Technologies of Education in Physical Training

UDC 796.615.825.

Oksana Blavt
oksanablavt@mail.ru

Integration of Technological Means for Testing Control of Flexibility in Students' Joints Among Students of Special Medical Groups

National University «Lviv Polytechnic» (Lviv)

Abstract:

The question of technological provision of the test control in physical education of students of special medical groups of higher educational establishments. The topicality of the study is predetermined by objective necessity of qualitative modernization of the way of flexibility monitoring on the basis of innovative approaches. The objective of the work is to create a way of monitoring of general mobility of joints in which owning to new action it would be possible to maintain prompt thorough defining of flexibility index. It was work out the technology of test control with the usage of instrumental system created on the basis of synthesis of modern electronic techniques and software. The presented methodology ensures elimination of a range of problematic factors of the valid methodology of flexibility control on the basis of integrating technology of multiple functions into a single automated system.

Key words:

flexibility, testing, control, monitoring, electronic system.

Formulation of the problem. In terms of pedagogical physical education practice objective assessment of physical capacity by testing students control is regarded as one of the actual problems. The formed control organization in special medical groups (SMG) is based on the results of monitoring test [5]. Test control as a dominant factor is the integral part of physical education and functions as regulatory supply. The realization of this function ensures its efficacy [1]. The choice of authentic and practical use of tests that reflect the dynamics of the studied parameters at different stages of physical education taking into account the conclusions importance of the control is extremely relevant.

The problem of quality control system in students physical education in SMG today is considered quite discrete in the available literature. However, there are some inconsistencies in this matter of concerning the specific monitoring of these groups. Current extensive theoretical analysis of researchers existing works [1; 2–5] investigated by topic shows that the majority of them concentrated on questions of testing students of major medical groups. Meanwhile, experts ignored aspects of test control of SMG which prompted us to conduct experimental research in this direction.

One of the most informative parameters according to which the state of physical fitness of students is measured is an indicator of the mobility level in the joints – flexibility. As one of the determinants that insures dynamics of physical fitness, the question of monitoring flexibility over time is the subject of the discourse of specialists in different research centers. According to the researchers [1–4] it is an important physiological factor in the physical training and determines its dynamics necessary to obtain quantitative knowledge that will help to evaluate the growth components of physical fitness and to determine the nature of the problems related to its low level.

Today there are many ways of monitoring flexibility – from simple, using the normal line, to complex, using various devices. Monitoring provides flexibility dimension range of motion in joints such as the muscles ability to lengthen within their structural constraints [2; 4]. Sophisticated measurement techniques are more developed and most of thematic interest than practical application and therefore are not used in the physical education practice of SMG.

The most common method of flexibility control in the physical education practice of SMG is a way of monitoring the over all joint mobility index by which the flexibility of musculoskeletal systemis determined.

This technique is performed by specialized test exercises [5]. The feasibility of using this test due to the fact that from a practical point of view the most important is the flexibility of the spine and it is believed that the results of this exercise can draw conclusions about the «joint flexibility of the body». In addition, it is easy and accessible for measurements during mass surveys and it does not require special realization conditions.

We point out that to ensure the procedures standardization in this technique is almost impossible. This method of flexibility testing is characterized by a certain subjective evaluation dependence of compliance on all the requirements of the test teaching exercises set during visual monitoring. In addition, along with the temporal loss (5 minutes per student) a significant probability of error tabulation exercise and complicates it is impossible to obtain reliable objective monitoring results and definitions. Also it is difficult to obtain informative monitoring results through a large number of uncontrolled variables and lack of registration for certain test results. In fact, authenticity test to determine the flexibility index addicts from the many external factors effects which eliminate the limited possibilities. Therefore, there is a need for a fundamentally new approach to this issue.

We note that in the theory and practice of SMG students physical education issues related to the testing procedures of informative mobility in joints are developed enough and it is recognized by industry experts [1; 3; 5]. Research industry researchers [1; 2–5] suggest that one of the challenges facing researchers of students physical education with health disabilities is a fundamental need for conversion test control, which involves the integration of modern technologies in monitoring process.

Finding ways to improve methods of the mobility level determining in the joints led to the choice of topic and research direction. Analysis of existing publications on this issue [1; 2–5] indicates that one of the most promising ways to improve test control is the development and practical implementation of new highly efficient tools, methods and technologies to monitor. In this respect, we note that the technical basis of this question in the field of physical education students in need of academic SMG refinement [1; 3–5]. Today the approach to implement automated joint mobility of SMG students is not implemented in the existing scientific literature. Therefore, further study is relevant for efficient methodology of testing flexibility in the context of modern electronic devices.

The aim of the research is the argumentation and implementation of modern electronic technology tools to improve flexibility testing of SMG students.

The task of the research is to create a way of monitoring the overall joint mobility, which through new actions could be efficient to perform thorough determination of the flexibility index.

Methods and research organization. For the purpose achievement methods of analysis and synthesis, abstraction, formalization and modeling are used. The study was conducted at the Department of Physical Education and «Electronic Devices» of National University «Lviv Polytechnic» during the 2014–2015 academic year.

The results of the research. Specificity of technical equipment in the field of physical culture, focused on information provision control and informed management decisions, provides methodological support test process in the form of diagnostic systems. Using the capabilities of modern electronic equipment, for the insurance of time loss, provision monitoring accuracy and elimination of the human factor influence on the inspection results, we developed a testing method using software electronic system of monitoring the overall joints mobility (Fig. 1) which provides automated operational thorough definition of the flexibility index of the musculoskeletal system.

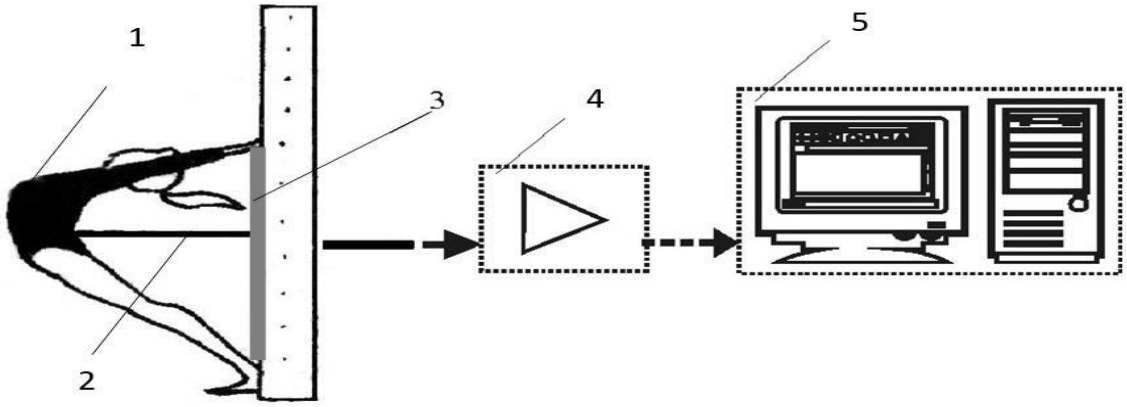

Fig. 1. Block diagram of monitoring overall joint mobility:
1 – monitoring subject (student); 2 – rubber band with LED;
3 – lineup photodiodes; 4 – amplification block based on operational amplifier;
5 – electronic computing device

In the elaborated system for fixing the deformation value fixed reflector – LED with a wide spectrum that covers the spectrum of visible light is fixed on the rubber band. The feasibility of using LEDs in the proposed system is that a sensor has several advantages that significantly distinguish it from others. Among them are high precision, minimalism in size, high speed performance and high resolution, lack of sensitivity to external influences (vibration, etc.) [7].

The line of photodiodes – photodetectors, which registers a falling signal on a photodiode, is located on the gymnastic wall. When performing the test task the rubber band, which is fixed on a student, stretched. However, due to its deformation reflector shifts, and thus the position of the reflected beam changes, which is fixed on the photodiodes line. The value of strain on rubber band corresponds to received signal from the respective photodiode in the line, on which the radiation is done. The signal is enhanced by the photodiode amplification using block that is based on operational amplifier. Then the signal channels wireless infrared comes to electronic computing device. Later using software infrastructure visual information on the outcome of the exercise is formed (flexibility index) in the clear for a teacher way.

Testing flexibility index of musculoskeletal system using electronic monitoring system eliminates the subjective specialist determination of compliance of all methodological test exercise conditions by students: position maintenance of the student's heel from the floor, and the probability of the maximum distance determination at which he is able to bend and keep a stable position for two seconds.

Monitoring the overall joint mobility using electronic monitoring system in which exercise testing flexibility index of the musculoskeletal system is that the student with fixed led adopted rubber band takes standardized starting position near gymnastic wall on which a line of photodetectors is placed. When performing the test task, the signal from the tape (LED) is registered by the line. The last fixes the process of the exercise and its outcome, which promptly blocks reinforcement from the operational amplifier. Then digital signal is transmitted to the electronic computing device via infrared channels. This signal is «electronically converted» by software and teacher receives a logical representation of the flexibility index on the screen [6].

It is known that the maximum effect of automation is achieved with an integrated approach where different information systems interact. This is the approach we use in our development of software infrastructure. The software is developed to automate the process of doing information registration, flexibility monitoring and automated processing of summary information at various stages of SMG physical education. The function of this software is to create an integrated database of flexibility test control, which establishes its replication, processing and interactive analysis using statistical and mathematical methods and algorithms. In this way, storage, update, adjust and use of large multidimensional array of information control during the course of physical training of SMG students is provided. Used for this interface provides high ergonomic properties of the electronic system and the possibility of efficient professionals with data test control. Further, their archiving is done in the infrastructure of the storage centers and data processing in personal text format for each student and is available for them.

The advantages offered by electronic flexibility monitoring system in comparison to existing assessment methods of the musculoskeletal system mobility is simplified and automated monitoring; the testing accuracy insurance; ease of use and compact device; monitoring urgency consists of receiving information (usually within 60 seconds) data time view and analysis results; lasting observations during the course of SMG physical training with updating processing results; high monitoring accuracy; automatization of the multiple tests results as an electronic protocol; rapid computation of complex results representation in digital or graphical form; user experience patterns of the results and their dynamics; test control results save in the database in hypertext arrays format that forms information space in SMG physical education to a new level and provides implementation-centered approach to control.

Conclusions. Resolving the insurance test control problem of students with health disabilities represents the theoretical and practical significance for improving methods of complex testing in SMG physical education.

Automated electronic measuring structure is developed through the modern electronic technology and software use, that is offered for the first time and has significant advantages over existing methods of monitoring and controlling the dynamics of the musculoskeletal system joint mobility development. System integration of technological means for test control of SMG students provides its metrological accuracy and timely receipt of orderly systematic information monitoring.

The main methodological result of the study is that the use of the proposed system allows to intensify the process of test control during the physical training of students. In turn, this allows to solve the current

monitoring issue for timely corrective training program according to the results. The latter is the overriding factor in improving the management of students physical education with health disabilities in the limited period of the course.

Prospects for further developments are seen in the other test samples reorganization through the advanced information technologies use for the strict controls organization in the area of SMG physical education.

References

1. Blavt, O. Z. (2014). Testovyi kontrol yak systemoutvoriuyuchyi chynnyk fizychnoho vykhovannia studentic spetsialnykh medychnykh hrup VNZ [Test control as system formation factor of physical education of students of special medical groups of higher educational establishments]. *Slovozhanskyi baukovo-sportyvnyi visnyk, 2 (40)*, 27–32.

2. Krasnikov, A. A. (2010). *Testirovanie: teoretiko-metodicheskie znaniya v oblasti fizicheskoy kultury i sporta* [Testing: theoretico-methodological knowledge in the field of physical culture and sport]. Moscow: FiS.

3. Kovalenko, T. G. (1999). *Bioinformatsionnye ozdovovitelnye tehnologii v sisteme fizicheskogo vospitaniya i reabilitatsii studentov s oslablennym zdorovyem* [Bioinformational recreational technologies in the system of physical education and rehabilitation of students with weak health]. Volgograd.

4. Koryagin, V. M., Blavt, O. Z. (2013). *Testovyi kontrol v fizicheskom vospitanii* [Test control in physical education]. Germany: OmniScriptum GmbH & Co. KG.

5. Koryagin, V. M., Blavt, O. Z. (2013). *Fizychne vykhovannya studentiv u spetsialnykh medychnykh hrupakh* [Physical education of students in special medical groups]. Lviv: Vydavnytstvo Lvivskoi politekhniky.

6. Koryagin, V. M., Blavt, O. Z. (2015). *Sposib monitoryngu zahalnoi rukhlyvosti suhlobiv: rishennya pro vydachu patentu na korysnu model* [Way of monitoring of the general joint mobility: resolution of issuing of utility certificate], 201506808.

7. Xsensor Technology Corporation. Retrieved from http://www.xsensor.com/

Information about the Authors:

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

Received 03.12.2015