











## Interrelation of Physical, Professional and Combat Performance of the Future Officers Engaged in Strength Sports during Studying

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### Abstract

The paper presents the correlation analysis results of the paratrooper cadets' indicators of basic physical qualities development and their results in the standards of combat training. The study involved cadets (male) of the Faculty of Air Assault Forces training of the Odesa Military Academy (Ukraine) of the 1st – 4th years of study (aged 18-22 years), who attended academy Crossfit classes while studying (n=40). The results of the cadets engaged in Crossfit in physical fitness were compared with the results of the cadets of the same faculty who did not play sports (n=216). The study was conducted in 2018-2019. The level of physical qualities development was assessed by the results of cadets' performance in the following exercises: the 100 m run (speed), pull-ups (power qualities), the 3 km run (endurance). Training and combat activities of paratrooper cadets were assessed according to the standards of tactical and fire training. It was found that most standards of tactical training had medium and high degrees of relationship with the cadets' level of physical qualities development of ( $r=0.33-0.85$ ). The highest correlation coefficients were recorded in terms of the standards that have a pronounced motor component of combat activity ( $r=0.71-0.85$ ). According to most standards, cadets engaged in Crossfit had higher correlation coefficients than the cadets who were studying according to the traditional system of physical training, which confirms the importance of strength sports to increase the combat readiness of the future officers of the Ukrainian Air Assault Forces.

**Keywords:** physical training, physical qualities, paratrooper cadets, Crossfit.

### 1. Introduction

The specificity of modern military conflicts and combat activities, along with maneuverability, tension, and dynamism is marked by rapid and unexpected changes in the situation with the use of various means of armed struggle, uneven development of hostilities, when personnel must be ready to act in any climate, geographical nature, withstanding significant physical and mental stress [1-5]. Despite the fact that modern technology is widely used in the service of military personnel of different military branches, a service member decides on the final result in combat activity, and a high level of individual training of each service member increases the combat potential of the armed forces [6-10].

Scientists note that the units of the Air Assault Forces (AAF), which must have high operational mobility, deploy combat activities on the flanks and in the enemy's rear in a short time, maneuver quickly, strike vital locations of the enemy boldly and suddenly, meet the modern requirements of combined arms warfare the most [11]. The main tasks of the AAF are disruption of control of enemy troops and activities in the enemy's rear; preventing the planned use of reserves by the enemy; fighting assault forces of the enemy; occupation and maintenance of important objects and boundaries in order to ensure the smooth and timely

operation deployment in certain operational areas. In addition to the main tasks, the AAF can participate in the fight against illegal armed groups, international operations to maintain peace and security, measures to protect the lives and health of citizens and state property outside Ukraine, and perform other tasks defined by the laws of Ukraine [11 -13].

Modern combat activities of the AAF require a high level of physical qualities development, as they involve long-lasting route marches with full armor on, accelerated movement with additional loads, manual execution of a large amount of work, loading ammunition, overcoming artificial and natural obstacles, i.e. they have a pronounced motor component [11, 12, 14].

One of the modern and effective means of physical education of paratrooper cadets can be Crossfit, which has a number of advantages in comparison with the traditional means of forming the physical readiness of paratrooper cadets to perform the tasks assigned to them.

The essence of Crossfit is to perform simple and clear exercises for the development of different muscle groups by the method of high-intensity circuit training. Crossfit is unique in the way that there are many variations of exercise combinations, mainly power-oriented, and each workout is significantly different from the previous one [15-20]. The main advantages of crossfit, in comparison with the traditional means of physical training and military-applied sports, for the development of physical qualities of paratrooper cadets are the lack of material costs for equipment (most exercises are performed with their own body weight, improvised means, and natural conditions); the minimization of time for classes (a short period of time is spent on performing sets of exercises); possibility to exercise under any conditions (in a sports hall, in limited space, in field conditions); availability for service members with different levels of physical fitness; many opportunities to vary loads (a wide range of simple and available exercises that can be combined into different complexes, it eliminates the possibility of adaptation to the same type of load); the possibility of conducting training for a large group of service members; the efficiency of the professionally important physical qualities development and the improvement of functional capabilities of service members of the Ukrainian AAF; the formation of knowledge and skills of service members on independent use of crossfit complexes in future professional activity.

**The aim of the study** is to investigate the interrelation between the physical, professional and combat performance of the future Air Assault Forces officers engaged in strength sports (Crossfit) in the process of studying.

## 2. Method

The study was conducted in 2018-2019 in the Odesa Military Academy (Ukraine). The study involved cadets (male) of the Faculty of Air Assault Forces training of the 1st - 4th years of study (aged 18-22 years), who attended academy Crossfit classes while studying (group №1, n=40). The results of the cadets engaged in Crossfit in physical fitness were compared with the results of the cadets of the same faculty who did not play sports (group №2, n=216). The level of physical qualities development was assessed by the results of cadets' performance in the following exercises: the 100 m run (speed), pull-ups (power qualities), the 3 km run (endurance). Training and combat activities of paratrooper cadets were assessed according to the standards of tactical standards (boarding of personnel in a helicopter (1T); covert advance to the enemy's object (7T); movement on the battlefield (8T); trench and (fire) positions occupation (10T), the delivery of ammunition under enemy fire (15T), landing on the car through the tailgate (22T), attack on the front edge of the enemy's defenses moving on foot (30T)) and fire training (incomplete disassembly of weapons (11FT), assembly of weapons after incomplete disassembly (12FT), stacking combat kit in combat vehicles (18FT)).

Research methods included the theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, testing, and methods of mathematical statistics. During the examinations, the authenticity of the difference between the cadets' indicators was determined due to the Student's t-test. The significance for all statistical tests was set at  $p < 0.05$ .

## 3. Results and Discussion

The study of the results in pull-ups showed that in the 1st year of study, the indicators of the cadets of both groups №1 and №2 did not differ significantly ( $p > 0.05$ ) (Table 1). In the 2nd year of study, the cadets of group №1 were recorded to have significantly better results in comparison with the cadets of group №2, by 2.2 times ( $p \leq 0.05$ ), in the 3rd year - by 3.8 times ( $p \leq 0.001$ ), and in 4th year - by 6.1 times ( $p \leq 0.001$ ). During the period of study at the academy, the results in this exercise increased significantly in both groups: in

group №1 – by 8.7 times ( $p \leq 0.001$ ), in group №2 – by 2.9 times ( $p \leq 0.001$ ). The best results in pull-ups in both groups were found in the 4th year of study, which indicated a positive dynamics of the paratrooper cadets' results in this exercise both during training according to the current system of physical education and Crossfit training. In addition, the level of power qualities development of the cadets of both groups was assessed as "excellent" during all years of study.

The analysis of the results in the 100 m run showed that in the 1st year of study, the results of the cadets of both groups did not differ significantly ( $p > 0.05$ ) (Table 1). During the 2nd and 3rd years, the indicators of speed development of the cadets of both groups №1 and №2 were improved in comparison with the 1st year of study but did not differ significantly ( $p > 0.05$ ). In the 4th year, the results of the cadets, who attended academy Crossfit classes, were significantly better than in the group of cadets who were training according to the current system of physical training, by 0.5 s ( $p \leq 0.05$ ). This indicated the effective impact of Crossfit training not only on the power qualities of paratrooper cadets but also on the speed ones. The analysis of the cadets' dynamics of speed qualities while studying at the academy showed that the results of the 100 m run improved significantly in both groups – the best results were found in the 4th year of study. However, in group №2, the difference in the indicators between the cadets of the 4th and 1st years accounted for 0.6 s ( $p \leq 0.01$ ), and in group №1 – for 1 s ( $p \leq 0.05$ ), which indicated a more pronounced effect of Crossfit classes on the speed qualities development of the future officers of the Ukrainian AAF, in contrast to the classes according to the current system of physical training. The level of speed qualities development of the cadets of both groups was assessed as "excellent" in all years of study.

**Table 1.** Comparative analysis of the physical qualities development of the cadets of both groups №1 and №2 during studying ( $n=256$ )

Years of study	Group №1 ( $n=40$ )		Group №2 ( $n=216$ )		Significance value	
	n	$\bar{X} \pm m$	n	$\bar{X} \pm m$	t	p
Pull-ups, times						
1st	7	14.5 $\pm$ 1.21	63	14.2 $\pm$ 0.34	0,22	$p > 0,05$
2nd	14	18.0 $\pm$ 1.02	54	15.8 $\pm$ 0.29	2,07	$p \leq 0,05$
3rd	10	20.5 $\pm$ 0.89	50	16.7 $\pm$ 0.26	4,10	$p \leq 0,001$
4th	9	23.2 $\pm$ 0.92	49	17.1 $\pm$ 0.28	6,34	$p \leq 0,001$
$t_{1-4}$ (p)		5.41 ( $p \leq 0.001$ )		6.58 ( $p \leq 0.001$ )		
The 100 m run, s						
1st	7	14.2 $\pm$ 0.31	63	14.3 $\pm$ 0.14	0,29	$p > 0,05$
2nd	14	13.9 $\pm$ 0.27	54	14.0 $\pm$ 0.12	0,34	$p > 0,05$
3rd	10	13.5 $\pm$ 0.20	50	13.9 $\pm$ 0.11	1,75	$p > 0,05$
4th	9	13.2 $\pm$ 0.19	49	13.7 $\pm$ 0.12	2,22	$p \leq 0,05$
$t_{1-4}$ (p)		2.75 ( $p \leq 0.05$ )		3.25 ( $p \leq 0.01$ )		
The 3 km run, s						
1st	7	773.4 $\pm$ 12.05	63	776.5 $\pm$ 7.54	0,22	$p > 0,05$
2nd	14	739.8 $\pm$ 11.57	54	750.7 $\pm$ 7.79	0,78	$p > 0,05$
3rd	10	719.9 $\pm$ 11.26	50	738.6 $\pm$ 7.61	1,38	$p > 0,05$
4th	9	701.2 $\pm$ 10.68	49	727.4 $\pm$ 7.42	2,02	$p \leq 0,05$
$t_{1-4}$ (p)		4.07 ( $p \leq 0.001$ )		4.67 ( $p \leq 0.001$ )		

The study of the results in the 3 km run showed that in the 1st year of study, the indicators of the cadets of both groups №1 and №2 did not differ significantly ( $p > 0.05$ ) (Table 1). Despite the fact that in the 2nd and 3rd years of study, the level of endurance development of the cadets engaged in Crossfit was better, in comparison with the results of cadets who were training according to the current system of physical education, by 10.9 s and 18.7 s respectively, a significant difference between the average results of the groups were not detected ( $p > 0.05$ ). In the 4th year, the cadets of group №1 had significantly better results in the 3 km run (11 min 41 s) than the cadets of group №2 (12 min 07 s) by 26.2 s ( $p \leq 0.05$ ). During the study at the academy, the results of the cadets of both groups in the 3 km run improved authentically ( $p \leq 0.001$ ) by 1 min 12.2 s in group №1, and by 49.1 s in group №2. The comparison of the obtained results with the normative

requirements showed that the level of endurance development was assessed as "satisfactory" in both groups in the 1st year of study. In the 2nd – 4th years of study, the results were assessed as "good" in group №2 and as "excellent" in group №1. This confirmed one more time the positive impact of Crossfit training on the development of all physical qualities of paratrooper cadets, in particular, endurance.

The results of the correlation analysis are presented in Table 2.

**Table 2.** The relationship between the level of physical qualities development and the results of the compliance with the standards for combat training of the cadets of groups №1 (n=40) and №2 (n=216) (c.u.)

Standards for combat training	The 100 m run		Pull-ups		The 3 km run	
	Group №1	Group №2	Group №1	Group №2	Group №1	Group №2
1T	0.71	0.66	-0.49	-0.34	0.62	0.57
7T	0.68	0.61	-0.27	-0.24	0.69	0.62
8T	0.74	0.65	-0.24	-0.19	0.72	0.70
10T	0.72	0.67	-0.33	-0.27	0.74	0.71
15T	0.55	0.53	-0.61	-0.56	0.67	0.63
22T	0.48	0.45	-0.52	-0.50	0.44	0.38
30T	0.51	0.46	-0.33	-0.29	0.85	0.79
11FT	0.26	0.18	-0.28	-0.25	0.35	0.29
12FT	0.22	0.17	-0.25	-0.20	0.37	0.30
18FT	0.38	0.28	-0.77	-0.72	0.59	0.51

Note. r extreme for the cadets of group №1 – 0.310 (at  $p \leq 0.05$ ), for the cadets of group №2 – 0.196 (at  $p \leq 0.05$ )

In the process of correlation analysis, it was found that

- most of the studied standards of combat training of paratrooper cadets (except for the standards of fire training) had medium and high degrees of relationship with the level of all physical qualities development of the cadets of both groups ( $r=0.33-0.85$ ), which confirmed the conclusions of many scientists and the results of their own research on the need to improve the comprehensive physical fitness of paratrooper cadets in order to improve the efficiency of their training and future military professional (combat) activities;

- the highest correlation coefficients were recorded in terms of the standards that had a pronounced motor component of professional activity (the results in the 100 m run correlate with the standards of movement on the battlefield ( $r=0.65-0.74$ ), boarding in a helicopter ( $r=0.66-0.71$ ), occupation of fire positions ( $r=0.67-0.72$ ); the results in pull-ups correlate with the delivery of ammunition under enemy fire ( $r=-0.56--0.61$ ), stacking a combat kit in combat vehicles ( $r=-0.72--0.77$ ), the 3 km run – with the movement on the battlefield ( $r=0.70-0.72$ ), attack on the front edge of the enemy's defenses moving on foot ( $r=0.79-0.85$ ) and other standards);

- according to most standards, the cadets of group №1 had higher correlation coefficients than the cadets of group №2.

Thus, the correlation analysis of the level of physical qualities development of paratrooper cadets and the results of their compliance with the standards of combat training showed a fairly high level of relationship between the cadets' physical fitness, formed in the process of Crossfit training, and combat training. This states the efficiency of Crossfit training in terms of the improvement of the training and military professional (combat) activities of paratrooper cadets – future officers of the AAF.

The obtained results complement the conclusions of the works of many scientists [21-33] and expand them.

#### 4. Conclusions

1. A comparative analysis of the level of physical qualities development of the cadets who were engaged in Crossfit and the cadets who were training according to the current system of physical education, showed a positive effect of Crossfit training on the improvement of physical fitness of paratrooper cadets. Thus, in the senior years of study, the indicators of cadets engaged in Crossfit turned out to be significantly



better in terms of all the studied indicators ( $p \leq 0.05-0.001$ ).

2. The relationship between the indicators of physical fitness and combat readiness of cadets-future officers of the AAF was established. Thus, correlation analysis showed that most standards of combat training had medium and high degrees of relationship with the level of physical qualities development of cadets ( $r=0.33-0.85$ ); the highest correlation coefficients were recorded in terms of the standards that had a pronounced motor component of combat activity ( $r=0.71-0.85$ ). According to most standards, the cadets, who attended academy Crossfit classes, had higher correlation coefficients than the cadets who studied according to the current system of physical education, which confirmed the importance of Crossfit classes to increase the combat readiness of future specialists of the Ukrainian Armed Forces.

**The prospects for further research** are to study the impact of Crossfit classes on the health of cadets.

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