INITIAL STATE OF POLICE STUDENTS SWIMMING SKILLS AND EFFECT OF SWIMMING COURSE ON SWIMMING PERFORMANCE

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Abstract: The aims of the research were to determine initial state of Police University students swimming skills and effect of swimming course on swimming performance. Research consisted of initial and final testing with 10 swimming classes between. The sample consisted of 255 subjects (160 males; 95 females). Initial testing showed for males: 25 (15.63%) belonged to non-swimmers, 78 (48.75%) to semi-swimmer (MSS) and 57 (35.62%) to good-swimmer group (MGS); for females: 14 (14.74%) belonged to non-swimmers, 72 (75.79%) to semi-swimmer (FSS) and 9 (9.47%) to good-swimmer group (FGS). ANOVA showed statistically significant differences between good-swimmer and semi-swimmer groups (F=27.505, p=0.000 for males; F=27.657, p=0.000 for females). The t-test results after swimming course showed that all groups achieved statistically significant better swimming times: MSS-F=3.444, p=0.001; MGS-F=3.594, p=0.001; FSS-F=12.373 and FGS-F=4.054, p=0.004, p=0.000, while ANOVA showed remaining of statistically significant differences between good-swimmer and semi-swimmer groups (F=51.508, p=0.000 for males; F=24.764, p=0.000 for females).

Key words: Police students, swimming course, learning

INTRODUCTION

Police officers must be physically capable of performing all occupational requirements successfully in a safe and secure manner for all those concerned (Marion, 1998; Anderson, Plecas & Segger, 2001). They should have a good health status, psychological and intellectual qualities, appropriate personality traits, professional knowledge and adequate physical abilities (Dopsaj, Blagojević & Vučković,

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2007; Strating, Bakker, Dijkstra, Lemmink & Groothoff, 2010; Lagestad & Van den Tilar, 2014). In the cases of natural disasters, the police are one of the first services to respond. One of the most frequent natural disasters, both globally and in the Republic of Serbia, is floods. In the flood situations, police officers are involved in the rescue of human lives, the evacuation of vulnerable persons, repairing the damage, etc., which all together emphasizes the need for police officers to have good swimming skills (Milojković et al., 2015).

However, swimming can also be viewed in a wider context. Acording to Gošnik & Sedar (2010), swimming is a basic sport and ignorance of swimming knowledge and the lack of swimming facilities must not be just an excuse or a "sport" and local problem, but a global problem, the problem of health, hygiene, security, education and culture. Swimming also promotes excellent physiological fitness because it is a low-impact, aerobic activity, minimizing stress on the joints while exercising all of the major muscle groups of the body (Lee, Folsom & Blair, 2003). Individuals who can swim are more likely to be able to save themselves or others from drowning by performing basic swimming skills (Brenner, 2003; Irwin, Irwin, Ryan & Drayer, 2009). Also, one of the most important tasks for which physical education teachers, soldiers and police officers are prepared is their training for intervention in the water with the aim of saving someone's life (Kazazović, 2008).

Swimming in the police service implies the ability to overcome water area and obstacles (Dopsaj, Milošević & Blagojević, 2001), which could be of importance in reacting to floods. Apart from the selection of candidates for work in Firefighter and rescue unit, the swimming knowledge test is not an integral part of the entry criteria for employment in the Ministry of the Interior of the Republic of Serbia (Obradović, 2011). Currently, in accordance with the need for the work on activities in the field of security on and near the water surfaces, swimming skills tests are conducted for police officers who perform the above tasks and duties (Mitrović & Vučković, 2017).

During the floods in Republic of Serbia in 2014, a large number of police officers of the Ministry of Interior were engaged from the various organizational units: Sector for emergency situations, Special antiterrorist unit, Gendarmerie, Helicopter unit, Criminal police directorate, Police directorate, Traffic directorate, Border police directorate. Members of these units performed tasks related to the rescue and evacuation of injured and endangered citizens, raising the new security and protective infrastructure along the flooded areas, delivery of water, food, medical aid, hygiene items, clothing, etc. During their engagement, it was determined that some number of police officers did not know to swim, a significant number of police officers did not undergo water rescuing training and were not instructed in protection procedures in rescuing people (Milojković et al., 2015). Moreover, some police officers were not trained to steer the boats or to row, most police officers did not have knowledge of the proper use of construction embankments and the manner of using technical means for flood defence, while some officers did not have sufficient knowledge of providing first aid to the injured, especially the drowned. Together with the members of the Ministry of the Interior, over 500 students of the University of Criminal Investigation and Police Studies in Belgrade (UCIPS) were engaged in the mentioned activities during the 11 days of the flood. In the period immediately after the 2014 floods, an "Elaborate for the engagement of students and employees during emergency situations" at the UCIPS was prepared. The Elaborate determined that all UCIPS students were assigned to teams that, together with members of the regular staff of the Ministry of the Interior, were engaged in cases of natural disasters (Milojković et al., 2014).

The UCIPS in Belgrade educates students to work in the Republic of Serbia police through three departments: the Department of Criminology (DC), the Department of Forensic Engineering (DFI) and the Department of Information Technology (DIT). In the selection process for candidate's enrolment,

a test of swimming skills is not provided. During their studies, DC students attend the subject of the Special Physical Education (SPE), while DFI and DIT students do not have a single subject related to any form of physical activity. The curriculum of the SPE provides that students, in addition to the part related to the martial arts and the development of basic physical abilities, also have swimming course. Swimming course was realized in the period between 1993 and 2008, through one 60-minute class per week during all four years of studies. Students were required to pass the elements of swimming, diving and rescue techniques according to predefined norms and criteria at the beginning and the end of each school semester (Blagojević, Vučković, Koropanovski & Dopsaj, 2017). The result of such systematized and implemented swimming course during the studies, from the practical side, ensured that all graduate students had a high level of swimming skills as well as skills in the field of water rescue. From the scientific side, the testing results enabled a constant improving of training and educational work with students (Dopsaj et al., 2001; Dopsaj, 2005).

However, despite the fact that swimming course is still a part of the SPE curriculum, swimming has not been realized since 2008. To be more specific, none of the UCIPS students enrolled after 2006 were tested according to the swimming skills criterion. The same fact applies for the students engaged in the floods 2014. Finally, there are no any data about current UCIPS students swimming knowledge and swimming skills in the last 10 years. Therefore, the aims of this research were to determine initial state of swimming skills at the UCIPS student of both ganders and effect of 10 classes swimming course on their swimming performance.

METHODS

The sample

The total sample consisted of 255 subjects - 160 male (125 subjects from DC, 2 from DFI and 33 from DIT) and 95 female students (57 from DC, 23 from DFI and 15 from DIT). All subjects were from the first year of study in 2018/19 school year. Basic anthropometric measures were: body height (BH) = 182.29 ± 6.29cm, body weight (BW) = 79.08 ± 9.39kg and body mass index (BMI) = 23.75 ± 2.07kg/m^2 for males and BH = 169.02 ± 3.87cm, BW = 61.63 ± 5.50kg and BMI = 21.57 ± 1.85kg/m^2 for females. All respondents were healthy, with no acute and chronic diseases and without injuries of the locomotors apparatus to influence the test results. Before the beginning of the initial test, all respondents were introduced with the object and purpose of the research. The research was conducted in accordance with the terms of "Declaration of Helsinki for recommendations guiding physicians and biomedical research involving human subjects" - (http://www.cirp.org/library/ethics/helsinki/), as well as with the permission of the Ethics Committee of the Faculty of sport and physical education, University of Belgrade.

Testing procedure

The research consisted of initial testing held at the beginning of the first semester, 10 classes of swimming course and final testing held at the end of the same semester. Since there was no data on the students' previous training or knowledge in swimming, the first aim of the initial testing was to determine initial state of subjects swimming skills. For that purpose, testing was organised in 1.25 meter (m) deep pool. Subjects were instructed to swim over 25 m distance as fast as possible, with the correct use of any of the four swimming techniques (Rulebook on Criteria for Selection of Candidates for

Participants Course for Basic Training of Members of Firefighter and Rescue Unit, Official Gazette RS, 12/2019 & 14/2020). Students performed the start from a standing position in the pool, without jumping into the water or pushing off the pool wall. Based on the presented swimming skills on the initial testing, the subjects were divided into three groups: non-swimmers (the subjects could not swim over the given distance, MNS – male and FNS – female), semi-swimmers (respondents who swam the given distance with poor swimming technique, MSS – male and FSS – female) and good-swimmers (subjects who swam the given distance with good swimming technique including proper underwater breathing, MGS – male and FGS – female) (Rodić, Rupčić & Stojković, 2010). The level of subjects swimming skills was assessed by two experienced professors of physical education. The second aim of the initial testing was the assessment of students swimming performance, where time required to swim 25m distance was measured in seconds (s). After initial testing, subjects underwent 10 classes of swimming course with one 60-minute class per week for non-swimmers and one 30 minutes class per week for semi-swimmers and good-swimmers. The final testing was organized according to the same procedure as the initial testing – with the aim to assess students swimming performance after the course.

Swimming course methodology

The swimming course for non-swimmers was organized in the 1.25 m deep pool, where the water depth allowed standing and included: working on the ground, getting used to water exercises, breathing and keeping eyes open during water exercises, exercises to maintain a horizontal position and aquaplaning, water games, diving and learning basic swimming techniques (Stanković, Marković, Dopsaj, Ignjatović & Aleksić, 2016). Elements that were applied in non-swimmer training were selected in accordance with the relevant recommendations for non-swimmer training (Kazazović, 2008; Stanković, Milanović & Marković, 2015). The swimming course methodology for groups of semi-swimmers and good-swimmers was related to the partial improvement of arm and leg technique through freestyle, backstroke and breaststroke styles, where a swimming kickboard was used as an aid**.** After improvement of the partial movement with swimming kickboard, arm and leg movements were joined in the proper swimming technique. Together with improvement of the arm and leg techniques, the proper breathing technique was also practiced. More precisely, a combination of analytical and synthetic training methodology was used (Stanković, 2016).

Statistical analysis

All data were analyzed using the descriptive statistics to calculate the basic parameters of central tendency: arithmetic mean (MEAN), standard deviation (SD), minimum (Min) and maximum (Max) values. The existence of a general difference of variability between the groups was determined by one-way analysis of variance (ANOVA), while for the determination of partial difference between pairs of groups the t-test was used. Cohen's effect sizes (d) were calculated as the ratio of the difference in MEAN to SD, following the formula: d = (MEAN2 – MEAN1)/SD, where MEAN1 and MEAN2 were the means of the groups investigated and the SD was a pooled standard deviation of compared groups. Cohen classified effect sizes as *small* = 0.2, *medium* = 0.5 and *large* ≥ 0.8 (Sullivan & Feinn, 2012). Statistical significance was defined at 95% probability, i.e., at $p < 0.05$ level (Hair, Anderson, Tatham & Black, 1998). All statistical analyses were done by the application of software package SPSS Statistics 17.0.

RESULTS

The results of the initial testing, according to the subjects' level of swimming skills criteria, are shown in Table 1.

Table 1. *Results of initial testing in regard to swimming skills*

Males			
	Non-swimmers (MNS)	Semi-swimmers (MSS)	Good-swimmers (MGS)
DC	19	57	49
DFI	0	2	0
DIT	6	19	8
Σ (No)	25	78	57
Σ (%)	15.63%	48.75%	35.62%
Females			
	Non-swimmers (FNS)	Semi-swimmers (FSS)	Good-swimmers (FGS)
DC	9	39	9
DFI	1	22	0
DIT	4	11	0
Σ (No)	14	72	9
Σ (%)	14.74%	75.79%	9.47%

The results of descriptive indicators on the initial and final testing's for good and semi-swimmer groups of both genders, in regard to swimming time expressed in s, are shown in Table 2.

Table 2. *Results of descriptive statistics in regard to swimming time (s)*

Initial testing								
GROUP	N	MEAN	SD	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
MGS	57	18.04	2.57	0.34	17.36	18.72	12.05	24.42
MSS	78	21.98	5.23	0.59	20.80	23.16	16.13	48.26
FGS	9	20.69	2.41	0.80	18.84	22.55	17.00	24.44
FSS	72	33.13	7.01	0.83	31.49	34.78	21.62	51.33
Final testing								
GROUP	N	MEAN	SD	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
MGS	57	17.31	2.27	0.30	16.70	17.91	12.14	24.70
MSS	78	20.67	2.96	0.33	20.01	21.34	16.12	35.01
FGS	9	19.77	2.47	0.82	17.88	21.67	16.75	24.56
FSS	72	29.39	5.70	0.67	28.05	30.73	18.24	42.33

The results of ANOVA after initial testing showed statistically significant differences in swimming time between good-swimmer and semi-swimmer groups for both ganders (F = 27.505, p = 0.000 for males and F = 27.657, p = 0.000 for females). The results of t-test after the 10 classes swimming course showed that all groups achieved significantly better swimming times: MSS – F = 3.444, p = 0.001; MGS – F = 3.594, p = 0.001; FSS – F = 12.373 and FGS – F = 4.054, p = 0.004, p = 0.000. The results of ANOVA after the final testing showed remaining of statistically significant differences in swimming time between good-swimmer and semi-swimmer groups for both ganders (F = 51.508, p = 0.000 for males and F = 24.764, p = 0.000 for females).

Figure 2 shows the *effect sizes (d) and* relative *Δ (%)* differences between the groups for swimming performance on the initial and final test. Since the time of swimming in s was used to assess students swimming performance, where lower score is better, the values of the Cohen's effect sizes are in negative values.

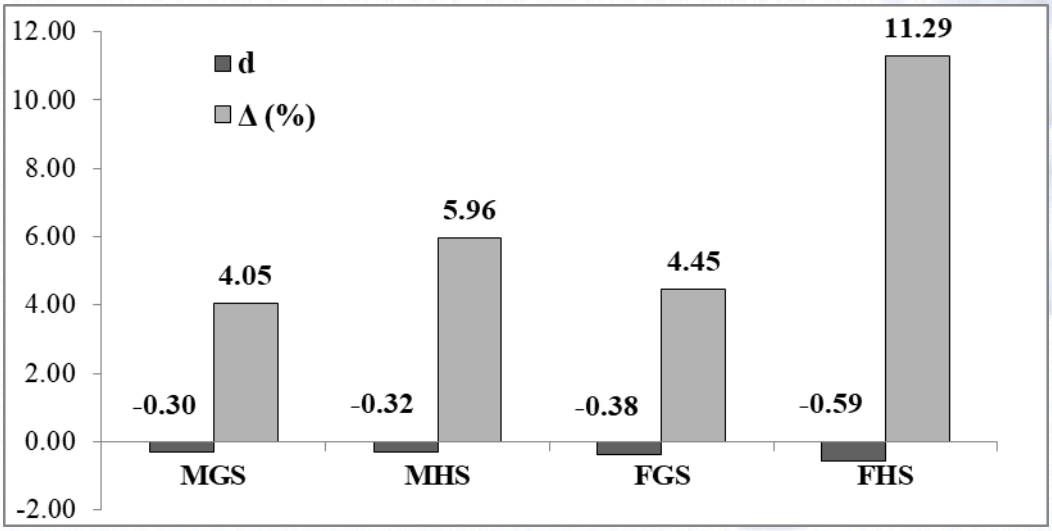

Figure 1. *Effect sizes (d) and relative differences Δ (%) between groups on initial and final testing*

The swimming performance test of non-swimmer subjects on final testing showed: for MNS - nine (9) students swam 25 m with an average time 33.15 ± 11.14 s, fourteen (14) students managed to swim an average 15.14 m in 21.34 ± 7.80 s and two (2) students have not learned to swim at all. For FNS – three (3) students swam 25 m with an average time 35.10 ± 1.72 s, nine (9) students managed to swim an average 16.56 m in 35.41 ± 7.74 s and two (2) students have not learned to swim at all.

DISCUSSION

The testing of initial level of students' swimming skills showed that 15.63% male and 14.74% female subjects did not know how to swim at all, 48.75% male and even 75.79% female students were semi-swimmers, while 35.62% male and only 9.47% of female subjects belonged to good-swimmer groups (Table 1). The percentage of non-swimmers is slightly below the percentage of non-swimmer students (20%) in the first years of the Faculty of Tourism and Sports Management in Croatia, but the great difference could be noticed for the semi-swimmer and good-swimmer groups since in the Croatian sample there were 70% of good-swimmers and only 10% of semi-swimmers (Budimir, Breslauer & Bokor, 2010). The reasons for the high percentage of UCIPS non-swimmers and semi-swimmers could be multiple: lack of swimming facilities in the areas where students come from, non-existence

of swimming courses at lower levels of school education, poor financial situation, etc. In addition, Komparić (2002) concluded that the most important reasons given by schools for not conducting organized training of non-swimmers are the lack of appropriate sports facilities (39.25%) and the lack of financial resources for the implementation of training programs (31.16%). It can also be assumed that the percentage of non-swimmers would be even higher if the testing was not performed in controlled conditions in a shallow pool, i.e. if the level of swimming skills was assessed in a real situation (river, lake, deep water, wearing a uniform, etc.),4 or if the longer swimming distance was chosen for initial testing. Since only the UCIPS first-year students were tested, it can also be assumed that a similar number of non-swimmers and semi-swimmers are in the senior years of study.

Such data could be worrying because, as mentioned earlier, UCIPS students may be occasionally (when needed) assigned to teams with other members of the regular staff of the Ministry of the Interior in cases of natural disasters and floods. Also, students in the non-swimmer group were not coherent in their previous swimming skills: some already had some swimming knowledge while some even did not dare to enter the water. This finding is in accordance with the study of Zenić & Petrić (2002), who concluded that in non-swimmer training programs, it would be desirable to form homogeneous groups according to swimming background, because working in a heterogeneous group is too demanding, increases the safety risk and often requires individual work. The results of the final testing in this researched showed that 10 classes swimming course can improve the level of non-swimmers swimming skills, but that such time frame is not enough for all students to learn to swim.

The statistically significant differences between good and semi-swimming groups were found both, on a general and partial level. More specifically, on the initial and final testing, MGS had statistically significant better average swimming time compared to MSS, while FGS had statistically significant better average swimming time compared to FSS. Also, the results of t-test showed that after the 10 classes swimming course all 4 groups achieved statistically significant better swimming times. Such t-test results confirmed that the training methodology used during the swimming course had a positive effect on the level of students swimming performance**.** Therefore, it can be assumed that achieving a better swimming time on the final test compared to the initial testing (Table 2) may be due to the improvement of swimming technique and not as a consequence of conditioning. This can be supported by the fact that MGS, MSS, FGS and FSS had classes lasting 30 minutes per week, while the improvement of swimming performance under the influence of the training program requires much more extensive physical work (Kazazović, 2008; Stanković et al., 2016). In addition, the obtained results of the Cohen's effect sizes showed that all four groups of swimmers can be classified into *medium* values (Figure 1).

In the selection process for working in the Ministry of the Interior of the Republic of Serbia, the assessment of candidates' swimming abilities is performed only within the Firefighter and rescue unit. The assessment is carried out for candidates of both genders by swimming 25 m distance regardless of the applied swimming technique, with measured swimming time. Based on the achieved swimming time, the candidates are evaluated with grades from 0 to 4 (Rulebook on Criteria for Selection of Candidates for Participants Course for Basic Training of Members of Firefighter and Rescue Unit, Official Gazette RS, 12/2019 & 14/2020). The Table 3. shows the criteria for scoring and distribution of UCIPS students based on the swimming time achieved in the final testing of this research - the classification also includes the times of students (9 males and 3 females students) who learned to swim during 10 classes swimming course.

Table 3. *Classification in relation to the Firefighter and rescue unit.*

Gender	Points	25 meters in s	No	%
Males	0	55 +	0	0
	1	54.99-37.01	2	1.38
	2	37.00-25.01	11	7.65
	3	25.00-19.01	63	43.75
	4	19.00 -	68	47.22
Females	0	60 +	0	0
	1	59.99-43.01	0	0
	2	43.00-31.01	31	36.91
	3	31.00-25.01	26	30.95
	4	25.00 -	27	32.14

Based on the results shown in Table 3, it can be concluded that 16 male and 11 female students would not pass the swimming test for Firefighter and rescue unit. Despite the fact that great number of students would pass the test, there is a still question whether they are able to participate in rescuing missions when tasks would include on-water operations. In regard, according to Wiesner & Rejman (2014), the consequences as injury and death from risky activity in water could be prevented if there is a high level of swimming, self-rescue and lifesaving skills. Therefore, since the UCIPS students undergo only short 10 classes swimming course, we assume that for the achieving the desirable level of swimming and lifesaving skills, longer period is necessary. Also, a longer period of time with a higher total number of classes for training is confirmed by the results of Cohen's effect sizes (Figure 1). More specifically, it can be assumed that with total fund of swimming classes increase, the values of the Cohen's effect sizes would be higher.

CONCLUSION

The aim of this research was to investigate the initial level police students' swimming skills and the possibility of their improvement through the 10 classes swimming course. The research was conducted on a sample of 255 students divided into non-swimmer, semi-swimmer and good-swimmer groups. Statistically significant differences, in the general and partial level, were found between groups in swimming performance. It can be concluded that the applied swimming course had the positive effect on all groups, but also that the level of swimming skills does not match the standards required by the needs for save and appropriate lifesavings. In regard, we could assume that, currently only small number of students could be safely included in the water-rescuing missions. Based on these results, there is a need for the new researches that will determine the initial status of swimming skills of all UCIPS students. The final goal of further researches should be related to the improvement of educational and training processes in the field of swimming, as well as the basis for the setting of a long-term strategy for the development and improvement of physical education teaching programs. Therefore, it is necessary to suggest an increase in swimming course total fund classes, which would be implemented during all eight semesters of study. This would provide continuous, planned and systematic educational and training impact throughout the whole period of schooling.

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