EVALUATION OF THE SPEED TRAINING OF THE SPORT GAMES PLAYERS BY MEANS OF A SHORT RUNNING TEST

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Abstract: *The aim of the research was evaluation of solidity and accuracy of the running test 10 x 3m as a test of sportspeople's special motor fitness. The material of the study are the results of examination of 40 sportswomen and 47 sportsmen who train three tem sports (basketball, volleyball and handball), of the age between 18 and 25. The research consisted of two tests evaluating the maximal anaerobic power – MAP (Georgescu's test and Vandewalle's test) and running test 10 x 3 m. What results from the analysis, the test meets the expectations of solidity and accuracy and its results can function as an indicator of special motor fitness of sport games players.*

Keywords: *sports games, tests of motor abilities, anaerobic capacity, Georgescu's test, Vandewalle's test*

1 Introduction

Sport games engage complexly sportspeople's motor potential in regard both to physical features and sources of energy that is used during competition. Basketball, volleyball, handball, football and other team sports are very dynamic and actions no longer than 10-20 seconds play a very important role for them. Team sports demand from the players much in the field of physical capacity, because during the game occur repetitively efforts of high intensity and variable duration. During such efforts the cost of muscular work is covered both by engagement of anaerobic and oxygen metabolism.

There are a number of tests assessing the level of MAP. Among others, these are: Margaria-Kalamen's test (Margaria et al. 1966), Wingate's test (Bar-Or 1978), Vandewalle's

test (Vandewalle et al. 1987), Georgescu's test (Georgescu 1976), Bosco's test (Bosco et al. 1983). Although these test were invented in the 1970s and 1980s, they are still used to evaluate anaerobic capacity of all sportspeople, not only sport games players (Hoffman et al. 2000, Bogadanis et al. 2008, Burgomaster et al. 2008, Billant & Bishop 2009, Szmatlan-Gabryś et al. 2009, et al., Kasa et al. 2012).

One of the tasks performed often in motor tests is a vertical jump test. It meets the requirement of producing the largest force in the shortest possible time. Therefore, many experiments have been performed to count the MAP form the results of the vertical jump test- the difference between the height in standing position and the height of the jump has been measured (Fox & Mathews 1974, Harman et al. 1991, Johnson & Bahamonde 1996, Sayers et al. 1999, Keir et al. 2003). In it often assumed, in accordance to Szopa (1989), that the approximate MAP measure can be the maximal anaerobic work (MAW) calculated from the jump.

2 Objective

All tests and measurements described above can provide information about the state of training of a player in the field of maximal anaerobic power. However, not all of them are possible to be performed without sufficient equipment. Moreover, it is problematic to treat the vertical jump test as the best measure of a sportsperson's anaerobic power in some sport disciplines, even after performing adequate calculations that take into consideration their body weight. Information about the upper limbs' force is also important. As a result, in the thesis, short running test (10 x 3m) is presented. Their results, although presented only in the form of the time of performing the test, can be credible indicators of anaerobic power of sportspeople's upper and lower limbs. The main aim of the study is a thorough analysis of the solidity and accuracy of the above mentioned tests.

3 Methodology

The material of the study presents the results of examination of 40 sportswomen and 47 sportsmen who train three group games: basketball, volleyball and handball. The majority of them are students and players of university teams of Cracow. The sportspeople were of age between 18 and 25.

The research has been performed in 2008 by the team of the scholars from the Department of Theory of Methodology of Sport and Recreational Games of University School of Physical Education, Cracow, under the supervision of the authors of the thesis.

Firstly, the anthropometrical measurements were performed and then laboratory tests of the maximal anaerobic power according to Georgescu's and Vandewalle's conception. In the next day of research, tests of motor effects were conducted in a sports hall.

The sports people were always encouraged to maximal effort, so that the performed test had diagnostic value. The research consisted of:

1. Tests of maximal anaerobic power (MAP)

a) *"Force-velocity test"* - it allows to determine the maximal anaerobic power obtained during 4-6 very short, ten-second, super maximal exercises on the stationary bicycle (Vandewalle 1987). The task of the sportsperson was to achieve in each of these exercises maximal rotation rhythm in the shortest possible time. The resistance was applied individually to each sportsperson in relation to their bodyweight according to the scheme: I exercise - 7% of bodyweight, II exercise - 8% of the bodyweight, III exercise - 9% of the bodyweight, IV exercise - 10% of the bodyweight, V exercise - 11% of the bodyweight, VI exercise - 12% of the bodyweight. If the subject obtained lower anaerobic power by next exercise in relation to the previous one, the test was stopped. Each exercise was preceded by approximately 4-minute relaxation pause. The pause lasted until the pulse of the subject fell below 120 heartbeats per minute, but the pause was not shorter than three minutes. The measurement of the pulse was performed wirelessly, with a breast-belt that was a part of the stationary bicycle's set. The test was performed on a stationary bicycle of the Monark brand, model 874E. This type of a stationary bicycle allows exact load measurement through putting appropriate weights in a special basket (on straps).

b) *Geogescu's test* – consists of assessing force obtained while performing a series of 30 jumps of maximal intensity (Georgescu 1976). The task of each subject was to perform the largest possible number of jumps while minimizing contact with the floor. The Georgescu's test was performed on a tensometric carpet included in a set (carpet, interface and computer program) named FiTRO Jumper produced by Slovakian company FiTRONiC, Inc. (Diagnostic and Training Systems). On the basis of the results it has been possible to assess average time of flight and support phases of three consecutive jumps. The maximal anaerobic power was counted from average quantities of time of the jump and the support phase, from three highest, consecutive jumps.

2. The pendular running test 10 x 3 m

The task of the subject was to run 3-meter distance ten times. The distance was restricted by lines, for example an attack line and the middle line of volleyball court. The person doing the exercise was supposed to touch the ground behind the lines with a hand and a foot by each

change of direction. It was important that the touch was performed alternately: once with right hand and right foot, next time with left hand and right foot, etc. The subject started individually, from standing position and the stopwatch was started after the subject first touched the ground. A similar method of measurements to the "tapping" test with a hand (EUROFIT 1988) was applied: the subject starts independently and the stopwatch is started during performing the exercise. As a result, the observational error was limited to reaction time of a person operating the stopwatch. In consequence, it is advised that the measurements of all sportspersons from one community always be taken by only one person. In this case it can be assumed that the observational error is identical in each measurement. During performance of the test, the person taking measurements was counting aloud each completed cycle. The persons were running forward. The test was performed twice with a 10-minute pause.

3. Statistics

The basic measurements of descriptive statistics were used in counting the results: arithmetic mean and standard deviation. In order to estimate the solidity and accuracy of the proposed measure of special motor fitness (the result of the 10 x 3 m running) the Pearson's lineal correlation factor was used.

4 Results

The results of the measurements are presented in table 1. The maximal anaerobic power (MAP) is in relative units (MAP / kilogram of bodyweight). The better results obtained by the subjects in two tests have been used to count the arithmetic mean of the results from the consecutive tests.

Table 1. *The examined sportspeople's statistic characteristics of somatic features, anaerobic power tests and the 10 x 3 m running test*

Somatic features and results of tests	**Women**		**Men**	
	$\overline{X}$	**SD**	$\overline{X}$	**SD**
Body height [cm]	175,12	8,73	184,31	4,91
Bodyweight [kg]	66,27	7,08	81,83	8,00
MAP – Vandewalle's test [W]	10,21	1,14	12,16	1,69
MAP – Georgescu's test [W]	16,67	4,01	21,58	6,82
10 x 3 m run [s]	11,30	0,94	10,45	0,69

To obtain information about accuracy of the proposed test, the correlation of the 10 x 3 m running test's results with counted MAP values (Georgescu's test, Vandewalle's test) was performed. The specific interpretation of the accuracy indicator was proposed by Meining (1975), who presented this classification for sport-motor tests: $1.00 \geq r \geq 0.85$ – excellent accuracy; $0.85 > r \geq 0.80$ – very good accuracy; $0.80 > r \geq 0.75$ – good accuracy.

Assessing the accuracy of sport-motor tests should be performed through correlating the results of newly invented tests with the results of already existing, trustworthy and checked ones. As such should be regarded Vandewalle's and Georgescu's tests. Therefore, the values of correlation factors obtained in the research prove high accuracy of the 10 x 3 m running test's results as an indicator of the level of strength and speed abilities. It is visible especially in correlation with the MAP values obtained by examined sportspeople in the test with stationary bicycle ("Force-velocity test"). In this case, the values of correlation indicate excellent accuracy in groups of women and men.

Table 2. *Lineal correlation values between the 10 x 3 m run's results and the level of maximal anaerobic power of examined sportspeople*

Maximal anaerobic power	**10 x 3 m run**	
	Women	**Men**
MAP – Georgescu's test	0,747	0,781
MAP – Vadewalle's test	0,920	0,953

Establishing correlation between the first and the second measurement's results allowed assessing accuracy of the tests. In accordance with Zaciorski (1979), the following levels of solidity for sport-motor tests: $1.00 \geq r \geq 0.95$ – excellent solidity; $0.95 > r \geq 0.90$ – good solidity; $0.90 > r \geq 0.80$ – acceptable solidity.

As it can be observed in table 3, the correlation values prove that the solidity of the test is excellent.

Table 3. *Lineal correlation values between the first and the second 10 x 3 m running test's results*

	I measurement	
	Women	**Men**
II measurement	0,955	0,986

5 Discussion

Many scientists have examined the anaerobic capacity training (Stepto et al. 1999, Norkowski 2003, Sharkey & Gaskill 2006, etc.). However, they obtained various results that depended from the weight load used. The effects described of a training applied had also various scale, in relation to the way of assessing anaerobic capacity.

The basic method to shape and maintain high level of anaerobic capacity is interval training with maximal intensity of load. Additionally, it is considered the best to apply maximal, repetitive exercises not lasting longer than 10 seconds (Laursen & Jenkins 2002, Norkowski 2003, Sharkey & Gaskill 2006).

The control of training applied in such a way should be based on tests in which a similar exercise was applied. These requirements are met by the 10 x 3 m running test proposed in this thesis. As can be concluded from the analysis, the results of the test can provide information about the level of sport games players' strength and speed abilities. However, it must be remembered that the result of the test is the time of performance, not the counted value of power in watts per kilogram of bodyweight, as in Vandewalle's and Geogrescu's tests. Hence, it cannot substitute laboratory tests assessing the level of anaerobic capacity of the players. Nevertheless, because of the simplicity of performing it (e.g. using special measurement equipment is not necessary) and the character of performance (exercise similar to players' actions e.g. in group games), the test can facilitate the temporal assessment of the sport games players' special motor training.

6 Conclusions

One of the elements of the training effects' control in sport games is an evaluation of the players' functional state. In this thesis, the focus has been put on the evaluation of anaerobic capacity that is the ability to perform short-time exercises of high intensity (Żołądź 2001). These exercises are most frequently called supermaximal and these are, for example, all kinds of sprints, jumps, throws and weight sports. The players´functional state is connected with Self-confidence of player in competition. The players´functional state is also an important mark of somatic health and condition.

In order to examine the player's anaerobic potential, that is the anaerobic capacity, the maximal anaerobic power (MAP) is measured. The MMA is presented in relation to the sportsperson's body weight (Watt / kilogram of body weight). From the perspective of physics, the force is defined as work performed in a certain period of time. As a result, in order to obtain large quantity of force one must perform the biggest amount of work in the

shortest time. Furthermore, the work is defined as the product of force and the distance. The maximal anaerobic power is, therefore, a good indicator of velocity and force capacities. On the base of the presented research analyses can be concluded that the 10 x 3 m running test meets the requirements of solidity and accuracy.The results of the proposed test can be used to control the level of the sport games players' special motor training.

7 References

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