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**TÍTULO:** Desarrollo de las cualidades físicas de los cadetes durante diversas actividades deportivas.

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**RESUMEN:** El artículo presenta resultados del análisis comparativo del nivel de desarrollo de las cualidades físicas de los cadetes de la Institución de Educación Militar Superior (IEMS), que se dedicaron a diferentes tipos de deportes durante el estudio. 219 cadetes, que eran miembros de los equipos deportivos de IEMS en 15 tipos de deportes, participaron en la investigación. El nivel de

desarrollo de las cualidades físicas de los cadetes se evaluó de acuerdo con los resultados en carrera de 100 m, dominadas, superación de la carrera de obstáculos y carrera de 3 km. Se determinó que los cadetes que participaban en eventos multideportivos tenían el nivel más alto de desarrollo de las cualidades físicas. Esto demuestra la necesidad de utilizar ampliamente eventos multideportivos en el entrenamiento físico en IEMS.

**PALABRAS CLAVES:** entrenamiento físico, cualidades físicas, deporte, cadetes.

**TITLE:** Development of cadets' physical qualities during various sports activities.

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**ABSTRACT:** The results of the comparative analysis of the physical qualities development level of the cadets of higher military educational institution (HMEI), who were engaged in different kinds of sports during studying, are presented in the article. 219 cadets, who were the members of the HMEI sports teams in 15 kinds of sport, took part in the investigation. The level of the cadets' physical qualities development was evaluated according to the results in 100 m race, pull-ups, overcoming the obstacle course, and 3 km race. The cadets who were engaged in multisport events were determined to have the highest level of the physical qualities development. It proves the necessity to wide use multisport events in the physical training at HMEI.

**KEY WORDS:** physical training, physical qualities, sport, cadets.

## **INTRODUCTION.**

In today's hybrid wars, military-professional (combat) activities of military personnel take place under extreme environmental conditions with significant physical and psychological stress, increasing exhaustion and other unfavorable factors of combat activity (Groeller, et al., 2015; Habchuk, et al., 2016; Kyrolainen, et al., 2018; Oderov, et al., 2017).

The combat conditions require military personnel to have psychological stability, a proper level of physical and volitional powers development, military-applied motor skills, as well as sufficient reserve physiological capabilities of the organism (Burley, Drain, Sampson, & Groeller, 2018; Oliver, et al., 2017; Rolyuk, et al., 2016; Sergienko, & Andreianov, 2013; Santtila, Pihlainen, Viskari, & Kyrolainen, 2015). Military-applied sports contribute to the effective implementation of these requirements.

The analysis of scientific works (Prystupa, & Romanchuk, 2012; Prontenko, et al., 2019; Roljuk, & Lojko, 2014; Gibala, Gagnon, & Nindl, 2015) shows that military-applied sports activities promote the development of general and special physical qualities and applied skills, the formation of moral

and volitional qualities of military personnel. The endurance, strength, speed, agility, decisiveness, courage, self-management and the ability to orient in difficult conditions, purposefulness, and persistence are those qualities that are developed during the military-applied sports activities and on which the effectiveness of up-to-date military professional (combat) activity depends (Galimova, et al., 2018; Kudryavtsev, et al., 2018; Lodyaev, 1988; Manocchia, et al., 2013; Prontenko, et al., 2019; Starchuk, et al., 2017). However, the investigations on the comparison of the efficiency of various military-applied sports during cadets' of HMEI physical improvement with the purpose to improve their physical fitness level, applied skills, the efficiency of military-professional (combat) activity, are insufficient.

## **DEVELOPMENT.**

### **Methodology.**

The aim of this article is to investigate the impact of the various kinds of sports activities on the level of cadets' physical qualities development.

The research was conducted at Ivan Kozhedub Kharkiv National Air Force University. The cadets (male) of the 1<sup>st</sup> – 5<sup>th</sup> years of study, aged 18–25, who were the members of the sports teams of the HMEI in 15 kinds of sport, among which are military pentathlon, aeronautic multisport events, combined events, orienteering, hand-to-hand fighting, sports double-event, kettlebell lifting, CrossFit, arm sport, powerlifting, tug of war, futsal, volleyball, basketball, shooting with standard weapons, took part in the investigation.

The level of the cadets' physical qualities development was evaluated according to the results in the 100 m race, pull-ups, overcoming the obstacle course (400 m), and the 3 km race. The exercises check of cadets of all classes was conducted under the same conditions during the annual examination of the best organization of physical training and sporting and mass participation events. The uniform was military.

Research methods: theoretical analysis and generalization of literature, pedagogical observation, testing, questionnaire, statistical analysis.

Researches related to the involvement of cadets were carried out in compliance with all relevant national regulations and institutional policies (Order of the Minister of Defense of Ukraine "On Approval of the Regulation on the Organization of Scientific, Scientific and Technical Activities in the Armed Forces of Ukraine" dated 27.07.16, No. 385). An informed agreement was received from all the people involved in this research.

### **Results and discussion.**

The main form of the physical training of the Ukrainian Armed Forces, during which military personnel can be engaged in military-applied sports, is sporting and mass participation events (Griban, et al., 2014; Kamaiev, et al., 2018).

HMEI traditionally pays great attention to physical training and sporting and mass participation events. All necessary conditions for the cadets' sports activities are created. The classes in hand-to-hand fighting, kettlebell lifting, military pentathlon, aeronautic multisport events, sports double-event (shooting and hand-to-hand fighting), combined events, orienteering, CrossFit, arm sport, powerlifting, tug of war, shooting with standard weapons, futsal, volleyball, basketball, etc are functioning actively.

The sports competitions in more than 20 kinds of sport and military-applied exercises are held among the cadets. The examination of the best organization of physical training and sporting and mass participation events are carried out every year. The sportsmen of HMEI take part in the championships of the world, Ukraine, the Armed Forces of Ukraine, international competitions of the International Military Sports Council, championships of the region and the city systematically. Every year the Candidate Masters of Sports, Masters of Sports, Masters of Sports of International Class in different kinds of sports are graduated to serve for the Armed Forces of Ukraine.

The study results of level of cadets' physical qualities development who were engaged in different kinds of sports during studying are shown in Tables 1–4.

The analysis of the cadets' of various sports specializations speed performance according to the results in the 100 m race showed that the multisport events (combined events – 12.74 sec, military pentathlon – 12.83 sec), orienteering (13.04 sec), CrossFit sportsmen (13.08 sec), and representatives of game sports (futsal – 13.04 sec, basketball – 13.07 sec) were determined to have the highest results (Table 1).

The cadets engaged in shooting and tug of war were defined to have the worst results (13.82 sec and 14.07 sec respectively). Despite the fact that the 100 m race is not one of the competitive disciplines in military pentathlon and orienteering, the cadets attending these classes were ranked the 2<sup>nd</sup> and the 3<sup>rd</sup> concerning the level of speed performance.

The comparison of the results of the multisport events sportsmen ranked the 2<sup>nd</sup> and the 3<sup>rd</sup> in the 100 m race with the indicators of the cadets of other sports classes indicates that they are better than the ones of the sportsmen of the majority of sports classes authentically ( $p < 0.05$ – $0.001$ ), excluding CrossFit, futsal, and basketball ( $p > 0.05$ ) (Table 1).

In general, the average results in the 100 m race of the sportsmen of all sports classes (excluding the tug of war class) are evaluated as excellent (the standard for achieving an excellent level for cadets of the 5<sup>th</sup> year of study accounts for 13.8 sec). The speed performance of the cadets from the tug of war class is evaluated as good.

**Table 1.** The results in the 100 m race of the cadets who were engaged in different kinds of sports during studying (n=219,  $X \pm m$ , sec).

Kinds of sports	n	The average result	Ranking place
Combined events	12	12.74±0.12	1
Military pentathlon	16	12.83±0.11	2
Orienteering	11	13.04±0.12	3
Futsal	20	13.04±0.09	4
Basketball	12	13.07±0.12	5
CrossFit	10	13.08±0.12	6
Powerlifting	18	13.28±0.10	7
Aeronautic multisport events	12	13.29±0.13	8
Volleyball	14	13.35±0.11	9
Sports double-event	14	13.39±0.09	10
Hand-to-hand fighting	15	13.47±0.10	11
Armsport	16	13.59±0.11	12
Kettlebell lifting	14	13.77±0.10	13
Shooting with standard weapons	9	13.82±0.13	14
Tug of war	10	14.07±0.13	15

The analysis of the cadets' development of power qualities according to the results in pull-ups proves that the representatives of strength sports and multisport events that consider pull-ups one of the competitive disciplines are defined to have the best average results. Thus, the cadets of the CrossFit (24.37 reps), combined events (23.69 reps) and kettlebell lifting classes (22.65 reps) took the top-ranking places (Table 2). The representative of the powerlifting (22.40 reps) and arm sport classes (21.81 reps) also showed quite high results.

The representatives of the game sports (15.28–16.40 reps) and tug of war classes (14.83 reps) were discovered to have the worst development level of power qualities. The results of the cadets engaged in military pentathlon are worse authentically ( $p > 0.05$ ) than the ones of the cadets attending the classes in CrossFit and combined events. Besides, the indicators of the multisport events sportsmen are better authentically ( $p < 0.05$ – $0.001$ ) than the results of the cadets engaged in shooting, game sports, and tug of war. The level of power qualities of the cadets of all the sports classes is estimated as excellent (the standard is 16 reps).

**Table 2.** The results in pull-ups of the cadets who were engaged in different kinds of sports during studying (n=219,  $\bar{X} \pm m$ , reps).

Kinds of sports	n	The average result	Ranking place
CrossFit	10	24.37±1.27	1
Combined events	12	23.68±1.38	2
Kettlebell lifting	14	22.65±0.96	3
Powerlifting	18	22.40±1.15	4
Armsport	16	21.81±1.22	5
Military pentathlon	16	19.85±1.04	6
Sports double-event	14	18.50±1.07	7
Hand-to-hand fighting	15	18.25±0.98	8
Orienteering	11	17.96±1.44	9
Aeronautic multisport events	12	17.85±1.41	10
Shooting with standard weapons	9	16.87±1.53	11
Volleyball	14	16.40±1.30	12
Futsal	20	15.91±1.11	13
Basketball	12	15.28±1.23	14
Tug of war	10	14.83±1.73	15

The analysis of the results in overcoming the obstacle course (400 m) showed that the multisport events sportsmen (military pentathlon – 1 min 48 sec, combined events – 1 min 48 sec, aeronautic multisport event – 1 min 53 sec) were defined to have the highest results and ranking places (Table 3). The cadets attending the classes in shooting and tug of war had the worst results in the development of military-applied skills (2 min 07 sec and 2 min 13 sec respectively).

The statistical analysis showed that the results of pentathlon sportsmen (the 1<sup>st</sup> ranking place) are the same as the results of the cadets of the combined events class authentically ( $p > 0.05$ ). In comparison with the other classes, the results of pentathlon sportsmen are better authentically ( $p < 0.05 - 0.001$ ) that indicates the high efficiency of military pentathlon concerning the formation of applied skills of the future officers of the Ukrainian Armed Forces.



**Table 3.** The results in the obstacle course overcoming of the cadets who were engaged in different kinds of sports during studying (n=219,  $X \pm m$ , sec).

Kinds of sports	n	The average result	Ranking place
Military pentathlon	12	107.92±1.23	1
Combined events	16	108.15±1.18	2
Aeronautic multisport events	12	113.38±1.25	3
Futsal	20	118.85±1.34	4
Orienteering	11	119.17±1.30	5
Armsport	16	121.54±1.19	6
Hand-to-hand fighting	15	122.16±1.20	7
Kettlebell lifting	14	123.52±1.33	8
Volleyball	14	123.76±1.50	9
Sports double-event	14	123.79±1.27	10
Powerlifting	18	124.02±1.24	11
CrossFit	10	124.10±1.55	12
Basketball	12	125.08±1.69	13
Shooting with standard weapons	9	126.67±1.48	14
Tug of war	10	132.51±2.05	15

The analysis of the endurance development of the cadets of different sport specializations according to the results in the 3 km race proves similar trend to the obstacle course overcoming, when the multisport events sportsmen are determined to have the best results: combined events – 10 min 42 sec, military pentathlon – 10 min 45 sec, orienteering – 10 min 57 sec (Table 4).

The results of cadets engaged in combined events do not differ authentically from the ones of the cadets attending the classes in military pentathlon and orienteering ( $p > 0.05$ ). The indicators of pentathlon sportsmen are better than the average results of the representatives of the other sports classes authentically ( $p < 0.05 - 0.001$ ).

The cadets engaged in powerlifting (12 min 02 sec), shooting (12 min 06 sec) and tug of war (13 min 03 sec) were found out to have the worst results in the 3 km race. Except for the representatives of these sports classes, an average endurance level of the cadets is evaluated as excellent (the standard for the cadets of the 5<sup>th</sup> year of study is 12 min 00 sec).

**Table 4.** The results in the 3 km race of the cadets who were engaged in different kinds of sports during studying (n=219,  $X \pm m$ , sec).

Kinds of sports	n	The average result	Ranking place
Combined events	12	642.39±6.71	1
Military pentathlon	16	645.27±6.41	2
Orienteering	11	657.28±6.95	3
Futsal	20	679.19±7.05	4
Kettlebell lifting	14	684.51±6.25	5
Aeronautic multisport events	12	686.11±7.02	6
Sports double-event	14	696.14±6.45	7
Basketball	12	698.57±7.82	8
Hand-to-hand fighting	15	702.80±6.34	9
Volleyball	14	715.38±7.70	10
Armsport	16	717.39±6.14	11
CrossFit	10	718.93±7.22	12
Powerlifting	18	722.10±6.77	13
Shooting with standard weapons	9	726.40±8.01	14
Tug of war	10	783.29±10.43	15

The analysis of the point total for 4 exercises performed by the sportsmen of the different sports classes of the HMEI showed that the sportsmen of the combined events (164.8 points) and military pentathlon classes (163.4 points) had the biggest amount of points (Fig. 1).

The cadets specializing in orienteering and futsal (146.5 and 140.3 points respectively) showed almost the same level. The cadets attending the sports classes in aeronautic multisport events, kettlebell lifting, CrossFit, arm sport, sports double-event, hand-to-hand fighting, powerlifting, volleyball, and basketball have slightly lower but almost the same point total (127.5–134.8 points). The cadets attending the sports classes in shooting (112.9 points) and tug of war (97.6 points) were determined to have the worst level of physical fitness.

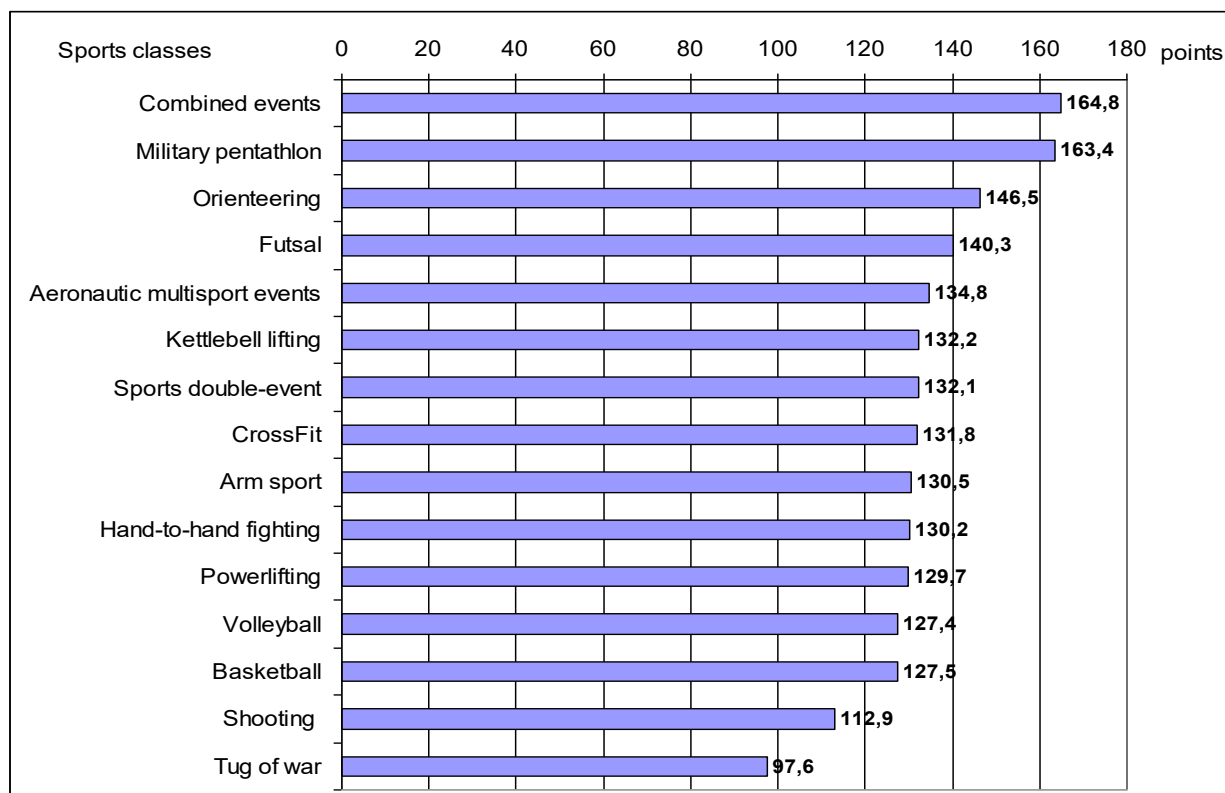


Fig. 1. The comparative analysis of the physical fitness level of the cadets who were engaged in different kinds of sports during studying according to the point total for 4 exercises performance.

Thus, the cadets engaged in combined events were determined to have the highest physical fitness level. And this is obvious because all the exercises that were used for our study (except for the obstacle course) are the competitive disciplines in this sport. However, the pentathlon sportsmen showed quite a high development level of physical qualities, although these exercises are not included in military pentathlon. It proves a positive influence of the military pentathlon activities on the level of the physical fitness of the HMEI cadets. Moreover, none of the studied sports but the military pentathlon promotes the formation of the professionally important motor abilities of the future Ukrainian officers.

Except for the cadets attending the abovementioned sports classes, the representatives of orienteering, futsal, aeronautic multisport events, sports double-event, hand-to-hand fighting, kettlebell lifting, arm sport, powerlifting showed quite a high physical fitness level. It indicates a high level of general physical fitness of the cadets engaged in these sports.

## **CONCLUSIONS.**

The results of the cadets attending combined events classes are determined to be the highest among the representative of the sports classes.

The cadets engaged in combined events are found out to have the highest results in the 100 m and 3 km races (12.74 sec and 10 min 42 sec respectively); the cadets specializing in CrossFit – the highest results in pull-ups (24.37 reps); the military pentathlon sportsmen – in the obstacle course overcoming (1 min 48 sec). This indicates the necessity of the implementation of multisport events (combined events, military pentathlon, and aeronautic multisport events) like the efficient means of the formation of military-applied skills of the cadets who are the future officers of the Ukrainian Armed Forces, into the system of physical training at HMEI.

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