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Motor Status of Military Pilots in Montenegro

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Abstract

The results of numerous kinesiological studies in contemporary armed forces of today indicate the considerable role that the motor skills of soldiers play in the performance of multi-purpose specific tasks. The aim of this research was to determine targeted motor profiles of military pilots. The sample of participants consisted 20 military pilots of the Armed Forces of Montenegro, aged 36.3±11 years. The sample of measurements included 18 indicators of motor skills for the evaluation of precision, balance, flexibility, speed, coordination, explosive power, repetitive strength, aerobic and anaerobic endurance. The central and dispersion parameters of the variables were calculated. It was determined that the motor profile of military pilots was not at a satisfactory level, except for indicators of aerobic endurance, and explosive and repetitive strength. The results obtained indicate the need to carry out further research to predominantly study the impact of a broad spectrum of motor predictors on the criterion in the form of simulation movements of military tasks typical for certain military specialties. This would provide important data pertaining to military organization in the sense of improving the assessment and development of the conditioning potentials of soldiers.

Keywords: *motor profile, motor skills, physical fitness, army, air force*

Introduction

The level of conditioning potential to a great extent reflects one's state of health and ability to perform different forms of physical activity related to everyday life, sport, or professional activities (Grygiel-Górniak et al., 2016). Motor skills in the military are important for performing tasks specific to its various units, or its more specifically determined military specialties. What this primarily refers to is the following: flying, diving, weighted and non-weighted marching as a part of conditioning, the evacuation and transport of the wounded, tactical procedures in offense and defense, saboteur anti-terrorist activities, alpine and mountain terrain activities, skiing and outdoor stay in winter conditions, search and rescue on land and at sea, and evacuation activities and rescue missions in case of natural and man-made disasters and catastrophes. It is clear that each of these activities requires a certain level and specific manifestation of the motor potential of soldiers (Banjević, 2021).

The military pilots should be ready to perform tasks that include survival training in extreme conditions, such as after a forced landing, crossing long distances on foot, etc. (Rintamäki et al., 2005; Tomczak, 2013). On the other hand, physical preparation is necessary in order to perform work tasks. Numerous studies indicate that physically fit pilots suffer significantly less from various disability than their less able colleagues (Rintala, Häkkinen, Siitonen, & Kyröläinen, 2015). Therefore, physical training seems to be very useful for a military pilots who aim to maintain adequate professional competence and health (Willardson et al., 2010; Rintala et al., 2015).

The profession of a military pilot is a privilege for certain individuals with highly developed psycho-physical characteristics. They require specially developed abilities, so as to be able to efficiently and safely operate aircrafts in various stressful and dangerous situations (Meško, 2008). The detection and development of special pilot skills is a very important factor in contemporary flight preparations (Carretta, 2000). The level of difficultly which dictates the work environment of a military pilot requires efficiency in manifesting their motor skills. This primarily refers to the time needed to receive and process information, as well as the specific motor response which is usually very complex (Temme et al., 1995). In that sense what is also required is the need to assess the dominant motor skills in the movement activity of military pilots.

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Motor status of Air Force pilots was assessed by vary motor tests in different armies (Jukić et al., 2008; Meško et al., 2013; Tomczak & Haponik, 2016). These motor tests are assessed on the basis of exercises measuring the strength of abdominal muscles and shoulders, speed, agility and running stamina (Tomczak, & Haponik, 2016). Military pilots are characterized by a medium level of physical fitness and a medium level of aerobic capacity (Tomczak, & Haponik, 2016).

However, the motor status of military pilots, is insufficiently researched, and also there are no previous studies that have investigated motor status of Montenegrin military pilots. Therefore, the aim of this research was to determine the target motor profiles of pilots of the Armed Forces of Montenegro. The achieved aim will provide feedback relevant for the aspect of gaining insight into the current state of the motor status of the participants, which will have a clear practical importance in the sense of the construction of effective training-transformational processes. In addition, the possible errors when defining and applying the current batteries for the evaluation of the conditioning potential of the members of the Armed Forces of Montenegro will be determined, whereby clear guidelines will be given to the military in the sense of improvements made to the evaluation system of the motor potential of soldiers.

Methods

Participants

This is a transversal study and consists of a one-time evaluation of the relevant motor indicators of military pilots. The sample of participants consisted of 20 military pilots of the Armed Forces of Montenegro, aged 36.3±11 yrs. The research was carried out in accordance with the Declaration of Helsinki.

Procedures and measures

The evaluation of the state of the participants' motor skills was carried out based on the performance and analysis of the following motor tests: pointing with a long implement, overhand horizontal throw at a wall target, the static tandem balance test in the eyes closed position, the seated forward bend test, the shoulder pole stretch, hand tapping, the 20m sprint with a high start, climbing up and down on a bench and the Swedish ladder wall bar, the figure eight running drill bending, seated medicine ball throw from the chest, the standing broad jump, pull-ups, 60 second squats, two-minute torso lifts, two-minute push-ups, the 300 yard dash with a change in direction, and the 3200 m run. The motor tests were used in accordance with the Protocol for the assessment of motor skills in the armed forces (Jukić et al., 2008).

Statistical analysis

The results were first systematized, then statistically processed on a PC using the SPSS 20.0 software (Statistical Package for Social Sciences, v20.0 SPSS Inc., Chicago, IL, USA). For all the applied indicators of motor status, the descriptive statistical parameters of the central tendency and measures of variability were calculated: the means, standard deviation, minimum result, maximum result, variation width, coefficient of variation, and standard error. Testing the normality of the distribution of the frequencies of the applied variables was carried out using the coefficient of asymmetry, skewness, and coefficient of flatness, kurtosis.

Table 1. The central and dispersion parameters of the motor skills variables of military pilots

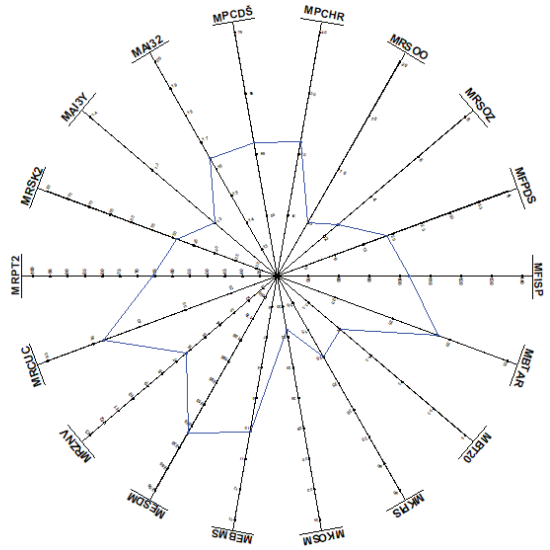
Variables	Min	Max	VW	M	Se	SD	KV	Sk	Ku
MPCDŠ	55.0	67.0	12.0	60.9	0.92	3.6	5.91	0.38	-0.71
MPHCR	13.0	28.0	15.0	21.8	1.18	4.6	21.10	-0.57	-0.30
MRSOO	2.8	8.5	5.7	5.0	0.37	1.4	28	0.77	1.13
MRSOZ	1.4	6.0	4.6	2.6	0.32	1.3	50	1.69	3.12
MFPDS	7.0	28.0	21.0	18.9	1.69	6.6	34.92	-0.54	-0.78
MFISP	58.0	134.0	76.0	103.3	4.45	17.2	16.65	-0.88	2.96
MBTAR	18.0	36.0	18.0	28.4	1.23	4.8	16.90	-0.47	0.31
MBT20	3.5	4.8	1.3	4.0	0.10	0.4	10	0.74	-0.42
MKPIS	14.7	33.2	18.5	19.9	1.42	5.5	27.63	1.71	2.08
MKOSM	19.3	25.2	5.9	21.8	0.46	1.8	8.25	0.38	-0.52
MEBMS	7.2	13.1	5.9	10.1	0.39	1.5	14.85	-0.04	0.05
MESDM	176.0	245.0	69.0	223.0	4.95	19.2	8.60	-0.97	1.00
MRZNV	1.0	11.0	10.0	6.3	0.78	3.0	47.61	-0.14	-0.99
MRČUČ	30.0	63.0	33.0	47.8	2.94	11.4	23.84	-0.18	-1.40
MRPT2	31.0	100.0	69.0	65.2	4.63	17.9	27.45	0.12	-0.09
MRSK2	28.0	77.0	49.0	49.1	3.63	14.1	28.71	0.10	-0.45
MAI3Y	1.1	1.4	0.3	1.2	0.03	0.1	8.33	0.37	-0.92
MAI32	13.2	19.5	6.3	16.4	0.46	1.8	10.97	-0.38	-0.30

Legend: Min – minimum result; Max – maximum result; VW – variation width; M – mean; Se – standard error; SD – standard deviation; KV – coefficient of variation; Sk – Skewness; Ku – Kurtosis; MPCDŠ – pointing with a long implement; MPHCR – overhand horizontal throw at a wall target; MRSOO – the static tandem balance test in the eyes open; MRSOZ – the static tandem balance test in the eyes closed; MFPDS – the seated forward bend test; MFISP – the shoulder pole stretch; MBTAR – hand tapping; MBT20 – the 20m sprint with a high start; MKPIS – climbing up and down on a bench and the Swedish ladder wall bar; MKOSM – the figure eight running drill bending; MEBMS – seated medicine ball throw from the chest; MESDM – the standing broad jump; MRZNV – pull-ups; MRČUČ – 60 seconds squats; MRPT2 – two-minute torso lifts; MRSK2 – two-minute push-ups; MAI3Y – the 300-yard dash with a change in direction; MAI32 – the 3200 m run.

Results

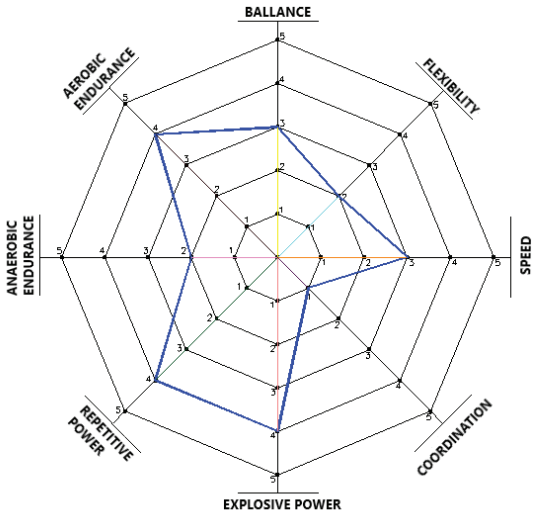
Table 1 shows the basic descriptive parameters of the motor skills of military pilots.

Based on the analysis of table 1, it can be concluded that the obtained distribution frequencies indicate that the applied motor tests consist of movement tasks of varying difficulty, but also that this did not lead to a significant dispersion of the results. An epikurtic asymmetry was noted for half of the motor tests. In that sense, two balance tests stand out predominantly, which is not surprising considering that pilots need to have precisely those features and abilities which were studied using the aforementioned measuring instruments. The negative asymmetry (hypokurtic) is moderate, which indicates a mild dominance of numerically greater results in the statistical series, and was determined in the distribution of frequencies of the remaining variables. The determined values of the motor status of the pilots of the AF of Montenegro are shown in graph 1.



GRAPH 1. The values of the motor status of military pilots

According to the standardized model (Jukić et al., 2008), estimates of individual motor skills of military pilots of the Montenegrin Air Force were obtained, which are shown in Graph 2.



GRAPH 2. Evaluations of the motor skills of military pilots

By analyzing the numerical values shown in graph 2, the motor skills of the military pilots of the AF of Montenegro were evaluated based on the following: balance – 3; flexibility – 2; speed – 3; coordination – 1; explosive power – 4; repetitive strength – 4; anaerobic endurance – 2; aerobic endurance – 4.

Discussion

It is of exceptional importance, when accepting a candidate into the armed forces, that the forces "get" members with those motor skills profiles are closest to those of an imaginary model of a soldier, who will spend the first few years of service performing jobs and tasks which are psychologically and physically very demanding. In addition, the members of the armed forces need to be in a constant "good form", their military readiness during the year as well as during several years must not be questioned, nor can it fall below the optimum level, which is a considerable difference from the "timing" of achieving top form characteristic of athletes (Banjević, 2012).

Members of the armed forces, unlike the individual athlete or members of a sports team, have an exceptionally broad range of activities which require of them to make use of all their human resources. This should be borne in mind, as it is not possible to use a unique criterion for the assessment and evaluation of the level of physical abilities for all structural segments of the military. However, that is the current state of affairs, even though we know that the air force, navy, or ground forces have different requirements, as do special units and the military police.

Although the results show variability in different motor skills, the level of physical performance of military pilots is not great. However, previous studies report a good level of performance of military pilots (Fogelholm et al., 2006; Sovelius, Salonen, Lamminen, Huhtala, & Hämäläinen, 2008; Meško et al., 2013; Rintala et al., 2015). It is expected that military pilots achieve significantly better results in relation to civilians on motor tests of coordination, speed and repetitive strength (Meško et al., 2013). The study (Tomczak, 2010) should also be pointed out, in which the level of motor skills between military pilots and students of the Faculty of Sports was compared. It was established that the students of the Faculty of Sports were better only in the speed of running at 15 m, and it should be added that the pilots were on average 14 years older. However, it should be noted that the results given are hardly satisfactory compared to typical athletic levels of endurance or strength sports (Montgomery, 2006). Also, Shin & Jee (2019) point out that the motor skills of military pilots have declined today compared to the results of their colleagues from 20 years ago. Compared to data collected in 2000, back force and explosive power decreased by 33% and 20%, respectively. Leg strength and balance parameters decreased by 10% and 30%, respectively (Shin & Jee, 2019).

One study (Idrizović & Banjević, 2013) has shown that, considering the determined association between individual predictor motor variables and the defined criterion in the form of a polygon used to simulate the movement activities of military pilots, the dominant motor skills in their case are: speed, coordination, anaerobic endurance, and explosive power of the lower extremities. Guided by these very significant findings, this study evaluated precisely these abilities, whereby it was concluded that in the case of military pilots, with the exception of aerobic endurance, and explosive and repetitive strength, they were at not at all at a satisfactory level. One of the main causes of such a state is precisely the development of those motor skills which are currently being tested in the military, that is, repetitive strength and aerobic endurance in particular.

Based on the achieved results, it is noticeable that Montenegrin military pilots achieved high results on explosive and repetitive strength tests, as well as on the aerobic endurance test, which is in line with previous research (Meško et al., 2013; Rintala et al., 2015). Also, the authors point out that good strength and endurance of the extensor muscles of the torso can prevent problems with the spine related to flying (Honkanen, 2019).

Average results were achieved in balance and speed tests and according to Shin & Jee (2019) these parameters have a negative growth in the last twenty years in the population of military pilots. Poor results achieved on tests of flexibility, anaerobic endurance and coordination. Although flexibility and anaerobic endurance are not considered crucial motor skills, on the other hand Tomczak (2015) points out that coordination skills are very important when it comes to military pilots.

This conclusion draws with it a series of facts which should be presented to the military, and one in particular is essential in the sense of improving the conditioning potential of soldiers of different specialties. It reads as follows: The current battery of tests for the evaluation of the conditioning potential of soldiers cannot be valid since it is identical for every unit within the armed forces and for military specialty. In fact, by applying it in its current form, no adequate feedback can be obtained on the state of important motor qualities which dominate the various movement tasks of soldiers. This could certainly be connected to the various energy balances in certain military specialties, which to a great extent dictate the level and quality of the manifestation of individual motor potentials. Specifically, years of research and experience from the field obtained by numerous armed forces have indicated that the conditioning preparedness for the performance of military activities consists of the following two basic elements of physical ability: the ability to do aerobic work (endurance) and muscle power (Sharp, Knapik, & Wallker, 2008). They represent two basic elements of the overall energy balance in the bodies of soldiers (Shvartz, & Reibold, 1990). The decrease in the values of these abilities due to age, and thus a considerable decrease in energy consumption, emerges as a result of morphological and functional changes in the cardiovascular system and skeleto-muscular system, while the speed of the decrease is influenced by numerous factors, primarily changes in body mass and the percentage of body fat during the course of one's lifetime (Buskirk, & Hodgson, 1987). According to the current Guidelines for testing the physical abilities of professional soldiers of the Armed Forces of Montenegro, for all the elements of the conditioning preparedness the tests and norms differ only in relation to age. This has provided support for the fact that the abilities of the human body decrease with age, but these norms are not associated with the requirements of various military duties.

Conclusion

Based on the obtained data, it was determined that the motor profile of military pilots is not at a satisfactory level, with the exception of indicators related to aerobic endurance, and explosive and repetitive strength. Also, the currently dominant battery of tests for the evaluation of the conditioning potential of the soldiers is not adequate from the aspect of the inability to perform a target evaluation of those motor skills which dominate the movement tasks of various military specialties.

The results of this research provide a contribution to shedding light on the state of the motor skills of military pilots and the validity of implementing the current battery of tests for the evaluation of the conditioning potential of soldiers. It is important to carry out more extensive research which would include the remaining military specialties, whereby primarily, based on determining the effects of a broad spectrum of motor predictors on the criterion in the form of a polygon for movement simulation, it would be possible to precisely define those motor skills which should be subjected to the processes of contemporary training technology. This would undoubtedly contribute to the improvement of the conditioning potential of the soldiers, and thus the increase in their overall combat readiness.

The special significance of this paper lies in the type of sample of participants, which could in a way also account for the limitation in the study in terms of any generalizations of the results. Still, bearing in mind the considerable significance of the army as a special part of the community, the theoretical and practical impact of this research is undeniable.

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Conflicts of interest
The authors declare that there are no conflicts of interest.

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