from October 2014. to March 2015. with 31 athletes in boxing and kick boxing practicing at the NSA. Studies were made in boxing hall of NSA without the influence of metrological factors. Each test person made two attempts. For the purpose of execution what was needed was a playground; field to be leveled and not slippery. To measure the results we used two electronic stopwatches (to reduce the subjective factor contact and photo converters can be used). Each of the persons
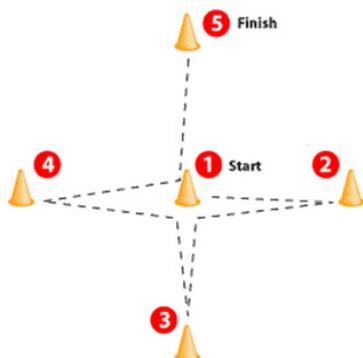

Fig. 3 Test „Compass-2"

surveyed had to be in a sports suit with comfortable shoes. Before the test general and particular warming of the muscles is performed. The accuracy of measurement of results - 0.01 sec. Each performance is written down in a specific protocol, each result is recorded in the

respective column for a first attempt, a second attempt and third – the better of the two. In the first horizontal row the personal data (names) is placed.

Test „Compass-2" (Fig. 1.)

Starting position:
• Athletes are in a standing position, feet are at the width of the shoulders, with cone 1 between them, and hands touch the top of the cone;
• The tested athletes are required to pass the test for the shortest possible time, as shown in Fig. 1.;
• The distance between the cones is 2 meters;
• The test subject should always be facing cone 5;
• The test subject must start from cone 1 to cone 2 and back with side running, touching cone 2 with the right hand;
• We go to cone 1 and touch it with the left hand, continue to run back to the cone 3, which also must be touched with a hand;
• From cone 3 to cone 1 athletes must run, then touch cone 1 with one hand;
• From cone 1 athletes then have to go to cone 4 with side running, touching the cone with their left hand and again with side running to cone 1, which they have to touch with their right hand;
• From cone 1 to cone 5 the athlete runs; it is the final of the test, time is stopped and recorded in protocol.
• The commands are: „Ready", „Go";
• Do not run properly;
• Do not touch the top of the cone with their fingers;
• Surrounding the cone;
Mistakes of the researcher:
• Does not monitor, does not correct and does not break testing for not following the standard requirements mentioned above;
• Further motivating some of the respondents;
Possible equivalents tests:
Bigger distance between the cones - 3 or 4 meters. Another option is to circumvent the cones without touching.

Test „Stork" (Fig. 2.)

Starting position:
Respondents stand on one leg (optional) on their toes, as the other folds and the foot is placed on the knee of the supporting leg. Hands placed on hips and are not moving (Fig. 2.). The purpose of the test is to maintain the state of equilibrium of the respondents for a longer time. The longer time preserving the equilibrium is assessed with

Fig. 2. Test „Stork"

a higher score.

Mistakes of the respondents:

• Step forward with the support leg;

• The leg is not placed on the knee of the supporting leg;

• Hands are not placed on the hips;

• Performing rotational movements in order not to lose balance.

Mistakes committed by the researcher:

• Do not monitor the proper execution of the test (stepping forward, hands are not on the hips, foot is not placed on the sciatic area, etc.)

• Motivate a competitor to achieve a better result.

Possible equivalents tests: the hands are placed behind the neck, entire foot on the ground.

Test „Davis" (Fig. 3.)

Starting position:

A test person stands in support, arms are placed at width 91.4 cm. (36 inches). Hands are placed on the markers (in our study we used masking tape). When the athlete is ready first he raises his left hand and in the fastest way places it on the right, then puts back the left hand on the start tag, the same is done with the right hand. This marks one cycle. For our study, athletes in boxing and kick boxing had to make ten cycles. The test should not be conducted by persons who do not have well-developed shoulder muscles, as it can lead to injury.

Mistakes of the respondents:

• Hands are not placed on the markers;

• Hands are not touched;

• Lost of balance from trying to do the exercise too fast and the person falls to the floor.

Mistakes done by the researcher:

• Does not watch whether respondents put hands of markers;

• Does not watch for a touch of the hand;

    Possible equivalent tests: fewer performances - 5 cycles.

• ***Mathematical and statistical methods***: variance analysis, correlation analysis to determine the reliability of the three tests we used the coefficient of correlation having only two attempts with the given
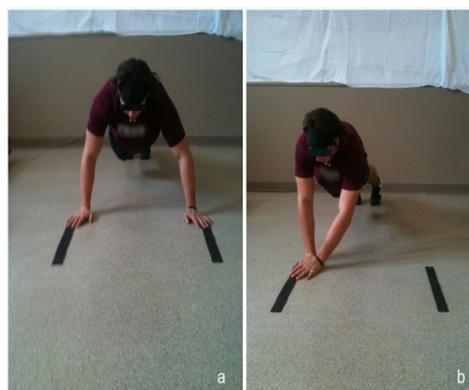

Fig. 3. *Test „Davis"*

Table 2. Tests used to control the agility in boxers and kick boxers

№	Name of the test	Unit	Accuracy	Direction of movement
1	„Compass-2"	s	0,01s	(-)
2	„Stork"	s	0,01s	(+)
3	„Davis"	s	0,01s	(-)

Table 3. Variance analysis of the achievements of boxer and kickboxers in the test „Compass-2"

№	Athletes	N	ME	R	Min	Max	X	S	V	As	Ex
1	Boxers	16	сек.	3,43	4,46	7,89	5,83	0,92	16	0,73	0,63
2	Kick boxers	15	сек.	2,58	4,8	7,53	5,8	0,67	12	0,58	0,91

Table 4. Variance analysis of the achievements of boxers and kick boxers in the test „Stork"

№	Athletes	N	ME	R	Min	Max	X	S	V	As	Ex
1	Boxers	16	сек.	221,97	30,15	252,12	123,9	75,13	60	0,5	-1,23
2	Kick boxers	15	сек.	218,9	19,48	238,38	115,84	67,27	58	0,38	-0,79

Table 5. Variance analysis of the achievements of boxers and kick boxers in test „Davis"

№	Athletes	N	ME	R	Min	Max	X	S	V	As	Ex
1	Boxers	16	сек.	3,2	5,34	8,54	6,95	0,98	14	-0,17	-1,04
2	Kick boxers	15	сек.	3,87	5,63	9,5	7,46	0,97	13	0,38	0,47

Table 6. The values of the correlation coefficient by which to judge the reliability of the test „Compass-2", „Stork" and „Davis" in boxers

Name of the test	„Compass-2"	„Stork"	Davis
Rtt	0,83	0,67	0,90

Table 7. The values of the correlation coefficient by which to judge the reliability of the test „Compass-2", „Stork" and „Davis" in kick boxers

Name of the test	„Compass-2"	„Stork"	Davis
Rtt	0,66	0,50	0,87

test. At a minimum interval of time under the same conditions we had identical retesting. Calculating the Pearson correlation metric scaling in between the two rows of statistical measurement we got the results. The contestants were divided into two groups - the first group of 16 boxers and the second - 15 kickboxers. The survey results are presented in Tables 6. and 7.

RESULTS

By variance analysis, we wanted to compare the achievements of boxer and kickboxers within the three tests for control of agility that we used in our study. The results are presented in Table 2., 3. and 4.

The tables below presents the correlation coefficient by which we judge the reliability of the three tests presented in our study.

DISCUSSION

In the test „Compass-2" and „Davis" lower values are perceived as better, while in the test „Stork" the more time you keep the equilibrium, the better the performance. This is noted in Table 2. The analyses of the achievements of boxers and kickboxers gives the following:In the test „Compass-2" comparing the average arithmetic value, we see that the results are extremely close.

The reason for this can be sought in the relatively close movements during competition carried out in boxing and kickboxing.

As for the reliability of the tests in our study at values r ≥ 0,8 according to the literature (Brogli (Брог-ли), (2012); Zatsiorski (Зациорский), 1979) the test is an appropriate statistical reliability and vice versa lower values would put results in doubt. By the method test-retest, we found the reliability of the three tests used in our study. For the first test „Compass-2", the values of **r** are the following - in boxers it is 0.83, which means that it is reliable and this test can be performed with

elite athletes in boxing, men. In kick boxers - 0.66, we believe that this test is not suitable for elite athletes in kickboxing. Probably it would be necessary for this test to be made with a larger contingent to improve reliability in this test with kickboxers. Another reason for that result we can find at the age, which at the kickboxers group is more diverse - we have athletes aged 19 to 34 years. We did a try to increase the reliability by removing three of the results with the greatest difference between the first and second attempts. This however means that we look at the results of 12 athletes in kickboxing, the value of r = 0,73, again lower values than desired. We thought it might be appropriate to remove the results of the oldest study participants, obtaining the value of r = 0,67 - no big change again.

The second test that we used in our research is „Stork," which is related to the equilibrium stability, which is a manifestation of agility. By using the variance analysis we compared the performance of both groups. The average arithmetic value is close; boxers showing slightly better results. In the criterion "best result" boxers are better achievers than kickboxers. A reason for that is probably the larger experience in boxing the studied subjects had. The lower result was achieved by n athlete in kickboxing. The extent of the two groups studied is very similar and achievements are very close. The coefficients of variation are extremely large. This means that the groups are highly non-homogeneous. Some of the test subjects do well, others too weak. The reason for this could be the fact that the test is related to the equilibrium resistance which has direct relevance of vestibular apparatus of the man who is strictly individual for each person; another reason could be the internal discomfort - fatigue, stress, mental problems etc. or a good motivation to achieve the highest score. It is obvious from the spread, which is extremely high that this test is stressful for a number of athletes. While some deal with ease and can withstand more

than 120 seconds, others hardly withstand 30 seconds. Also between the two attempts of one tested person there are very different results. This is best seen in the statistical reliability of this test in the target groups. At boxers it was 0.67, while at kickboxers was 0.50. For us these results are not satisfactory and we believe that the test „Stork" should not be implemented as a means to control the motor quality agility in elite athletes in boxing and kickboxing. When we remove three results with the greatest difference between the two trials, the value of „r" at kickboxers rose slightly and is 0.59. At boxers r = 0,80 and in this case the test can be used as a control test of agility.

The „Davis" is suitable for testing only male athletes training boxing and kickboxing, as it is quite heavy and could lead to serious injury in other respondents. The reason is that the shoulder belt is placed under high load. It is therefore necessarily for test subjects to have good warming up before the test. Comparing the results of boxer and kickboxers by the criterion average arithmetic value as well as in other tests, the arithmetic value is better in boxers.

The best achievement is of a boxer - 5.34 sec., while the best achievement in the contestants of kickboxing is 5.63 seconds or 0.29 seconds better achievement. The weakest result was tested in an athlete of kickboxing - 9.5 sec.

Coefficients of variation were 14% and 13%. Both groups are highly homogeneous.

The statistical reliability in the testing of boxers is 0.90, while it was 0.87 in kickboxers - extremely high, which means that the test is suitable for control of the motor quality agility of respondents.

Out of the three tests we used in our research the test „Davis" has the highest reliability in both groups. We believe that this test is appropriate to be used for control of agility in male athletes, training boxing and kickboxing.

CONCLUSION

• When we have strong homogeneity of the groups, as in the „Davis" test, the reliability is high enough both at boxers and kickboxers groups.
• Reliability of the „Stork" test is not satisfying for both groups of boxers and kickboxers.
• The „Compass-2" test has a satisfying reliability in the group of boxers and can also be used to control the motor quality agility.
• From the survey it shows that where the groups are homogenous we have high reliability of results and vice versa, where the groups are non-homogenous we have lower reliability.

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