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TABLE OF CONTENTS

TOPIC III
Police organization – structure,
Functioning and human resources

Gabor Kovacs
THE MAIN FEATURES AND CHARACTERISTICS OF THE ORGANISATIONAL CULTURE OF THE HUNGARIAN NATIONAL POLICE 3

Dane Subosic, Obrad Stevanovic, Slavisa Djukanovic, Dejan Milenkovic
THE POSSIBILITIES AND LIMITATIONS OF INDIVIDUAL RISK ASSESSMENT OF DOMESTIC VIOLENCE BY APPLICATION OF THE MATRICES OF PROBABILITY AND CONSEQUENCES..... 15

Bojan Jankovic, Goran Vuckovic, Sasa Milojevic, Boban Milojkovic, Bojan Mitrovic
THE ANALYSIS OF THE QUALIFICATION LEVEL OF MEMBERS OF POLICE INTERVENTION PATROLS FOR APPLICATION OF MEANS OF COERCION 29

Filip Kukic, Milivoj Dopsaj, Jay Dawes, Dunja Prpic
EFFECTS OF A 4-WEEK TRAINING INTERVENTION ON ESTIMATED VO2max AND BODY COMPOSITION AMONG FEMALE POLICE OFFICERS: PILOT STUDY 39

Aleksandar Cvorovic, Robin Orr, Novak Bacetic
EFFECTS OF A 12-WEEK PHYSICAL TRAINING PROGRAM AND NUTRITION PLAN ON THE BODY COMPOSITION OF OVERWEIGHT POLICE TRAINEES 49

Zorica Vukasinovic Radojicic, Aleksandra Rabrenovic, Safet Korac
PERFORMANCE APPRAISAL OF CIVIL SERVANTS - | COMPARATIVE PERSPECTIVES..... 61

Radivoje Jankovic, Nenad Koropanovski, Rasa Dimitrijevic
EVALUATION OF TESTS FOR THE ASSESSMENT OF POLICE OFFICERS PHYSICAL ABILITIES..... 73

Danijela Spasic, Ivana Radovanovic, Nenad Milic
LOCAL SECURITY COUNCILS AND COMMUNITY POLICING IN SERBIA - BETWEEN VISION AND REALITY..... 83

Vince Vari
FNEW WAYS IN THE MEASUREMENT OF THE POLICE PERFORMANCE IN HUNGARY: RESULTS OF THE GOOD STATE AND GOOD POLICE PROJECT..... 97

Filip Miric
ETHICAL ASPECTS OF POLICE WORK..... 109

Dalibor Kekic, Milos Milenkovics
QUALITY MANAGEMENT IN POLICE STATIONS IN THE REPUBLIC OF SERBIA ... 119

Svetlana Ristovic
HUMAN RESOURCE MANAGEMENT IN THE POLICE
- Strategic and Legal Basis of Career Development – 129

Philipp Stein
DEPROFESSIONALISATION OF POLICE WORK – THE INCREASED
DEPLOYMENT OF "AUXILIARY POLICEMEN" IN GERMANY 141

Ivan Djorovic
THE PROFESSIONALISATION
OF THE POLICE COMMUNICATIONWITH MEDIA..... 153

Marina Vasic
INTERNAL COMPETITION IN THE MINISTRY OF INTERNAL AFFAIRS AS MEANS
OF IMPROVING THE EQUAL OPPORTUNITIES SYSTEM
FOR WOMEN AND MEN 171

TOPIC IV
Contemporary security challenges

Zorica Mrsevic, Svetlana Jankovic
CHALLENGES OF INCLUSIVE SECURITY 183

Vladimir Vekovic, Violeta Culafic
CLIMATE CHANGE IN THE REPUBLIC OF SERBIA,
PARIS AGREEMENT AND CHAPTER 27..... 193

Sasa Mijalkovic, Marija Popovic Mancevic
CSECURITY SCIENCES AT THE STATE UNIVERSITIES
OF THE REPUBLIC OF SERBIA..... 205

Zarko Obradovic
SECURITY CHALLENGES AND PILLARS OF THE SERBIAN FOREIGN POLICY 219

Dragan Jevtic, Miroslav Talijan
DEMOGRAPHIC CHANGES AS A SECURITY THREAT
IN THE PROCESS OF GLOBALIZATION 233

Jasmina Gacic, Milos Tomic
ORGANISATIONAL DEVIANCE OF THE STATE AND NATURAL DISASTERS..... 247

Hajradin Radoncic, Samed Karovic
SECURITY OF THE REPUBLIC OF SERBIA THROUGH PRISM
OF CHURCH AND RELIGIOUS COMMUNITIES 257

Hatidza Berisa, Igor Barisic, Katarina Jonev
THE SOURCE OF ISLAMIC EXTREMISM IN SOUTH-EASTERN EUROPE..... 271

Nenad Kovacevic, Antonio Mak, Mitar Kovac
CURRENT PROBLEMS IN THE FUNCTIONING
OF THE NATIONAL SECURITY COUNCIL OF THE REPUBLIC OF SERBIA..... 283

Branko Lestanin, Vanda Bozic, Zeljko Nikac
COUNTER TERRORISM AND MIGRANT CRISIS IN CONTEXT OF CRIMINAL LAW
COOPERATION BETWEEN COUNTRIES OF THE REGION..... 293

Marjan Gjurovski, Snezana Nikodinovska Stefanovska
CONCEPTUAL APPOROACH IN CREATING SECURITY POLICY
OF THE REPUBLIC OF MACEDONIA 305

Vladimir Cvetkovic, Marina Filipovic, Slavoljub Dragicevic, Ivan Novkovic
THE ROLE OF SOCIAL NETWORKS IN DISASTER RISK REDUCTION..... 311

Milan Marcinek
FIRE INVESTIGATION: LEGAL REGULATIONS AND PERFORMANCE OF FIRE INVESTIGATORIN THE SLOVAK REPUBLIC 323

Gyongyi Major, Aleksandar Cudan
WORLD ORDER TRANSFORMATION AND SECURITY POLICY CHALLENGES 335

Bozidar Otasevic, Sasa Atanasov
SOURCES OF DANGER AT THE SITE OF DISCOVERY OF SECRET LABS FOR DRUGS PRODUCTION 347

Vladan Mirkovic
TERRORISM AS A MEANS OF HYBRID WARFARE 357

Drazan Bojic
POLITICAL SECURITY IN BOSNIA AND HERZEGOVINA TWENTY YEARS AFTER THE DAYTON PEACE AGREEMENT 371

TOPIC V
Cyber crimes and it security

Petar Cisar, Imre Rudas
OVERVIEW OF SOME SECURITY ASPECTS OF SMART PHONES. 383

Aleksandar Miljkovic, Milan Cabarkapa, Milan Prokin, Djuradj Budimir
THE IMPORTANCE OF IOT AND IOT FORENSICS 395

Aleksa Maksimovic, Slobodan Nedeljkovic, Mihailo Jovanovic, Jelena Misic, Vojkan Nikolic, Dragan Randjelovic
A NOVEL MULTI-ATTRIBUTE DECISION-MAKING METHOD TO FIGHT THE CYBER-CRIME 405

Brankica Popovic, Ana Kovacevic, Kristijan Kuk
COMPREHENSIVE FORENSIC EXAMINATION WITH BELKASOFT EVIDENCE CENTER 419

Goran Matic, Milan Miljkovic, Zoran Macak
CRISIS MANAGEMENT OF MALICIOUS ACTIVITIES IN CYBERSPACE 435

Milan Gligorijevic, Radosav Popovic, Aleksandar Maksimovic
THE ROLE AND IMPORTANCE OF INTEGRATION OF FUNCTIONAL TELECOMMUNICATION SYSTEMS IN EMERGENCIES 445

Yanling Wang
APPLICATION OF MODERN TECHNOLOGY IN PREVENTING AND COMBATING ORGANIZED CRIME 457

TOPIC VI
Innovative methods in forensic science

Aleksandra Vulovic, Venezija Ilijazi, Jelena Lamovec, Stevo Jacimovski
ASSESSMENT OF AIR POLLUTION DISTRIBUTION FROM RADIOACTIVE SOURCES AND ITS IMPACT ON HUMAN HEALTH 475

Filip Babic, Jelena Kalajdzic, Biserka Milic, Nikola Milasinovic
ANALYTICAL TECHNIQUES FOR AMYGDALIN DETERMINATION IN FRUITS:CURRENT STATE AND TRENDS 485

Bozidar Banovic, Jovana Vujosevic
BONES AS FORENSIC EVIDENCE 495

Jozef Metenko, Martin Metenko, Miriam Metenkova
DIGITAL TRACE AND THEIR CRIMINALISTIC ATTRIBUTES AND SIGHTS 509

Lazar Nesic, Andjelko Maric, Milivoje Loncar, Jasmina Indjic
IMPLEMENTATION OF THE NEW STANDARD ISO/IEC 17025:2017 AND ITS IMPACT ON THE QUALITY OF WORK IN FORENSIC LABORATORIES 525

Elena Zaitseva
THE DOCTRINE OF SPECIAL KNOWLEDGE IN CRIMINAL PROCEEDINGS AND ITS INFLUENCE ON THE FORMATION OF THE SYSTEM OF FORENSIC EXPERTOLOGY 537

Fangzhou He
THE RESEARCH OF SAME SOURCE TEST METHOD OF MONITORING VIDEO BASED ON PATTERN NOISE 547

Sandra Adiarte
MOVEMENT ANALYSIS IN FORENSICS – AN INTERDISCIPLINARY APPROACH ... 559

EVALUATION OF TESTS FOR THE ASSESSMENT OF POLICE OFFICERS PHYSICAL ABILITIES[1]

Radivoje Janković, PhD[2]
Nenad Koropanovski, PhD
Raša Dimitrijević, PhD
University of Criminal Investigation and Police Studies, Belgrade

Abstract: Physical abilities play an important role in the performance of police work and are one of the main preconditions for the effectiveness of critical incidents resolving. Therefore, one of the methods for determining the police officers working skills is checking the basic physical abilities (BPA) and specific physical abilities (SPA) development levels. The problem in this paper was the evaluation of the BPA tests used by the police organizations and the Test for assessment of specific physical abilities of police officers (OC_{SAPO1}). The aim of the study is to determine the battery of tests that describes the observed space from the aspect of professional orientation. The sample consisted of 99 male examinees (age 28.1 ± 6.1 years) divided into four groups: 30 ACPS students, 28 members of the General Police Unit, 17 members of the Special Anti-terrorist Unit and 22 subjects of control group. Eighteen BPA variables were used, as well as the efficiency of a job related fitness test OC_{SAPO1} with metabolic and functional physical activity indicators. Based on the descriptive indicators, factor analysis has determined the mutual structure and structure of quantitative relations between all BPA, SPA and metabolic variables. The analysis of communality determined that extrusion values in all variables ranged from 0.456 to 0.862. The obtained results cumulatively explained 67.51% of the variability, and four main groups of factors are distinguished. The first group is defined by the specific physical abilities of police officers, the second by maximum muscular forces, the third by variables of the rate of force development and the fourth by physiological variables. Based on the analysis of the obtained results average values, it was found that 54.86% of respondents correspond to the group they belong to. In practice, in selection and control of the BPA level, the battery of tests are used for the assessment of the police officers complete motor space. Finally, the results of this study indicate that the tests OC_{SAPO1}, Long jump and the maximum number of pull-ups, mostly discriminate efficiency in motor space of police officers.

Key words: police, obstacle course, physical abilities

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2 radivoje.jankovic@kpa.edu.rs

INTRODUCTION

Police officers interventions are performed in complex circumstances and can range from verbal warning to the use of different levels of physical force (Dopsaj et al., 2012). Resolving certain tasks in a legitimate and efficient manner, among others, implies an adequate level of development of basic physical abilities (BPA) and specific physical abilities (SPA) (Vučković et al., 2011[a]). Physical abilities are particularly important during interventions in critical situations. More concrete, these situations involve assisting people in natural disasters, traffic accidents and overcoming the individuals who commit assault or resist (Anderson et al., 2001). For these reasons, assessment of the BPA and SPA level development is an integral part of the selection, education and determination of the working ability of police officers, with the method of testing and norms defined in relation to gender, age and professional specialization (Janković & Dimitrijević, 2012).

In previous studies of physical abilities in the police officers population, muscular strength and general aerobic endurance were singled out as the most important abilities in selection processes, physical abilities levels assessment and successful performance of police work (Nutting and Maxwell, 1992; Bonneau and Brown, 1995; Anderson et al., 2001). Also, it was found that a certain level of manifestation of the maximum isometric force of the back and leg extensors and the maximum isometric force of the hand finger flexors, may have significance for the successful and efficient execution of police duties (Blagojevic, 1996; Dopsaj & Vuckovic, 2006). Since the repetitive power is the muscular ability to realize successive fast and powerful movements during the creatine phosphate energy phase, which are carried out in the zone of maximum and submaximal intensity, it is one of the properties that statistically significant describe the specific motor space and manifests itself in a large number of police tasks (Arvey et al., 1992; Dopsay et al., 2002). The importance of speed power in police work is reflected in the fact that it is expressed in the area of specific physical abilities such as punches, throws, levers and blocks or, in the area which represents a self-defense techniques, in handling and use of the official weapons (Blagojević et al., 2006; Vučković et al., 2011[b]). On the other hand, general aerobic endurance as a physical ability, may be considered as one of the health-related physical fitness most important component (Kayihan et al., 2014). During the working career of police officers, it was noticed that with a reduction in the time spent on physical activities, the risk of cardiovascular disease increases, as well as a significant increase in body weight (Sörensen et al., 2000). Also, police officers with better general aerobic abilities in situations of specific fatigue, recovers more quickly from stress, or have greater tolerance to stress (Blagojević et al., 2006).

The level of physical abilities development should be also considered in the context of specific tasks that are characteristic for the different police unit organizations. In this sense, the battery test should be designed to suit the real situations that are more likely to be met by police officers (Anderson et al., 2001; Lonsway, 2003). This accomplishes one of the basic goals – selection of the individuals with adequate physical abilities for work in the police (Dopsaj et al., 2007). Previous studies have shown that batteries containing tests for assessing different types of strength and aerobic endurance are justified in the selection of personnel to work in the police, and that BPA monitoring in this area represents a good prediction for the successful performance of police duties (Arvey et al., 1992; Bonneau & Brown, 1995; Boyce et al., 2008). In addition to a battery of tests for BPA assessment, for more specific indicators of the professional ability of an individual, job-related fitness test are used (Strating et al., 2010; Janković et al., 2015). These tests aim to assess the level of specific fitness and correspond to situational conditions and efforts made during professional tasks (Anderson et al., 2001; Dopsaj & Janković, 2014). This means that the test simulates, or contains, the most significant areas of the motor space

in solving critical situations (Bonneau & Brown, 1995; Lonsway, 2003). Studies have shown that in the majority of cases there are: running, jumping, crawling, maintaining balance, pulling, climbing, lifting, carrying or pulling loads, pushing and fighting. It has also been found that these tasks take place in the duration of 60 to 120 seconds in the submaximum or maximum intensity zone (Anderson et al., 2001; Jackson & Wilson, 2013; Dopsaj & Janković, 2014).

Based on the above, it is evident that for determining the physical fitness of police officers, a complete motor space from the aspect of BPA and SPA is observed, for which different batteries of tests are used (Wilmore & Davis, 1979; Greenberg & Berger, 1983; Bonneau & Brown, 1995; Lonsway, 2003; Strating et al., 2010; Jackson & Wilson, 2013). Improving the quality of testing of basic and specific physical abilities may be obtained by the measurement characteristics of instruments, new measurement procedures, normative parameters and finally, with their professional implementation (Fajnman, 1999; Strating et al., 2010). The problem in this study is the evaluation of the tests used for assessing police officers BPA and the job-related fitness test to assess police officers SPA (OC_{SAPO1}). The aim of study is to establish a battery of tests that stands out as the dominant representative of the observed area in terms of professional orientation.

RESEARCH METHODS

THE SAMPLE

The study involved a total of 99 respondents with an average age of 28.1 ± 6.1 years, which were divided into four subsamples. The first group consisted of 30 male students of the third studying year at the Academy of Criminalistic and Police Studies (ACPS_m), aged 22 ± 1.1 years, where all respondents underwent education in the course of the Specialized Physical Education. The second group consisted of 28 members of the General Police Unit (GPU m), aged 32.4 ± 4.5 years, with 8.7 ± 4.6 years of average working experience in the Ministry of Interior and they all have passed educational treatment for police work. The third group consisted of 19 members of the Special Anti-terrorist Unit (SAU_m), aged 33.1 ± 4.6 years. The fourth group included 22 respondents of the control group (CON_m), which are in recreational level engaged in the martial arts (aikido, karate and the Russian systema). The average age in CON_m was 26.5 ± 4.9 years, the average sports experience was 3.4 ± 1.3 years and the average weekly training range was 2.9 ± 0.7 hours. All respondents have undergone the necessary education course to solve specific motor assignments that are performed within OC_{SAPO1} in the extent of 9 instructional training school lessons.

THE VARIABLES SAMPLE

Eighteen BPA variables were used, as well as the efficiency of a job related fitness test OC_{SAPO1} with metabolic and functional physical activity indicators. The variables of BPA were measured by standard procedures (Dopsaj et al., 2010), and values were established for: the maximum isometric force of the left hand finger flexors (FmaxLH); the rate of force development of the left hand finger flexors ($_{RFD}$LH); the maximum isometric force of the right hand finger flexors (FmaxRH); the rate of force development of the right hand finger flexors ($_{RFD}$RH); the maximum isometric force of the back extensors (FmaxB); the rate of force development of the back extensors ($_{RFD}$B); the maximum isometric force of the legs extensors (FmaxL); the rate of force development of the legs extensors ($_{RFD}$L); the Abalac test (ABL); the Long jump (LJ); the maximum number of sit-ups with trunk rotation performed in 30 seconds (SU); the

maximum number of pull-ups (PULL); the time required for the 15 push-ups (PUSH); 30 meters maximum speed running with a start from the ground (30m); a 300 yards shuttle run test (SRT300); the Cooper test (CT); the Illinois test agility (IAtest).

The specific physical abilities are evaluated by using the job related fitness test: the obstacle course for the assessment of police officers specific skills (OC_{SAPO1}). The OC_{SAPO1} was realized on a space with the surface of 25x15 meters (Figure 1). Prior to the test, OC_{SAPO1} was introduced (each part of the test was explained in detail). Then the subjects practiced every course task in the period of two school classes (90 minutes), and completed the OC_{SAPO1} with high intensity soon after. After a break lasting at least 24 hours, the subjects were tested for the first time (Test 1) preceded by a 10 minute warm up. The Test 1 recovery consisted of 15 minute low intensity run and walk, as well as of 5 minute stretching. After 48 hours, namely the time period which enabled a full physical recovery, the subjects repeated the testing where the following variables were measured: the time required for the realization of OC_{SAPO1} (t_{SAPO1}), the concentration of lactate in capillary blood in the fifth minute of the recovery (La_5) and the maximum heart rate (HR_{max}). The obstacle course of police officers specific skills is structured on the basis of motor assignments that hypothetically simulate situations and tasks for which, in space-time frame, police officers must be practically trained (Figure 1). In this way, each individual comes into the stressful situations of growing physical fatigue, in which all technical-tactical movements must be perform correctly (Dopsaj & Janković, 2014; Jankovic et al., 2014). OC_{SAPO1} included the following tasks:

A. Starting on sound signal,

B. 20m sprint in a straight line,

C. Stopping, taking cover and reaching for the firearm,

D. After threat assessment, while holding the gun in firing position, subject leaves the cover from the left side, passes the cones from the outer side and crawls underneath the rope set at 55 cm height in marked spots. Distance between the cones is 250 cm,

E. Stopping and taking cover, changing the magazine and putting the firearm back on the duty belt,

F. Three part task: 1. Crossing over 110 cm high obstacle; 2. crawling beneath 55cm obstacle (F'); 3. Crossing over 110 cm high obstacle. The distance between the obstacles being 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 math with a forward roll,

J. Approaching the punching bag, taking 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 predetermined attack, overcoming the attacker using SPA techniques, controlling and handcuffing him,

L. 15 m maximal speed running, with changing 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 (men) or dragging it (women) for 10 m from the starting position to the marked point,

O. Safely placing the dummy (sack) on the ground,

P. Running through the finish line.

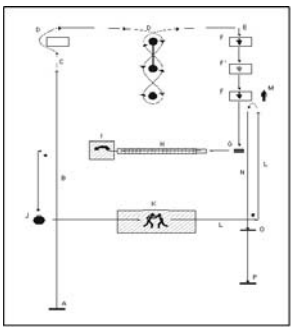

Figure 1. Design of the OC_{SAPO1}

The time required for the realization of OC_{SAPO1} was measured by Physical Abilities Testing computer system - PAT 02 and is expressed in seconds with two decimals (Dopsaj & Janković, 2014). PAT 02 consists of a measuring device, a set of required cables, application software and running sensors. The respondent passes through the first sensor and activate the chronometer, and by passing through the sensor at the end of the polygon switches off the time measurement. Capillary blood sampling was performed by the *Unistik 3 Comfort (Owen Mumford, Ltd., U.K.)* disposable lancet. Lactate concentration was determined with the portable lactate analyzer of the latest generation (*Lactate Plus NOVA biomedical, USA*), by biosensor method with lactate oxidase *(Lactate Methodology - Lactate oxidase biosensor)* (Hart et al., 2013). The concentration of lactate in capillary blood in the fifth minute of the recovery (La_5) is expressed in mill moles per litre (mmol/L), as a measure of metabolic acidosis. The maximum heart rate (HR_{max}) was measured by a mobile heart rate monitor SIGMA PC 15 (Sigma Electro GmbH, Germany).

STATISTICAL DATA PROCESSING METHODS

The results are presented through the basic indicators of descriptive statistics. In a further results processing by the factor analysis, the mutual structure and structure of quantitative relationships between all general and specific physical and metabolic variables were determined (Hair et al., 1998). For all statistical analysis software program IBM SPSS Statistics 22, ID: 729327 (premium faculty pack) was used.

RESULTS

Table 1 shows descriptive statistics results of the BPA and the measured OC_{SAPO1} parameters.

Table 1. *Descriptive statistic results for all groups*

Variables	ACPS_m		GPU_m		SAU_m		CON_m	
	MEAN	**SD**	**MEAN**	**SD**	**MEAN**	**SD**	**MEAN**	**SD**
FmaxLH (DaN)	53.47	6.94	44.82	5.85	51.85	6.76	49.18	9.15
$_{RFD}$LH (DaN/s)	53.16	21.18	42.29	27.00	50.37	18.77	43.60	21.07
F_{max}RH (DaN)	56.83	6.85	51.04	5.39	54.36	7.20	52.05	8.53

$_{RFD}$RH (DaN/s)	54.37	19.33	41.46	21.54	52.34	22.15	44.60	21.29
F_{max}B (DaN)	167.86	18.11	148.06	18.28	168.24	19.00	155.47	15.17
$_{RFD}$B (DaN/s)	67.64	26.54	60.62	18.05	72.17	20.51	65.82	17.75
F_{max}L (DaN)	165.58	18.12	142.48	19.83	165.72	16.59	149.96	16.46
$_{RFD}$L (DaN/s)	66.35	22.69	61.58	16.64	73.36	24.13	66.95	28.48
ABL (cm)	43.38	5.77	36.06	6.07	42.29	5.59	40.04	5.04
LJ (cm)	235.78	10.88	205.13	23.35	230.89	13.73	222.14	14.91
SU (No)	28.55	2.55	21.79	5.66	29.22	2.32	25.62	2.50
PULL (No)	15.03	5.09	4.37	5.28	19.72	5.17	9.06	5.18
PUSH (s)	11.96	1.48	15.87	3.54	11.43	0.84	12.79	2.24
30m (s)	4.51	0.15	4.88	0.20	4.52	0.15	4.70	0.22
SRT_{300} (s)	64.54	2.85	71.40	6.44	62.86	2.15	66.71	2.34
CT (m)	2602.01	220.84	2163.28	265.06	2880	229.49	2389.61	196.77
IA_{test} (s)	18.81	1.13	20.33	1.56	17.23	0.46	19.27	1.22
t_{SAPO1} (s)	87.92	6.98	94.39	11.06	76.87	7.43	90.89	8.84
La_5 (mmol/L)	12.60	2.25	12.52	2.29	11.51	1.77	11.20	2.24
HR_{max} (B/min)	187.88	5.63	183.31	6.70	174.72	8.91	182.28	8.35

The analysis of communality determined that extrusion values in all variables ranged from 0.456 to 0.862. which means that retained factors largely explain the variability in all completed tests. The obtained results cumulatively explained 67.51% of the variability, and four main groups of factors are distinguished. Table 2 shows the results of factor analysis.

Table 2. *The variables Igen scores by main components*

	Main component			
Variables	**1**	**2**	**3**	**4**
SRT_{300} (s)	-0.864	-0.211	-0.203	0.024
PULL (No)	0.830	0.510	0.261	-0.176
PUSH (s)	-0.806	-0.338	-0.126	-0.013
SU (No)	0.804	0.340	0.111	0.181
LJ (cm)	0.795	0.396	0.081	0.015
IA_{test} (s)	-0.779	-0.154	-0.373	0.340
CT (m)	0.776	0.193	0.347	-0.317
30m (s)	-0.717	-0.272	-0.175	0.194
ABL (cm)	0.717	0.361	0.006	0.105
t_{SAPO1} (s)	-0.705	-0.134	-0.305	0.003
F_{max}RH (DaN)	0.236	0.9t15	0.216	-0.005
F_{max}LH (DaN)	0.350	0.897	0.212	-0.090
F_{max}L (DaN)	0.492	0.892	0.247	0.158
F_{max}B (DaN)	0.508	0.862	0.286	0.113
$_{RFD}$LH (DaN/s)	0.190	0.452	0.739	-0.037

$_{RFD}$L (DaN/s)	0.193	0.101	0.721	0.126
$_{RFD}$LH (DaN/s)	0.124	0.367	0.688	0.064
$_{RFD}$B (DaN/s)	0.243	0.061	0.657	-0.090
HR_{max} (B/min)	-0.084	-0.014	-0.122	0.807
La_5 (mmol/L)	0.001	0.071	0.236	0.727

DISCUSSION

The four groups of factors were identified by factor analysis. The first factor group is defined by the specific physical abilities of police officers, and besides the OC_{SAPO1} test, includes the aerobic and anaerobic ability, the repetitive power of the arms flexors and extensors, as well as the repetitive power of the abdominal flexors. This group also includes the explosive power of the legs and maximal running velocity. The common denominator of the second factor group are the values of the maximum force (F_{maxB}, F_{maxL}, F_{maxLH}, F_{maxRH}), while the third factor group includes all four measured rate of force development variables. The fourth factor group includes physiological variables: the maximum heart rate and measured concentration of lactate in capillary blood after polygon realization (Table 2).

In the research on a population of police officers (Milošević, 1985), the structure of motor characteristics was examined with a battery of tests which included 76 physical and 4 morphological tests. By the use of the factor analysis, it has been established that for successful performance of professional duties, police officers should have adequately developed physical abilities in the space of different types of muscular power (maximum, dynamic, speed and explosive), anaerobic endurance, as well as velocity and precision in performing of the self-defence techniques. In the research conducted by Blagojević (1996), it has been found that it is possible to predict the dynamics of judo-technique structuring with a high level of reliability. A factor that is defined as the general factor of judo education is distinguished. It was concluded that the efficiency of judo-technique training in police officers population depends on both morphological and physical manifest and latent variables. In the studies which investigated the formation of the battery of tests based on the analysis of *bona fide* occupational requirement, it was concluded that the battery of tests, except for the assessment of BPA should also contain the tests that simulate specific police tasks. More specifically, the traffic patrol police officers additional test should have a simulation of jumping over the highway border or fence and the arrest of a suspect who refuses to cooperate and is located in the vehicle (Wilmore & Davis, 1979). Also, on the basis of regression analysis, it was determined that the probability of success in overcoming the suspect is increased if better results are achieved on the strength tests: maximum bench press, upright rowing, leg press and hand grip (Greenberg & Berger, 1983).

Considering that the quality of the police officers professional skills depends on SPA level (e.g., self-defence techniques, use of the police baton, handling of the gun), they need to be permanently trained (Vučković et al., 2011[a]). It was found that the *Police Physical Competency Test* execution efficiency is associated with the time that a police officer used for physical activities. Also, the job related fitness tests may be used as the mean for SPA improvement, because OC_{SAPO1} practising has an educational effect (Jankovic et al., 2015). In addition, it has been shown that OC_{SAPO1} is a valid test for assessing the specific abilities of police officers in anaerobic-lactate regime (Dopsaj & Jankovic, 2014), and that there is a significant correlation between the results of the polygon with the BPA. The highest level of positive correlations

were found between OC_{SAPO1} and tests that assessed the repetitive power of the abdominal flexors, agility and anaerobic and aerobic endurance (Janković & Koropanovski, 2017).

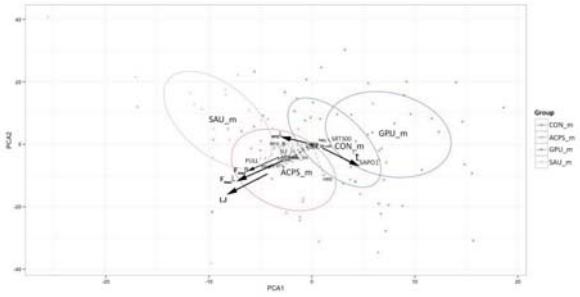

Figure 2. *Analysis of the main components with a limit in relation to group membership.*

In this study, the results of a factor analysis showed that 54.86% of the variability can be explained by belonging to a group in relation to the professional specialty. Of all the tests carried out from the motor area, the explosive power of the leg muscle extensors, or the variable LJ, proved to be the most discriminating. With the explosive power of the leg muscle extensors, the collinear are the maximum isometric force of the back and leg muscles extensors , which implies that these tests, according to the generator of physical abilities, are mutually related. The effectiveness of specific police skills polygon realization is collinear with $_{RFD}$L and best separates members of the Special Anti-terrorist Unit compared to other tested populations (Figure 2). In practice, in selection and control of the BPA level, the battery of tests are used for the assessment of the police officers complete physical abilities space. Finally, the results of this study indicate that the tests OC_{SAPO1}, Long jump and the maximum number of pull-ups, mostly discriminate efficiency in police officers physical abilities.

The most important limitation of this study lies in a fact that our sample was relatively small and ageing disperse, which should be taken into account in comparison with the other worldwide results. Another limitation refers to the lack of data on dietary and exercise habits, as well as on the morphological characteristics. Finally, the study did not evaluate the classification of the respondents relative to their respective departments, the workload levels to which they were exposed during professional engagement, or their performance efficiency.

CONCLUSION

The aim of this study was to determine the representative battery of tests that in the future period would be used for the assessment of the observed physical abilities areas. The study involved 99 respondents which were divided into four subsamples.: 30 ACPS students, 28 members of the General Police Unit, 19 members of the Special Anti-terrorist Unit and 22 respondents of the control group recreational engaged in the martial arts. Respondents were tested with eighteen variables of basic physical abilities, and for the needs of determining specific motor abilities, the job-related fitness test OC_{SAPO1} was used. The results were primarily processed by descriptive statistical analysis and then by application of the factor analysis. The results of the research have shown that it is possible to separate the tests for the assessment of police officers SPA. On the basis of factor analysis results, tests that mostly discriminate police officers SPA are: the job-related fitness test OC_{SAPO1}, the Long jump and the maximum number of pull-ups.

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LITERATURE

1. Anderson, S.G., Plecas, D., Segger, T. (2001). Police officer physical ability testing. Re-validating a selection criterion. *Policing: An International Journal of Police Strategies & Management*, 24(1), 8-31.
2. Arvey, R., Landon, T., Nutting, S., Maxwell, S. (1992). Development of Physical Ability Tests for Police Officers: A Construct Validation Approach. *Journal of Applied Psychology*, 6(77), 996–1009.
3. Blagojević, M. (1996). Uticaj morfoloških i motoričkih karakteristika policajaca na efikasnost džudo tehnika. Beograd: Kaligraf.
4. Blagojević, M., Dopsaj, M., Vučković, G. (2006). *Specijalno fizičko obrazovanje I*. Policijska akademija, Beograd.
5. Bonneau, J., Brown, J. (1995). Physical ability, fitness and police work. *Journal of Clinical Forensic Medicine*, 2, 157–164.
6. Boyce, R., Ciulla, S., Jones, G., Boone, E., Elliott, S., Combs, C. (2008). Muscular Strength and Body Composition Comparison Between the Charlotte-Mecklenburg Fire and Police Departments. *International Journal of Exercise Science,* 1(3), 125–135.
7. Dopsaj, M., Blagojević, M., Marinković, B., Miljuš, D., Vučković, G., Koropanovski, N., Ivanović, J., Atanasov, D., Janković, R. (2010). *Modelne karakteristike antropometrijskih pokazatelja i bazično-motoričkih sposobnosti (BMS) zdravih i utreniranih mladih osoba oba pola – populacioni pokazatelji Republike Srbije.* Bajina Bašta: Forma.
8. Dopsaj, M., Blagojević, M., Vučković, G. (2007). Normativno-selekcioni kriterijum za procenu bazično motoričkog statusa kandidata za prijem na studije Kriminalističko-policijske akademije u Beogradu, *Bezbednost,* 49(4), 166–183.
9. Dopsaj, M., Janković, R. (2014). Validnost poligona specifične spretnosti kod studenata Kriminalističko-policijske akademije: Metabolički i funkcionalni pokazatelji fizičkog opterećenja. *Nauka-bezbednost-policija*, 19(1), 185–199.
10. Dopsaj, M., Milošević, M., Blagojević, M., Vučković, G. (2002). Evaluacija valjanosti testova za procenu kontraktilnog potencijala mišića ruku kod policajaca. *Bezbednost*, 44(3), 434-444.
11. Dopsaj, M., Vučković, G. (2006). Pokazatelji maksimalne sile pregibača leve i desne šake u funkciji selekcionog kriterijuma za potrebe policije. *Sport Mont*, 4(10-11), 148-154.
12. Dopsaj, M., Vučković, G., Blagojević, M. (2007). Normativno-selekcioni kriterijum za procenu bazično motoričkog statusa kandidata za prijem na studije Kriminalističko-policijske akademije u Beogradu. *Bezbednost,* Beograd, 49(4), 166–183.
13. Dopsaj, M., Vuković, M., Milojković, B., Subošić, D., Eminović, F. (2012). Hand grip scaling in defining risk factors when using authorized physical force. *Facta universitatis – series: Physical Education and Sport*, 10(3), 169–181.

14. Fajnman, R. (1999). *Karakter fizičkog zakona.* Beograd: Klub NT.
15. Greenberg, G.J., Berger, R.A. (1983). A model to assess one's ability to apprehend andrestrain a resisting suspect in police work. *Journal of Occupational Medicine*, 25 (11), 809–813.
16. Hair J., Anderson R., Tatham R., Black W. (1998). *Multivariate Data Analysis* (Fifth Ed.). USA: Prentice – Hall, Inc.
17. Hart, S., Drevets, K., Alford, M., Salacinski, A., Hunt, E.B. (2013). A method comparison study regarding the validity and reliability of the Lactate Plus analyzer. *BMJ Open* 3:e001899. doi:10.1136/bmjopen-2012-001899.
18. Jackson, C.A., Wilson, D. (2013). The Gender-Neutral Timed Obstacle Course: a valid test of police fitness? *Occupational Medicine,* 63, 479–484.
19. Janković, R., Dimitrijević, R. (2012). Stanje i mogućnosti unapređenja načina procene motoričkih sposobnosti u sistemu Ministarstva unutrašnjih poslova Republike Srbije. *Kultura polisa,* 9(1), 419–435.
20. Janković, R., Dopsaj, M., Dimitrijević, R., Savković, M., Vučković, G., Koropanovski, N. (2015). Validity and reliability of the test for assessment of specific physical abilities of police officers in anaerobic-lactate work regime. *Facta Universitatis – series: Physical Education and Sport*, 13(1), 19–32.
21. Janković, R., Koropanpvski, N. (2017). Povezanost morfoloških karakteristika, opštih motoričkih sposobnosti i specifičnih sposobnosti policajaca. *Tematski zbornik radova „Upravljanje policijskom organizacijom u sprečavanju i suzbijanju pretnji bezbednosti u Republici Srbiji"* (pp. 137-153). Beograd, Kriminalističko-policijska akademija.
22. Kayihan, G., Özkan, A., Köklü, Y., Eyuboğlu, E., Akça, F., Koz, M., Ersöz, G. (2014). Comparative analysis of the 1-mile run test evaluation formulae: assessment of aerobic capacity in male law enforcement officers aged 20–23 years. *International Journal Occupational Medicine and Enviromental Health.* 27(2), 165–174.
23. Lonsway, K. (2003). Tearing down the wall: Problems with consistency, validity, and adverse inpact of physical agility testing in police selection. *Police Quarterly* 6(3), 237–277.
24. Milošević, M. (1985). Određivanje strukture motoričkih svojstava milicionera. Zemun: VŠUP.
25. Nutting, S., Maxwell, S. (1992). Development of physical ability tests for police officers. *Journal of Applied Psychology*, 77(6), 996-1009.
26. Sörensen, L., Smolander, J., Louhevaara, V., Korhonen, O., Oja, P. (2000). Physical activity, fitness and body composition of Finnish police officers: a 15-year follow-up study. *Occupational Medicine*, 50(1): 3-10.
27. Strating, M., Bakker, R., Dijkstra, G., Lemmink, K., Groothoff, J.W. (2010). A job-related fitness test for the Dutch police. *Occupational Medicine*, 60, 255–260.
28. Vučković, G., Subošić, D., Kekić, D. (2011[a]). Physical abilities of police officers as prerequisite for suppressing violence at sporting events in the Republic of Serbia. *Facta universitatis – series: Physical Education and Sport*, 9(4), 385–397.
29. Vučković, G., Blagojević, M., Dopsaj, M. (2011[b]). *Specijalno fizičko obrazovanje 2*. Kriminalističko-policijska akademija, Beograd.
30. Wilmore, J.H., Davis, J.A. (1979).Validation of a physical abilities field test for the selection of state traffic officers. *Journal of Occupational Medicine*, 21(1), 33–40.