

THE EFFECTS OF PROGRAMMED TRAINING ON MOTOR SKILLS OF THE SERBIAN ARMED FORCES MEMBERS

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Physical training is an integral part of the entire training of the Serbian Armed Forces members. It is the basis of combat readiness, as well as an essential part of every soldier's life. The main idea of the research is to examine whether high-intensity interval training has a positive impact on functional and motor skills of the Serbian Armed Forces members. Repetitive strength, as one of the studied skills is much better in the respondents of an experimental group, which indicates that the implemented interval training has led to significant improvement of the results on the test for repetitive strength assessment and is in accordance with the results of previous research. Furthermore, it has been confirmed that the experimental programme does not significantly affect functional skills, i.e. no differences have been found in aerobic endurance of the members of the experimental group in comparison to the control group. The implemented experimental programme should serve as an idea and basis for finding, creating and programming new ways of exercising within physical training at all levels of a system, such as the Serbian Armed Forces.

Key words: interval training, physical abilities, motor skills, professional military personnel

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Introduction

The essential aspect of considering a man and a soldier as a healthy, physically and professionally capable persons has not changed throughout history, only that, in accordance with civilizational progress and technological development, the modalities of diagnostic, selection and development have changed. The first type of physical education in schools, in our country, appeared in 1808 as a part of pre-military training, at the Great School in Belgrade.¹ In the first military school in Požarevac, in 1838, gymnastics was introduced into the curriculum. In the former Yugoslav People's Army, after the Second World War, classes of physical exercising, sports competitions and physical training (hereinafter PT) were introduced gradually, in compliance with the personnel and organizational capacities.²

Physical training is an integral part of the entire training of the Serbian Armed Forces members (hereinafter referred to as SAF). It is the basis of combat readiness of every soldier, as well as an integral part of the life of each of them. Today, physical training in the Serbian Armed Forces is a planned, systematic and permanent process of training and exercising aimed at raising and maintaining the level of physical abilities. The objective of physical training is to achieve and maintain the standards of individual physical abilities necessary for successful performance of tasks, as well as to achieve and nurture good health, develop habits on the need and opportunities provided by physical exercising and sports and the development of moral and volitional characteristics of the personality of each individual within the SAF. The tasks of physical training in the Serbian Armed Forces are to develop, maintain and improve basic motor and functional skills, acquire knowledge and master a certain level of skills, such as overcoming infantry obstacles, swimming, wrestling, skiing, climbing, i.e. hiking, etc. necessary to perform specific tasks by a soldier and to develop health and hygiene habits and the psychological need for movement. The mentioned objectives and tasks are achieved through the implementation of physical training programmes through morning exercising, PT classes, applied PT, fitness marches, physical fitness tests, free sports activities, sports days and sports championships.

In the training of soldiers, the most common and main type of physical training are PT classes that last from 45 to 60 minutes and, depending on the level of a unit, are conducted 3-5 times a week. The objective of these classes is to maintain or improve physical abilities that are important for military profession through continuous, planned and long-term work. Professional military personnel (hereinafter PMP) is subject to some requirements related to physical abilities, which are reflected in their

¹ Ranđelović, M. (2012). Analiza motoričkih sposobnosti kadeta sportista i nesportista Vojne akademije. *Godišnjak Ana*, 18, 51-63.

² Glavač, T. B. (2015). *Motoričke sposobnosti, morfološki status i životne navike kod pripadnika Vojske Srbije*. Unpublished doctoral dissertation. Belgrade: Faculty of Sports and Physical Education.

tests. Namely, fulfilling the set standards confirms physical ability to perform various tasks, which can be assigned within missions and tasks within some unit. Physical fitness test as a mandatory type of testing and monitoring the state of physical fitness for all officers, non-commissioned officers and soldiers was first introduced in 1955.³

The Regulation on physical training in the SAF (hereinafter Regulation) has been in force since 2011, which defines the rule to regularly check physical (motor and functional) abilities of all PMP of both sexes, through a battery of tests: push-ups on the ground, pull-ups from the ground, running at 2,400 metres, marching at 10,000 metres (for persons over 51) and overcoming infantry obstacle course (for persons under 32). Using this battery of tests, repetitive strength of arms and shoulders, chest and trunk muscles, aerobic endurance and endurance of leg muscles, as well as general physical ability and coordination of movement are assessed. All PMP, both sexes, are divided according to age into seven categories. A table of standards has been made for each category and a minimum standard has been set that a person has to meet in order to pass physical fitness test. Depending on unit in which PMP work, the minimum standards that have to be met are 50 to 60 points.

In order to meet the mentioned standards, each PMP has to be responsible and obliged to attend various types of physical training, and also to be at the level of optimal physical fitness with individual exercising in order to reach defined standards. Although many aspects are defined by the Regulation, there are some problems that arise in the implementation of PT.

One of the main problems of PT in the SAF is that the analysis, systematization and organization depending on service or specialty of PMP, which would define primary motor and functional skills that have to be maintained in order to successfully perform all assigned missions and tasks, has not yet been fully carried out. It is known that PMP has to develop and maintain harmony between functional and motor skills because there is no service or specialty in the Serbian Armed Forces that would exclude one of the mentioned skills. Therefore, the required characteristics of physical abilities can currently be discussed only hypothetically. Hadžić and Guzina (2013) in their original scientific paper wanted to define quantitative differences in morphological characteristics, motor and functional skills under the influence of physical training programmes in the annual assessment of professional military personnel (PMP). Tests were performed at the beginning (initial physical fitness test) and after six months (exit physical fitness test). The test was conducted on a sample of 88 PMP. In that research, measuring instruments were used to assess morphological characteristics, motor and functional skills, which consisted of: body weight, push-ups, sit and reach (sit-ups) and running at 3,200 metres. The obtained results showed significant

³ Vajić, S.M. (2014). *Uvođenje, razvoj i realizacija organizacionih oblika fizičkog vaspitanja u kopnenoj vojsci Jugoslovenske narodne armije u periodu 1945–1995*. Unpublished master thesis. Belgrade: Faculty of Sports and Physical Education.

differences in the final measurement in comparison to the initial in all variables, i.e. the increase in repetitive strength of arms, shoulders and torso, aerobic endurance and weight loss. On the basis of the obtained results, they have concluded that proper and regular physical training enables passing physical fitness test during the annual assessment.

It is assumed that aerobic, aerobic-anaerobic and anaerobic energy sources are present in the field of functional skills, while repetitive, static and maximum strength predominate in the field of strength. Aerobic endurance is synonymous with general endurance, i.e. endurance in long work of moderate intensity, which engages most of muscle mass, while anaerobic endurance is the ability to use energy in oxygenfree conditions, the ability to compensate for negative changes in the inner environment and the degree of tissue adaptation to functioning in conditions in which the needs for oxygen are not met (Stojiljković et al, 2012). In the field of coordination, the coordination of the whole body, the speed of performing complex motor tasks and agility come to the fore. In the field of speed, the speed of reaction, the speed of individual movement and the speed of alternating movements come to the fore, and balance, precision and flexibility are also important. On the basis of the mentioned needs, a hypothetical factor structure of desirable physical abilities of PMP can be derived, where we get the following representation: functional abilities – 37%, strength – 21%, speed – 16%, coordination – 7%, balance – 7%, accuracy – 7%, flexibility – 5% (Družeta, 2008). This hypothetical structure should satisfy the main physical abilities for all services and specialties in the SAF

The research method

The main idea of the research is to examine whether high-intensity interval training (hereinafter HIIT), which was performed through some type of exercising within Tabata protocol⁴, has a positive effect on functional and motor skills of the SAF members. These types of exercises have been used for many years in the training of recreational and top athletes in the world and are becoming increasingly popular. The essence of this way of training is work in which intervals of high to submaximal loading intensity alternate with periods of recovery of lower to moderate intensity. HIIT is an exercise method that aims to improve performance with short high-intensity training (Babajić et al, 2014). High intensity, which cannot be maintained for a long time by continuous training or training with moderate intensity, has a great effect on increasing functional abilities, aerobic and anaerobic (Klingor et al, 2013; Helgerud et al, 2007; Gormley et al, 2008). The studies on athletes and

⁴ Tabata, I., Nishimura, K., Kouzaki, M., Hirai, Y., Ogita, F., Miyachi, M., Yamamoto, K. (1996). Effects of moderate-intensity endurance and high-intensity intermittent training on anaerobic capacity and VO₂max. *Medicine & Science in Sports & Exercise*. 28 (10), 1327-1330.

general population have shown that increasing the exercise intensity stimulates training stimulus and physiological adaptation by increasing $VO_2\max$, anaerobic threshold and stroke volume.^{5,6}

Since PT class lasts from 45 to 60 minutes, then some time is devoted to introductory and final part, in the main part of the class there are between 30 and 40 minutes left for effective exercising. However, the available time has to be used as economically and efficiently as possible. Namely, the adequate selection of exercises and the manner of their use can ensure that PMP reaches defined standards and is always physically ready to perform all assigned missions and tasks. By planning and programming PT classes, it is necessary to find a way, that is, to think of such a concept, which could simultaneously act on several physical abilities. This would increase the effect of exercising and somewhat accelerate the raising of the level of physical abilities to the required standards. The challenges of science and experts in the field of sports and PT today are the development of exercise programmes, which will simultaneously affect a number of abilities, such as cardiorespiratory, motor, body composition, etc. (Milanović, 2015).

The objective of our research was to determine the effects of two seven-week exercise programmes, as well as their impact on aerobic endurance and repetitive strength of PMP, as well as mutual comparison of the results obtained through these two programmes within PT classes. In this paper, experimental research has been implemented, where two groups have been formed, one being control and the other experimental one. Both groups have been formed in the Serbian Armed Forces unit with the current personnel, and the research has been conducted during regular PT classes as a part of physical training.

During the classes, the control group conducted the exercise programme that had already existed as a part of physical training and was based on a continuous mode of training, while the experimental group conducted a newly developed exercise programme, whose focus was on intermittent exercising, calisthenic exercises, or exercises with your own body. The research has been approved by responsible officers, so it was conducted.

The sample of respondents

The research was conducted on a sample of 34 members of the Serbian Armed Forces unit, who volunteered. The respondents were divided into two groups – experimental and control. Both groups conducted programmes through regular PT

⁵ Laursen PB, Shing CM, Peake JM, et al. (2005). Influence of high-intensity interval training on adaptations in well-trained cyclists. *Natl Str Cond Assoc*, 19, 527–533.

⁶ Gibala MJ, Little JP, van Essen M, et al. (2006). Short-term sprint interval versus traditional endurance training: similar initial adaptations in human skeletal muscle and exercise performance. *J Physiol*, 575, 901–911.

classes as a part of physical training. The control group worked according to the programme of raising the level of physical abilities, which is based on a continuous mode of work, and the experimental group according to a specially developed programme, whose focus was on the intermittent mode of operation. Since the Serbian Armed Forces is an organization in which unforeseen and unplanned tasks often occur, there was also absence from PT classes, which was tolerated up to 10%. It means that the respondents who, due to the needs of their service, during the conduct of the programme missed more than 10% of the planned PT classes, were not checked on the final test and were not considered for further analysis of the results. At the end of this cycle, there were four such members, which means that a total of 30 PMP was selected for this research, i.e. 15 respondents in each group. According to the categories used for testing in the Serbian Armed Forces, the control group had the following distribution: I - 3 respondents; II - 2; III - 3; IV - 2; V - 5. The experimental group: I - 3 respondents; II - 2; III - 3; IV - 2; V - 5. The selection of the respondents was done on the basis of free choice, i.e. on a voluntary basis, and the establishment of groups on the principle of random selection. The age range of the respondents was from 25 to 45. The average age of the respondents of the experimental group was 35.87, and the respondents of the control group 35.27.

The exercise programme

The planned programmes were conducted during seven weeks, a 45-minute class every working day (Monday – Friday). The respondents from both groups conducted their programmes in parallel and simultaneously. Each class consisted of three parts, an introductory one lasting 5–10 minutes, the main one lasting 30 to 35 minutes and a final one lasting 5 minutes.

For the work with the experimental group in this research, we used the programme, whose focus was on interval exercises (high-intensity training) that was conducted during regular hours of PT classes during working hours on training area in the barracks, where the unit is stationed. The programme conducted with the experimental group consisted of different variants of calisthenic exercises (exercises with one's own weight), continuous and interval running. During the first classes of this programme, the respondents mostly had continuous running at certain distance that they have to cover for some time, all on the basis of the initial test, strength exercises in a certain number of series, where the number of repetitions was also defined on the basis of the initial test.

The introductory classes were planned and used to prepare the respondents' bodies for the efforts expected through further programme. Moreover, through the programme, exercises that are characterized by high intensity of work, which are replaced by short breaks, as well as running certain routes, were implemented. In this part of the programme, work was done with moderate, high or submaximal intensity.

The experimental group programme

This programme presents the content that was conducted only in the main part of the classes. The exercises to shape your body and jogging were used in the introductory part, and loosening and stretching exercises in the final part.

Ord. no. of class	Contents of PT Class	Note
1	<p>Initial test is carried out to assess physical abilities of respondents in order to develop and implement a physical training programme. The test assesses repetitive strength of arm muscles, shoulder area, chest muscles, torso flexor muscles, leg muscles and aerobic endurance.</p> <p>The disciplines that are implemented are:</p> <ol style="list-style-type: none"> 1. repetitive strength - push-ups, sit-ups and squats for 2 minutes, 2. aerobic endurance - running at 2400 metres. 	
2	<p>Exercises: push-ups and sit-ups. Exercises are done in pairs in 3 series:</p> <ul style="list-style-type: none"> - Push-ups are done with 30% of RM*. - Sit-ups are done with 50% of RM. <p>The break between series is up to 60 minutes, and between exercises 2 minutes.</p> <p>The break between exercises and running is up to 4 minutes.</p> <p>Running: 2*1200 metres with moderate intensity (65-75% of MHR**), with the break between series of up to 5 minutes - fast walking.</p>	<p>* RM - repetition maximum on the initial test</p> <p>** MHR - maximum heart rate;</p>
3	<p>Exercises: push-ups, sit-ups, pull-ups (lying up*) and squats. All exercises are done in three series, as follows:</p> <ul style="list-style-type: none"> - Push-ups are done in series with 30, 40 and 50% of RM. - Sit-ups are done in pairs with 50% of RM. - Pull-ups are done in a series of 5–10 repetitions, with 6–12 repetitions in a series. - Squats are done in a series of 10–12 repetitions. <p>The half of respondents first does the first two exercises, and then respondents rotate.</p> <p>The break between series is up to 60 minutes, and between exercises 2 minutes.</p> <p>Running: 15 minutes with moderate intensity 65-75% of MHR.</p>	<p>Pull-up in a supine position* - Respondents who cannot meet the planned number of repetitions in pull-ups do a supine position.</p>

4	<p>Respondents do circuit training with 8 exercises. The order of exercises is the following: push-up, holding resistance on forearms, trunk lifting, squat, diamond push-up, V-up, bridge, step up. Exercises are done 20 minutes, and the break between exercises is 20 minutes for rest and change of position. A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 80–95% of MHR. The remaining time after 4 series (if any) is used for walking with exercises for relaxing and loosening the engaged muscles and calming pulse.</p>	
5	<p>Exercises: push-ups (different options), holding resistance on forearms, step up. Four series are done, a series contains all three exercises one after the other, after which a break is given. The exercises are done as follows:</p> <ul style="list-style-type: none"> - Push-ups (standard) are done in the first two series with 40% of RM; in the other two series, diamond push-ups are done with 10-15 repetitions. - Holding resistance on forearms is done 20 minutes. - Step up is done alternately, a total of 20 repetitions. <p>The break after each series is 90 minutes. The break between exercises and running is 3-5 minutes, a light walk. Running: 2*8 minutes with moderate intensity 70-75% of MHR. The break between two series of running is up to 5 minutes.</p>	
6	<p>Exercises: push-ups, sit-ups, pull-ups (in a supine position) and squats. All exercises are done in three series. Push-ups are done in series with 30, 40 and 50% of RM. Sit-ups are done in pairs with 40–50% of RM. Pull-ups are done in a series of 5–10 repetitions (pull-ups in a supine position in a series of 6–12 repetitions). Squats are done in a series of 10–12 repetitions. The half of respondents first does the first two exercises, and then respondents rotate in workout. The break between series is up to 60 minutes, and between exercises 2 minutes. Running: 15 minutes with moderate intensity 65–75% of MHR.</p>	
7	<p>Respondents do circuit training with 8 exercises. The order of exercises is the following: push-up, holding resistance on forearms, trunk lifting, squat, diamond push-up, V-up, bridge, step up. Exercises are done 20 minutes, and the break between exercises is 20 minutes for rest and change of position. A total of 4 series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). Use the remaining time after 4 series (if any) for a walk with exercises for relaxing and loosening the engaged muscles and calming pulse. The exercise intensity is high to submaximal 80–90% of MHR.</p>	

8	Running: 35 minutes lower to moderate intensity 60–70% MHR. Running is done without break.	
9	Respondents run 4 series of 1200 metres with moderate to high intensity 75–85% MHR. The break between series is 2 minutes.	
10	Exercises: push-ups, squats, V-ups and trunk lifting. Respondents do all four exercises continuously, one after the other in 3 series without break (when the last exercise in the series is over, they immediately move on to the first exercise in new series). The number of repetitions for exercises in order is 30–40% RM/10/10/12. 3 sets of exercises are done, with the break between sets of 2-3 minutes.	
11	Respondents do circuit training with 8 exercises. The order of exercises is the following: push-up, squat, legionnaire* (the easiest option), running in place, spider push-up, holding resistance on forearms with lifting in resistance, jumping jacks, V-up. Exercises are done 20 minutes, and the break between exercises is 20 minutes for rest and change of position, i.e. preparation for the next exercise. A total of 4 such series are done with the break between series of 3 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 80–90%.	Legionnaire* - heel stance, handy – squat – resistance (push-up) – squat – upright (jump from squat)
12	Running: 35 minutes lower to moderate intensity 60–70% MHR. Running is done without break.	
13	Exercises: spider push-up*, holding on forearms, lying position towards heel, bridge, squat and pull-up (lying in a supine position). Respondents do four series of two exercises in two sets. The following is done: spider push-up and holding on forearms; lying position to heel and bridge; squat and pull-up (in a supine position). The number of repetitions for the exercises in order is 12–16/30 minutes/20/10/15/5–10 (8–12). Exercises in series are done without break. The break between series is up to 60 minutes, and between sets is 2 minutes. During remaining time respondents run with moderate intensity, according to free assessment.	Spider push-up* - when descending to the ground, leg bends at knee and extends so that knee touches elbow.
14	Respondents do circuit training with 8 exercises. The order of exercises is the following: legionnaire, high knee running, holding in resistance on forearms, push-up, resistance running, V-ups, high jump from squat, skip. Exercises are done 30 minutes, and the break between exercises is 10 minutes for rest and change of position. A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 85–95%.	

15	Running: 35 minutes with moderate intensity 65–75% MHR. Running is done without break.	
16	<p>Exercises: legionnaire, squat, jumping jacks, step up, resistance running, high knee running.</p> <p>Respondents are divided into two groups and do exercises through the station method. Three stations are set up in the area of 20 metres, at the start, at 10 and 20 metres. Respondents doing the same exercises are arranged in width according to the following: legionnaire is done at the start, easy running leads to the next station where squats are done, and easy running leads to 20 metre where jumping jacks are done. They return to the previous station by easy running, where an alternating step up is done, moving then towards the start, and upon arrival, there is resistance running. After the exercise completion, high knee running covers the entire length of the space of 20 metres.</p> <p>All exercises are done 30 minutes. The break between exercises is the transition from one station to the other, not longer than 10 minutes. The break between series is 4-5 minutes.</p> <p>The exercise intensity is high to submaximal 85–95%. Respondents do a total of 3 series.</p>	
17	<p>Exercises: push-ups (different options), holding resistance on forearms, step up.</p> <p>Four series are done. A series includes all three exercises one after the other, followed by break.</p> <p>The exercises are done as follows:</p> <ul style="list-style-type: none"> - Spider push-ups are done in the first two series with 16-20 repetitions, depending on physical abilities of respondents; in the other two series, diamond push-ups are done with 10-15 repetitions. - Holding resistance on forearms is done in the time of 20 minutes - Step up is done alternately, a total of 20 repetitions. <p>Each series is followed by the break of up to 90 minutes. The break between exercises and running is 3-5 minutes, a light walk.</p> <p>Running: 2*8 minutes with moderate to high intensity 70–80% MHR. The break between series of running is 3-5 minutes.</p>	
18	<p>Respondents run 3 series of 3 repetitions at a distance of 400 metres. Running is done with submaximal intensity of 85–90% of MHR, i.e. up to 90 minutes.</p> <p>The break between repetitions is about 90 minutes, i.e. until pulse reaches the value of about 120 BPM*.</p> <p>There is an active 5-minute break between series.</p>	BPM* - beats per minute

19	<p>Exercises: push-ups, sit-ups, pull-ups (lying in resistance) and squats. All exercises are done in 4 series. Push-ups are done in series with 30, 40, 70 and 40% of RM. Sit-ups are performed in pairs with 50–60% of RM. Squats are done in a series of 5–10 repetitions (pull-up in a supine position in a series of 8–14 repetitions). Squats are done in a series of 10–15 repetitions. The half of respondents first does the first two exercises, and then respondents rotate. The break between series is up to 60 minutes, and between exercises 2 minutes. Running: 10-minute jogging with low to moderate intensity of 60–70% MHR.</p>	
20	<p>Respondents do circuit training with 8 exercises. The order of exercises is the following: legionnaire, holding on forearms with the support on a leg (the support is the half time on a leg and the half on the other leg), high jump from squat, holding with lifting in resistance, resistance running, push-up, high knee running, side holding (the support is the half time on a hand and the half on the other). Exercises are done 30 minutes, and the break between exercises is 10 minutes for rest and change of position. A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 80–95%. Time is announced every 15 minutes so that respondents can make the planned changes.</p>	
21	<p>Respondents run 3 series of 3 repetitions at a distance of 400 metres. Running is done with submaximal intensity of 85–90% of MHR, i.e. up to 90 minutes. The break between repetitions is about 90 minutes, i.e. until pulse reaches the value of about 120 BPM. The active break between series is 5 minutes.</p>	
22	<p>Exercises: push-up, high knee running, walking in step up, holding, squat jumps, jumps using legs and arms (touch of toes with hands), resistance running. Respondents are divided into two groups and do exercises through the station method. A certain number of respondents are distributed on 20-metre-long space in width, doing the same exercises as follows: 12–15 push-ups are done at the start, then they immediately get up and run with high knees to the end of the planned space. On the way back, they walk in steps up, where they do holding for 40 minutes on the start, and then they jump over the distance of 20 metres again by squatting. On the way back, there are jumps with arms and legs, and upon arrival at the start, there is running for 40 minutes. After the end of the series, the second group starts exercising. Break is the time it takes a group to do all the planned exercises.</p>	

	The exercise intensity is high to submaximal 80–95%. Respondents do a total of 3 series.	
23	Exercises: push-ups, sit-ups, trunk lifting and squats. Respondents do all exercises in pairs, and the maximal number of repetitions is done for 60 minutes, in 3 series. The series are performed so that the exercises are done one after the other. The break between exercises is 90 minutes, and between series 4 minutes.	
24	Respondents do circuit training with 8 exercises. The order of exercises is: legionnaire, holding in resistance on forearms, spider push-up, high jump from step up with change of a leg, holding with lifting in resistance, resistance running, jumping jack and squat. Exercises are done 30 minutes, and the break between exercises is 10 minutes for rest and change of position. A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 80–95%.	
25	Respondents run as follows: 3 series of 3 repetitions at a distance of 400 metres. Running is done with submaximal intensity of 85–90% of MHR, i.e. up to 90 minutes. The break between repetitions is about 90 minutes, i.e. until pulse reaches the value of about 120 BPM. There is a 5-minute break between series.	
26	Respondents do circuit training with 8 exercises. The order of exercises is: legionnaire, holding in resistance on forearms, resistance running, jumping jack, step up, spider push-up, jump from squat with 180° turn, holding with lifting in resistance. Exercises are done 30 minutes, and the break between exercises is 10 minutes for rest and change of position. A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 85–95%.	
27	Exercises: push-up, sit-up, step up, holding and side holding in the support on forearms. Push-ups and sit-ups are done in three series (first exercise, then the other one). Operating time is 1 minute. The maximal number of repetitions is done for the specified time. If there is failure, the work should not be interrupted, but should continue in facilitated conditions (push-ups should be done with support on knees, and sit-ups so that only the upper part of body rises from the ground to the lower part of shoulders). The break between series is 90 minutes, and between exercises 3 minutes. After that, step up, holding and side holding on forearms are performed.	

	<p>Step up is done for a period of 40 minutes, followed by the break of 10 minutes and after that, side holding is done for 20 minutes on left forearm. At the end of time, holding is immediately transferred to both forearms, and the last 20 minutes to side holding on right forearm.</p> <p>There are 3 series, and the break between series is 60 minutes.</p> <p>Running: 10 minutes at 70–80% of MHR.</p>	
28	<p>Respondents do circuit training with 8 exercises.</p> <p>The order of exercises is: high jump from squat with 180° turn, spider push-up, high knee running, holding with lifting in resistance, resistance running, push-up and V-up (alternating lifting of a leg).</p> <p>Exercises are done 30 minutes, and the break between exercises is 10 minutes for rest and change of position.</p> <p>A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 85–95%.</p>	
29	<p>Exercises: push-up, sit-up, step up, holding and side holding in resistance.</p> <p>Push-ups and sit-ups are done in three series (first exercise, then the other one).</p> <p>Operating time is 1 minute. The maximal number of repetitions for the specified time is done. If there is failure, the performance should not be interrupted, but should continue in facilitated conditions (push-ups should be done with the support on knees, and sit-ups so that only the upper part of body rises from the ground to the lower part of shoulders).</p> <p>The break between series is 90 minutes, and between exercises 3 minutes.</p> <p>After that, step up, holding and side holding in resistance are performed.</p> <p>Step up is done for a period of 40 minutes, followed by a 10-minute break and after that, side holding is done for 20 minutes on left forearm. At the end of time, holding is immediately transferred to both forearms, and the last 20 minutes to side holding on right forearm. There are 3 series, and the break between series is 60 minutes.</p> <p>Running: 10 minutes with moderate to high intensity 70–80% of MHR.</p>	
30	<p>Respondents do circuit training with 8 exercises.</p> <p>The order of exercises is: resistance running, push-up, high knee running, legionnaire, holding in resistance on forearms, jumping jack, V-up (alternately raising a leg) and bridge.</p> <p>Exercises are done 30 minutes, and the break between exercises is 10 minutes for rest and change of position.</p> <p>A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises).</p> <p>The exercise intensity is high to submaximal 85–95%.</p>	

<p>31</p>	<p>Exercises: push-ups, sit-ups, pull-ups (lying in resistance) and squats. All exercises are done in three series: - Push-ups are done in series with 40, 50 and 70% of RM. - Sit-ups are done in pairs with 60% of RM. - Pull-ups are done in a series of 5–10 repetitions (resistance in a supine position in a series of 12–15 repetitions), and squats in a series of 15–20 repetitions. The half of respondents first does the first two exercises, and then respondents rotate. The break between series is up to 60 minutes, and between exercises 2 minutes. Running: 15 minutes with moderate to high intensity 70–80% of MHR.</p>	
<p>32</p>	<p>Respondents do circuit training with 8 exercises. The order of exercises is: push-up, resistance running, bridge, holding on forearms, high knee running, squat, jumping jack, holding with lifting in resistance + push-up (after the allotted time for workout, respondents do another 5-8 push-ups). Exercises are done 30 minutes, and the break between exercises is 10 minutes for rest and change of position. A total of 4 such series is done with the break between series of 2 minutes (active break, walking and loosening and stretching exercises). The exercise intensity is high to submaximal 80–95%.</p>	
<p>33</p>	<p>Exercises: push-up, sit-up. - Push-ups are done in series with 30, 40, 50 and 70% of RM. - Sit-ups are done in pairs with 50–60% of RM. 4 series are done. The break between series is 60 minutes and between exercises 2 minutes. The break between exercises and running is active and lasts 2-3 minutes. Running: 2400 metres with high intensity 75–85% of MHR.</p>	
<p>34</p>	<p>Exercises: push-up, sit-up. - Push-ups are done in series with 50% of RM. - Sit-ups are done in pairs with 50% of RM. There are 2 series. The break between series is 60 minutes, and between exercises 2 minutes. The break between exercises and running is active and lasts 3-4 minutes. Running: 2*1600 metres with high intensity 75–85% MHR. The break between two series of running is up to 5 minutes.</p>	
<p>35</p>	<p>The final test is performed in order to assess the new state of physical abilities of respondents caused by the implemented physical training programme. The test assesses the repetitive strength of arms and shoulder area muscles, chest muscles, torso flexor muscles and aerobic endurance. The disciplines that are applied are: 1. repetitive strength - push-ups, sit-ups and squats for 2 minutes, 2. aerobic endurance - running at 2400 metres.</p>	

The control group programme

The programme conducted with the control group is based on a continuous mode of workout, which involved alternating continuous running and exercises. During running, the intensity was dosed according to the subjective assessment of exercisers themselves, with time limits with periods of walking between series of running. The exercises were performed by the station method, where each exercise was done in a certain number of series and repetitions. The exercises that were most often used in this programme were push-ups, sit-ups and pull-ups.

Ord. no. of class	Contents of PT Class	Note
1	The initial test is performed due to the assessment of physical abilities of respondents in order to develop and implement a physical training programme. The test assesses the repetitive strength of arms and shoulder area muscles, chest muscles, torso flexor muscles, leg muscles and aerobic endurance. The disciplines that are applied are: 1. repetitive strength - push-ups, sit-ups and squats for 2 minutes, 2. aerobic endurance - running at 2400 metres.	
2	6-minute alternating movement: (walking-running) in a ratio of 2:2, moderate intensity running, 10 minutes of a combination of exercises to shape your body, 22 minutes of alternating movement (walking – running*) 2:2, moderate intensity running (group work) and 7 minutes of walking and loosening and stretching exercises.	The walking-running ratio is expressed in minutes.
3	6-minute alternating movement (walking-running) 2:2, moderate intensity running, 10 minutes of a combination of exercises to shape your body, 22 minutes of alternating movement (walking – running) 2:2, moderate intensity running (group work*) and 7 minutes of loosening and stretching exercises.	The first group consists of persons who ran up to 10.45 minutes in the 2400 metres test, the second between 10.45 and 12.00 minutes, and the third group consists of persons who ran over 12.00 minutes. All persons over the age of 40 belong to the third group, and their further classification is done in accordance with their endurance.
4	5 minutes of moderate intensity running, 10 minutes of a combination of exercises to shape your body, 25 minutes of alternating movement (walking – running) 2:3, moderate intensity running (group work) and 5 minutes of loosening and stretching exercises.	
5	5 minutes of moderate intensity running, 10 minutes of a combination of exercises to shape your body, 25 minutes of alternating movement (walking – running) 2:3, moderate intensity running (group work) and 5 minutes of loosening and stretching exercises.	

<p>6</p>	<p>4 minutes of moderate intensity running, 6 minutes of a combination of exercises to shape your body, 16 minutes of strength training, group circuit workout - station system: 1st station - push-ups 2 series of 45 seconds each, 2nd station - sit-ups 2 series for 45 seconds, 3rd station – pull-ups of 2 series 70% of the maximum. Each series is followed by 90-second rest with loosening and stretching exercises. 15 minutes of alternating movement (walking – running) 2:3, moderate intensity running (group work) and 4 minutes of walking with loosening and stretching exercises.</p>	
<p>7</p>	<p>4 minutes of moderate intensity running, 6 minutes of a combination of exercises to shape your body, 15 minutes of strength training, group circuit workout– station system: 1st station - push-ups, 2 series of 60 seconds each, 2nd station - sit-ups, 2 series of 60 seconds each, 3rd station – pull-ups of 2 series, do the first series with 70%, and the second with 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 15 minutes of alternating movement (running - walking) 3:2, moderate intensity running (group work) and 5 minutes of walking with loosening and stretching exercises.</p>	
<p>8</p>	<p>4 minutes of moderate intensity running, 4 minutes of a combination of exercises to shape your body, 15 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 2 series of 60 seconds each, 2nd station - sit-ups, 2 series of 60 seconds each, 3rd station - pull-ups of 2 series, do the first series with 70%, and the second with 100% of the maximum. Each exercise is followed by 60-second rest with loosening and stretching exercises. 18 minutes of alternating movement (running - walking) 4:2, moderate intensity running (group work) and 4 minutes of loosening and stretching exercises.</p>	
<p>9</p>	<p>4 minutes of moderate intensity running, 4 minutes a combination of exercises to shape your body, 15 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 2 series of 60 seconds each, 2nd station – sit-ups, 2 series of 60 seconds each, 3rd station – pull-ups of 2 series, do the first series with 70%, and the second with 100% of the maximum. Each exercise is followed by 60-second rest with loosening and stretching exercises. 18 minutes of alternating movement (running - walking) 4:2, moderate intensity running (group work) and 4 minutes of loosening and stretching exercises.</p>	

10	<p>4 minutes of moderate intensity running, 6 minutes of a combination of exercises to shape your body, 11 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 60 seconds, 2nd station – sit-ups, 60 seconds, 3rd station – pull-ups, 70% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 21 minutes of alternating movement (running – walking) 5:2, moderate intensity running (group work) and 3 minutes of walking with loosening and stretching exercises.</p>	
11	<p>3 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 16 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 2 series of 60 seconds each, 2nd station – sit-ups, 2 series of 60 seconds each, 3rd station – pull-ups of 2 series, do the first series with 70%, and the second with 100% of the maximum. Each exercise is followed by 60-second rest with loosening and stretching exercises. 18 minutes of alternating movement (running – walking) 6:2, moderate intensity running (group work) and 3 minutes of loosening and stretching exercises.</p>	
12	<p>3 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 10 minutes of strength training, group workout with change: 1st group - push-ups, 2 series of 90 seconds each, 2nd group - pull-ups, 2 series, 70% of the maximum, Each exercise is followed by 90-second rest with loosening and stretching exercises. 24 minutes of alternating movement (running – walking) 6:3, moderate intensity running (group work) and 3 minutes of loosening and stretching exercises.</p>	
13	<p>4 minutes of moderate intensity running, 6 minutes of a combination of exercises to shape your body, 22 minutes control test, group circuit workout - station system: 1st station - push-ups, 3 series of 60 seconds each, 2nd station – sit-ups, 3 series of 60 seconds each, 3rd station – pull-ups, 3 series, the first and second series is done with 70%, and the third with 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 8 minutes of moderate intensity running, 5 minutes of loosening and stretching exercises.</p>	

14	<p>5 minutes of moderate intensity running, 4 minutes of 4x50m acceleration, 6 minutes of a combination of exercises to shape your body, 24 minutes of alternating movement (running – walking) 9:3, 6 minutes of loosening and stretching exercises.</p>	
15	<p>5 minutes of complex exercises in motion, 4 minutes of a combination of exercises to shape your body, 17 minutes of strength training, group circuit workout – station system: 1st station - push-ups, 60 seconds, 2 series, 2nd station – sit-ups, 60 seconds, 2 series, 3rd station – pull-ups, 2 series, 100% of the maximum. Each series is followed by 60-second rest with loosening and stretching exercises. 16 minutes: moderate intensity running (group work), 3 minutes of walking with loosening and stretching exercises.</p>	
16	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 16 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 90 seconds - 2 series, 2nd station – sit-ups, 90 seconds - 2 series, 3rd station – pull-ups, 3 series, 100% of the maximum, pronation. After each series, rest for 90 seconds with loosening and stretching exercises. 2*8 minutes of alternating running: 4 minutes of moderate, 2 minutes of high and 2 minutes of low intensity (group work), 4 minutes of walking with loosening exercises.</p>	
17	<p>7 minutes of complex exercises in motion, 18 minutes of strength training, group circuit workout according to the station system: 1st station - push-ups, 2 series, 45 seconds each (narrow and wide resistance), 2nd station – sit-ups, 2 series of 90 seconds each, 3rd station – pull-ups, 2 series, 100% of the maximum (the first by supination, the second by pronation). Each exercise is followed by 90-second rest with loosening and stretching exercises. 16 minutes of moderate intensity running (group work), 4 minutes of walking with loosening and stretching exercises.</p>	
18	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 8 minutes of strength training, group workout with change: 1st group - push-ups - 2 minutes, 2nd group - pull-ups with 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 24-minute running 4*800 m high intensity, rest between sections about 2 minutes (group work) and 4 minutes of walking with loosening exercises.</p>	

19	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 12 minutes of strength training, group workout with change: 1st group – sit-ups, 2 series of 2 minutes each, 2nd group – pull-ups, 2 series, 100% of the maximum. Each exercise is followed by 60-second rest with loosening and stretching exercises.</p> <p>19 minutes of running: 2 minutes of moderate intensity, 3 minutes of high intensity, 2 minutes of moderate intensity, 1 minute of submaximal intensity, 2 minutes of moderate intensity, 1 minute of submaximal intensity, 2 minutes of moderate intensity, 1 minute of submaximal intensity, 5 minutes of low intensity, 5 minutes of walking with loosening and stretching exercises.</p>	
20	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 12 minutes of strength training, group circuit workout - station system: 1st station - push-ups exercise (narrow, normal and wide support in resistance for 40 seconds), 2nd station – 2-minute sit-ups with alternating turns to the left and right, 3rd station – pull-ups, 2 series, 100% of the maximum, Each exercise is followed by 60-second rest with loosening and stretching exercises, 20-minute “fartlek” running with variable intensity (from low to submaximal), 4 minutes of walking with loosening exercises.</p>	
21	<p>8 minutes of complex exercises in motion, 12 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 2 minutes, 2nd station - sit-ups, 2 minutes, 3rd station - pull-ups, 100% of the maximum. Each exercise is followed by 60-second rest with loosening and stretching exercises.</p> <p>21-minute running (“pyramid”): 2 minutes low, 2 minutes moderate, 2 minutes high, 2 minutes submaximal intensity; (rest 3 minutes - jogging and walking); 2 minutes submaximal, 2 minutes high, 2 minutes moderate and 2 minutes low intensity (group work) and 2 minutes of walking with loosening and stretching exercises.</p>	
22	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 10 minutes of strength training, group workout with change: 1st group – sit-ups, 2 minutes, 2nd group – pull-ups, 2 series, 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises.</p>	

	26-minute running, 2 series 4x400m with submaximal intensity, (work in groups) after each section there is rest (jogging - walking) 2 minutes, and after the series 3 minutes.	
23	6 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 12 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 100% of the maximum, 2nd station - sit-ups, 90 seconds, 3rd station - pull-ups, 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 18 minutes: running pace 2:2:2, moderate, low and high intensity, 4 minutes of walking with loosening and stretching exercises.	
24	6 minutes of moderate intensity running, 9 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 100% of the maximum, 2nd station - sit-ups, 90 seconds, 3rd station - pull-ups, 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 26 minutes: running 8x400m with submaximal intensity. Each section is followed by a break (jogging - walking) for 2-3 minutes, 4 minutes of walking with loosening exercises.	
25	4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 14 minutes of strength training, group workout with change: 1st group – sit-ups for 2 minutes, 2nd group – pull-ups, 2 series, 100% of the maximum (the first series by supination, the second series by pronation). Each exercise is followed by 90-second rest with loosening and stretching exercises. 18 minutes of moderate intensity running (group work), 4 minutes of walking with loosening and stretching exercises.	
26	6 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 10 minutes of strength training, group circuit workout according to the station system: 1st station – push-ups, 100% of the maximum, 2nd station – sit-ups, 2 minutes, 3rd station – pull-ups, 100% of the maximum. Each exercise is followed by 120-second rest with loosening and stretching exercises. 20-minute running, 2 series 6*200m with submaximal intensity, (group work). Each section is followed by the break of 60 seconds (jogging - walking), and after each series 90 seconds (jogging - walking), 4 minutes of loosening and stretching exercises.	

27	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 14 minutes of strength training, group workout with change: 1st group – sit-ups for 2 minutes, 2nd group - 2 series of pull-ups, 100% of the maximum (the first series by supination, the second series by pronation). Each exercise is followed by 90-second rest with loosening and stretching exercises. 18 minutes of moderate intensity running (group work), 4 minutes of walking with loosening and stretching exercises.</p>	
28	<p>8 minutes of complex exercises in motion, 12 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 100% of the maximum, 2nd station - sit-ups, 2 minutes, 3rd station - pull-ups, 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 21-minute running ("pyramid"): 2 minutes low, 2 minutes moderate, 2 minutes high, 2 minutes submaximal intensity (3-minute walking); 2 minutes submaximal, 2 minutes high, 2 minutes moderate and 2 minutes low intensity, 4 minutes of walking with loosening and stretching exercises.</p>	
29	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 14 minutes of strength training, group workout with change: 1st group – sit-ups for 2 minutes, 2nd group – pull-ups, 2 series, 100% of the maximum (the first series by supination, the second series by pronation). After each exercise, there is rest for 90 seconds with loosening and stretching exercises. 18 minutes of moderate intensity running (group work) and 4 minutes of walking with loosening and stretching exercises.</p>	
30	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 14 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 2 series of 90 seconds each, 2nd station – sit-ups, 2 series of 90 seconds each, 3rd station – pull-ups, 2 series, 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 18-minute "fartlek" - the game of running with different intensity (from low to submaximal). 4 minutes of walking with loosening and stretching exercises.</p>	
31	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 16 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 90 seconds, 2nd station - sit-ups, 90 seconds,</p>	

	<p>3rd station - pull-ups in 2 series, 100% of the maximum, Each series is followed by 60-second rest with loosening and stretching exercises.</p> <p>2*8 minutes of alternating running: 4 minutes of moderate, 2 minutes of high and 2 minutes of low intensity (group work), 4 minutes of walking with loosening exercises.</p>	
32	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 12 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 2 minutes, 2nd station - sit-ups, 2 minutes, 3rd station - pull-ups, 100% of the maximum. Each exercise is followed by 120-second rest with loosening and stretching exercises. 20-minute running: "pyramid" - 4 minutes of low, 4 minutes of moderate, 2 minutes of high intensity and vice versa (group work), 4 minutes of walking with loosening and stretching exercises.</p>	
33	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 12 minutes of strength training, group circuit workout - station system: 1st station - push-ups, 2 minutes, 2nd station - sit-ups, 2 minutes, 3rd station - pull-ups, 100% of the maximum. Each exercise is followed by 90-second rest with loosening and stretching exercises. 20-minute running: "pyramid" - 4 minutes of low, 4 minutes of moderate, 2 minutes of high intensity and vice versa (group work), 4 minutes of walking with loosening and stretching exercises.</p>	
34	<p>4 minutes of moderate intensity running, 5 minutes of a combination of exercises to shape your body, 14 minutes of strength training, group workout with change: 1st group – push-ups, 2 minutes, 2nd group – sit-ups, 2 minutes, 3rd group – pull-ups, 100% of the maximum (the first series by supination, the second series by pronation). Each exercise is followed by 90-second rest with loosening and stretching exercises. 18 minutes of moderate intensity running (group work), 4 minutes of walking with loosening and stretching exercises.</p>	
35	<p>The final test is performed in order to assess the new state of physical abilities of respondents caused by the implemented physical training programme. The test assesses the repetitive strength of arms and shoulder area muscles, chest muscles, torso flexor muscles and aerobic endurance. The disciplines that are applied are: 1. repetitive strength - push-ups, sit-ups and squats for 2 minutes, 2. aerobic endurance - running at 2400 metres.</p>	

The sample of variables and method of their measurement

Every professional member of the Serbian Armed Forces has the obligation to check their physical abilities once a year, which is defined by the Regulation on physical training in the Serbian Armed Forces. Testing and measurement for the purpose of this research, which has also been included in the annual assessment of respondents' physical fitness, referred to the assessment of aerobic endurance and repetitive strength, which are considered through four variables that have been performed in the following order: push-ups, sit-ups, squat and running at 2400 metres (R2400).

This battery of tests has been used to measure some functional and motor abilities on the initial and final testing and changes that occurred as a result of the implemented training programmes. When performing the measurement, the respondents had a break of about 10 minutes between each of the tested variables for recovery and preparation for testing the next variable. Those breaks were active, with light walking, jogging, exercises for shaping the body and stretching exercises, in accordance with the recommendations by Gadžić (2016). Although the Regulation and Standards for testing physical abilities do not provide for testing the squat variable, it has also been tested in this research. The necessity to add this test comes from the fact that a soldier during his engagement has to travel long distances on different terrains and in different conditions, then to transfer great loads over long distances, which requires strength and endurance of leg muscles, along with all other motor and functional abilities. The opinion that leg strength is the basis for successfully solving various tasks assigned to members of the Armed Forces has been confirmed. In this regard, the test for assessing the repetitive strength of leg muscles is applied (Bianco et al, 2015). The test is performed in a way that the respondent takes a step out position with shoulder-width apart feet, and arms are extended. From the initial position, the respondent descends the body vertically to the position where thighs are parallel to the ground. When descending the body, the support has to be on the whole foot at all times. Squats are done continuously without break, until cancellation. The result of the test is the number of correctly done repetitions.

The initial and final test has been carried out, with the same measurement instruments, in the morning in the same training area.

The objective of this test was to check the success of the planned programmes and their impact on the physical abilities of the Serbian Armed Forces members. The testing of the Serbian Armed Forces members on both measurements has been conducted in accordance with the Regulation on PT in the presence of a doctor and possession of the necessary certificate for persons older than 40.

Statistical data processing

The data collected during the work with the experimental and control group have been analyzed using the main parameters of descriptive statistics: arithmetic mean (Mean), standard deviation (SD), maximum value (Max) and minimum value (Min). The distribution normality has been checked using curvature coefficient - Skewness (Skew) and roundness coefficient – Kurtosis (Kurt). The significance of the differences between the respondents of the experimental and control group in the examined abilities obtained at the final measurement in relation to the initial measurement has been studied by the non-parametric Mann-Whitney U test. In order to determine the effects of the programme, i.e. the differences between the initial and final measurement in the experimental and control group, for each of the analyzed groups (subsamples), the Wilcoxon signed-rank test has been used. All analyses have been performed with the assistance of statistical data processing packages IBM SPSS, *STATISTICS v.21*.

The research results

The main statistical parameters measured in the control and experimental group are presented in Table 1. The results have been obtained on the basis of standardized tests that are used as a battery of tests in the Serbian Armed Forces.

Table 1 – *The descriptive statistics on the initial test for the control and experimental group*

Statistics/groups	Variables	Mean	SD	Min	Max	Skewness	Kurtosis
CON	push-ups	45,93	12,820	21	63	-0,496	-0,750
	sit-ups	55,60	12,443	33	72	-0,491	-0,855
	squats	51,33	15,954	26	77	0,032	-1,013
	R2400	11,31	1,202	9,33	13,5	0,198	-0,765
EXP	push-ups	44,60	11,642	26	61	-0,164	-1,232
	sit-ups	54,67	12,882	31	71	-0,635	-0,573
	squats	46,67	17,137	25	80	0,531	-0,648
	R2400	11,29	1,258	9,39	13,16	-0,299	-1,380

Legend: CON – control group; EXP – experimental group; R2400 – running at 2,400 metres; Mean – arithmetic mean; SD - standard deviation; Min – minimum value; Max– maximum value.

Table 2 – *The descriptive statistics on the final test for the control and experimental group*

Statistics/groups	Variables	Mean	SD	Min	Max	Skewness	Kurtosis
CON	push-ups	47,87	12,147	23	64	-0,588	-0,464
	sit-ups	57,67	12,454	34	74	-0,504	-0,650
	squats	52,73	14,940	28	75	-0,072	-0,929
	R2400	11,16	1,148	9,35	13,41	0,211	-0,499
EXP	push-ups	49,47	10,371	32	62	-0,284	-1,181
	sit-ups	61,60	10,370	38	75	-1,000	0,546
	squats	51,73	17,186	29	84	0,442	-0,785
	R2400	10,94	1,064	9,35	12,58	-0,204	-1,231

Legend: CON – control group; EXP – experimental group; R2400 – running at 2,400 metres; Mean – arithmetic mean; SD – standard deviation; Min – minimum value; Max–maximum value.

After processing the obtained results of the main statistical parameters in the control and experimental group on the initial and final test, which are presented in Table 1 and 2, it can be concluded that the control group had better average results in three out of four measured variables: push-up (45.93 - 44.60), sit-up (55.60 - 54.67) and squat (51.33 - 46.67) on the initial test in comparison to the experimental group. Regarding the results obtained in the final test, they show that the experimental group had better average results in three out of four measured variables: push-up (47.87 - 49.47), sit-up (57.67 - 61.60) and running at 2400 metres (11.16 - 10.94) compared to the control group. Comparing the obtained results on the initial and final test in the control, as well as the experimental group, it can be seen that the average results are better in all measured variables in both groups in the final measurement compared to the initial one.

Comparing the minimum and maximum values in both groups, it can be concluded that better results have been achieved in all variables in the final test in comparison to the initial test, except for the variable squat in the control group, where the maximum value in the final test is lower than the initial (77-75).

A greater range of standard deviation results is more noticeable in the initial test in both the control and experimental group of respondents. When it comes to measures of the distribution form, after processing all the tested variables, it can be concluded that on the basis of the processed and obtained results, skewness and kurtosis do not deviate from the normal distribution.

The significance of differences between the experimental and control group

In order to determine the statistical significance in the differences of ranks in the respondents of the control and experimental group in functional and motor abilities, the non-parametric Mann-Whitney U test has been used at the initial and final measurement. It has been done for each variable and is used to study the differences of two independent groups.

Table 3 presents the obtained results of the significance of the differences in the control and experimental group on the initial measurement.

Table 3 – *The results of the differences on the initial measurement*

VARIABLE	MANN-WHITNEY U TEST	Z	Sig.(p)	Mean Rank	
				Control	Experimental
push-ups	101.50	-0.46	0.65	16.23	14.77
sit-ups	109.50	-0.12	0.90	15.70	15.30
squats	91.50	-0.87	0.38	16.90	14.10
R2400	107.00	-0.23	0.82	15.13	15.87

Legend: R2400 – running at 2400 metres; Z – value; Sig.(p) – the level of the significance of differences between groups; Mean Rank – the average value of rank

The results from Table 3 show that the tests have not defined statistically significant differences between the control and experimental group, but the results of the mean values of ranks at the initial measurement show that the control group has achieved better results in all measured variables in comparison to the experimental group.

Table 4 presents the obtained results of the significance of the differences in the control and experimental group at the final measurement.

Table 4 – *The results of the differences on the final measurement*

VARIABLE	MANN-WHITNEY U TEST	Z	Sig.(p)	Mean Rank	
				Control	Experimental
push-ups	106.50	-0.25	0.05	15.10	15.90
sit-ups	89.50	-0.95	0.05	13.97	17.03
squats	108.00	-0.19	0.85	15.80	15.20
R2400	97.50	-0.62	0.65	16.50	14.50

Legend: R2400 – running at 2400 metres; Z – value; Sig.(p) – the level of the significance of differences between groups; Mean Rank – the average value of rank

The results from Table 4 show that the conducted tests have defined statistically significant differences between the respondents of the control and experimental group on two out of four tests. The results of the mean values of ranks on the final measurement show that this time the respondents of the experimental group have achieved better results in three out of four measured variables: push-ups (15.10 – 15.90), sit-ups (13.97–17.03) and running at 2400 metres (16.50 – 14.50) – lower value is better result.

The effects of the experimental programme

The Wilcoxon signed-rank test has been used to study the effects of the implemented programmes that have been conducted with the control and experimental group. It is used for repeated measurements aimed at checking the same respondents on two occasions (initial and final measurement) or under different conditions. This test has examined the impact of the implemented programmes, as well as whether there is a change in the results from the initial to the final test.

Table 5 and 6 present the obtained results of the effects of the implemented programme in the control and experimental group from the initial to the final measurement.

Table 5 – *The results of changes from the initial to the final measurement in the control group*

VARIABLE	Z	Sig.(p)	r
push-ups (CON)	-3.453	0.001	0.630
sit-ups (CON)	-3.370	0.001	0.615
squats (CON)	-1.824	0.068	
R2400 (CON)	-3.304	0.001	0.603

Legend: R2400 - running at 2400 metres; Z - value; Sig. (p) - the level of the significance of changes of results; r - magnitude of impact

Table 6 – *The results of changes from the initial to the final measurement in the experimental group*

VARIABLE	Z	Sig.(p)	r
push-ups (EXP)	-3.420	0.001	0.624
sit-ups (EXP)	-3.305	0.001	0.603
squats (EXP)	-3.426	0.001	0.625
R2400 (EXP)	-3.408	0.001	0.622

The results of the Wilcoxon signed-rank test from Table 5 show that the control group respondents have achieved statistically significantly better results in three out of four measured variables (push-ups, sit-ups and running at 2400 metres) in the final measurement compared to the initial one. No statistically significant difference has been noticed between the initial and final measurement in the squat variable in the control group.

The results of the Wilcoxon signed-rank test from Table 6 show that the respondents of the experimental group have achieved statistically significantly better results in all four measured variables (push-ups, sit-ups, squats and running at 2400 metres) in the final measurement compared to the initial one.

Discussion

In this paper, the impact of a seven-week interval training programme on the repetitive strength and aerobic endurance of the Serbian Armed Forces members has been studied.

This type of exercising is a high-intensity physical activity that uses intervals of submaximal or maximal intensity in order to work in the conditions above the anaerobic threshold (Fratrić, 2012).

The need for physical activity and physical training among the Serbian Armed Forces members is at a high level due to the obligation for the PMP to be physically capable of responding to all assigned tasks at all times. This statement relates to all armies of the world, so it is important to consider the physical ability of the PMP of the Serbian Armed Forces in comparison to the physical ability of members of foreign armies. By comparison, it can be concluded that in terms of motor skills, i.e. repetitive strength, the PMP is somewhere in the middle with better, and also worse results compared to members of other armies. When it comes to functional abilities, i.e. aerobic endurance, the PMP of the Serbian Armed Forces lags behind members of some foreign armies to a certain extent (Glavač, 2015). Such research results can be viewed from the perspective of conditions, time and motivation for work, as well as the manner, scope and intensity of the conduct of physical exercise. It is a well-established practice that for the development of physical abilities in working with the PMP of the Serbian Armed Forces, continuous methods of work are mainly used, which requires time and work without long breaks, which is difficult to achieve for a longer period. Namely, the problem is the continuity of work with the PMP, due to a great number of obligations and tasks they have, which leads to the absence from PT classes, as well as from physical training in general. Due to these problems, some more detailed periodization, which is implemented in sports and with athletes, loses its meaning.

In order to improve or maintain physical ability at a high level, i.e. at the level of the most developed armies in the world, it is necessary to perform needs analysis, set work models, and then start planning and programming training. The physical training of PMP is based on the same principles of exercising of professional or recreational athletes, but the essential difference is that PMP has to maintain their physical abilities

at the required level throughout the year, at all times. Knowing that training planning is a complex management activity, which determines the goals and tasks of the training process, periodization and the necessary technical, material and personnel conditions (Družeta, 2008, according to Milanović, 2005), it can be concluded that the aggravating factor is the lack of continuity in work, as well as the impossibility of consistent adherence to training periodization due to unplanned professional obligations, absence and regular duties. Periodization in military profession does not recognise the terms such as supercompensation or downsizing and improving form because physical ability of all members at all times during the year has to be at such a level to meet the defined standards, both when testing physical abilities and when solving various tasks assigned to a professional military person.

Repetitive strength, which has also been the subject of this study, is significantly better with the respondents of the experimental group, so it can be said that the implemented interval training, as a consequence of a relatively great number of repetitions followed by short breaks, has led to significant improvement in the results of the repetitive strength assessment test, which is in compliance with the results of previous research (Kraemer et al, 2004; Harman et al, 2008). Since soldiers are exposed to different types of workload during daily activities, not only of physical nature, training methods during physical training should be set in such a way that they are intense enough, which, on the other hand, requires that the scope of work is reduced to minimum. The additional confirmation of this attitude is suggested by the fact that PT classes last from 45 to 60 minutes, which is not enough time for more extensive work.

The research results have confirmed the assumption that interval training is more efficient for PMP in terms of improving the selected motor skills, and that the implemented programme does not significantly affect functional abilities, i.e. aerobic endurance compared to the control group programme.

Summarizing all results from both tests, it can be noticed that both groups have made some progress, which may not be too great, and that can be partly explained by the lower motivation of the respondents during the final measurement, where it was necessary to conduct each test to the maximal number of repetitions. Namely, the respondents have also been tested their physical abilities, so not everyone has been motivated to do the test with 100% of their abilities, but they have done as much as they needed for a certain number of points. Each number of repetitions carries a certain number of points, and the grade depends on it, so some respondents have calculated how many repetitions they needed for some grade.

Conclusion

It can be concluded that desirable results in terms of the adequate level of physical abilities of PMP can be achieved by organized, planned and programmed work, as well as successful fulfillment of standards of physical fitness test and smooth performance of all missions and tasks that can be assigned to PMP at any time.

Today, there are few scientific and research papers that deal with the quality and modernization of physical training in the military and the implementation of training stimuli and training methods that follow modern trends in physical preparation, both in recreational and professional sports.

The research on the effects of interval training within PT classes and physical training on some functional and motor abilities, which are mostly represented and needed by the Serbian Armed Forces members, unequivocally indicates the need for diversity and a combination of different training methods and contents. During the planning and conduct of physical training with the Serbian Armed Forces members, special attention should be paid to the development and maintenance of aerobic endurance, muscular endurance and repetitive strength. This conclusion has been made on the basis of considering the tasks and missions that are assigned to professional military personnel from the aspect of the needs of physical abilities.

Since each task has to be performed with high or submaximal intensity, the required working capacity should be maintained for as long as possible and the decline in working capacity should be delayed as long as possible.

We must not forget that a continuous and programmed process of physical exercising with professional military personnel contributes to the development and maintenance of the levels of motor and functional abilities, as well as health status in general. However, planning physical training for professional military personnel is very complex due to regular and extraordinary engagement, which is why one of the main laws of training process - continuity (Koprivica, 2002) is called into question.

The implemented experimental programme should serve as an idea and basis for finding, creating and programming new ways of exercising within physical training at all levels of a system such as the Serbian Armed Forces. Creating new, purposeful plans and programmes within physical training, the introduction of new and modern exercises in a combination with different training methods would have long-term positive effects on the Serbian Armed Forces members. They can be reflected in the improvement of physical abilities, the quality of health and psychological status, the increase in the efficiency of performing the assigned tasks and, finally, the improvement of the life quality.

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Ефекти програмираног тренинга на моторичке способности припадника Војске Србије

Физичка обука је саставни део целокупне обуке припадника Војске Србије. Она је основ борбене готовости, као и саставни део живота сваког војника. Основна идеја истраживања јесте да се испита да ли интервалне вежбе високог интензитета имају позитиван утицај на функционалне и моторичке способности припадника ВС. Репетитивна снага, као једна од испитиваних способности, знатно је боља код испитаника експерименталне групе, што указује на то да је примењено интервално вежбање довело до значајног побољшања резултата на тесту за процену репетитивне снаге и у складу је са резултатима ранијих истраживања. Такође, утврђено је да експериментални програм не утиче значајније на функционалне способности, односно нису утврђене разлике у аеробној издржљивости припадника експерименталне групе у односу на контролну групу. Примењени експериментални програм требало би да послужи као идеја и основ за проналажење, креирање и програмирање нових начина вежбања у оквиру физичке обуке на свим нивоима система какав је Војска Србије.

Кључне речи: *интервални тренинг, физичке способности, моторичке способности, професионална војна лица*