Research article

THE IMPACT OF THE SPECIAL PHYSICAL EDUCATION ON CHANGING AEROBIC ENDURANCE IN STUDENTS

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Abstract. *The aim of this research is to determine the changes in aerobic endurance of students achieved after taking part in Special Physical Education 1, general part - SPE 1 program activities realization. The initial and final measurements of aerobic endurance (Cooper's test of running for 12 minutes) in 119 of students (39 female and 80 male students, aged 19 to 21) of the University of Criminal Investigation and Police Studies in Belgrade-CPU students were carried out during the freshmen year of undergraduate studies at the beginning and the end of the summer semester, i.e., at the entrance exam and after SPE 1 realization. The Student's t-test for dependent samples was used to determine the significance of the differences between the variables monitored at the initial and the final measurement. The results for the sample of female students (N=39) showed that after teaching SPE 1, a statistically significant change (p<0.018) in the aerobic endurance occurred (M=2288.2±218.27m, Mean±SD; t=-2.473 at the final measurement vs M=2226.8±277.07m, Mean±SD at the initial measurement). The results obtained for the sample of male students (N=80) showed also that after realized teaching SPE 1, a statistically significant change (p<0.021) in the above mentioned variable occurred, also (M=2847.7±185.77m, Mean±SD; t=-2.512 at the final measurement vs M=2747.8 ±237.03m, Mean±SD at the initial measurement). It can be concluded that after the SPE 1 course taught during the freshmen year of undergraduate studies aerobic endurance significantly improved in students of both genders.*

Key words: *Aerobic Capabilities*, *Cooper's* Test, *Special Physical Education*, *Students*

INTRODUCTION

Students attend lessons for the subject Special Physical Education 1 - general part (SPE 1) from the University of Criminal Investigation and Police Studies in Belgrade (CPU) as part of their undergraduate academic studies program during their second semester as a mandatory subject. The SPE 1 with its content and goals is directly related to developing, maintaining, and elevating to a higher level the health, professional and special capabilities and knowledge of special significance for efficient and successful performing of professional tasks of the servicemen of the Ministry of Internal Affairs of the Republic of Serbia (Milošević, Mudrić, Jovanović, Amanović, & Dopsaj 2005; Milošević, & Milošević, 2013; Milošević, & Milošević, 2014; Amanović, Baić, Nikać, & Ljubisavljević, 2015). Admission of candidates to the CPU includes: health status, psychological capabilities, skills verification tests, affinities and capabilities, and success achieved in previous education. Affinity test verification and skills test verification consists of a test of general knowledge, a test of Serbian language knowledge and literature and a basic motor skills test. Verification of the basic motor skills (BMS) of the candidates who apply for the CPU in Belgrade includes motor educability assessment, aerobic endurance, muscle force estimation, maximum back muscles force, maximum muscle force of dominant palm, and repetitive strength of arms' extensors (Dopsaj, Milošević, Blagojević, & Vučković, 2002; Amanović, Milošević, & Mudrić, 2004; Milošević et al., 2005). One of the tasks of the SPE 1 is also development of basic motor skills in students of the CPU (Amanović, Jovanović, & Mudrić, 1999; Milošević et al., 2005; Milošević, Nemec, Nemec, & Milošević, 2017; Milošević, Nemec, Nemec, & Milošević, 2018). The term of endurance implies a capability to exercise over a longer period of time without reduction of its efficiency, hence it can be considered a capability of opposing fatigue (Zatsiorsky, 1975). Endurance is the capability of an individual to maintain the given intensity of an activity (Farfelj, 1972), or to extend the duration of an action already initiated (Gajić, 1985). Endurance implies the quite complex capability of opposing fatigue (Nićin, 2000), i.e., it is an action performed without reduction in efficiency (Kukolj et al., 1996).

The aim of this research is to determine the differences in aerobic endurance of students achieved after taking part in SPE 1 program activities.

METHODS

Sample of participants

The sample of participants included 119 of students of both genders of the CPU aged 19 to 21 who had undergone a selection process - passed the entrance exam and enrolled in the freshmen year of undergraduate studies. It was made up of 39 female students (body height, BH=169.34±6.17cm, body mass, BM=65.89±10.18kg, body mass index, BMI=22.98±4.78kg/m²) and 80 male students (BH=181.81±7.31cm, BM=79.19±8.09kg, BMI=23.96±1.79kg/m²). All of the participants have previously passed psychological tests and medical examination and confirmed their eligibility for jobs and working tasks within the Ministry of Internal Affairs of the Republic of Serbia.

Measurement

The aerobic endurance of the students is tested on the athletic running track by teachers and next to the SPE at the CPU. For estimation of aerobic endurance, Cooper's running test over a 12-minute period (in meters) was carried out according to standard protocol (Milošević, 1985; Milošević et al., 2005). The distance covered during that time indirectly points to the degree of development of the aerobic system of students of both genders. The initial and final measurements of the aerobic endurance in CPU students was realized during the freshmen year of undergraduate studies at the beginning and the end of the summer semester, i.e., at the entrance exam and after the SPE 1 realization. Aerobic endurance is an integral part of the battery of tests used to estimate the basic motor skills of students of the CPU:

- COOPERm - aerobic endurance - Cooper's 12-minute running test for male students (in meters);
- COOPERf - aerobic endurance - Cooper's 12-minute running test for female students (in meters).

Data Processing

The results reached were analyzed by descriptive statistics including: calculating the basic parameters of central tendency, arithmetic mean (Mean), coefficient of variation (cV%), standard deviation (SD), minimum and maximum value of each observed variables (Min, Max), the indicator of degree of inclination - the coefficient of asymmetry (Skew), and the indicator of the degree of curvature - the coefficient of flattery (Kurt). Significance of differences of the studied variables, created under the influence of teaching from the subject of the SPE 1, was determined by performing the Student's t-test for dependent samples. Statistical significance was defined at 95% of probability, hence at the level $p>0.05$. Due to the determination of the degree of influence (effect size) of educational treatment (the impact of teaching of the SPE 1 to change of aerobic endurance of an body of students) eta-square was calculated. All analyses were determined by using the statistical package for data processing SPSS 20.0.

RESULTS

Table 1 presents the values of basic descriptive indicators of aerobic endurance of the female (COOPERf) and male students (COOPERm).

Table 1 The initial and the final measurement basic descriptive indicators

	COOPERf (in m)		COOPERm (in m)	
	Initial measurement	Final measurement	Initial measurement	Final measurement
Mean	2226.8	2288.2	2747.8	2847.7
SD	227.07	218.27	237.03	185.77
cV%	12.44	9.54	8.63	6.52
Min	1675.0	1970.0	2235.0	2610.0
Max	3075.0	3080.0	3440.0	3250.0
Skew	0.537	1.384	0.490	-0.153
Kurt	1.218	3.244	0.295	-0.408

The coefficient of variation for the studied variable at the initial measurement marks a moderate degree of homogeneity of the participants around average values (cV%=12.44 for the sample of female students, hence cV%=8.63 for the sample of male students), while at the final measurement a higher degree of homogeneity is recorded (cV%=9.54 for the sample of female students and cV%=6.52 for the sample of male students). The value of standard deviation (*SD*) of the variable monitored is satisfactory, hence it is less than 10% of the average value which points out that the sample which is monitored in this research solidly represents the population of students of the CPU.

Table 2 The t-test results for dependent samples at the initial and the final measurement

Variable	Mean initial measurement	Mean final measurement	df	t-value	Sig.	Eta square
COOPERf (in m)	2226.8	2288.2	38	-2.473	0.018	0.14
COOPERm (in m)	2747.8	2847.7	79	-2.512	0.021	0.07

Table 2 presents the significance of differences determined between the initial and the final measurement. Results of the Student's t-test for dependent samples in female students showed that a statistically significant impact of teaching SPE 1 on aerobic endurance (t=2.473; p<0.018). Values of eta-square (0.14) in female students show that the impact of educational treatment on the result of the repeated test is great. The results of the Student's t-test for dependent samples in male students also showed the statistically significant impact of teaching SPE 1 on aerobic endurance (t=-2.512; p<0.021). The eta-square value (0.07) for the male students points out of the moderate impact of educational treatment on the result of the repeated test.
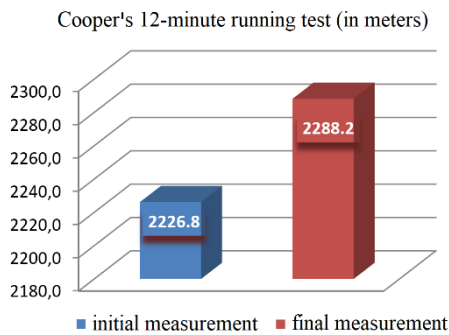
Graph 1 The mean values at the initial and the final measurement for the female students (N=39)
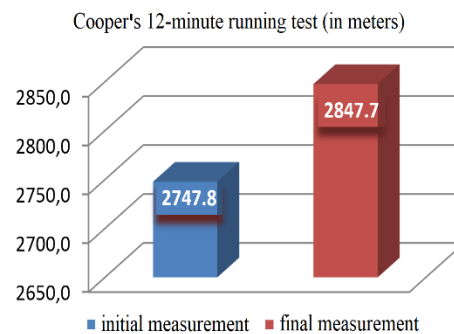
Graph 2 The mean values at the initial and the final measurement for the male students (N=80)

DISCUSSION

The foundation of work capabilities of humans represents the level of development of the aerobic energetic mechanism, hence the foundation of professional general basic physical training as a civilian, member of a military group, as well as a police officer (Milošević, 1985;

Lord, 1998; Vučković, 2002). The development of basic motor skills is one of the tasks of the SPE 1 which is a precondition for the qualitative performance of police tasks, and represents a foundation for other specific physical capabilities which are dominant for the successful training and competence of employees of the Ministry of Internal Affairs of the Republic of Serbia (Milošević et al., 2005; Milošević, & Milošević, 2013; Milošević, & Milošević, 2014). The results of Cooper's 12-minute running test obtained in this research on the sample female students (N=39) showed a statistically significant improvement (p<0.018) in aerobic endurance under the influence of teaching SPE 1 (M=2288.2±218.27m, Mean±SD; t=-2.473) compared to the initial measurement (M=2226.8±277.07m, Mean±SD). The change of absolute value amounts to 61.4m, while the change/improvement of relative values amounts to 2.8%. Concerning the sample of male students (N=80), the results at the initial measurement (M=2847.7m±185.77, Mean±SD) compared to the final measurement (M=2747.8±SD= 237.03, Mean±SD, t=-2.512) also showed a statistically significant improvement (p<0.021). The change of the absolute value amounts to 99.9m, while the change/improvement of the relative values amounts to 3.5%.

With an aim to provide actual, descriptive, classification and normative criteria for the estimation of basic morphologic features and basic motor skills in healthy students aged of 18 to 26, Dopsaj et al. (2010) yielded satisfactory values of aerobic endurance in 356 female students (CPU and the Faculty of Sport and Physical Education, University of Belgrade students). The results of aerobic endurance tested by Cooper's 12-minute running test were M=2225.1±214.00m (Mean±SD).

Blagojević (2003) studied the aerobic endurance of a student population of the first three years of study (students of the Police Academy, generation 1995/1996). Average values of Copper's 12-minute running test were: 2820.8±200.6m for the freshmen year, 2748.4±193.6m for the sophomore year, 2721.9±184.3m for the junior year of studies.

The study of Janković (2009) on a population of students of the CPU (generation 2006/2007) yielded the following results: the average value of Cooper's 12-minute running test for the freshmen year students amounts to 2791.03±237.64m with a coefficient of variation of 8.51%; for the students of the sophomore year of studies it amounts to 2595.84±326.34m, with a coefficient of variation of 12.57%; for students of the junior year of studies it amounts to 2500.46±271.20m, with a coefficient of variation of 10.85%.

CONCLUSION

Based on results of the research it can be concluded that teaching the SPE 1 subject at the end of the freshmen year of undergraduate studies, as a one-semester subject at the CPU, significantly impacts the improvement of aerobic endurance in students of both genders.

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UTICAJ SPECIJALNOG FIZIČKOG OBRAZOVANJA NA PROMENE AEROBNE IZDRŽLJIVOSTI STUDENATA

Cilj ovog istraživanja bio je da se utvrde promene u aerobnoj izdržljivosti nakon realizovane nastave iz predmeta Specijalno fizičko obrazovanje 1, opšti deo-SPE 1. Inicijalno i finalno merenje aerobne izdržljivosti (Cooper-ov test trčanja u trajanju od 12 minuta) 119 studenata (39 devojaka i 80 muškaraca, starosti od 19 do 21 godine), studenata Kriminalističko-Policijskog Univerziteta (CPU) u Beogradu realizovana su u okviru prve godine osnovnih akademskih studija, na prijemnom ispitu i na kraju letnjeg semestra, odnosno pre i posle realizacije SPE 1. Za utvrđivanje značajnosti razlika između posmatranih varijabli na inicijalnom i finalnom merenju korišćen je Studentov t-test za zavisne uzorke. Rezultati u ovom istraživanju na uzorku studentkinja (N=39) pokazali su da je nakon realizovane nastave iz predmeta SPE 1, došlo do statistički značajne promene apsolutne vrednosti pomenute varijable na finalnom merenju (p<0.018) aerobne izdržljivosti (M=2288.2±218.27m, srednja vrednost±SD; t=-2.473 na finalnom merenju vs M=2226.8±277.07m, srednja vrednost±SD na inicijalnom merenju). Rezultati dobijeni na uzorku muškaraca (N=80) takođe su pokazali da je nakon realizovane nastave iz predmeta SPE 1, došlo do statistički značajne promene apsolutne vrednosti pomenute varijable na finalnom merenju (M=2847.7±185,77m, srednja vrednost±SD; t=-2,512 na završnom merenju nasuprot M=2747,8±237.03 m, srednja vrednost±SD na početnom merenju). Može se zaključiti da se nakon realizovane nastave SPE 1 na prvoj godini osnovnih studija aerobna izdržljivost značajno poboljšala kod učenika oba pola.

Ključne reči: *aerobna sposobnost, Kuperov test, specijalno fizičko obrazovanje, studenti*