

GROUNDS OF OPTIMUM LEVEL OF DEVELOPMENT OF BASIC PHYSICAL QUALITIES WHICH PROVIDE HIGH LEVEL THE FUNCTIONAL STATE OF STUDENTS IN THE PERIOD OF FLYING TRAINING

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Annotation. Directions of scientific ground of optimum level of development of basic physical qualities of students are considered in the period of the flying training. 247 students of 1-4 courses took part in an experiment. Monitoring of level of psychophysical preparedness is carried out, functional being and flying training of students in the different stages of the flying teaching. The decline of indexes of level of development of some psychophysiological and psychomotor qualities is set on the last period of teaching. It is related to the overstrain of functional and physiological backlogs of organism as a result of growth of the professional loadings. The optimum levels of development of general physical qualities, flying capabilities, functional state of students are certain. Dany of recommendation in relation to the parameters of the training loading during sporting mass work.

Keywords: optimum, level, functional, state, pilot.

Introduction

Reorganization of Ukrainian Air Armed Forces (AAF) especially sharply put forward a question about quality of training of military specialists. First of all it concerns the most complex kinds of professional activity, to which profession of military pilot belongs.

Professional training of pilots belongs to such components of aviation system, where there is great quantity of important factors, timely revelation of which ensures safety of flights by improving of training process [1, 8].

Difficult economic situation in the country resulted in negative after-effects in cadets' professional training, including cadets of flight specialties. Quantity of practical flight hours of one cadet decreased, while flight training program stipulates certain scope of hours for mastering pilot techniques, navigation and familiarizing with combat application of pilot techniques. Pilot practice started to depend on reserves of fuel that resulted in still longer intervals in pilot practice. [3].

Intervals in flight practice started to threaten safety of flights and professional level of pilot.

As our research has showed problem of physical training of cadets at different stages of professional formation and perfection in military HEE is not a new, insufficiently studied one [2, 4, 5, 7, 10]. Nevertheless, reformation of education requires studying of this problem from positions of modern technologies of improvement of quality of education in compliance with new state educational standards [2, 6].

Researches, which have been being carried out since creation of AAF of Ukraine, practically have not touched the problem of pedagogical process's optimization in pilots' physical training in flight practice period.

Analysis of scientific pedagogical literature on the studied problem points that optimization of educational process is still the factor, which intensifies pedagogical process and requires determination of pedagogical conditions, factors, methods and forms, which would influence on optimization of pedagogical process of special physical training (SPT) in flight practice period of cadets' training.

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Purpose, tasks of the work, material and methods

The purpose of the research is to scientifically ground optimal level of development of main cadets' physical qualities in the period of flight practice trainings.

For achievement of the purpose of the research we carried out monitoring of level of professionally important qualities, psycho-physical conditions, functional state and practical pilot experience⁴ on different stages of pilot training.

For solution of the set tasks we used the following methods: theoretical analysis and generalization literature sources, orders, which regulate flight training, in order to ground the directions of pilot-cadets' SPT during flight practical training; empiric study of actual state of cadets' special physical training in period of flight training; determination of physical conditions and functional level, pedagogical experiment for determination of effectiveness of special physical training's model; mathematical processing of the obtained empirical data on computer with the help of mathematical statistics methods. Pilot faculty of Kharkov university of Air Forces, named after I. Kozhedub (KUAF) served as experimental base. 247 of respondents – 1-4 years cadets took part in experiment.

Results of the researches

In the course of research we established influence of specificity of professional activity on different individual psychic, physical features and on functional state of cadets. It is conditioned by the following: combination of influences of different by content and scope kinds of activity (theoretical learning, training on simulators, physical training, initial stage of flight training, replacement of training aircraft by training-combat one, flight with instructor and independent flights, different flight tasks and so on); by different extent of cadets' adaptation to conditions and content of flight training, by different initial level of psychic and physical development and etc.

During first period of study (1st – 2nd years) especially expressed dynamics of development of physical qualities was registered: there increased indicators ($p \leq .05$) of development of strength, indicators of quickness, general endurance ($p \leq 0.001$), special qualities ($p \leq 0.001$) and functional state ($p \leq 0.05$) (See table 1).

In the second period of study (2nd-3rd years) there happens further substantial ($p \leq 0.01$) increment of indicators, which characterize development of strength, quickness; expressed increment of functional state indicators, general endurance ($p < .001$), level of special qualities significantly changed ($p < 0.01$).

In third period of study (3rd- 4th years of study) there happens reduction of functional state growth ($p \leq 0.5$); quickness indicators significantly drop ($p < 0.001$); such indicators as strength also reduce but insignificantly. Indicators of special qualities, general endurance have stable positive dynamics in their development. It should be noted that indicators of all physical qualities confidently increased ($p \leq 0.001$ - $.01$) for 4 years period of study.

Table 1

Indicators of cadets' physical conditions and functional state in period of their study (n=59; $\bar{X} \pm m$ in points)

Physical abilities	Year of study			
	1	2	3	4
Strength	29.08±0.67	31.59±0.69*	35.46±0.7**	34.47±0.56
Quickness	30.14±0.76	32.46±0.68***	32.76±0.6**	32.17±0.6***
General endurance	24.9±0.87	25.4±0.82***	29.42±0.84***	29.58±0.75
Special features	24.06±0.64	25.63±0.57***	26.34±0.56***	26.47±0.56
ИФС	60.5±0.17	64.1±0.16*	78.6±0.16***	69.1±0.16*

*) level of statistic significance of average values' differences $p < 0.05$

**) level of statistic significance of average values' differences $p < 0.01$

***) level of statistic significance of average values' differences $p < 0.001$

Significant variability of dynamics of cadets' special physical qualities and functional state in the period of their study witnesses, on the one hand, about non-uniformity of changes and heterochronic character of psycho-physical phase of development in young age and, on the other hand, these results reflect influence of professional activity. For example, reduction of indicators of some psycho-physiological and psycho-motor qualities on the last stage of study, is evidently connected with overstrain of functional and first of all physiological reserves of organism as a result of professional loads, while cognitive, psychic processes have stable positive dynamics in their development.

It was proved by psycho-physiological examination of cadets on simulator.

The established regularities of development of some qualities shall influence on dynamics of flight training's results. For this purpose, in order to prove this assumption, we analyzed the levels of physical abilities, which permit to achieve the best results of flight training with maintaining of high functional level of KUAf pilot-cadets.

Solution of this task implies finding of adequate models for prediction of high level of flight training with high level of functional state (FSL) as functions of independent variables' level and determination of optimal levels of these independent variables (main physical abilities: endurance, quickness, strength).

Equation for determination of flight skills and functional state (in points) is as follows with ($p \leq 0.05$):

$$R_{fl.sk.} = 10.54 - 0.07 \times R_{quick.} + 0.15 \times R_{str.} + 2.12 \times R_{end.}$$

$$R_{fsl} = 51.28 + 0.02 \times R_{quick.} - 0.15 \times R_{str.} + 1.28 \times R_{end.}$$

Where: $R_{quick.}$ – level of quickness; $R_{fl.sk.}$ – level of flight skills; $R_{str.}$ – level of strength; $R_{fsl.}$ – level of functional state; $R_{end.}$ – level of endurance.

For solution of optimization task (FSL maximization with maximization of flight skills' level) we shall use method of in-depth analysis in Windows STATISTICA – construction of Desirability Profiles [9].

In fig. 1 we present results of combined function of desirability. Searching for profile, we obtained FSL value = 99.3 points (high level) and value of flight skills = 95.8 points (high flight skills), general value of Desirability Profiles – 0.83 of conventional unit.

These values are obtained at the level of components: level of quickness development 43.4 points, level of strength's development - 24.8 points, level of endurance development - 39,7 points. Such level of motion abilities'

development conditions functional preparedness, productivity of leading energy-supply mechanisms in mastering of aircrafts of appropriate kind of aviation and of all kinds of flight. The program of motion abilities' development, realized at physical culture trainings in experimental group, was oriented on reaching of such level of motion abilities.

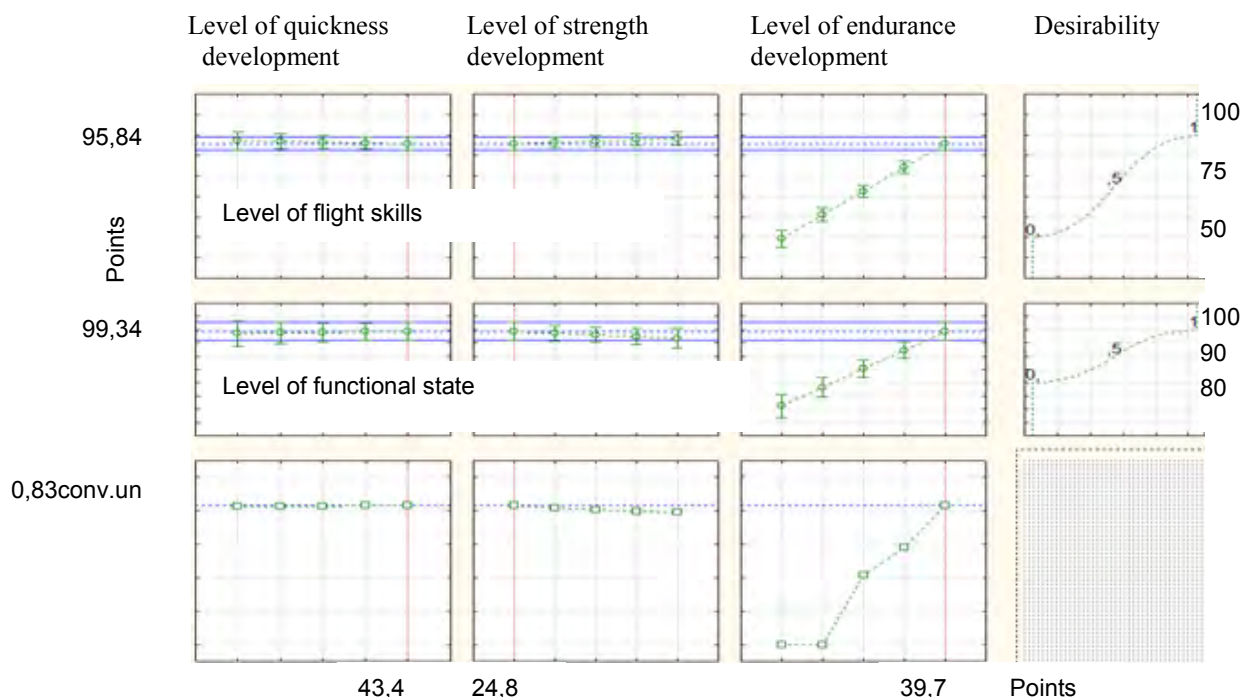


Fig.1. Optimal profile of development of general physical abilities, which are necessary for achievement of high level flight skills, with maintaining of cadets' appropriate functional state

One of main indicators of effectiveness of measures, directed creation and realization of pedagogical conditions for optimization of cadets' flight training, is comparison of results, achieved by control and experimental groups' cadets during flight practice.

In fig.2 we present rating of experimental group (EG) cadets and control group (CG) cadets of pilot faculty, by results of control of flight skills.

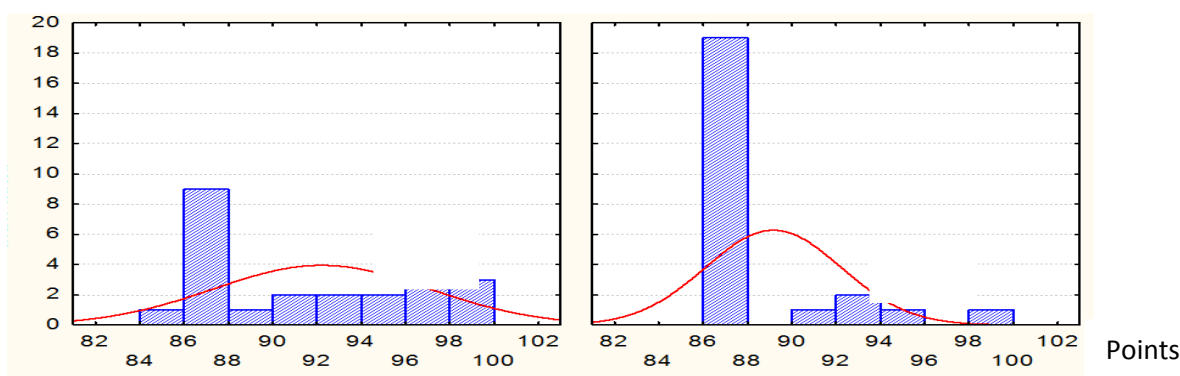


Fig.1. Histogram of distribution of EG and CG cadets of pilot faculty by results of rating control of flight skills' level

By *U* criterion of Manna-Wittny we found confident differences by character of mutual rating of flight skills in EG and CG. We stated difference at level $p \leq 0.05$ with parameters $U = 183$. $Z = 2.165$.

Conclusions

As a result of study of dynamics of professionally important skills, cadets functional state on different stages of flight training, we established reduction of level of some psycho-physiological and psycho-motor abilities at last period of study that is connected with overstrain of functional and first of all physiological organism's reserves, resulted from professional loads.

With the help of theoretical and experimental methods with application of desirability function we determined optimal levels of development of general physical abilities, flight skills and functional state of HUAF pilot-cadets, availability of which exclude difficulties in mastering of aircrafts of appropriate kinds of aviation and for all kinds of flights. We also provided recommendations concerning parameters of training loads with MSM (sport mass measures).

The prospects of further researches are connected with searching of ways and methods of collection of objective, high quality information and modern methods of determination and control over functional state of flight specialties' cadets.

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