

Components of positive impact of exposure on university physical culture and sports on students' physical activity

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Abstract: This article presents an analysis of activities performed by teachers and administrative personnel of higher education institutions to create and make the best use of the physical culture and sports environment in higher education establishments. It was revealed that this environment should rest on the following structural components: rating scales for athletic performance evaluation of students and contemporary methods for teaching physical education lessons at universities. The efficiency of using rating score systems to measure the athletic performance of students was confirmed by a significant increase ($P < 0.01$) in the number of young people who participate in PE and sports on a regular basis and who take part in competitions of various levels. The application of cardio and strength training programs (HOT IRON) in physical education lessons has proved effective for students as well. The students in the experimental group significantly improved their muscle power ($P < 0.01$) and overall endurance (0.05). These programs can also be applied for effective body shaping and obesity prevention.

Key words: higher education institutions; students; health; physical education and sports; physical culture and sports environments; athletic performance rating; cardio and strength training; HOT IRON; obesity prevention; motivation for performing sport.

Introduction

The review of scientific studies focused on the main issues of physical upbringing of today's generations shows that lack of physical activity in schoolchildren and students is a major challenge facing educators and health care specialists around the world (Osipov, Vonog, & Zhavner, 2016). It was found that physical education lessons given at Russian higher education institutions today do not provide the required level of physical activity necessary for better health and balanced physical development of future specialists (Funina, & Frolov, 2016; Osipov, Starova, Malakhova, et al. 2016). The results of the monitored level of physical development and health in Russian university students reveal a noticeable decrease in the main indicators of their physical health during their studies. At the same time, there is an increasingly bigger number of students with excess weight or suffering from obesity (Osipov, Kudryavtsev, & Iermakov, 2017; Peshkov, & Sharaykina, 2014). It should be noted that this trend towards deteriorating health in younger generations and growing numbers of obese people everywhere in the world does set the alarm bells ringing among health care specialists (Radzimińska, Weber-Rajek, & Moska, 2016; Gaetano, 2016; Hardman, 2008).

They believe that these issues may be resolved through introduction of brand new educational programs (Levanova, Kokorina, Nikitin, et al. 2016; Kirk, & Haerens, 2014), or major changes to the process organisation and structure of education institutions *per se* (Osipov, Starova, Malakhova, et al. 2016). Such changes should involve improvement of health culture in students and educators, and nurture strong views on necessity to keep a healthy lifestyle (Kudryavtsev, Kramida, & Osipov, 2016; Melnyk, Amaya, & Hoyinq, 2016; Iermakov, Cieślicka, & Muszkieta, 2015). Higher education, as S. Lundvall thinks, will play an essential part in development of physical health awareness in the young people of today (Lundvall, 2015).

F. Trudeau claims that introduction of extracurricular sports programs into the educational process will maximise the positive effects, such as better overall performance in their studies, and in the longer run – dedication to physical activity (Trudeau, & Shephard, 2008). Specialists agree that various sports programs may significantly increase the students' motivation for being more physically active and doing sports (Wallhead, & Ntoumanis, 2004). For example, A. Bozhkova is convinced that application of specialised athletic programs in students with delicate health produces a positive impact (Bozhkova, Slavcheva-Hinkova, & Lekina, 2017). The authors of this article are certain that introduction and use of sport-oriented programs in the education process (aimed at attracting students to different types of sports) and physical upbringing will help the emergence and development of the physical culture and sports environment at universities. This environment is defined by specialists as a combination of conditions and possibilities needed for physical formation and development of a person, involving both their space-and-object environment and the social reality (Patrikeev, & Durkin, 2012).

The need to qualitatively improve the level of physical development and health of university students has long been indicated by many experts. A. Bolotin, in particular, calls for an effective system that would attract students to regular physical activity and healthy lifestyle (Bolotin, & Bakayev, 2015). There is no doubt that personalities of graduates are shaped in the environment of the education institution they once chose as their alma mater, so, given that there is an effective physical culture and sports environment arranged, it will have a definitive impact on the psychological and physical evolution of a young professional (Manzheley, 2013).

According to S. Lundvall, the modern stage of physical education in students can be characterised by increasing motor activity during their studies (Lundvall, & Schantz, 2014). It should be said that in some countries, for instance in China, physical education curricula of students are being converted from being based on the criteria of athletic improvement to the criteria of health and fitness. The name of the program itself has been changed, so now it is quite relevantly called "Physical Culture and Health" instead of the former "Physical Education" (Jin, 2013). Such adjustments demand extensive elaboration of existing physical education programs for development of university students in search for innovative approaches to teaching the subject. Unfortunately, a substantial number of PE teachers at universities see no practical need in changing the structure and form of lessons with students. To give one example, the studies that investigated different styles of physical education in Greece demonstrated that the vast majority of teachers would use an authoritative, bossy, military-like style of giving lessons rather than trying to meet the students halfway listening to their wishes and suggestions (Sirmpas, Digelidis, & Watt, 2016). In the meantime, it is only possible to reach significant improvement of students' physical skills if the existing system of physical education gets a dramatically different look, as L.A. Volobaeva suggests (Volobaeva, & Gilazieva, 2013). It is preferable to reject the system of compulsory physical education in favour of student-centred individually developed plans and personality training programs in term of physical development of young people.

Apart from reluctance of many teachers to change the style and method of conducting lessons in physical education, there are a number of other aspects. According to S. Yu. Schetinina, to create and maintain the physical culture and sports environment in educational institutions it is necessary to revise the rating scale used to measure activity in PE lessons and keep track of desires and needs of those doing sport (Schetinina, 2014). The necessity to introduce the system of module-based rating of students in relation to their physical culture is discussed by I. Manzheley (Manzheley, & Cherniakova, 2014). The fact that there is a need in a comprehensive system for evaluation of physical development of students studying in various universities is stated by Z. Beddoes who studies the dynamics of changes in the indicators demonstrated throughout the world (Beddoes, Prusak, & Hall, 2014).

S. Geidne believes that in order to develop a favourable and health-saving environment for the young people of today, it is important to establish youth sports clubs (Geidne, Quennerstedt, & Eriksson, 2013), including as A. Osipov thinks, in the setting of large education institutions (Osipov, Kadomtseva, Lepilina, et al. 2015). It is also necessary to acquire reliable data about the existing level of motor activity in students and their physical abilities in general. It would help to work out how appropriate and successful their interaction is (Druz, Iermakov, & Muszkieta, 2017). One of the biggest driving forces that push most young people into doing physical activity and sports is their desire to slim down (Petrova, Pronina, Baron, et al. 2016). Concerns about keeping their body fit and beautifully proportioned are reported by S. Allender to be the leading motivation for young girls in Britain (Allender, Cowburn, & Foster, 2006). However, despite the noteworthy support of physical activity in schoolchildren and students of educational institutions in England and Wales, the level of engagement of young people in physical culture and sports remains rather low (Boccaro, Kanters, Cerin, et al. 2012). A number of latest researches have been registering a remarkably steady negative trend in the way contemporary young people treat their physical health (Fotynyuk, 2017; Kudryavtsev, Kramida, & Osipov, 2016). The experts shall draw attention to the presented aspects required for tackling the problem of finding a way to increase the level of motor activity in students. D. Merkel supposes that to succeed, the young need to find a balance between doing physical activity and sports, psychological welfare and academic performance (Merkel, 2013). It is these criteria that must be taken into account when creating and maintaining an effective physical culture and sports environment in educational institutions.

It is possible to single out a few basic components within the structure of effectively applied physical culture and sports environment. First of all, it is availability of sports societies (clubs and associations) to students and university teachers, which would allow organisation of various fitness and health and mass sports events. Also, it is necessary to monitor the physical condition of university students and the teaching staff. Recently, due to a great number of major sporting events held in the Russian Federation, large universities have created volunteer unions and centres where young people are trained for working as volunteers at various sporting competitions (Osipov, & Vonog, 2016). Given that the compulsory requirements that must be fit by the candidates for volunteering are the following: a good level of physical preparation, knowledge of sport-specific rules and hands-on experience in the area, it is certain that they will definitely foster the formation and development of the physical culture and sports environment in education institutions where they perform their activities. Nevertheless, the authors are sure that the abovementioned aspects are insufficient for creation of

sustainable physical culture and sports environment in a larger education institution. There is a call for qualitative structural changes to the educational and bringing-up process at universities. Such changes are described by the authors as: rating systems introduced to the educational process to control and evaluate the athletic performance of students and university employees, as well as PE lessons based on the latest methods of function and strength training.

Material & methods

Among those effectively applied control systems for physical and sporting achievements of university students and workers (educators, administrative and technical staff), there is a rating score system that has been recently introduced into the Krasnoyarsk State Medical University named after Professor V.M. Voino-Yasenetsky (Osipov, Dvorkina, & Shubin, 2014). Thanks to collaboration of employees from the Physical Culture Department, sports club and university administration, there have been worked out and agreed upon the main control criteria for the physical and sporting performance, which resulted in application of a rating score system in which students and employees are given credits for achievements in physical culture and sports. The points are credited throughout the whole calendar year for participation in fitness and health events and mass sporting occasions of different level. The number of points depends on the status of competitions: international, national, regional, etc. The total rating score has no upper limit. It should be pointed out that even though the points do not affect the academic performance of the students, in accordance with the Rector's order, they are taken into consideration when monthly scholarships are allocated. The employees are given monthly bonuses in addition to their salaries, proportionate to their earned rating score. The results shown by both students and university employees are then checked by a special commission appointed by the Rector and published on the official website of the university. Thus, the students and employees are stimulated to collect as many points as possible in the course of their physical and sporting activity. The Siberian Federal University has a competitive program in use called "Healthy Lifestyle". One has to register with the SFU sports club and receive a personal record card. During the academic year, students shall spend the minimum of 6 hours a week attending lessons in university sports clubs which they put in their record cards. In addition, they are encouraged to take part in competitions of different level: in-house, city, regional, national, or international. Attendance (absence of missed lessons) at regular PE lessons is also taken into account. At the end of the academic year, the record cards are handed back to the SFU sports club and in accordance with the compiled rating, the top 500 students who happened to fit the requirements of the competitions get a reward in cash.

As for the new methods used with students, these can be referred to as lessons based on cardio and strength training (HOT IRON). This kind of training is comprised of specifically designed exercises (squats, sit-ups, bends, long steps, etc.) with barbells of various weights done to particularly selected music. Its main advantages, according to experts, are visible slimming effect, elimination of excess weight and improved strength endurance. Scientists claim that activities based on the HOT IRON system do facilitate significant improvement in the way one looks, thus boosting physical attractiveness, so there is no surprise they are so popular with both female and male students (Osipov, Kudryavtsev, Kramida, et al. 2016). Nevertheless it is important to highlight that this training system may only be used by persons who took a relevant course in a certified centre and earned an instructor's certificate that authorises them to work with the HOT IRON cardio and strength training programs (Osipov, Gibaeva, & Pereus, 2014). The percentage of university teachers who have such a certificate are extremely small (due to considerable investment of money and time needed for this qualification). That is the reason why lessons based on the HOT IRON training programs are taken as an advanced scientific know-how in most educational institutions of the Russian Federation.

To evaluate how the abovementioned structural changes to the educational process at universities affect the level of fitness and health in students, the authors conducted a number of studies. The primary goal was to significantly improve the motor activity and physical health in students and university employees. It was planned to achieve the desired indications through introduction of the said changes that present structural components of an active physical culture and sports environment in institutions of secondary and higher professional education and, in authors' opinion, boost its positive impact on the participants of the education process. The studies were carried out at the two largest universities of the Krasnoyarsk territory: the Siberian Federal University (SFU) and the Krasnoyarsk State Medical University named after Prof. V.F. Voino-Yasenetsky (KSMU). These universities have been enjoying the said rating score systems to control the physical and sports achievements of students and employees for 3 years. This time span allows tracing and measuring the efficiency of the applied rating systems (the number of students actively involved in doing fitness and sports, level of their physical health, number of PE lessons they have a week). The Siberian Federal University provided the platform for this experiment of the impact of exposure to physical activities involving the strength and function training methods (HOT IRON) on the students' physical shape. The total number of participants – 300 people; students – comprised of males in their 2-3 year. The age of the students – 19-20. The students were divided into 2 equal groups: experimental group (n=150) and control group (n=150). Throughout the academic year, the students from the control group attended their PE lessons based on the regular system applied at SFU, involving sport

games and motor activities combined with general physical training. The students in the experimental group had their PE lessons within the cardio and strength training program (IRON SYSTEM). The lessons were conducted in a gym with a set of exercises done with weights (dumbbells and mini-barbells) to carefully selected music. Such lessons were given by teachers who hold certificates of the HOT IRON program instructors that they had received upon completion of a training course in an authorised centre. All students in the studies underwent a medical check-up and were permitted to the lessons. To define the dynamics of changes in the indicators of physical performance of the young people, the students were asked to take a number of normative tests. Each standard test (pull-ups, 100 m sprint, 3000 m run, forward bends) could explicitly demonstrate the level of physical performance of students, and thus, served as a rather reliable evaluation criterion.

Results

The dynamics of changes to the efficiency indicators in terms of the applied rating score systems and the students' physical and sporting achievements evaluation showed that the total number of males scoring rating points for this type of activity is steadily growing from year to year. It is important to emphasise, too, that at the same time, the number of students in their final years of studying seeking for places in special medical groups was found to be decreasing, based on the results of medical check-ups conducted at the beginning of each year. At first, when the rating score systems were being introduced; the special medical groups contained 3436 students at SFU and 846 at KSMU. After 2 years of using the rating score systems to measure the physical and sporting performance of students, the number of males directed to the special medical groups fell significantly ($P < 0.01$). At SFU, there were 2349 students assigned to special medical groups, whereas at KSMU, those groups were comprised of 544 students. The main data can be found in Table 1.

Table 1. Indicators showing the efficiency of rating systems in evaluation of physical and sporting activities of students.

Universities	Number of students with rating scores			Results of medical observations		
	2014	2015	2016	2014	2015	2016
SFU	1683	2842**	3794**	3436	2977*	2349**
KSMU	267	1005**	1438**	806	692*	544**

Note: – probability: * - $P < 0.05$; ** - $P < 0.01$.

The results of normative tests taken at the beginning of the studies did not show any substantial differences in the level of physical performance between the students in the experimental and the control groups. At the end of the studies, though, there were, indeed, consistent differences revealed in relation to strength (the experimental group showed consistently ($P < 0.01$) better results in pull-ups) and overall endurance (the experimental group were consistently ($P < 0.05$) faster in covering the distance of 3000 m). Another important factor is that the students in the control group demonstrated consistent ($P < 0.05$) increase in body weight. They were found to have gained approximately 3 kg over the academic year. The students in the experimental group, on the contrary, were reported to have lost about 1 kg. The full set of results of the normative tests taken by the students is presented in Table 2.

Table 2. The dynamics of physical performance and body weight in students participating in the study of efficiency of cardio and strength training (HOT IRON).

Physical qualities	At the beginning of the study		At the end of the study	
	Control group (n=150)	Experimental group (n=150)	Control group (n=150)	Experimental group (n=150)
Speed (100 m, sec)	13±2	14±2	13±4	12±3
Flexibility (forward bend, cm)	6±3	5±3	5±2	7±2
Strength (number of pull-ups)	10±4	9±4	9±3	14±3**
Endurance (3000 m, min)	14±1.5	14±2	14±2.5	12±1*
Body weight (kg)	75±4	74±3	78±4*	73±3

Note: – probability: * - $P < 0.05$; ** - $P < 0.01$.

Discussion

The results of the studies demonstrate that PE lessons based on the new cardio and strength training programs which are attractive for young people of today prove to be significantly more effective when it comes

to boosting young people's health, developing their physical qualities and correcting their body weight to stabilise at the optimal level. The students in the experimental group show a definitive increase in the indicators of their muscle power ($P < 0.01$) and overall endurance ($P < 0.05$) – the main physical quality required for successful professional activity (Osipov, 2013). In the meantime, they also demonstrate an insignificant loss in body weight, which makes the cardio and strength training programs advisable as an effective preventive measure against excess weight and obesity. Unfortunately, the students in the control group failed to show improvement that would be anywhere near significant increase in physical performance. Moreover, they were found to have gained in weight, 3 kg over one academic year on average. It is a rather alarming sign of insufficiency of the existing PE programs offered at universities to young people. Both Russian and foreign experts note that the efficiency of most conventional PE programs does not meet the required standard (Kudryavtsev, Iermakov, & Osipov, 2016; Song, & Chen, 2012). Thus, application of programs and methods of function training, as well as cardio and strength training in the process of physical education of young people shall dramatically improve the efficiency of PE lessons.

Encouraging young people of today to do regular physical exercise is quite a hard task. Even those students who have enough time for physical activities fail to achieve the indicators recommended by health care specialists – 30 minutes of activity a day, as S. Roberts claims (Roberts, Reeves, & Ryrrie, 2015). It is well-known that the beauty of the body proportions and shaping are the main driving forces behind the physical culture and sports done by young people today (Osipov, Kudryavtsev, et al. 2017; Allender, Cowburn, & Foster, 2006). So, application of programs that help to correct the proportions and body weight effectively will be encouraging enough for students to keep them engaged in physical activities. The authors believe that the monetary reward paid to students based on the results of the rating scores in their physical and sports performance serves as an effective encouragement. In some cases, such rewards may exceed the amount of monthly scholarship by multiple times. Unfortunately, it must be admitted that the vast majority of higher education institutions of the Russian Federation apply only one-off irregular forms of financial encouragement of students as a reward for their achievements in sports. The authors ascertain that without substantial mechanisms of student encouragement, it is unlikely that the problem of deteriorating fitness and health can be resolved in the young people of today.

It is worth noting that application of rating score systems to evaluate physical and sports performance of students increases the efficiency of implementation of the development strategy in physical culture, sports and tourism of the Russian Federation, which is highlighted by A. Osipov (Osipov, Kadomtseva, & Kharlamova, 2016). To score more points in the rating system, the young people feel motivated to go to extracurricular activities and sign up for courses in sports clubs and sections. It complies with the strategic goals to increase the weekly level of motor activity in population and boosts the physical health of students.

Most young people feel the need to be recognised by others or somewhat stand out from the crowd, also, in their physical performance. Publishing rating score data on the official university websites allows students to show their best at sports and attract attention from their peers. Another advantage of publishing data of physical and sports achievements is that it motivates students and creates a special social environment of young people with high motor activity and good physical health. This way the high level of motivation for doing physical exercise and sports is achieved and maintained. The conditions that are fulfilled in the meantime, are referred to by M. Kondric, as an opportunity to complete with the peers, popularity and higher social status, health and fitness, as well as sporting events (Kondric, Sindic, & Schiefler, 2013).

Application of the structural changes to the educational process presented in this article will eventually help to create the physical culture and sports environment and expose all participants of the education process to it for their own benefit. This environment proves to be effective not only for students, but also for teachers, post-graduate students, and administrative staff. All requirements for effective fitness and sports environment will be met. Such requirements include availability in the educational institutions and qualitative use of complexes for academic, medical, educational, administrative and other forms of activities found in an educational institution aimed at improvement of the level of physical performance, health and sports achievements of every person involved in education.

Conclusions

The studies carried out by the specialists in the area of physical health and population health care around the world indicate that there is a rather alarming issue of deterioration in the main indicators of physical health in most young people, including those studying at universities. The main cause is considered to be a significant drop in the level of daily activity of students, which further leads to development of obesity in younger population. To tackle this issue efficiently, the specialists suggest exposing students to extensive programs oriented at sporting activities. Also, universities are suggested to create a special physical culture and sports environment which would encourage young people to develop into healthy personalities who understand the value of physical activity and healthy lifestyle. The main structural components of such environment, according to the authors, shall be concentrated around the training centres and volunteering departments, rating

score systems to measure the students' physical and sports performance throughout their studies at university, PE lessons that use the cardio and strength training methods (HOT IRON). The researches demonstrate that application of such methods improves the level of main physical qualities and motor capability of students dramatically. Also, these methods can be used in control of the body weight in young people, which is becoming increasingly important as a way to prevent obesity. Application of rating score systems and systems of evaluation of the students' physical and sporting achievements increases the level of weekly motor activity in young people to a large extent, too. Moreover, the rating score systems inherently increase the number of students involved in doing physical exercise or sports.

To sum up, the results of all studies conducted by the authors make it possible to conclude that there are a number of crucial components to the effective impact of the physical and sports environment of university on the motor activity of the students and it has been proved to have a positive overall effect on successful health-saving activities that a young person of today must demonstrate.

Conflicts of interest - If the authors have any conflicts of interest to declare.

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