

THE PHYSICAL TRAINING OF STUDENTS PRACTISING POWERLIFTING IN PHYSICAL EDUCATION AND SPORT UNIVERSITIES

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***Abstract.** This study is an analysis of the literature, a synthesis of the opinions of sport specialists on the physical training of students who practise top-level sport while studying in higher education institutions. In the view of many authors, the basis of sports training is physical training. At the same time, physical training is inextricably linked to increasing the general level of the body's functional capabilities, improving multilateral physical development and strengthening health. According to the sports training theory, physical training in powerlifting, as in other sports, is divided into general physical training (GPT) and special physical training (SPT). The present research reflects information related to the processes, percentage and ratio of using GPT and SPT in powerlifting but especially in higher education students who practise this type of sport. In addition, the paper examines effective ways of transferring the positive action of correctly selected and used exercises to the training process. It also provides an overview of the precautions related to the incorrect use or selection of auxiliary exercises. Based on the statement that special physical training aims to develop the physical skills of athletes so that they meet the specifics of the chosen sport, the article includes a series of classifications of exercises for SPT in powerlifting.*

***Keywords:** physical training, sport, powerlifting, students.*

Introduction

According to Klychkov and Sergeeva (2019), studious youth of any age and qualification needs physical training. This category of people represents the reserve of future specialists, the potential of a country's future (Garipova & Zotova, 2016). This can only be achieved by optimising the physical training of students (Lukyanov et al., 2020). One of the basic objectives of a higher education institution is to create the conditions for maintaining and strengthening the health of students by motivating them for the practice of physical culture and sport (Budarnikov et al., 2020; Listkova, 2019; Garipova & Zotova, 2016).

Listkova (2019) mentions that students' work capacity can be raised or maintained at a high level through a process of physical training adjusted to the curriculum, which is currently quite exhausting. The author emphasises that physical education classes in higher education do not provide the necessary level of physical training, and the solution to this problem would be to attend extra classes providing various forms of fitness training or to practise physical activities of a sporting nature.

These statements and ideas are attributed to students attending "non-sport" universities. However, one of the objectives of our research is to analyse the physical training of students in "sport" universities, who, in addition to the curriculum that contains many hours of various physical activities, also practise top-level sport after classes.

Research purpose

The current research aims to highlight aspects of physical training as a component part of the sports training of students practising powerlifting in physical education and sport universities.

Objectives

- Performing a theoretical analysis of the literature in order to affirm the need for physical training of students in higher education institutions;
- Highlighting aspects of physical training in the sport of powerlifting;
- Providing arguments for the physical training of sports students who practise powerlifting.

Methodology

Theoretical and practical methodological sources of the literature were analysed in this paper. The solution to the proposed objectives was made possible through theoretical research methods: analysis and synthesis, induction and deduction, idealisation, comparison and generalisation.

Results

Several authors (Shilikin, 2020; Budarnikov et al., 2020; Kalenikova, 2004; Man'ko, 2009; Nikolaev et al., 2020) note that strength training attracts more and more young people. One reason would be that other sports such as track and field and gymnastics are not as popular, which is why their attention is focused on new strength sports including powerlifting (Kalenikova, 2004; Garipova & Zotova, 2016). "Powerlifting increases work capacity and increases the level of strength in those that practice it." (Perov, 2005, p. 118) This is a "young" sport, but it is developing at a fast pace. One proof would be its inclusion in the curriculum of higher education institutions (Man'ko, 2009). This popularity is explained by the accessibility of this sport, the rapid increase of results and its positive effects on the health of those who practise it, e.g., improved basic physical qualities (Kalenikova, 2004; Shilikin, 2020; P'yanzin & P'yanzina, 2021; Perov, 2005; Avsievich, 2016; Garipova & Zotova, 2016), increased functional capacity of the body, normalised activity of the cardiovascular system, a multilateral and symmetrical physical development (Budarnikov et al., 2020). Moreover, University Powerlifting Championships are held annually in various countries (Perov, 2005). Moldova has also been among them since 2007.

Starting from the idea that strength training can be practised for health, corrective or sports purposes (Nikolaev et al., 2020), powerlifting, which consists of performing strength exercises (Kalenikova, 2004), can be considered a full means of physical culture (Perov, 2005) and can be practised both in and outside the student environment for health strengthening (P'yanzin & P'yanzina, 2021; Nikolaev et al., 2020), correction (Shilikin, 2020), muscle development (Chaynikov & Filatov, 2020; Nikolaev et al., 2020), development

of physical qualities, adaptive and recreational objectives (Perov, 2005), but also as a top-level sport (Kalenikova, 2004).

According to several authors (Mutaeva & Petrov, 2020; Dashinorboeva, 2007; Gilev, 2007), sports training has a complicated structure where the most important link is physical training. Popov and Zankovets (2016) share the same opinion and, together with other authors (Chaynikov & Filatov, 2020), suggest that a correct and well-organised system of strength training is its basis. Zavyalov (2015) believes that a fundamental factor that ensures better results and successful participation in powerlifting competitions is strength training.

Strength is defined as the ability to overcome certain external stimuli or to resist them through certain muscle tensions (Platonov, 2017; Man'ko, 2009; Gilev, 2007). Kalenikova (2004) says that this is a “basic” physical quality without which no activity is possible. Attributing this definition to powerlifting, the success in this sport will be directly influenced by the factors that limit the working capacity of the muscular system (Avsieich, 2016). In this regard, Kievskaya et al. (2020) state that muscle strength is the basis of human physical training and matters enormously in both sports and applied activities.

Physical training is defined as a process that ensures the development of physical qualities such as strength, endurance and speed (Shejko et al., 2013) but also the ability of functional systems and mechanisms that ensure their level of manifestation (Platonov, 2017). Finally, it is oriented towards the multilateral development of the individual (Shejko et al., 2013; Dashinorboeva, 2007; Gilev, 2007).

It is known that physical training is divided into general physical training (GPT) and special physical training (SPT) (Dashinorboeva, 2007; Gilev, 2007; Platonov, 2017).

General physical training (GPT) is aimed at increasing work capacity and developing basic physical qualities (Gilev, 2007; Yurkov, 2020; Kalenikova, 2004). As mentioned by Platonov (2017), it ensures a general level of functional and physical abilities, which forms a safe basis for SPT. According to several authors (Platonov, 2017; Dashinorboeva, 2007), although GPT aims at the multilateral development of physical qualities, in contemporary sport, GPT aims at developing those physical qualities or muscle groups that will beneficially affect SPT in a particular type of sport. The above authors also state that excessive or insufficient attention paid to certain qualities or abilities can negatively affect sports performance. In addition, the famous scientist Platonov (2017) mentions that, in relation to this issue, there must be a certain harmony in development, which needs to be understood not as a muscular symmetry but as a development that will ensure some interaction and mutual assistance in performing specific motor actions typical of a category of sport. Kalenikova (2004) provides different statements, referencing a number of authors who claim that increasing physical training up to a certain level becomes “conditioning training” or physical culture for building strength and health. This can be achieved by performing physical exercises from various sports such as track and field, sports games, swimming, weight training or gymnastics (Gilev, 2007). Based on these statements, GPT can be sporting and non-sporting in nature.

In powerlifting, GPT exercises are used in the warm-up and cool-down parts of the workout but, taking into account the training stage and the athlete's qualification, they are included in the actual training session. They are intended to stimulate certain muscle groups by using primarily dumbbells, barbells, various training machines, tires, shock absorbers but

also by including exercises from gymnastics, swimming, sports games and others (Shejko et al., 2013). Even if they are not related to competitive exercises, the sports result will depend on the successful “transfer” of the training from the general to the special one (Perov, 2005), which can also be negative (Dashinorboeva, 2007).

Special physical training (SPT) is aimed at developing certain physical qualities, skills and abilities necessary for a particular sport (Gilev, 2007; Platonov, 2017; Nikolaev et al., 2020; Shejko et al., 2013; Kalenikova, 2004) and improving the technique of that sport (Yurkov, 2020). Dashinorboeva (2007) characterises SPT as a specialised development of GPT and states that some of its objectives are: improving the physical qualities necessary for the given sport; developing motor skills that will improve the technical and tactical processes in that sport; developing muscle groups that ensure the performance of competitive exercises.

The ratio and content of GPT vs. SPT, as well as their means and methods, are constantly changing and largely depend on the training stage, the athlete’s individual characteristics and level of training, etc. As performance increases, the percentage of SPT gradually increases (Dashinorboeva, 2007). According to Gilev (2007), GPT takes around 70% for novice athletes and 30% for highly qualified athletes. Avsievich (2016) recommends 30-40% SPT for beginner powerlifting athletes and up to 80-90% for elite athletes. Moreover, the author mentions that it is possible to increase the SPT up to 100% and have the GPT to represent exercises that accelerate the recovery processes, but this only refers to elite athletes.

Sports activity is a pedagogical process that forms and perfects the functions and physical qualities of athletes; various sports activities impose specific requirements on their physical qualities. Therefore, each type of sport has specific physical training systems (Klychov & Sergeeva, 2019). Perov (2005) believes that strength skills are of enormous importance in human social life and professional activity. Competitive powerlifting is closely related to the manifestation of the maximum level of physical strength (Chaynikov & Filatov, 2020; Zavyalov, 2015; Perov, 2005). In other words, at the current stage of progress in powerlifting, obtaining high sports results without high indicators of strength is impossible, which places this quality as a basis in this field (Avsievich, 2016; Budarnikov et al., 2020).

Strength training in powerlifting is subordinated to certain factors, namely: age and gender; performance level; individual possibilities and their correspondence with the effort provided; individual characteristics; motivation; concentration and focus on performing the exercises; moral-volitional ability; level of technical training; ability to recover; high intensity of the preparatory stage (Nikolaev et al., 2020; Platonov, 2017).

Citing a number of authors, Man’ko (2009) proposes the following for strength training planning: performing a sufficient volume of strength exercises during the training session; developing the strength of auxiliary and stabilising muscles; increasing muscle mass and decreasing adipose tissue; symmetrical development of muscle groups involved in competitive exercises; eliminating the athlete’s “weak spots”.

Properly selected strength training methods and means have a positively effect on the musculoskeletal and nervous systems, which will prevent the occurrence of low training effectiveness, the deterioration of health and various traumas (Platonov, 2017). The components of the means used in physical training are formed in accordance with the requirements of physical qualities and their role in the chosen type of sport (Platonov, 2017). This concerns the specialists in terms of selecting the methods and means of special strength

training, the amount of effort in various training periods but also special-aid exercises in powerlifting (Zavyalov, 2015).

The maximum effect of strength training will be possible by distributing the effort on macro-, meso-, microcycles in which the exercise volume, intensity and type will vary (Man'ko, 2009). The annual powerlifting training plan contains: periods, preparation stages, exercise volume and intensity, GPT and SPT ratio, competitions for each stage, planned result, tests and more. It usually consists of two macrocycles covering the preparatory, competitive and transition periods. Its importance is characterised by planning the effort per stage over well-defined periods. Thus, proper planning will provide a high level of strength training (Suleymanov et al., 2020).

The means of strength training are exercises that act on the muscles. Exercises used to increase the level of strength training can be performed with weights, various equipment, training machines, etc. (Kalenikova, 2004). In support of this statement, P'yanzin and P'yanzina (2021) argue that the training of elite athletes is characterised by a small number of specialised exercises of high intensity and volume. The effect of strength training directly depends on the exercises used. When selecting them, the following are taken into account: acting on the same muscle groups needed for competitive performance, exercise level, execution time, execution speed, muscle work regime and others. Therefore, SPT exercises are proposed to be divided into three groups: specific, specialised and non-specific. In this regard, Avsievich (2016) and Shejko et al. (2013) provide a classification of powerlifting exercises as follows:

- Competitive exercises, which include squat, bench press and deadlift;
- Special aiding exercises, which contain elements close or common to competitive ones and are divided into: development (locally oriented towards the development of the necessary physical qualities) and adjustment (lead-in exercises, especially used to improve competitive technique) (Shejko et al., 2013);
- Aiding exercises, which include the full range of exercises in the field of GPT.

Therefore, the basic means of SPT in powerlifting are competitive and special aiding exercises. This is also confirmed by Platonov (2017), who states that achieving a high level of physical training in a sport is based on special aiding and competitive exercises, but this does not diminish the role and need for GPT.

Strength training aims at developing various strength skills, increasing muscle mass, strengthening tendons and the bone-ligament system. In addition, conditions are created for increasing the level of speed, endurance, elasticity, coordination and other qualities (Platonov, 2017). Starting from this idea and the statement that powerlifting is a type of sport where the physical quality of strength predominates, we have researched the literature to give the opinion of specialists on how other physical qualities develop or manifest in this field.

Perov (2005) mentions that absolute strength is negatively related to endurance, namely the higher the absolute strength, the lower the endurance. The author analysed the results of the traditional cross-country of the "P. F. Lesgaft" Academy of Physical Culture, where 29% of students specialising in powerlifting and weightlifting took the cross-country test in 2003, but in 2004, only 12% took this test. In October 2004, the same students became absolute champions at the Open Weightlifting Championships in St Petersburg.

According to Kalenikova (2004), flexibility is the ability of the human body to perform movements with the necessary range of motion. Its development is of particular importance in sport. It is known that flexibility can be classified as passive and active but also general and special. The range of motion that corresponds to the needs of a particular type of sport is considered as special flexibility. Therefore, in powerlifting, this quality is manifested in the execution of bench press arching, where the competitive technique depends enormously on the level of flexibility of the spine.

Avsievich (2016) indicates that, in powerlifting, exercises are performed at low speed because heavy weights are used. In support of this view, Chaynikov and Filatov (2020) argue that maximum speed and strength are in a negative correlation. This means that, when performing maximum muscle effort, the athlete uses significant weights, which is achieved by a slow muscle contraction.

It is known that intellectual and physical effort exhausts the body. The high volume of intellectual effort of the university curriculum in combination with intense training can lead to the occurrence of chronic fatigue syndrome. Strength training is manifested through a high level of physical and emotional effort, which, if incorrectly planned and structured, will lead to negative changes in the level of homeostasis and will damage the adaptation process. Moreover, the exhaustion of student athletes, as an undirected and incorrect process, negatively affects their capacity for intellectual work and therefore their study process. (Chichkova et al., 2018; Polievsky et al., 2021)

After analysing strength training in Pavlov's doctoral thesis of 1999, Man'ko (2009) mentioned that the research was focused on powerlifting students in the Humanities Faculty. The strength training methodology consisted of a wide range of exercises alternating high volume with low intensity and low volume with high intensity. The author highlights an important aspect, namely that students also participated in physical education classes promoting the development of abilities and skills that do not directly affect the sports result in powerlifting.

Based on the above, we can say that students attending physical education and sport universities, in addition to the volume of intellectual effort, also make considerable physical effort to meet the requirements during various practical classes.

From the multitude of higher education institutions and specialisations, we can deduce the following categories of students who practise powerlifting:

1. students at sport universities specialising in strength training (powerlifting, weightlifting, etc.);
2. students at sport universities specialising in fields other than strength training;
3. students at universities with other specialisation than sport.

When planning the powerlifting training after classes, it is simpler to do this for the first and third groups. The reason is that group 1 specialises in this field, and their lessons are aimed at acquiring specific skills and knowledge. In the case of group 3, the volume of physical effort is represented only by the physical education lesson, which does not raise problems to the planning process. The problem occurs with students in group 2, whose volume of physical effort is represented by various physical activities such as track and field, gymnastics, swimming or various sports games. Given their distribution into specialties,

years of study and semesters, they have an impressive volume of physical activity, which is why it becomes extremely complicated to calculate when to plan the basic effort.

We present below the results of an experiment, as part of a larger study, which was conducted at the State University of Physical Education and Sport (USEFS) in the Republic of Moldova to assess the general and special physical training of a group of sports students specialising in fields other than strength.

Participants in the experiment were a group of 11 male students practising powerlifting, who were selected to compete in the powerlifting sports event at the 2019 National Universiade of the Republic of Moldova. The experiment lasted 6 months, from October 2018 to March 2019, and ended with participation in the competition on 11 April 2019.

The experimental methodology included powerlifting exercises with 3 to 4 training sessions per week and a length of approximately 90 minutes each. In October-December, the training programme consisted of approximately 50% special-aid exercises, 40% competitive exercises and 10% GPT exercises performed with an intensity of 70-80% of the maximum capacity. In January-February, the training programme consisted of approximately 50% SPT exercises (especially auxiliary ones) and 50% competitive exercises performed with an intensity of 80-90% of the maximum capacity. In March, the training programme consisted of approximately 70% competitive exercises and 30% SPT exercises (especially auxiliary ones) performed with an intensity of 80-95% of the maximum capacity. Two weeks before the competition, the athletes performed 100% competitive exercises with an exercise intensity of 80-95%, and their results are shown in Table 1.

Table 1. Average indices for the parameters of the experimental group (n -11)

No.	Parameter	$\bar{X} \pm m$		T	P
		initial	final		
1	Horizontal bench press with chains (1RM / kg)	120.0 ± 2.25	130.0 ± 2.15	3.21	< 0.01
2	Barbell front squats (1RM / kg)	130.2 ± 2.85	141.5 ± 2.21	3.13	< 0.01
3	Barbell deadlifts on boxes (1RM / kg)	180.8 ± 3.30	195.3 ± 3.00	3.25	< 0.01
4	Pull-ups (no. / MR)	18.4 ± 0.90	21.3 ± 0.85	2.35	< 0.05
5	Parallel bar dips (no. / MR)	28.4 ± 1.12	32.8 ± 1.10	2.82	< 0.05
6	Standing long jump (cm)	205.0 ± 3.11	215.0 ± 2.96	2.32	< 0.05

(P - 0.05 - 2.201; 0.01 - 3.106; 0.001 - 4.437)

Calculation formula – Student’s Criterion: $t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{m_1^2 + m_2^2}}$

Analysing Table 1, we can see that all parameters had positive values, with parameters 1, 2 and 3 (representing exercises in SPT) demonstrating a level of statistical authenticity, P < 0.01, and for parameters 4, 5 and 6 (representing exercises in GPT), P < 0.05.

In addition, USEFS students achieved the following results at the National Universiade: 5 athletes won the first place, 2 athletes - the second place, 2 athletes - the third place, and 2 athletes - the fourth place.

Thus, we can see that the experimental methodology was correctly designed, which led to obtaining both positive results in the experiment and high performance in competition.

Conclusion

After studying the powerlifting literature, it has been found that physical training involves the development of physical qualities and emphasises strength training as a physical quality without which success is impossible in this sport. Physical training is divided into general and special, a topic addressed in this article, where even if GPT is meant to develop the body multilaterally, this development must ensure a certain interaction of motor actions specific to the given sports branch.

The GPT-SPT ratio varies depending on the athlete's qualification and training stage, in the sense that GPT for beginners can be 70%, and SPT can reach up to 80-100% for elite athletes. When planning the effort distribution, coaches and students practising powerlifting in sport universities must take into account the volume of effort made during compulsory practical classes included in the curriculum. Thus, in the transition and preparatory periods, GPT should be limited as needed during training sessions. The difficulty of planning occurs in the competition period when only SPT exercises are present, and combining them with the effort during practical classes will have a negative effect on the sports result.

Following this pedagogical experiment, it has been found that the statistical authenticity of the results obtained is $P < 0.05$ and $P < 0.01$, which argues in practice some aspects of physical training for powerlifting student athletes. Moreover, it argues that the adjustment of the GPT/SPT/competitive exercise ratio allows the achievement of high sports results.

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