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THE IMPORTANCE OF DEVELOPING AN EXERCISE COMPLEX IN PREPARING PARA ARMWRESTLERS FOR COMPETITION

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Abstract. This article is devoted to examining the scientific and theoretical foundations of developing a set of exercises in the process of competitive preparation in para armwrestling. The results of the study demonstrate that a purposefully structured set of exercises enables the harmonious development of strength, endurance, and technical skills in para armwrestlers, significantly enhancing competitive effectiveness. The article is oriented toward formulating practical recommendations based on scholarly literature in the fields of sports physiology, biomechanics, and adaptive physical education.

Keywords: para armwrestling, exercise complex, adaptive sport, competitive preparation, strength training, physical fitness.

INTRODUCTION

Para armwrestling is one of the sporting disciplines designed for persons with disabilities that is gaining increasing popularity worldwide, being recognized not only as a means of physical rehabilitation but also as a high-level competitive activity. The achievements made in the field of adaptive sport over recent decades have led to the institutional strengthening of many disciplines, including para armwrestling: this sport is being incorporated into the official competition calendar by the International Paralympic Committee (IPC) and its affiliated organizations. However, the methodology of competitive preparation in para armwrestling remains an insufficiently studied area: the majority of existing scientific sources focus on mainstream armwrestling, while specially developed programs that account for the unique physiological and biomechanical characteristics of athletes with disabilities are very few. This situation indicates the existence of a significant gap for scientific research. Preparation for competitive activity is one of the central problems of sports pedagogy. Correctly structuring an exercise complex is of decisive importance not only for improving an athlete's physical capacities, but also for ensuring functional adaptation to competitive conditions. In the context of para armwrestling, this issue becomes even more complex, since competition participants have a variety of physical limitations: complete or partial dysfunction of the shoulder girdle and arm muscles, injuries to the nervous system, biomechanical changes resulting from amputation, and others.

METHODOLOGY AND LITERATURE REVIEW

This article is purely theoretical in nature, based on the analytical study and synthesis of existing scientific and methodological literature. Analysis of the scientific literature on armwrestling shows that among the main physical qualities demanded by this sport, short-term strength (isometric and dynamic), strength-endurance, reaction speed, and technical skill occupy a special place. Data obtained from studying the biomechanics of movements performed in classical armwrestling also serves as the primary reference for para armwrestling, but requires an adapted analysis. For example, studies cited in Western literature indicate the predominance of the wrist

flexor muscles (flexor carpi radialis, flexor carpi ulnaris) and the anterior shoulder muscles (biceps brachii, brachialis) during armwrestling. In para armwrestling, particularly in cases of amputation or spinal injury, the functional capacities of these muscles may be altered, giving rise to compensatory movements while simultaneously increasing the leading role of entirely different muscle groups.

Russian-language literature in the field of adaptive sports pedagogy provides an important theoretical foundation. The fundamental works of S.P. Evseev and L.V. Shapkova set out in detail the general principles of preparing persons with disabilities for sports activity: among these principles, individualization, gradual increase of load, ensuring recovery processes, and preventing pathological compensations are of particular importance. These principles take on even sharper significance in the context of para armwrestling, since an incorrectly structured training session may not only prove ineffective, but may also aggravate existing injuries or lead to new trauma.

Uzbek-language sports science literature is dominated by the view that physical preparation should be of a comprehensive nature. In the national scientific school, correctly determining the ratio between general physical preparation (GPP) and special physical preparation (SPP) in systematizing sports training is regarded as the main indicator of program development. For para armwrestling, this ratio is formed in a specific way: within the framework of general physical preparation, strengthening the cardiovascular system, improving respiratory efficiency, and expanding the overall functional reserves of the body are envisioned, while within special preparation, strength and technical exercises adapted to the competitive movement are performed.

Although the number of specialized studies on para armwrestling in foreign literature remains limited, general theoretical works in the field of adaptive sports kinesiology provide an important methodological foundation. In particular, comparative studies by British and Canadian scholars show that the load parameters (volume, intensity, recovery time) necessary to induce hypertrophy in the muscles of athletes with disabilities may differ significantly from those of able-bodied athletes. This difference is especially pronounced in athletes with spinal injuries: their autonomic nervous system responds differently to the metabolic changes occurring during muscle activity, which means that monitoring and adjustment mechanisms need to be strengthened in the final preparation program.

RESULTS AND DISCUSSION

Based on the literature review, a number of key factors that must be taken into account when developing an exercise complex for para armwrestlers are identified. The first and most important factor is the athlete's medical-physiological profile. Athletes with disabilities constitute a heterogeneous group: amputation, spinal injury, cerebral palsy, acquired or congenital muscular dystrophies, and other conditions each give rise to specific biomechanical limitations. For this reason, even for athletes belonging to the same competition class, a generalized exercise complex is not always effective; ideally, the complex should be designed individually on the basis of the nature of the athlete's injury, the map of preserved muscle functions, and the compensatory movement stereotype.

The second important factor is a deep understanding of the biomechanical structure of the armwrestling movement. From a biomechanical perspective, the competitive movement is divided into "start" and "finish" phases: the start phase requires short-term maximal strength, while the

finish phase sees strength-endurance play a decisive role. Following this principle, both components must be reflected in a balanced manner within the exercise complex. Evidence cited in the literature shows that programs focused solely on developing maximal strength often fail to produce the expected results in competitive performance, since the actual application situation in armwrestling requires not only strength, but also the skill of applying force at the right moment and in the right direction. This situation justifies the need to combine technical-tactical preparation with strength preparation.

The issue of the pre-competition preparation period in para armwrestling also occupies a special place in the literature. The theory of periodization in classical sports pedagogy is also applied to athletes with disabilities, but the duration of the period and the dynamics of the load must be adapted in accordance with the medical condition. During the pre-competition preparation period (usually 6–8 weeks), the exercise complex takes on a special-preparatory character: volume is reduced and intensity is increased; the main focus is placed on exercises closest to the competitive movement and rhythm. By the end of this period, the athlete should reach a physical and psychological peak, entering the state of "form" (sports form). The specific feature of this process for para armwrestling is that recovery (regeneration) processes may differ significantly depending on the type of injury: in athletes with spinal injuries, the risk of overload is considerably higher due to changes in thermoregulation and the circulatory system.

Regarding the structural composition of the exercise complex, the literature review makes it possible to identify several universal components. The warm-up section is particularly important in para armwrestling: the majority of injury cases occur when insufficient attention is paid to warming up, and furthermore, in athletes with disabilities, the joint and tendon apparatus may sometimes be shortened due to habitual inactivity, making it susceptible to sudden strain without adequate preparation. The main section includes strength exercises (free weights, block-type machines, elastic bands), technical exercises (static and dynamic exercises in the competitive position, practical exercises with a partner), and coordination exercises. The closing section consists of stretching and breathing normalization exercises, serving to accelerate recovery.

Within the strength preparation component, the ratio of exercises performed in isometric and dynamic regimes is of particular importance for para armwrestling. Isometric exercises (applying force without movement) are widely used to train muscle contraction in positions specific to the competitive stance in armwrestling. The literature emphasizes that these exercises are especially effective in developing the ability to maintain a low-amplitude position. Dynamic exercises, in turn, are aimed at increasing muscle volume (hypertrophy) and strength-endurance, and include arm press, wrist curl, shoulder pull, and other movements. For athletes with disabilities, a large portion of these exercises are performed in a seated position or on specially adapted machines, which necessitates adapting standard equipment or creating specialized apparatus.

Psychological preparation should also not be overlooked in the context of para armwrestling. The literature shows that the reaction of athletes with disabilities to competition stress can sometimes differ from that of able-bodied athletes: self-acceptance, entering the sporting arena from a societal perspective, and the influence of the personal history related to the injury have a significant effect on psychological state. For this reason, the exercise complex should be viewed as part of a broader preparation system that includes, beyond the purely physical component,

psychological elements such as pre-competition motivational preparation, stress tolerance exercises, and strengthening a positive relationship with one's own body.

The literature also provides important indicators on the criteria for assessing the effectiveness of an exercise complex. Measuring isometric strength (dynamometry), determining the range of motion, and recording weightlifting performance indicators are widely used to monitor the level of special physical preparation. However, in para armwrestling, applying these measurement methods in a standard manner is not always possible: for example, strength indicators for an athlete with amputation cannot be compared with those of another athlete. For this reason, the effectiveness assessment system must be based on each athlete's personal dynamics, i.e., comparison with previous indicators should be the predominant approach.

The literature review also established that correctly determining muscle recovery time is very important when developing an exercise complex for para armwrestlers. A number of sources recommend a 48–72 hour recovery period between training sessions for athletes with spinal injuries, while for athletes with amputation, this indicator may be shortened or extended depending on the individual's condition. Developing a management and monitoring system to prevent overtraining must be an integral part of the exercise complex.

CONCLUSION

Developing an exercise complex for preparing para armwrestlers for competition is not a purely technical matter, but rather a complex scientific-practical process that embodies the principles of sports pedagogy, physiology, biomechanics, and adaptive education. The literature review shows that the foundation of an effective exercise complex consists of the principle of individualization, compliance with medical-physiological indicators, biomechanical justification, and the presence of a psychological component. The specific characteristics of para armwrestling athletes — the diversity of injury types, compensatory movement stereotypes, and the unique dynamics of recovery processes — render standardized programs ineffective and necessitate the design of each training program in a unique, adapted manner. To achieve competitive effectiveness, a comprehensive approach must be adopted that ensures the harmonious development of strength, strength-endurance, technical skill, and psychological stability. The exercise complex should be based on the principle of periodization, divided into pre-competition, competition, and post-competition periods, with an appropriate ratio of load volume and intensity ensured in each period.

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