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Original research article

VALIDITY AND RELIABILITY OF THE TEST FOR ASSESSMENT OF SPECIFIC PHYSICAL ABILITIES OF POLICE OFFICERS IN THE ANAEROBIC-LACTATE WORK REGIME

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Abstract. *The subject of this paper was the examination of validity and reliability of the obstacle course test (OC_SAPO1) that can be used to assess the specific abilities of police officers in the anaerobic-lactate work regime. Twenty-five students of the Academy of Criminalistic and Police Studies took part in this research (14 male and 11 female). The testing was performed according to the test – retest method for determining reliability. The studied variables included: performance time of the OC_SAPO1 (indicator of effectiveness), lactate concentration in capillary blood (measure of metabolic acidosis) and the value of heart rate frequency (measure of the functional exertion of the cardiovascular system). The results of t-test showed that the participants mastered the OC_SAPO1 7.17 seconds faster in the second testing (t – 4.164, p < 0.01), i.e. 7.25% faster, which suggests the that there is a learning effect and that test can be used for educational purposes. A statistically significant difference of the measured concentration of lactates and maximum heart frequency was not established between the two tests. Based on Cronbach's Alpha results, we can claim that the OC_SAPO1 is a reliable measuring instrument for the evaluation of the specific ability of police officers in anaerobic-lactate work regime. A lower reliability of the Cronbach's Alpha test was established for maximum heart frequency when compared to the other studied variables. The registered levels of the studied variables classify the OC_SAPO1 as a test of sub-maximal intensity in the anaerobic-lactate work regime.*

Key words: *obstacle course, specialized physical education, anaerobic work, reliability, validity, police.*

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INTRODUCTION

Police work and responsibilities demand high levels of basic and specific physical abilities, as factors that directly affect professional efficiency (Arvey, Landon, Nutting & Maxwell, 1992; Strating, Bakker, Dijkstra, Lemmink & Groothoff, 2010; Vučković, Subošić & Kekić, 2011). The specific nature of professional tasks demands that police officers should have above average level physical abilities compared to the general population (Sörensen, Smolander, Louhevaara, Korhonene & Oja, 2000; Boyce et al., 2008). For that reason it is necessary to periodically monitor and assess the level of police officers' physical abilities (Blagojević et al., 2006; Strating et al., 2010; Janković & Dimitrijević, 2012). Police officers use different methods of law enforcement, one of which is the means of coercion. Interventions used by police officers of both sexes include verbal warnings, the use of physical force of different intensity and even the use of deadly force (Dopsaj, Vuković, Milojković, Subošić & Eminović, 2012). In these situations, personal integrity, the integrity of another police officer or of the subject of correction is jeopardized (Blagojević et al., 2006; Vučković et al., 2011; Janković et al., 2012). Aggravating circumstances in such cases can be the suspect's morphological features, physical abilities and knowledge of martial arts. The training, education and professional development of police officers is focused on achieving and maintaining adequate basic and specific physical abilities, as the basis for successful police work (Blagojević et al., 2006; Vučković et al., 2011). The level of specific physical abilities of police officers should be the result of training and education, followed by continuous professional development.

Previous research showed that activities exercised during the use of means of coercing most often happen in a 60 to 120-sec interval, in the zone of sub-maximal or maximal exertion (Anderson, 2001; Lonsway, 2003; Strating et al., 2010). In most cases, the type of activity and motor tasks performed by police officers included: running, jumping, crawling, balancing, threading, climbing, lifting/carrying/dragging a load, pushing (back), pulling and fighting (Wilmor & Davis, 1979; Farenholtz & Rodes, 1986; Anderson, 2001; Strating et al., 2010). Modern test procedures demand that test instruments be designed specifically for pre-defined motor tasks. Also, test situations should be as similar as possible to real life situations from the aspect of physical effort during police work (Müller, Benko, Raschner & Schwameder, 2000; Anderson, 2001). In police departments in North America, Australia and Western Europe, for selection and monitoring of the level of physical abilities, specific tests-obstacle courses are used. The main function of these tests is the assessment of specific skills during sub-maximal and maximal work intensity (Farenholtz et al., 1986; Arvey et al., 1992; Bonneau & Brown, 1995; Anderson, 2001; Boyce et al., 2008).

In the research of Arvey et al. (1992), the most frequently identified physical activities included physical restraint of the suspect, pushing, pulling, running and carrying an injured person. In his research, Anderson (2001) analyzed solving incident situations that occur when means of coercion are used. The analysis showed that this kind of intervention usually has three parts: 1. Approaching the problem-chase/pursuit (maximum running speed in a straight line and/or with a change in direction with overcoming obstacles), 2. Problem solving - fight (use of self-defense, baton, handcuffs and/or firearms), 3. Removing the problem (taking, carrying or dragging the suspect/injured person). Lonsway (2003) in his study analyzed physical ability tests used for the selection process of women applying for police service. He concluded that most often obstacle courses include running a 20-550m long track, overcoming different obstacles and also climbing, jumping, threading, balancing and dragging or carrying weight. For all the analyzed obstacle courses, the final performance score was defined as test completion time. It was established that this kind of assessment method, used in US police departments, has a discriminating effect on the female population when used for selection purposes. In his research, Mendeš (2010) found that police officers face different obstacles in critical situations that demand the use of physical abilities. Based on the research results, a straight line obstacle course, 240m long and 10m wide with 20 different obstacles, was proposed. The objective was to complete the whole obstacle course in the shortest time possible in order to develop physical abilities. Strating et al. (2010), based on the results of the Police Physical Competence Test (PCT), concluded that the sex and age of police officers are significant predictors of the level of physical abilities. When PCT is used in the selection process or assessment of physical abilities, this fact has to be taken into account in order to neutralize the discriminating effect it might have. Vučković et al. (2011) studied the basic and specific physical ability of police officers in relation to the efficiency of violence suppression in sports events. They concluded that police officers have to have a certain level of specific professional skills and abilities. Those specific physical abilities refer to self-defense and offensive techniques (especially open-hand techniques), the use of police baton and handcuffs.

Assessment of basic physical abilities (BPA) used in the Ministry of Interior of the Republic of Serbia (MoI) is conducted continuously, starting from admission, training, education and throughout the professional service of each police officer. Test batteries and normative standards are defined based on age, sex and professional duties. Specific physical abilities (SPA), assessed during training and education of future police officers, serve also as feedback on the quality of the system of education and training. During professional service, police officers are obliged to further develop and maintain adequate levels of specific abilities. Quality assessment is done in line with the law and it is not conditioned by sex or age (Janković et al., 2012).

Tests used for BPA assessment at the Basic Police Training Centre (BPTC), Academy of Criminalistic and Police Studies (ACPS) and Ministry of Interior (MoI), from the point of intensity, test completion time and mechanisms of ATP resynthesis can be classified into three groups (Janković et al., 2012):

- Anaerobic-alactate capacity tests, assessing speed-strength and maximum isometric muscle force. These tests are performed at maximal intensity, in up to 5-second intervals.
- Combined anaerobic-alactate and anaerobic-lactate tests, assessing repetitive strength of different muscle groups. These tests are performed at sub-maximal intensity, in 10 to 30 sec. intervals.
- Aerobic Cooper test, assessing general aerobic capacity performed in 12 min time intervals.

Based on the analysis, we can conclude that the currently used tests do not assess the anaerobic-lactate system of the police officers. Other types of assessment used, besides BPA assessment, include the assessment of Specialized Physical Education (SPE) techniques mastery level, i.e. Specific Physical Abilities (SPA). SPA assessment is done by expert observation. The subject's performance in each test task is evaluated and a numerical grade based on pre-defined criteria is assigned. This evaluation is conducted in all three educational stages: basic (conceptual), directed (derived conceptual) and situational level. The conceptual level includes motion algorithms, throwing, hitting, blocking, sweeping and levers. The derived conceptual level includes combinations of the afore-mentioned elements. The situational level includes algorithms comprised of handcuffing, taking away the suspect, solving situations where the suspect shows resistance and self-defense (Blagojević et al., 2006). The test conditions for all SPE techniques assessment demand that the subject is not tired or under any kind of physical or situational stress.

Based on the analysis of the tests currently used by the MoI RS, we can notice that there is a need for designing a test for the assessment of specific abilities during intense physical exertion at the situational level. The test would be designed for trainees of basic police courses, students of ACPS and MoI RS employees. The obstacle course for the assessment of specific abilities of police officers (OC_SAPO1) includes tasks identified as crucial for the successful completion of one part of police work.

The goal of this paper is to examine the validity and reliability of an obstacle course that can be used for the assessment of the specific ability of police officers in the anaerobic-lactate work regime. The main goal is to validate the OC_SAPO1 as a method for assessing the specific ability of police officers in the anaerobic-lactate work regime. This paper aims to contribute to the development of a technological process used for training, practicing and monitoring the level of physical ability of the MoI RS staff.

METHOD

For this research, an experimental method with inductive reasoning was used. The experiment was conducted by field testing (Ristanović & Dačić, 1999).

The sample of participants

For this research, 25 students (14 male and 11 female) were selected using random sampling. All of the participants were third-year students selected from different departments - criminalistic, police and security department. The basic descriptive characteristics for the male participants were: age– 22.2 ± 1.14 years; BH – 182.05 ± 4.07 cm; BM – 83.88 ± 10.54 kg; BMI – 25.28 ± 2.79 kg·m^{-2}; and for the female: age – 21.8 ± 1.03 years; BH – 169.5 ± 4.58 cm; BM – 60.42 ± 4.84 kg; BMI – 20.99 ± 0.93 kg·m^{-2}. All of the participants were informed about the assessment and research goals. The research was conducted in line with the "Declaration of Helsinki for recommendations guiding physicians in biomedical research involving human subjects" (http://www.cirp.org/library/ethics/helsinki/), with the permission of the Ethical Committee of Faculty of sports and physical education, University of Belgrade.

Assessment methodology

The OC_SAPO1 was administered in a 25x13 m field (Fig. 1). Before the actual testing, the participants were familiarized with the OC_SAPO1, and every test segment was explained in detail. The participants tried out each of the tasks. After the initial familiarization, the participants were exposed to the OC_SAPO1 which they had to go through in high intensity. After the minimum 24h rest period, the participants reached the actual test situation (Test 1). Test 1 was preceded by a 10 min warm up. The test-retest method was applied in order to assess test reliability. The recovery part after Test 1 included low intensity running and walking for 15 min followed by 5 min of stretching.

After 48 h, i.e. the period sufficient for full physical recovery, the participants were tested again (Test 2). In both tests, the measured variables included: time (t) for OC_SAPO completion (efficiency indicator), maximal heart rate - HR_{max} (measure of the functional exertion of the cardiovascular system) and lactate concentration in capillary blood in third (La_3) and fifth minute (La_5) after OC_SAPO1 completion (indicator of metabolic acidosis).

OC_SAPO1 included following tasks (Fig. 1):

A. Start at the sound signal,
B. 20m sprint in a straight line,
C. Stopping, taking cover and reaching for a firearm,
D. After threat assessment, while holding the gun in the firing position, the participants leaves the cover from the left side, passes the cones from the outer side and crawls underneath the rope set at a height of 55 cm in marked spots. The distance between the cones is 250 cm,
E. Stopping and taking cover, changing the magazine and putting the firearm back into the duty belt,

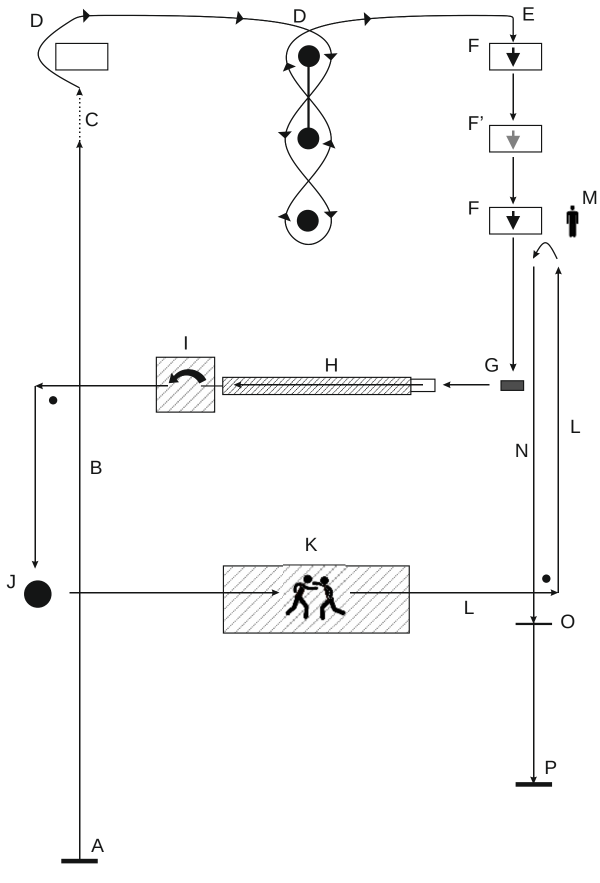

Fig. 1 The OC_SAPO1 design

F. Three-part task: 1. Crossing over a 110 cm-high obstacle; 2. crawling beneath a 55cm-obstacle (F'); 3. Crossing over a 110 cm-high obstacle. The distance between the obstacles is 250 cm,
G. Approaching the focus pad (held by an assistant), throwing 4 punches and 2 kicks, with maximal speed and intensity,
H. Climbing the 70 cm high platform and crossing the 120 cm high and 500 cm long balance beam.
I. Leaping on the mat with a forward roll,
J. Approaching the punching bag, taking a baton, hitting the bag 4 times with maximal efficiency and putting the baton back on the duty belt,
K. Reaching the mats and defending against a predetermined attack, overcoming the attacker using SPE techniques, controlling and handcuffing the suspect,
L. The 15 m sprint at maximum speed, with a change of direction, to the dummy (sack),
M. Reaching the dummy (sack) and lifting it (men) or preparing for dragging the dummy (women),
N. Carrying the dummy or sack (man) or dragging it (women) for 10 m from the starting position to a marked point,
O. Safely placing the dummy (sack) on the ground,
P. Running through the finish line.

OC_SAPO1 completion time (t) was measured using the computer system *Physical Ability Test 01* (PAT 01) and expressed in seconds (s). PAT 01 is composed of measurement and data acquisition instruments, cable set, applicative software and running sensor. The participant activates the chronometer by passing through the first sensor and turns it off by passing through the sensor at the end of obstacle course. The result is showed in seconds, in two-decimal format (Dopsaj et al., 2014; Janković, Dopsaj & Dimitrijević, 2014).

Measuring metabolic and functional indicators

Two parameters were used to assess the metabolic and functional indicators of physiological exertion (Astrand, Rodahl, Dahl & Stromme, 2003):

- Lactate concentration in capillary blood expressed in millimoles per liter (La in mmol/L), as metabolic acidosis measure;
- Maximal heart rate (HR_{max}) expressed in beats per minute (bmp), as functional exertion of the cardiovascular system measure.

For measuring lactate concentration, a sample of 0.7 μl capillary blood was extracted from a finger in the third (La_3) and fifth (La_5) minute of recovery (Dopsaj et al., 2014). For collecting blood sample, a disposable blood lancet Unistik 3 Comfort (Owen Mumford Ltd. UK) was used. The lactate concentration was analyzed using a portable new generation lactate analyzer (Lactate Plus NOVA biomedical, USA), using a lactate biosensor based on lactate oxidization (Lactate Methodology - Lactate oxidase biosensor) (Hart et al., 2013). Establishing lactate concentration is important for adjusting optimal training intensity (Bishop, 2001) in order to improve metabolic performance (Kulandaivelan,Verma, Mukhopadhyay & Vignesh, 2009). HR_{max} was measured with a heart rate monitor SIGMA PC 15 (Sigma Electro GmbH, Germany).

Statistical analyses

The data were first analyzed using basic descriptive statistics: calculating mean and standard deviation scores (Mean and SD). For comparing Test 1 and Test 2 results, the t-test with paired samples was used. A correlation analysis for Test 1 and Test 2 results was performed using Pearson's correlation and Cronbach's Alpha, while the reliability of measurements was analyzed using the Interclass Correlation Coefficient. All of the statistical analyses were performed using the SPSS Statistics 17.0 Program (Hair, Anersen, Tatham & Black, 1998).

RESULTS

Descriptive statistic results for both measurements are presented in Table 1.

Table 1 Descriptive statistics results

	Test 1		Test 2	
	Mean	SD	Mean	SD
t (s)	106.02	10.49	98.85	8.61
HR_{max}(bpm)	186.29	7.05	187.11	7.24
La_3 (mmol/L)	11.20	1.88	10.85	2.00
La_5 (mmol/L)	11.07	1.73	11.28	2.15

t - test completion time; s – second; HR_{max} – maximal heart rate frequency; bpm - beats per minute; La_3 - lactate concentration in the blood in the third minute of recovery; La_5 - lactate concentration in the blood in the fifth minute of recovery; mmol/L – milimole per liter

The t-test showed that there is significant difference in OC_SAPO1 completion time for Test 1 and Test 2 ($p<0.01$). For HR_{max} variable, between La_3 and La_5 there was no statistically significant difference (Table 2).

Table 2 Results of the t-test

Pair	t values	Sig. (2-tailed)
t1 – t2	4.164	0.000
$HR_{max}1$ – $HR_{max}2$	- 0.529	0.602
La_31 – La_32	1.016	0.320
La_51 – La_52	- 0.567	0.523

t1- test completion time in the first measuring; t2- test completion time in the second measuring; $HR_{max}1$ - maximal heart rate frequency in the first measuring; $HR_{max}2$ - maximal heart rate frequency in the second measuring; La_31 - lactate concentration in the blood in the third minute of recovery in the first measuring; La_32 - lactate concentration in the blood in the third minute of recovery in the second measuring; La_51 - lactate concentration in the blood in the fifth minute of recovery in the first measuring; La_52 - lactate concentration in the blood in the fifth minute of recovery in the second measuring

Cronbach's Alpha Intraclass Correlation Coefficient results presented in Table 3 showed high test-retest reliability for the following variables: t, La_3 and La_5 and low reliability for HR_{max}.

Table 3 Results of Cronbach's Alpha and Intraclass Correlation Coefficient

Variable	Cronbach's Alfa	Single Measures			Average Measures			Sig.
		ICC	LB[2]	UB[3]	ICC[1]	LB[2]	UB[3]	
t (s)	0.741	0.474	0.015	0.750	0.643	0.030	0.857	0.001
HR_{max}(bpm)	0.584	0.420	0.032	0.696	0.591	0.062	0.821	0.018
La_3 (mmol/L)	0.764	0.618	0.308	0.811	0.764	0.470	0.895	0.000
La_5 (mmol/L)	0.788	0.656	0.359	0.832	0.792	0.529	0.908	0.000

ICC – Intraclass Correlation Coefficient; LB – Lower Bound; UB – Upper Bound; t – time necessary to complete the OC_SAPO1; s – second; HR_{max} – maximal heart rate frequency; bpm – beats per minute; La_3 – lactate concentration in the blood in the third minute of recovery; La_5 – lactate concentration in the blood in the fifth minute of recovery; mmol/L – milimole per liter

Linear regression results presented in Table 4 and in figures 2–5 showed statistically significant variability for the following variables: t, HR_{max} and La_3 and La_5.

Table 1 Results of the linear regression

	t1-t2	$HR_{max}1$- $HR_{max}2$	La_31-La_32	La_51-La_52
Pearson's Correlation	0.610	0.413	0.619	0.666
R Square	0.372	0.171	0.384	0.444
F Change	13.621	4.729	14.317	18.374
Sig.	0.001	0.040	0.001	0.000

t1– test completion time in the first measuring; t2 – test completion time in the second measuring; $HR_{max}1$ – maximal heart rate frequency in the first measuring; $HR_{max}2$ – maximal heart rate frequency in the second measuring; La_31 – lactate concentration in the blood in the third minute of recovery in the first measuring; La_32 – lactate concentration in the blood in the third minute of recovery in the second measuring; La_51 – lactate concentration in the blood in the fifth minute of recovery in the first measuring; La_52 – lactate concentration in the blood in the fifth minute of recovery in the second measuring

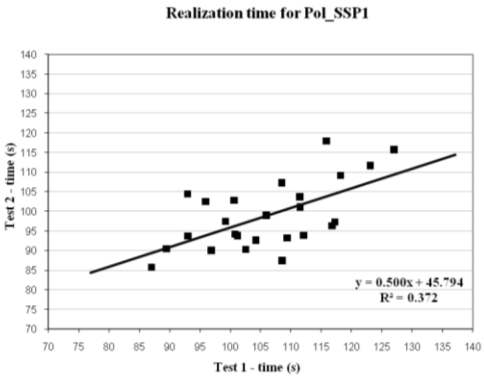

Fig. 2 Reliability of the OC_SAPO1 test in relation to test completion time

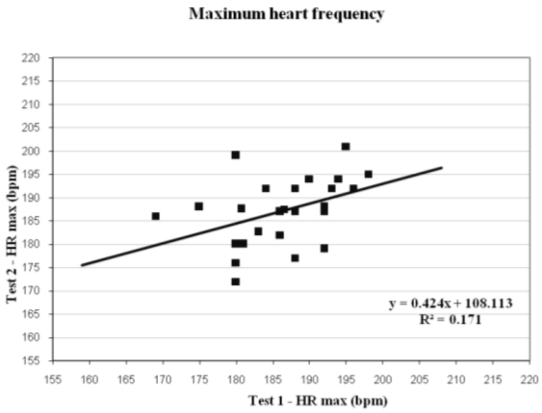

Fig. 3 Reliability of the OC_SAPO1 test in relation to maximum heart frequency

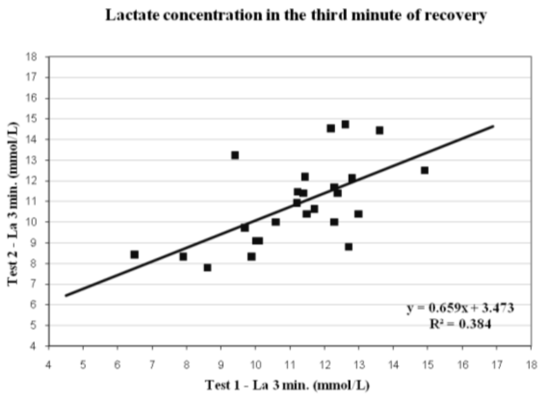

Fig. 4 Reliability of the OC_SAPO1 test in relation to lactate concentration measured in the third minute of recovery

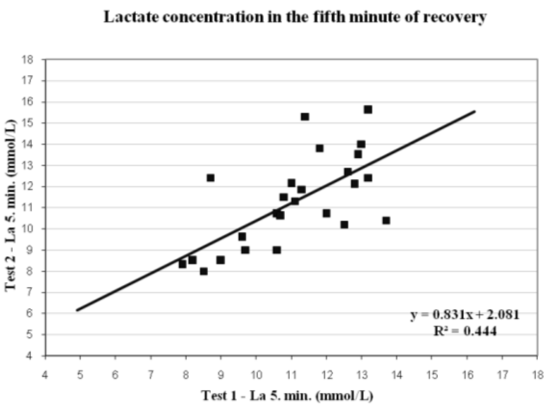

Fig. 5 Reliability of the OC_SAPO1 test in relation to lactate concentration measured in the fifth minute of recovery

DISCUSSION

Based on the presented results, we can conclude that there is statistically significant test completion time difference for the two measurements. The participants completed the OC_SAPO1 Test 2 in a 7.17sec shorter time i.e. 7.25% faster (t - 4.164, $p<0.01$). Pearson's correlation confirmed the statistically significant correlation between t1 and t2 ($r = 0.610$, $p = 0.001$). The highly significant part of second measurement variance is explained in first measurement 1, 37.2% ($p = 0.001$). Considering the fact that OC_SAPO1 was designed as a specific motor algorithm for assessing task completion quality and speed, for a set of different police work specific conceptual and situational tasks, we can conclude that significantly shorter completion time in the second measurement can be the result of learning effect. One of the methods used for the development of skill, as a complex physical ability that implies that a person is able to perform complex activities that demand motor coordination, in a correct, fast and rational manner in relation to variable spatial and time conditions, is an obstacle course method (Blagojević et al., 2006). Also, one of selection criteria for admission to ACPS is the ability to learn new motor structures efficiently (Vučković, Janković, & Dopsaj, 2001). We can assume that performing the test at maximal intensity had a positive effect on improvement of speed and task completion quality in the second measurement, which implies that the OC_SAPO1 has an educational effect. Based on these findings, a testing procedure using OC_SAPO1 should be administered in a way that the final scores are taken after familiarization in repeated measurement. The interval between two measurements (48 h) allows full recovery, i.e. restoration of the initial level of physiological processes (McArdle, Katch & Katch, 2007).

The true lactate peak time in recovery is unknown (Bishop & Martino, 1993), while according to Astrand et al. (2003) for determining the lactate peak concentration in the blood, samples must be taken in the first 5 to 10 minutes of the recovery period. In previous studies, the lactate peak was measured in the third (Pelayo, Mujika, Sidney & Chatard, 1996; Degoutte, Jouan & Filaire, 2003) and in the fifth minute of recovery (Weltman, Stamford & Fulco, 1979), while in the study of Alfaro, Palacios & Torras (2002) the level of lactate was measured in both the third and fifth minute. The efficiency of completing the OC_SAPO1, the time needed for performing individual tasks and the intensity of performance are of an intermittent character. The duration of the performance, break and the intensity define the changes in the heart rate and the level of lactate concentration, thus the measurement of lactate concentration in the third and fifth minute was done in order to deduce the optimal method of measuring for this test. Likewise, in this way the maximal lactate levels were measured in order to determine the reliability of the OC_SAPO1 by the test-retest method (Thomas, Nelson & Silverman, 2005). The research results showed no statistically significant difference for variables La_3 and La_5 at the initial and repeated measuring. There is a statistically significant correlation for La_3 and La_5 ($r = 619$, $p = 0.001$; $r = 660$, $p < 0.01$, respectively). For La_3 and La_5 the second measurement variance is explained in the first measurement with 38.4% and 44.4% ($p = 0.001$; $p < 0.01$). The highest test results correlation ($r = 0.666$, R Square = 0.444, $p< 0.01$) and test-retest reliability (Cronbach's Alpha = 0.788) of lactate concentration was register in $La_{5.}$ This result indicates that the metabolic indicator of anaerobic lactate should be measured in the La_5 of the second measurement. A comparison of lactate concentration measured for martial arts e.g. for judocas 12.3 mmol/L (Degoutte et al., 2003), wrestlers 13.03 mmol/L and kick-boxers 10.02 mmol/L (Karninčić, Baić & Belošević, 2010) indicates that the OC_SAPO1 demands similar anaerobic-lactate intensity of physical exertion as the listed sports (Dopsaj et al., 2014). In previous research, no statistically significant gender differences between lactate concentration and HR_{max} were registered (Janković et al., 2014). Considering the fact that the anaerobic threshold value is 4 mmol/L (Dopsaj et al., 2014), based on the presented results we can conclude that after the completion of the OC_SAPO1, the participant's metabolic stress level was in the zone of high anaerobic glycolysis (Dopsaj et al., 2014). Also, it can be concluded that, as a method for assessing specific ability, OC_SAPO1 has an equal effect on metabolic function reaction in male and female participants, so it can be used for assessing both men and women.

For HR_{max}, low reliability of Cronbach's Alpha was registered (0.584) and comparing to the other observed variables, a lower degree of agreement between two measurements (Average Measures: ICC = 0.420, p = 0.018) and lower consistency of the results (Single Measures: ICC = 0.474, p = 0.018). The total variance of the second measurement explained in the first measurement is 17.1% (p = 0.40). HR_{max} was used as a parameter for assessing physical exertion, or as component of minute volume. It is proportional to work intensity and oxygen consumption in a steady state. Between the two measurements, low statistical significance of the result consistency was registered. We can assume that the reason for these results comes from factors that impact HR_{max} during work: work time, pace and impact of discontinuation of work (McArdle et al., 2007). The average completion time for the OC_SAPO1 during the first measuring was 105.98±11.09sec and in second 98.87±9.07sec. Considering the fact that it take more than 120sec to reach the HR_{max}, period in which the OC_SAPO1 is administered, it can lead to different reactions for different participants. Also, change of work pace conditioned by different tasks, and performing handcuffing task (which is done near the test finish and can be treated as discontinuation of work) can differently affect a participant's HR_{max}. In their research, Dopsaj et al. (2014) found that a participant's heart rate after completion of the OC_SAPO1 was 95% of heart potential. HR_{max} value during the first measuring was 186.29 bpm and during the second 187.11 bmp, which is not a statistically significant difference (t- 0.529, p =0.602).

The results show that the OC_SAPO1 is a reliable instrument for assessment of SPA of police officers in the anaerobic-lactate work regime with high test-retest reliability in test completion time (0.741) and high reliability of lactate concentration in La_3 and La_5 in both measuring (0.764, 0.788, respectively). The high degree of result reliability for La_3 and La_5 was registered between measurements in the test completion period (Average Measures: ICC = 0.643, p = 0.001; ICC = 0.764; p < 0.01, ICC = 0.792, p < 0.01, respectively), and also statistically significant result consistency for the same variables (Single Measures: ICC = 0.474, p = 0.001; ICC = 0.618, p < 0.01, ICC = 0.656, p < 0.01, respectively). Both of these results confirm that both measurements are reliable for the assessment of OC_SAPO1 efficiency, and also for the level of physical exertion from the aspect of metabolic acidosis. Based on these observed values for variables t, La_3, La_5 and HR_{max}, the OC_SAPO1 can be classified as a sub-maximal intensity test in the anaerobic-lactate work regime.

Based on previous research, the tasks relevant for efficient police work were identified in order to support development, monitoring of the development level and setting standards of SPA. The OC_SAPO1 was designed in a way that simulates real motor tasks that police officers need to be trained for, in order to be able to perform them efficiently (Arvey et al., 1992; Bonneau et al., 1995; Anderson, 2001; Lonsway, 2003; Mendeš, 2010; Strating et al., 2010). Considering the fact that specific training calls for development of physical abilities through performing professional activities in real work intensity situations (Vučković et al., 2011), in regards to task structure and work intensity, the OC_SAPO1 can be used for development and assessment of SPA in the anaerobic-lactate work regime and based on logical analysis, can safely be considered a reliable test.

CONCLUSIONS

The OC_SAPO1 was designed in a way to simulate real motor tasks so that police officers can have proper spatial-time practical training. By performing he OC_SAPO1 tasks, each individual is faced with stressful situations of increased physical exertion, during which all technical-tactical activities have to be performed. Specific training calls for the development of physical abilities through performing professional activities in real work intensity situations. Considering this, in regards to task structure and workload, the OC_SAPO1 can be used for the development and assessment of SPA in the anaerobic-lactate work regime. A statistically significant difference for test completion time between two measuring was registered, i.e. the participants performed 7.25% more efficiently during the second measuring, which implies the educational effect of the OC_SAPO1. Based on these results, it is recommended that participants first be familiarized with the tasks, go through the test once in maximum intensity and that the efficiency of the OC_SAPO1 is measured in the retest after a 48 h recovery period. Based on the observed results, we can conclude that the OC_SAPO1 is a valid and reliable test for assessing specific physical ability in the anaerobic-lactate work regime. Future research should establish criteria and normative standards for the OC_SAPO1 in regards to age, sex and specialization of police officers.

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VALIDNOST I POUZDANOST TESTA ZA PROCENU SPECIFIČNIH FIZIČKIH SPOSOBNOSTI POLICAJACA U ANAEROBNO-LAKTATNOM REŽIMU RADA

Predmet ovog rada je ispitivanje validnosti i pouzdanosti testa – poligona (Pol_SSP1) koji se može koristiti za procenu specifične spretnosti policajaca u anaerobno-laktatnom režimu rada. U istraživanju je učestvovalo 25 studenata Kriminalističko-policijske akademije (14 muškaraca i 11 žena). Testiranje se sprovodilo po metodi za utvrđivanje pouzdanosti test – retest. Posmatrane varijable bile su: vreme potrebno za Pol_SSP1 (pokazatelj efikasnosti), koncentracija laktata u kapilarnoj krvi (mera metaboličke acidoze) i vrednost frekvencije rada srca (mera funkcionalnog opterećenja srčanosudovnog sistema organizma). Rezultati t-testa pokazali su da su ispitanici Pol_SSP1 savladali u drugom testiranju statistički značajno brže (t – 4.164, p < 0.01) za 7.17 sekundi, tj. za 7.25% što navodi na edukabilni efekat testa i može se koristit u nastavnom procesu. Kod izmerene koncentracije laktata i maksimalne frekvencije srca nije utvrđena statistički značajne razlika između dva testiranja. Na osnovu rezultata Cronbach's Alpha, može se zaključiti da je Pol_SSP1 kao instrument za procenu specifične spretnosti policajaca u anaerobno-laktatnom režimu rada pouzdan merni instrument. U ovom istraživanju kod maksimalne frekvencije srca uočena je niža Cronbach's Alpha pouzdanost testa u odnosu na ostale posmatrane varijable. Postignuti nivoi posmatranih varijabli svrstavaju Pol_SSP1 u testove submaksimalnog intenziteta u anaerobno-laktatnom režimu rada.

Ključne reči: *poligon, specijalno fizičko obrazovanje, anaerobni rad, pouzdanost, validost, policija.*