

## TESTS AND STANDARDS FOR EXPRESS-CONTROL OF PHYSICAL FITNESS AND HEALTH OF MIDDLE SCHOOL AGE PUPILS

Bodnar I.R., Andres A.S.

<sup>1</sup>Lviv State University of Physical Culture

<sup>2</sup>Lviv Polytechnic National University

**Abstract.** *Introduction:* to day, physical fitness testing often causes negative emotions in pupils. It results in sharp loss of pupils' wish to fulfill physical exercises in free time and worsens their health. Possibility to assess health level is an important motivation factor for pupils' passing physical tests. Objective testing system will form positive motivation for physical exercises' practicing and will facilitate increase of pupils' motor functioning. It will also facilitate optimization of their physical condition, improvement of physical fitness and strengthening of health. *Material:* we tested physical fitness level and made diagnosis of pupils' functional state (10-15 years' age; n=85) with the help of tool methodic. We also used regressive analysis. *Results:* the system of tests and standards for express-control over physical fitness and health of middle school age pupils has been worked out and substantiated. The system of tests envisages fulfillment of 4 exercises: back pressing ups on bench during 20 seconds; throwing and catching of ball with two hands from wall during 30 seconds; side bending; torso rising from lying position into sitting during 30 seconds. Integral indicator of pupils' physical fitness and health correlates with functional state of organism's leading systems. We worked out 5 levels' scale for express-control over physical fitness and health of middle school age pupils. The system stipulates calculation of integrative indicator with the help of regression equation by results of 4 test exercises and calculation of one index. *Conclusions:* The system of tests and standards permits the following: to divide pupils into relatively uniform groups even at the beginning of academic year for successful reasonable physical load. The system also permits to determine standard and find what shall be strived for by a pupil in order to achieve optimal physical fitness and somatic state; to motivate relatively weakly trained pupils for testing and further their physical self-perfection.

**Key words:** control, assessment, pupils, indices, physical education.

### Introduction

In Ukraine, recent time parents and physical culture (PC) teachers have had cautious attitude to physical fitness (PF) testing at PC lessons in secondary schools. The relevance of this problem is also proved by the fact that testing often causes negative emotions in pupils (especially those, who have low or middle PF levels). Negative emotions at PC lessons result in sharp weakening of pupils' wish to fulfill physical exercises in free time that, in its turn, worsens their health.

Health strengthening or its preservation at proper level is one of main purposes of PC lessons. Possibility to assess health level is an important motivation factor for many pupils' passing physical tests (61.5%). That is why it is important that application of pedagogic methods would permit for PC teacher, pupils and their parents to have information about children's PF and their health, deviations in their somatic state (for example bent to disorder of carriage). It would help to select proper individual correcting means.

For increase of motivation for PC tests' passing by all pupils (especially pupils with little deviations in health) it is necessary to individualize approaches to pupils' testing.

In scientific sources there is a contradiction in respect to directions of control at physical culture lessons. Many authors say that control shall be oriented on assessment of dynamic of pupils' physical fitness [1, 2, 3, and 4]. Other specialists [5, 6, 7] think that control shall be a measure of PC lessons' effectiveness, meaning improvement of organs' and systems' functional state. Some authors offer integral approach when assessing effectiveness of pupils [8] and students [9] physical education process. Such control shall be conducted by a number of indicators of organism's most important systems' functional state and by indicators of strength, endurance and coordination. Some authors [9] substantiate integral assessment, which is based on consideration of mentioned above and other groups of indicators: morbidity and way of life.

Among teachers there is no single opinion about orientation of pupils testing. Though, the quantity of teachers, who wish to receive information only about physical fitness level (17.24%) or rates of its increment (12.78%) is confidently ( $p < 0.05$ ) less than quantity of those, who want to receive complex information about somatic health and physical fitness of pupils (51.10%) [10]. That is why, among existing as on to day tests, suitable for application in school PC, it is necessary to choose, first of all, those, which are connected with health indicators.

The known methods of physical fitness assessment (Patent of RF for invention № 2109486, published on 4.27.1998, Bulletin №10; Patent of Ukraine for useful model № 61369, published on 25.07.2011, Bulletin №14) contain complex in calculation, heavy or not feasible for mass application in field conditions, methodic. Such methodic envisages presence of computer hardware and proper software; they do not give information about pupils' health level; they are standard and not interesting for children; they do not differentiate requirements depending on children's individual features.

In publications there is substantiation [10] and description [11] of tests system for PF determination of middle school age pupils. Though application of offered 9 tests system requires much time, deficit of which is always exists at PC lessons. That is why we took decision to for system for express control of pupils' PF, which would include the most informative exercises. Results of such exercises' fulfillment are connected with indicators of children's health.

**Hypothesis:** express-control system shall determine objective level of PF and health; form positive motivation of pupils for regular physical trainings. It will increase their motor functioning, facilitate optimization of physical condition; improvement of physical fitness and health.

**Purpose:** to improve system of express control over middle school age pupils' physical fitness and health.

#### Material and methods

**Participants:** in experiment 85 pupils (42 boys and 43 girls of 10-15 years' age) participated. Their parents gave written consent for children's participation in experiment.

**Procedure:** we carried out testing of physical fitness level and made diagnosis of pupils' functional state. Physical fitness level was determined by worked out and substantiated by us at previous stages [13, 14] test exercises (and indices). Pupils' functional state was diagnosed with the help of program-apparatus complex "Omega-M", produced by "Scientific-research laboratory "Dinamika Technologies"" (Saint-Petersburg) [12]. On the base of systemic analysis of functional and biological reserves, assessment of pupils' psycho-physical and psycho-emotional state we derived integral indicator of health functional state (*health*), subjected to analysis. Diagnosis was conducted in conditions of ordinary academic day of academic year (3<sup>rd</sup> semester) after standard warming up before main part of PC lesson. We made 5 minutes' cardiogram recording in sitting position. Electrodes were applied on limbs by common methodic in 1<sup>st</sup> standard position.

**Statistical analysis:** we calculated indicators' mean values and their mean square deviations. We also fulfilled regression analysis of results of pupils' passing 9 worked out by us tests and indices [10, 11] with integral indicator of functional state (*health*). Value of (*health*), found with the help of program-apparatus complex "Omega-M", was a dependent variable.

Limits of physical fitness and health (see table 1) were found, considering standard deviation from mean value. Average level was in the range of  $X \pm 1.0\sigma$ , higher or lower than average – in the range from  $X \pm 1.0\sigma$  to  $X \pm 2.0\sigma$ , high and low – accordingly higher and lower than  $X \pm 2.0\sigma$ .

#### Results of the research

Results of regression analysis permitted to say that pupils' functional state is substantially influenced by 4 indicators, which statistically confidently ( $p < 0.05$ ) positively impact on value of physical fitness and health index (IPFH in formula 1). So, we recommend finding the level of pupils' physical fitness and health, by calculation of physical fitness and health index (IPFH) by the following formula:

$$IPFH = 0.11 + 0.007X_1 + 0.006X_2 + 0.025X_3 + 0.004X_4, \quad (1)$$

Where IPFH – index of physical fitness and health;

$X_1$  – power endurance of arms (results of back pressing ups on bench during 20 sec.), Quantity of times;

$X_2$  – dexterity (results of exercise "throwing and catching of ball by two hands, from wall during 30 seconds), quantity of times;

X<sub>3</sub> – index of backbone mobility (to be determined by formula 2), conv. un.;

X<sub>4</sub> – power endurance of abdomen muscles (results of torso rising from lying position in sitting, during 30 seconds), quantity of times;

### Conditions of exercises' fulfillment

*Back pressing ups on bench during 20 sec.* Only complete pressing ups were registered. This exercise permits to assess arms power endurance.

*Throwing and catching of ball by two hands, from wall during 30 seconds.* Distance to wall was 2 meters. Hitting the ball with hands was prohibited – only catching was registered. Two attempts with 2 minutes interval were fulfilled and the best result was registered. For complex assessment of different dexterity forms we recommend to draw “target” on wall, of 1x1 m size with center at eye level of a pupil (distance from floor to lower edge of target – 1 m). Slip throws were not registered. This exercise is recommended for assessment of pupils' dexterity.

#### *Bending to the right (to the left)*

When pupil is in standing position, with hands pressed to thighs, we mark the point of middle finger's distal phalanx contact with thigh by chalk. Pupil fulfills bent to the right and makes 2-3 seconds' pause. The second mark is made. The distance between two marks is measured (with accuracy of 1 mm). To avoid forward deviation this exercise shall be fulfilled by the wall with pupil blades' contact with the wall.

Index of backbone mobility (IBM) is calculated by formula:

$$IBM = \frac{(L_1 - L_2) \times 0,5 - (L_2 + L_1)}{L_3} \quad (2)$$

Where IBM – index of backbone mobility;

L<sub>1</sub> – (lower) result of bending to one side, mm;

L<sub>2</sub> – (higher) result of bending to other side, mm;

L<sub>3</sub> – body length, cm.

*Torso rising in sitting position during 30 seconds,* from initial lying on back position with legs, bent under angle of 90° and fixed feet; arms – crossed on chest. The exercise is for assessment of abdomen muscles' endurance.

The value of calculated IPFH is compared with data of table 1. Using the data of this table we find the level of physical fitness and health of individual pupil.

**Table 1.** Graduation of pupils' physical fitness and health levels

Physical fitness and health levels	Physical fitness and health index
high (5)	>0.64
Above average (4)	0.58–0.64
Average (3)	0.44–0.57
Below average (2)	0.37–0.43
Low (1)	<0.37

Application in practice of worked out by us express testing system resulted in increase of self control skills for determination of physical fitness in 45% pupils; increase of motivation for passing tests in 87% ; motivation for further physical fitness improvement in 66% . 37 talented children were selected to sports circles. That is why the worked out system of pupils' physical fitness control can be recognized to be effective.

### Discussion

The worked out by us approaches to assessment of pupils' physical fitness level confirm results of other authors [7, 9] in respect to their orientation on children's health. The offered system of tests eliminates contradictions, described in works of domestic [1, 3, 6] and foreign [13-16, 22, 23] authors. We expanded the data of Sazhneva E.V. [8] and Pal'chuk M. [6] about demand in consideration of functional state indicators in control of pupils' health level.

When building the tests we considered recommendations of Peleshenko I.M. [20]. The author offers to fulfill tests in the following sequence: for quickness and coordination; for speed-power qualities and flexibility; for endurance. Besides, it is offered to observe the following sequence: from two (September, May) to four times (September, December, February, and May) in year. Besides, we considered recommendations of Kovalenko Y.O., and Boloban V.N. [19], Juha Habib et al. [17] and Tereshchenko I.A. et al. [24] about demand in paying attention to pupils' carriage, when they fulfill the tests; Pop C.L. [21] and Kashuba V.O. et al. [18] about health related orientation of physical education lessons.

The received results are the supplement of our previous researches [10, 11] in the context of substantiation of tests and standards of pupils' physical fitness and health current control.

Positive element of our research is the fact that for determination of pupils' PF and health it is enough to know the results only of few (four) easy, safe and feasible physical exercises. It is proved by correlation coefficient between physical fitness and health index and level of functional state ( $r=0.54$ ), that was found with the help of program-apparatus complex "Omega-M". Correlation coefficient witnesses that derived by us equation of multiple regressions, with higher than average accuracy degree, permits to assess pupils' health level. Integrative assessment of pupils' health level, combined with determination of physical fitness meets expectations of PC teachers.

The selected exercises are safe as far as they do no harm for health. Such exercises prevent from diseases, which are frequent in school age (as far as fulfillment of these exercises, considering symmetric development of muscles, facilitates reduction of carriage disorders in frontal plane). These test exercises are feasible as far as they are not technically and moderate by load. Thus, the worked out by us system of express assessment has no main disadvantages, which are intrinsic to many modern testing methodic. Besides, test exercise "bending to the right (to the left)" permits to assess harmony of a pupil's physical condition, which is one of health indicators; individualization of requirements (consideration of body length) raises objectiveness of test exercises and does not weaken pupils' wish to pass tests.

Physical fitness and health levels are recommended to be used as criterion of pupils' distribution into relatively uniform groups at the beginning of academic year for choosing proper physical load. Results of express-control can be used for determination of "weak links" in pupils' PF and selection of exercises for further physical self-perfection.

### **Conclusions**

We have worked out and substantiated safe, feasible, individualized, economic system of express-assessment of pupils' physical fitness and health, which envisages 4 test exercises: back pressing ups on bench during 20 seconds; throws and catching of ball from the wall during 30 seconds; side bending; torso rising from lying position into sitting one during 30 seconds. Integral indicator of pupils' physical fitness and health correlated with functional state of organism's most important systems' functional state. We also worked out 5-levels' scale for express-control of middle school age children's physical fitness and health.

The system of tests and standards permits the following: to distribute pupils in relatively uniform groups at the beginning of academic year for choosing proper physical load; to determine standard and find what a pupil shall strive for in order to achieve optimal state of physical fitness and somatic health; to motivate relatively weak pupils for PF testing and their further physical self-perfection.

Results of the worked out control system's implementation in physical education practice proved its effectiveness.

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**Information about the authors:**

**Bodnar I.R.;** <http://orcid.org/0000-0002-7083-6271>;  
ivannabodnar@ukr.net; Lviv State University of Physical Culture; 11, Kostushko str., Lviv, 79007, Ukraine.

**Andres A.S.;** <http://orcid.org/0000-0002-1472-9009>;  
andres\_a@ukr.net; Lviv Polytechnic National University; 12 Bandera street, Lviv, 79013, Ukraine.

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