TECHNOLOGICAL PROVISIONING OF TEST CONTROL OF SPECIAL HEALTH GROUP STUDENTS' POWER ABILITIES

Koryahin V.M., Blavt O. Z.
National University «Lviv Polytechnic»

Abstract. *Purpose:* to substantiate and realize modern electronic technological means for perfection of test control of students' power abilities in special health groups. *Material:* materials of students' test control have been used in the research. *Results:* we have developed electronic system for test monitoring of students' power abilities. Besides, we showed possibilities of innovative automated methodic application for test monitoring of students' power abilities. Strict regulation of monitoring significantly decreases dispersion of error and raises reliability of test. The mentioned monitoring system removes dependence of result on teacher's subjective perception of information. *Conclusions:* Implementation of the offered system of monitoring of students' power abilities' functional state ensures promptness of confident testing results' reception. It will facilitate effectiveness of control in students' physical education.
Key words: testing, control, monitoring, electronic system, mean.

Introduction

Practical realization of test control of power abilities in physical education of special health group (SHG) students envisages certain metrological provisioning. Such provisioning is most important element of control system in the course of physical education [2, 5, and 6]. Metrological provisioning of test control in physical education of SHG is presented as complex of means and methods, scientific-technical and organizational-methodic measures. All these are directed on ensuring of quality of system itself [11, 12]. The latter is characterized by combination of properties, ensuring reception of measurements' results with required accuracy, confidence and reproducibility [5, 6].

The available as on to day results of empiric researches show that test control methodic for power abilities in SHG physical education do not permit confident indicators [1, 2]. It was found that means of informational provisioning of SHG physical education monitoring have a number of significant disadvantages [9, 10].

Analysis of power abilities' testing results showed that existing methods and organizational forms of their control are characterized by informational unambiguity, absence of objective measuring indicators, possibility of specialist's subjective influence on results of control [1, 10]. Thus, it is practically impossible to conduct objectively testing and receive confident results of monitoring. In this connection the problem of ensuring of SHG students power abilities' test control objectivity has been significantly actualized. Considering importance of conclusions and received results of test control such direction of researches seems to be rather significant.

At present time leading specialists in the branch [2, 9, 14, and 17] raise question about significant reconstruction of test control metrological provisioning in SHG physical education. In a number of works [10, 11, 15] it was showed that such approach was conditioned by its decisive significance for physical education of such groups' students. In other works [1-5, 17] demand in searching of ways for increasing of tests' objectivity and requirements to confidence of information with the help of modern technologies is noted. It is considered that technical principles of this problem in physical education of SHG students require scientific perfection, considering achievements of modern technique [1, 9, 10, and 12]. Specialists say about absence of diagnostic-measuring devices in test control. It significantly weakens its effectiveness [1, 2, 4–12]. Therefore, one of promising direction of physical education's perfection of students with health abnormalities is working out and practical realization of new innovative highly effective technologies of test control [9, 10].

As per the data of scientific literature [1, 9, 11], to comply with metrological requirements of control methodic it is offered to come to qualitatively new measurement system. In opinion of leading specialists in he branch [8–10, 15, 17], modern level of electronic devices' development creates pre-conditions for solution of complex of tasks of test control. Implementation of technical innovations in test control of students' power abilities

doi:10.15561/20755279.2015.0606

is regarded as mechanism of removal of most of problem factors. In their basis there is integrating technology of multiple functions in single automated system [3, 5, 8, and 15].

Considering the above mentioned we think it purposeful to study innovative automated methodic of test monitoring of SHG students' power abilities test monitoring in context of modern electronic devices.

Purpose, tasks of the work, material and methods

The purpose of the research is substantiation and realization of modern electronic technological means for perfection of power abilities' test control in SHG.

The tasks of the work:

1. To determine peculiar features and disadvantages of existing methodic of testing of SHG students' power abilities.

2. To create method of SHG students' power abilities' control, in which it could be possible o realize operative testing of its state and to receive confident data.

The methods of organization of the research: we used methods of analysis and synthesis, abstracting, formalization and simulation. The research was conducted on the base of physical education and "Electronic devices" departments of National University "Lviv Polytechnic".

Results of the research

Let us note that in system of physical training power abilities, by their structure and assessment, are presented as the most multi-components parameter, comparing with other motor abilities [2, 8]. Therefore, it complicates the system of their monitoring.

One of effective methods of power abilities' assessment in SHG is measuring of their condition with the help of inertia dynamograph [1, 5, and 14]. In the course of such control the level of dynamic power efforts is registered. However, application of this device has a number of significant disadvantages. They reduce metrological authenticity of such monitoring.

In compliance with theoretical principles, in such case standardizing of control process shall be ensured. Strict regulation of monitoring process substantially reduces dispersion of error and increases reliability of test [4-6]. Main disadvantages of such test are absence of standardizing by parameters of student's initial position. The latter is caused by certain dependence of physical education specialist's subjective perception. In such cases student shall observe standardized position of upper shoulder belt. This position id set visually in the process of monitoring. Besides, there is rather high probability of error in confident determination of force vector in the course of students' fulfillment of test.

Using potentials of modern electronic technique, we worked out programmed electronic system of monitoring of students' power abilities' functional state [16]. By automated measurement and information transmitting to electronic protocol we tried to shorten time losses, increase test's confidentiality and weaken influence of human factor on monitoring results.

Electronic system has a form of drum (see fig.1), provided with system of return to initial position. The system has a cord, with one end fixed on the drum. At the second end of cord there is a sensor, fixed on student's arm. Directly near the drum there is highly accurate laser sensor of movement.

Sensor was chosen because of its advantages in comparison with other elements. Among them there are: high accuracy, minimal dimensions, speed of action (high speed of responsiveness to movement) and high resolution. It facilitates effective application of such sensors for construction of means of control. Technological principle of laser sensor is based on analysis of movement process. Chip calculates coordinates. Besides, laser beam permits to set maximal accuracy of movement. With it, frequency of reading is much higher in comparison with other technologies [18–20].

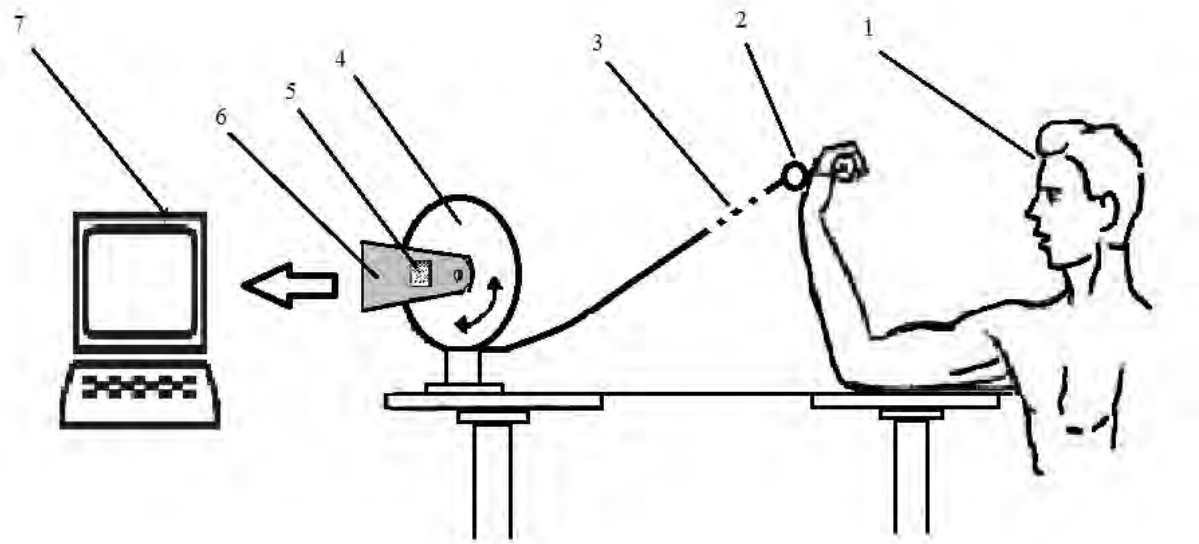

Fig.1. Structural diagram of monitoring of power abilities' functional state: 1 – subject of monitoring; 2 – sensor; 3 – cord; 4 – drum; 5 – laser sensor of movement; 6 – system of sensor's fastening; 7 – electronic calculation device.

Processing of sensors' electric signals and their visualization is provided by appropriate software. After exercise maximal result in physical units is displayed. Contact and interaction with computer is realized with the help of standard Bluetooth. Dynamic force efforts of student in fulfillment of test task cause drum's turning, which is registered by sensor of movement. Drum returns to initial position by return mechanism.

Control method [16] is realized by sensor with cord, fixed on student's arm. Other end of cord is fixed in drum's return mechanism. Laser sensor of movement is installed on drum. Under dynamic force efforts sensor signals are transmitted to electronic system. The system register signal of exercise's fulfillment and the result. The received data goes to electronic calculation device. Processing of this signal is fulfilled with the help of specially developed software.

Control over dynamic of power abilities in physical education is accompanied by a lot of information. That is why we thought it purposeful to make statistical processing of results also automatic. It permits to display results in digital or graph form on monitor.

Discussion

Methodic of control often give inaccurate information. It results in mistakes in controlling physical education process in general. Results of our researches confirmed the data of other authors [1–4, 9–12, 15, 17] that existing methodic of test control do not permit to receive objective indicators of the tested parameters. It results in not confidentiality of testing. In this case there is certain dependence of teacher's subjective perception of information. Besides, it hinders obtaining of confident testing results. As a result they can not witness about effectiveness of the used training means.

Analysis of theoretical principles of test control [1–17] permits to conclude that its basis is objective principle of result's obtaining. In this case effectiveness of physical education course is assessed on the base of the received result. Certainly, efficiency of control system's functioning in the whole to large extent depends on confidentiality and promptness of monitoring information. Basing on this information managing decisions are taken. Accuracy, reasonability, and objectivity of teacher's correcting actions are determined by intensity and quality of incoming information [1–6]. Usage of technical means of students' power abilities' control ensures

current monitoring: time of receiving information (usually within 20-60 sec); time of looking through the received data, analysis of results.

Automated process of receiving and processing of monitoring information permits to substantially improve quickness of information's obtaining and assessment in real time mode. It significantly shortens time losses for testing procedures. It is an important factor of increasing of control effectiveness. Monitoring of exercise's execution by group of students is possible with the help of one device as well as it is possible to conduct individual monitoring for every separate student.

High volume of information of current and operative control during course of physical education in SHG requires automation of receiving of multiple testing results. All these significantly simplify work of specialist on formulation of conclusions for taking further managing decisions. The offered automatic system ensures storage of information of monitoring multiple data. Such technology significantly influences on perfection of organizational forms of physical education. Presentation of results in the form of electronic protocol permits to significantly simplify search and interpretation of the received results during all course of training. It ensures storage of information and convenient looking through its structure and dynamic. In this case opportunities of testing results' processing expand. The created data base permits to have testing protocol just after 15-20 seconds after its finish.

For the first time we received scientifically grounded electronic system of complex informational-technological provisioning of test control of students' power abilities [16]. Implementation of the system in physical education process of students permits to unify and accelerate receiving and processing of results of monitoring. In this case effectiveness of training process's managing increases on the base of operative correction of individual pedagogic impacts.

Such monitoring of power abilities' functional state excludes subjective assessment of student's position and setting of force vector. The advantages of the offered system are:

1. standardizing of test monitoring procedure;
2. objectivity of control, that envisages removal of devices' dependence on object and subject of monitoring;
3. convenience in usage and portability of device;
4. current monitoring: consists of time of information's receiving (usually within 20-60 seconds), time of looking though obtained data and analysis of results;
5. ensuring of long-term observation with renewal of processing results;
6. high confidentiality of monitoring: system of high sensitivity registers the least deviation from pre-set parameters of exercise's fulfillment;
7. automatic obtaining of results of multiple testing; quick fulfillment of complex calculations with displaying results in digital or graph form;
8. convenience of looking through the structure of received results and their dynamic.

The enlisted factors to the fullest extent ensure promptness of obtaining of confident testing results and increase of control effectiveness in physical education of SHG students. Such approach permits to systemize scientific researches in the field of SHG physical education for obtaining of objective comprehensive information.

Conclusions

1. Application of technical means in system of test control of SHG students envisages ensuring of metrological confidence of the used methodic. Automated electronic measuring structure has been offered for the first time.

2. The worked out system has significant advantages, comparing with existing monitoring methodic and control of power abilities' functional state. Scientific potential of technical provisioning of control means in SHG permits to realize control and assessment of indicators at high level of objectivity.

3. The main methodic result of our work is the fact that application of the offered by us electronic system permits to intensify testing process in the course of physical education of students with health problems. It permits to complexly solve the problems of current control and to make rather substantiated conclusions about corrections (if required) in training program, in compliance with the received results.

Acknowledgements:

The work has been fulfilled in compliance with topic of combined plan of SRW in sphere of physical culture and sports for 2011–2015 “Theoretical-methodological principles of system of mass control and assessment of different population strata physical condition and physical fitness” (state registration number 0111U000192). The topic is governmentally financed.

Conflict of interests

The authors declare that there is no conflict of interests.

References:

1. Blavt OZ. Empirichna vivirka avtentichnosti testovogo kontroliu silovikh zdibnostej studentiv special'nikh medichnikh grup [Empiric verification of test control authenticity of power abilities of special health group students]. *Sportivnij visnik Pridniprov'ia*, 2014;2:13–17. (in Ukrainian)
2. Blavt OZ. Metrological assurance system control test in special medical groups in higher educational establishments. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2013;6:20–24. doi:10.6084/m9.figshare.714936
3. Blagush PK. *K teorii testirovaniia dvigatel'nykh sposobnostej* [On theory of motor abilities' testing], Moscow: Physical Culture and Sport; 1992. (in Russian)
4. Bondarevskij EA. *Pedagogicheskie osnovy kontrolia za fizicheskoj podgotovlennost'iu uchashchejsia molodezhi. Dokt. Diss.* [Pedagogic principles of control over physical fitness of pupils and students. Dokt. Diss], Moscow; 1983. (in Russian)
5. Godik MA. *Sportivnaia metrologiia* [Sport metrology], Moscow: Physical Culture and Sport; 1988. (in Russian)
6. Zaciorskij VM. *Osnovy sportivnoj metrologii* [Principles of sport metrology]. Moscow: Physical Culture and Sport; 2006. (in Russian)
7. Izaak SI. *Monitoring fizicheskogo razvitiia i fizicheskoj podgotovlennosti* [Monitoring of physical development and physical fitness], Moscow: Physical Culture and Sport; 2005. (in Russian)
8. Krasnikov AA. *Testirovanie: teoretiko-metodicheskie znaniia v oblasti fizicheskoj kul'tury i sporta* [Testing: theoretical-methodic knowledge in sphere of physical culture and sports], Moscow: Physical Culture and Sport; 2010. (in Russian)
9. Kovalenko TG. *Bioinformacionnye ozdorovitel'nye tekhnologii v sisteme fizicheskogo vospitaniia i reabilitacii studentov s oslablennym zdorov'em* [Bio-informational health related technologies in system of physical education and rehabilitation of students with weakened health]. Volgograd; 1999. (in Russian)
10. Koriagin VM, Blavt OZ. Elektronnoe obespechenie sistemy kontrolia v special'nykh medicinskikh gruppakh vuza [Electronic provisioning of control system in special health groups of HEE]. *VIII Mezhdunarodnaia nauchno-prakticheskaia konferenciia "Fizicheskaia kul'tura i sport studencheskoj molodezhi v sovremennykh usloviiakh*" [8th International scientific-practical conference "Students' physical culture and sports in modern conditions"], Tula; 2012. R. 137–142. (in Russian)
11. Koriagin VM, Blavt OZ. *Testovyj kontrol' v fizicheskom vospitanii* [Test control in physical education]. Lap Lambert Academic Publishing; 2013. (in Russian)
12. Koriagin VM, Blavt OZ. *Fizichne vikhovannia studentiv u special'nikh medichnikh grupakh* [Physical education of students in special health groups], Lviv: Lviv Polytechnic Publ.; 2013. (in Ukrainian)
13. Landa BKh. Metodika kompleksnoj ocenki fizicheskogo razvitiia i fizicheskoj podgotovlennosti [Methodic of complex assessment of physical condition and physical fitness], Moscow: Soviet sport; 2011. (in Russian)
14. Mironova SP. *Pedagogicheskij monitoring kak uslovie povysheniia effektivnosti upravleniia processom fizicheskogo vospitaniia studentov. Cand. Diss*. [Pedagogic monitoring as condition of increase of effectiveness of students' physical education management. Cand. Diss.], Tyumen; 2004. (in Russian)
15. Semenov LA. *Monitoring kondicionnoj fizicheskoj podgotovlennosti v obrazovatel'nykh uchrezhdeniiakh* [Monitoring of conditional physical fitness in educational establishments], Moscow: Soviet sport; 2007. (in Russian)
16. Koriagin VM, Blavt OZ. *Sposib ociniuvannia funkcional'nogo stanu silovikh iakostej* [Method of assessment of power abilities' functional state], Patent Ukraine, no. 98767, 2015. (in Ukrainian)

17. Sokolov AS. *Upravlenie fizicheskoj podgotovkoj studentov na osnove sistemy avtomatizirovannogo dinamicheskogo kontrolia. Cand. Diss*. [Managing of students' physical training on the base of automated dynamic control system. Cand. Diss.], Krasnodar; 2008. (in Russian)
18. Estivalet M. *The Engineering of Sport* 7. Paris: Springer-Verlag; 2009.
19. MacKenzie IS. *Input devices and interaction techniques for advanced computing*. Oxford UK: Oxford University Press; 2005.
20. Wouter B Puers R. *Ultra low power capacitive sensor interfaces Springer.* Chris Van Hoof; 2007.

Information about the authors:

Koryahin V.M.; http://orcid.org/0000-0003-1472-4846; koryahinv@meta.ua; National University «Lviv Polytechnic»; Str. Bandera, 12, Lviv, 79013, Ukraine.

Blavt O. Z.; http://orcid.org/0000-0001-5526-9339; oksanablavt@mail.ru; National University «Lviv Polytechnic»; Str. Bandera, 12, Lviv, 79013, Ukraine.

Cite this article as: Koryahin V.M., Blavt O. Z. Technological provisioning of test control of special health group students' power abilities. *Physical education of students,* 2016;1:43–48. doi:10.15561/20755279.2016.0106

The electronic version of this article is the complete one and can be found online at: http://www.sportpedu.org.ua/html/arhive-e.html

Received: 03.02.2016
Accepted: 22.02.2016; Published: 25.02.2016