

EVALUATION OF INTEGRATED TESTING THE MAXIMUM FORCE OF STUDENTS AGED 17-20 YEARS

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Annotation. The features of indicators of strength abilities of students of basic medical group are shown. The study involved 800 women aged 17-20 years, who were divided into age groups of 200 students. Established positive momentum indicators test dynamometry right and left hand, postural strength, forearm flexors right and left hands, extensor thighs and shins. Revealed results of a comprehensive development of maximum force to 12-point scale of the sigmoid in the age aspect. Notes are not identical levels of development. Comprehensive assessment "satisfactory" to be in the range 56-67,5% in all age groups of girls. The estimate of "excellent" is not fixed. It is necessary to pay attention to when planning the means and methods of force directions in physical education.

Keywords: pedagogical supervision, students, maximum strength, motor fitness, assessment.

Introduction

In the light of new physical culture education in higher school trends realization and implementation of pedagogical control technologies with application of motion abilities' evaluation method become urgent for modernization of students training, considering their individual features and interests in order to improve their motion preparedness level. Evaluation of students' motion abilities must facilitate their understanding own motion skills as well as the ways and aims of their physical perfection, that, in its turn, will promote active involving of students into this process.

Development and evaluation of strength attract attention of many researchers because insufficient development of muscles, which is connected with power abilities, leads to serious disorders and pathologies (from depressing of internal organs to progressing of diabetes). By the data of draft board 60% of 18-20 years old young men have insufficient physical level for exercises, which require power abilities [1], and by indicators, particularly by "power index", which is calculated by dynamometry of active hand in relation to the mass of body, the level of physical health is evaluated. Solution of health improving problems is a key task of physical education [2; 4; 5; 10; 11]. The mentioned above researchers also state that tests of power abilities shall have complex character and shall be selected for main muscles' groups: shoulder girdle, back, abdomen and so on [3; 7; 8; 9; 12]. Depending on conditions, character and the level of muscular strength manifestation several types of it can be distinguished: maximal, quick, power, static, dynamic, absolute and relative endurance [6]. The urgency of the given research is conditioned by special importance of power abilities' evaluation, because they influence on both the health and future professional activity of students.

The research has been fulfilled as per Combined plan of scientific & research works in the field of physical culture and sports for 2011-2015 in direction "Methodological and organizational-methodic principles of sportsmen's rational preparation" as per subject 2.18. "Improvement of mechanisms, which control sportsmen's motion activity".

Purpose, tasks of the work, material and methods

The purpose of the work is to develop technology for evaluation of complex testing of maximal strength, to reveal the dynamics of 17-20 years old girl students' indicators.

Experimental researches were carried out at four higher educational establishments in Sumy and involved 17-20 years old students (200 persons in every age group), which were related to health academic groups. The age of girl students was determined as per International standards in decimal system: from the date of birth to the date of testing. In total 800 girls were tested.

In the research such methods as analysis of scientific-methodic literature, pedagogical observation, pedagogical testing and statistical processing were used.

Results of the researches

Results of statistical processing of the obtained data of power abilities' testing are presented in table 1. The results of the data analysis permitted to establish: in the period from 17 to 20 years old dynamometry indicators both right and left hands improve by 10.2% and 10.7%, indicators of backbone strength – by 0,07%, indicators of right forearm flexor by 5.57% and of left forearm – by 7.52%, indicators of thigh and shin extensors increased by 6.95%. So, in our opinion development of girls' power abilities is connected with optimal physical age development during study at higher educational establishment.

Table 1

Indicators of 17-20 years old girl students' maximal strength

№	Tests	Age, years
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		17		18		19		20	
		\bar{X}	$\pm S$	\bar{X}	$\pm S$	\bar{X}	$\pm S$	\bar{X}	$\pm S$
1	Dynamometry of right hand, kg	22,12	3,09	22,92	3,11	24,14	2,99	24,38	2,85
2	of left hand, kg	20,04	2,87	20,54	2,91	21,47	2,74	22,20	2,65
3	Backbone power, kg	62,02	6,51	64,96	5,70	66,12	5,08	67,03	5,20
4	Forearm flexors: right arm, kg	23,84	2,46	24,14	2,53	24,51	2,67	25,17	3,31
5	left arm, kg	21,80	2,88	22,23	2,26	22,57	2,45	23,44	3,07
6	Thigh and shin extensors, kg	44,13	3,41	45,14	4,11	46,24	4,91	47,20	4,74

The next stage of the research was development of evaluation standards for maximal strength tests, which was carried out on the base of determined arithmetical means (\bar{X}) and standard deviations (S) in every age group. Tests' results were estimated by 5- and 12- points sigmoid scales (differentiating from $-2,5S$ to $+2,5S$). It should be noted that in the first scale evaluation step is from 1,0S to 1,3S, in the second– 0,5S. The result value in test exercise $\bar{X} \pm 0,5S$ is taken as average standard, $\bar{X} \pm 1,5S$ – is lower or higher than middle standard, $\bar{X} \pm 2,5S$ – is low or high norm [6]. Depending on the calculated values we determined the levels of development (low, below middle, middle, higher than middle and high).

As per right hand dynamometry indicators of 17-20 years old girls (see table 2), which were calculated by 12 points sigmoid scale, it was found that low, below middle and middle levels of development were intrinsic to 17 years old girls (correspondingly) – 6%, 29.5%, 29.5%, to 18 years old girls: 13%, 23%, 22%, to 19 years old girls: 9%, 17.5%, 35%, to 20 years old girls: 14%, 9.5%, 34.5%. Approximately 28.5% and 6.5% correspondingly of 17 years old girls, 37.5% and 4.5% of to 18 years old girls, 37% and 1.5% of to 19 years old girls and 41% and 1% of to 20 years old girls manifested higher than middle and high levels of development.

Table 2

Indicators of maximal strength development's complex testing by 12 points sigmoid scale (17-20 years old students, %)

Age, years	Points, levels of development											
	1	2	3	4	5	6	7	8	9	10	11	12
	low			below middle			middle		higher than middle		high	
Dynamometry of right hand, kg												
17	–	–	6	11,5	18	23,5	6	16,5	12	6,5	–	–
	6			29,5			29,5		28,5		6,5	
18	–	–	13	1,5	21,5	8,5	13,5	31	6,5	4,5	–	–
	13			23			22		37,5		4,5	
19	–	8	1	12	5,5	13	22	29,5	7,5	1,5	–	–
	9			17,5			35		37		1,5	
20	2	5	7	4,5	5	11	23,5	33	8	1	–	–
	14			9,5			34,5		41		1	
Dynamometry of left hand, kg												
17	–	0,5	4	13	17	24,5	8	7,5	20	4,5	1	–
	4,5			30			32,5		27,5		5,5	
18	–	0,5	12	2	23,5	11	10	22,5	10,5	7,5	0,5	–
	12,5			25,5			21		33		8	
19	–	1,5	7,5	10	12	12	15,5	28	12	1,5	–	–
	9			22			27,5		40		1,5	
20	1	5	7,5	3,5	5	21,5	22	14	20,5	–	–	1
	13,5			8,5			43,5		34,5		–	
Backbone power, kg												
17	–	–	3,5	15,5	23,5	12	9,5	16,5	10	9	0,5	–
	3,5			39			21,5		26,5		9,5	
18	–	3	7	10,5	12	8,5	20	20,5	15	3,5	–	–
	10			22,5			28,5		35,5		3,5	
19	0,5	2,5	6	9	9	20	24,5	12	10	6	0,5	–

	9			18		44,5		22		6,5		
20	1,5	3	4	3,5	14	29,5	19,5	8,5	7	7,5	2	–
	8,5			17,5		49		15,5		9,5		
Power of forearm flexors of right arm, <i>kg</i>												
17	–	1	2	21	17	6	14,5	18,5	18,5	1	–	0,5
	3			38		20,5		37		1,5		
18	–	0,5		19,5	20	16	0,5	19,5	21	2	–	1
	0,5			39,5		16,5		40,5		3		
19	–	–	0,5	14,5	24,5	13	1	38	5	1	1,5	1
	0,5			39		14		43		3,5		
20	–	–	–	13	23	14,5	15,5	23,5	1,5	3	3,5	3
	–			35,5		30		25		9,5		
Power of forearm flexors of left arm, <i>kg</i>												
17	1	0,5	0,5	2	29,5	10,5	27	17	11	1	–	–
	2			31,5		37,5		28		1		
18	–	–	2,5	7	31,5	9,5	15	19,5	10,5	2,5	0,5	1,5
	2,5			38,5		24,5		30		4,5		
19	–	–	1	32	6	9,5	11,5	29	6,5	1,5	2	1
	1			38		21		35,5		5		
20	–	–	1	22,5	7,5	20,5	14	21	6,5	1	4,5	1,5
	1			30		34,5		27,5		7		
Power of thigh and shin extensors, <i>kg</i>												
17	–	0,5	11,5	3	23	21	1	18,5	19,5	0,5	1	0,5
	12			26		22		38		2		
18	–	–	6	10,5	20	14	18	20,5	3	5	2,5	0,5
	6			30,5		32		23,5		8		
19	–	0,5	5	8	18	20	17	12,5	11	6,5	1,5	–
	5,5			26		37		23,5		8		
20	–	–	6	12	19	15,5	18	2,5	20,5	6,5	–	–
	6			31		33,5		23		6,5		

But, it should be noted that 4,5% 17-years old girls have low level of left hand dynamometry, 12,5%, of 18-years old girls, 9% of 19- years old girls and 13,5% of 20-years old. The levels below middle and middle are intrinsic to correspondingly the girls of 17 years old – 30% and 32,5%, of 18 years old – 25,5% and 21%, of 19 years old – 22% and 27,5% and of 20 years old – 8,5% and 43,5%. The levels higher than middle and high are intrinsic to correspondingly the girls of 17- years old – 27,5% and 5,5%, of 18- years old – 33% and 8%, of 19- years old – 40% and 1,5%, of 20- years old – 34,5% and 0%.

Regarding changes of girls backbone strength indicators we can note: 3,5% of 17- years old girls have low level of development 10% of 18- years old girls have low level of development, 9% of 19 - years old, and 8,5% of 20-years old girls. The levels below middle and middle were shown by the girls of 17 years old – 39% and 21,5%, of 18 years old– 22,5% and 28,5%, of 19 years old– 18% and 44,5% and of 20 years old– 17,5% and 49%. The levels higher than middle and high were manifested correspondingly by 17- years old girls– 26,5% and 9,5%, by 18- years old girls– 35,5% and 3,5%, by 19- years old girls– 22% and 6,5%, and by 20- years old girls– 15,5% and 9,5%.

The dynamics of girls' right forearm flexors' strength indicators is as follows: low, below middle and middle levels were manifested correspondingly by the girls of 17 years old – 3%, 38%, 20,5%, of 18 years old– 0,5%, 39,5%, 16,5%, of 19 years old – 0,5%, 39%, 14%, by the girls of 20 years old– 0%, 35,5%, 30%. Approximately 37% and 1,5% correspondingly of 17 years old girls, 40,5% and 3% – of 18 years old girls, 43% and 3,5% – of 19 years old girls, 25% and 9,5% – of 20 years old girls have higher than middle and high levels of development.

At the same time the level of left forearm flexors' strength in all age periods is following: 2% of 17 years old girls have low level, 2,5% of 18 years old girls have low level and 19–20- years old girls have – by 1%. Indicators also witness that the level below middle is intrinsic to 31,5% of 17 years old girls, to 38,5% of 18 years old girls, to 38% of 19 years old girls and to 30% of 20 years old girls. Middle and higher than middle levels are manifested by, correspondingly, 37,5% and 28% of 17 years old girls, by 24,5% and 30% of 18 years old girls, by 21% and 35,5% of 19 years old girls, and by 34,5% and 27,5% of 20 years old girls. High level was shown by 1% of 17 years old girls, by 4,5% – of 18 years old girls, by 5% – of 19 years old girls and by 7% of 20 years old girl students.

Besides, percentage of thigh and shins extensors' strength value was also determined. 12% of 17 years old girls have low level of development, 6% of 18 years old girls have low level of development, 5,5% of 19 years old girls and 6% of 20 years old girls have low level of development. The level below middle was manifested by 26%, of 17 years old girls, by 30,5% of 18 years old girls, by 26% of 19 years old girls and by 31% of 20 years old girls. 22% and 38% of

17 years old girls, 32% and 23,5% of 18 years old girls, 37% and 23,5% of 19 years old girls and 33,5% and 23% of 20 years old girls have middle and higher than middle levels correspondingly. Only 2% of 17 years old girls, by 8% of 18 and 19 years old girls and 6,5% of 20 years old girls have high level.

Application of sigmoid scales for evaluation of tests is purposeful only for homogeneous populations, which are variably measured by normal law, i.e., the trend of S-like distribution of results, where the largest quantity of the tested can receive points within 6-7 (of 12 points scale) and insignificant quantity can receive low or high points.. The next stage 17-20 years old girl students' testing for complex of maximal strength was determination of complex mark by 5 and 12-points sigmoid scales in relation to 6 tests (see table 3).

Table 3

Complex mark of development of maximal strength, calculated by 5 and 12 points sigmoid scales, by results of 6 tests

Quantitative mark, points,		Qualitative mark
calculated by 5 points sigmoid scales	calculated by 12 points sigmoid scales	
By 6 indicators		
30 и <	60 и <	excellent
26–29	48–59	good
22–25	36–47	satisfactory
18–21	24–35	bad
17 i >	23 i >	bad

Therefore, complex evaluation of development of maximal strength was carried out by results of 6 tests (in points): dynamometry of right and left hands; backbone power; right and left forearms' flexors; thighs and shins extensors (see fig.1).

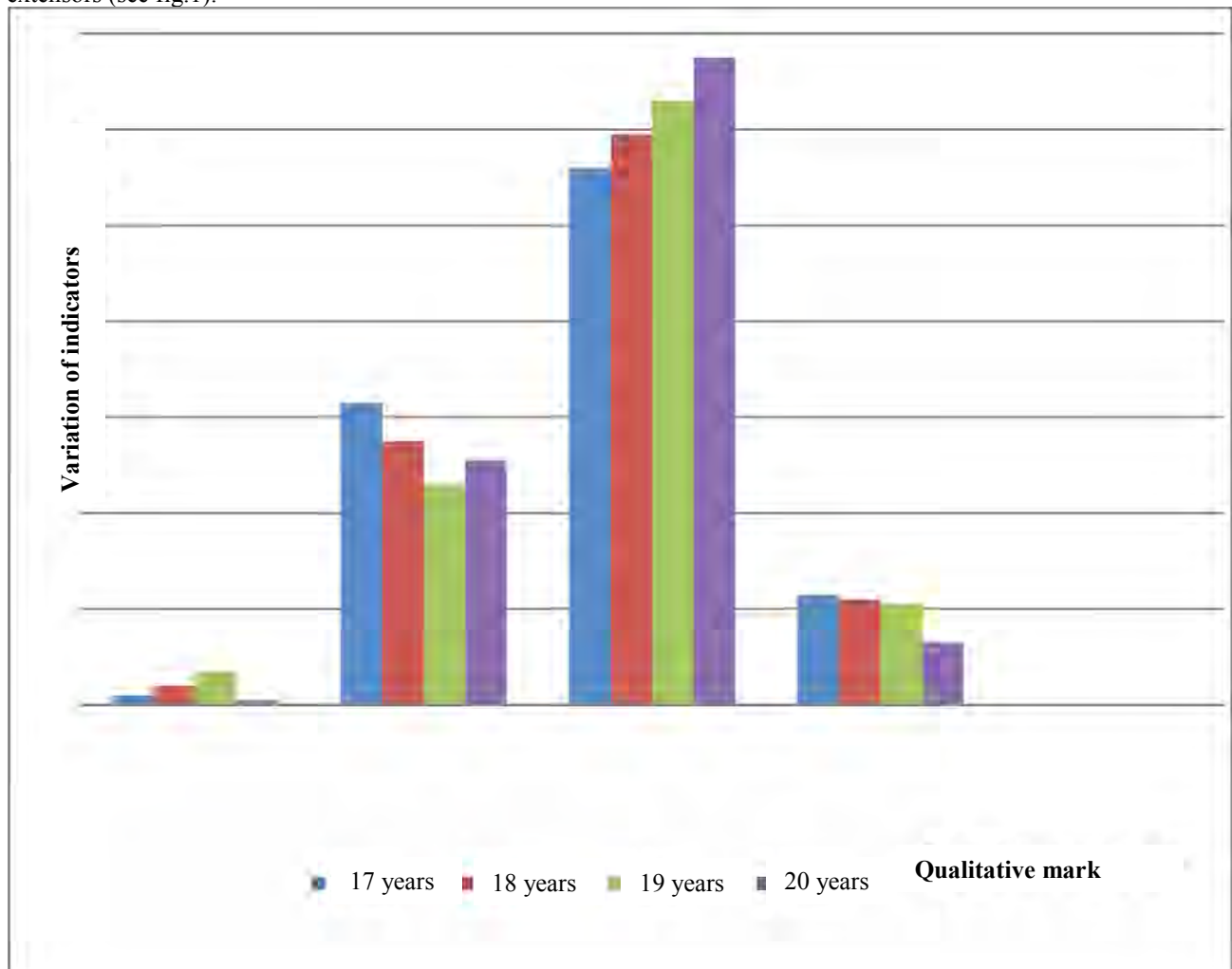


Fig.1. Indicators of complex mark of maximal strength's development of 17-20 years old girl studentst, calculated by 12 points scale

As it has been shown complex mark of maximal strength's development by 6 tests proves: 1% of 17 years old girls have "bad" mark, 2% of 18 years old girls have "bad" mark, 3,5% of 19 years old girls and 0,5% of 20 years old girls have "bad" mark. 31,5% of 17 years old girls 27,5% of 18 years old girls, 23% of 19 years old girls and 25,5% of

20 years old girls have “unsatisfactory” mark. “Satisfactory” was put to 56% of 17 years old girls, 59,5% of 18 years old girls, to 63% of 19 years old girls and 67,5% of 20 years old girls. 11,5% of 17 years old girls, 11% of 18 years old girls, 10,5% of 19 years old girls and 6,5% of 20 years old girls receive “good”.

Summary

The most exact idea about the level of students' motion preparedness is given by complex testing. The sense of control of students' motion activity's complex testing is in obtaining generalized indicator, which is expressed in points. That is, tests results, which were determined in centimeters, seconds, quantitative units were transformed into points, then total indicator for all complex (qualitative mark) is calculated. The results of our researches witness that 1,7% of girls carry out power complex with “bad” mark, 26,9% received “unsatisfactory”, 61,5% – “satisfactory” and 9,9% – have “good” mark. No one girl student, who could receive “excellent”, was found. Thus, there appears a demand to expand arsenal of power developing means at physical culture classes for students of definite age as well as to correct individual programs depending on the obtained results.

The prospects of further researches are connected with grounding of pedagogical control of power abilities and qualitative evaluation of boys of the same age.

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