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THE EFFECTIVENESS OF USING SPECIAL EXERCISES IN DEVELOPING THE STRENGTH AND PHYSICAL QUALITIES OF UPPER GRADE STUDENTS

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Abstract

This article analyzes the effectiveness of applying specific exercises to develop the physical strength qualities of high school students. Physical strength plays a significant role in the development of adolescents, positively influencing their overall physical fitness and health. The study examines principles for selecting exercises that are tailored to students' age, physical abilities, and physiological characteristics. The findings provide recommendations aimed at promoting a healthy lifestyle and improving the effectiveness of physical education by enhancing strength development in high school students. This material is valuable for physical education teachers and coaches and can be applied within the sports-education system.

Keywords: Physical strength qualities, high school students, specific exercises, physical education, healthy lifestyle, adolescent health, physical fitness, sports training, physiological development, explosive strength.

Introduction

In the modern educational process, ensuring the physical development of students, strengthening their health, and increasing their interest in sports holds significant importance. In particular, developing strength-related physical qualities in upper-grade students not only improves their overall physical fitness but also helps reduce stress during the learning process, fosters the development of volitional qualities, and enhances self-regulation skills. Strength as a physical quality refers to the ability to mobilize the muscular power present in the human body. These qualities play an important role in various forms of physical activity, such as lifting weights, running, jumping, and other exercises. Adolescence is a period during which the potential for developing strength qualities is particularly high, as it is characterized by increased muscle mass and improvements in neuromuscular functioning. This article analyzes the effectiveness of using special exercises to develop the strength-related physical qualities of upper-grade students. It also examines the principles of selecting appropriate strength exercises and using them effectively. The main objective is to enhance the physical preparedness of upper-grade students and to support the development of a healthy lifestyle by fostering strength development.

In the Decree No. PF-6099 of the President of the Republic of Uzbekistan dated October 30, 2020, it is stated that in order to ensure the development of a strong immune system in every citizen through regular engagement in physical education and mass sports, and the formation of vital skills for a healthy lifestyle — such as giving up harmful habits, adhering to proper nutrition principles, and organizing recovery and rehabilitation activities — systematic and effective implementation of mass physical activity events must be carried out. Furthermore, it emphasizes

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the need to create appropriate infrastructure and other necessary conditions to support these efforts.

Literature Review and Methodology

In works written by Uzbek authors, the role of endurance in promoting a healthy lifestyle is widely discussed. For example, in the textbooks by A. Abdullayev, Sh. Xankeldiyev, R. Salomov, D. Umarov, and A. Hasanov, it is emphasized that dynamic, static, and explosive types of strength play a significant role in various types of physical activity. These works also highlight that specific exercises and methodologies tailored to each age group are essential, especially during adolescence when muscle growth and the strengthening of neuromuscular connections provide an opportunity for effective strength development. Furthermore, the gradual increase in training load is presented as one of the fundamental principles for efficient strength enhancement.

As a result of the literature analysis, several important conclusions have been drawn regarding the development of strength-related physical qualities. These conclusions primarily encompass theoretical foundations, training principles, and age-appropriate approaches. Overall, the literature emphasizes that a systematic approach to strength development, load optimization, and increased motivation can significantly improve students' overall physical preparedness.

Results and Discussion

1. Theoretical Foundations of Strength Qualities

Types of strength-related physical qualities include **dynamic strength**, **static strength**, and **explosive strength**. These terms are commonly used in sports science and physical activity to describe a person's power and capabilities. Each type helps to identify how strength functions and influences performance. The following types are considered:

Dynamic Strength:

- Dynamic strength refers to the force a person uses while moving or during locomotion. It is evident in activities such as running, jumping, and lifting weights. Dynamic strength contributes to the execution of active movement.
- When measuring dynamic strength, the interaction between speed and force is primarily taken into account. For instance, this type of strength is essential in sprinting or any rapid movement.

Static Strength:

- Static strength is the force exerted without any visible movement of the body. It is mostly observed in activities where maintaining a certain position or holding an object in place is required, such as holding a pose or keeping the arm extended without moving.
- This type of strength requires maintaining power in a stable condition. Examples include holding a plank position or sustaining a heavy load without movement.

Explosive Strength:

- Explosive strength is the ability to generate a large amount of force in a very short period of time. It is most commonly used in activities that require maximal effort in minimal time, such as jumping, a fast sprint start, or delivering a powerful strike.

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• Explosive strength typically combines speed and force, as seen in sprinting or forcefully throwing a ball in basketball.

These three types of strength are often interrelated, as certain physical movements may require a combination of multiple strength qualities simultaneously, especially in athletic performance.

Physiological Characteristics of Adolescents and Their Impact on Strength Development

The physiological characteristics of adolescence play a major role in strength development. During this stage, the body is undergoing significant growth and change, which results in unique physiological traits. Below are the key physiological features of adolescence and how they influence the development of strength:

Growth and Development:

• Adolescence is a period marked by significant bodily changes, including the development of the skeletal and muscular systems. As adolescents grow older, their muscles become stronger and more capable of generating effective force. While bones grow and muscle tissue develops, it still requires time and proper training for muscles to reach their full strength potential.

Metabolism:

• Hormonal changes during adolescence — especially increases in testosterone and growth hormone — significantly affect muscle growth and overall physical development. Testosterone, in particular, plays a greater role in muscle development in males compared to estrogen. As these hormones increase, there is a noticeable rise in muscle mass and strength, creating favorable conditions for strength training in adolescent athletes. However, this process must be approached gradually and carefully.

Nervous System and Coordination:

• The nervous system also matures during adolescence, enhancing the ability to control and activate muscles effectively. Improvements in motor coordination and control of physical activity play a vital role in developing strength. A well-functioning nervous system enables quick and precise muscular responses, which is critical for performance. Therefore, coordination-focused and adaptive exercises are essential at this age to support speed and skill development.

Bones and Ligaments:

• The bones and ligaments of adolescents are not yet fully developed. Since bones are still growing, they may be more fragile and susceptible to injury under excessive loads. Likewise, ligaments and tendons (connective tissues between muscles and bones) are still maturing and need time to strengthen. Overloading these structures can lead to injury; thus, exercises must be carefully selected to suit the developmental stage of the adolescent.

Physical Activity and Exercise:

• Physical activity during adolescence supports muscle development, but long-term, consistent, and well-planned exercise programs are crucial for strength development. Strength training for adolescents should follow a structured plan, as excessive load during a still-developing stage can

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negatively affect growth. Therefore, a cautious and personalized approach is necessary to achieve the best results.

Age and Gender Differences:

• There are notable physiological differences between boys and girls during adolescence. Boys typically have higher testosterone levels, leading to greater muscle mass and strength. In contrast, girls produce more estrogen, which slows muscle growth. However, girls can still improve their strength with proper training tailored to their physiological needs. These sex-based differences should be considered when designing strength programs for adolescents.

3. Principles for Selecting and Applying Special Exercises

• Selecting exercises appropriate to the age and physical fitness level of students.

• Exercises can be performed both in gym settings and outdoors:

- Weight training exercises (dumbbells, barbells)
- Bodyweight exercises (sit-ups, pull-ups, push-ups)
- Dynamic activities and movement-based games

4. Experimental Research Findings

• Measurable changes achieved through the application of special exercises (including examples from experiments)

• Importance of a balanced program for developing physical qualities

For example, when analyzing the results of students, a comparison of their initial and final indicators was made, focusing on average values and drawing conclusions based on statistical evaluation.

Comparison of Initial and Final Results

An analysis was conducted comparing students' pull-up performance before and after the training program. The average number of pull-ups in the initial assessment was **5.2**, whereas in the final assessment, it increased to **7.8**, indicating a significant improvement in strength-related physical qualities among students.

Initial Pull-up Results:

Individual pull-up scores before training:

4, 5, 3, 6, 7, 4, 5, 5, 6, 3, 7, 8, 4, 6, 5, 7, 6, 6, 4, 5, 6, 4, 7, 5, 6

Final Pull-up Results:

Individual pull-up scores after training:

6, 8, 7, 9, 10, 6, 8, 7, 9, 6, 8, 10, 6, 9, 8, 9, 9, 9, 7, 8, 8, 6, 9, 7, 8

3. Improvement in Results

• The average initial result was **5.2**, while the final result reached **7.8**, showing an increase of **2.6 repetitions**. This reflects a clear and measurable improvement in the students' muscular strength, particularly in their pull-up ability.

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• The change in performance demonstrates students' engagement with the training program, the effectiveness of the applied exercises, and the overall enhancement in their physical preparedness.

4. Group-Based Analysis of Student Results

• **High-performing students:** Some students achieved between **8–10 pull-ups**, which may indicate prior experience with physical training or a higher initial fitness level. These students showed particularly strong results.

• **Medium and low-performing students:** Students achieving **4–5 pull-ups** were considered average or low performers. These groups may benefit from more targeted training, individualized approaches, and additional focus on specific muscle groups and techniques.

Conclusion

Strength development, especially during adolescence, requires a cautious and well-structured approach. In order for this process to be effective, several key principles must be considered when selecting and applying exercises. Taking into account the physiological changes occurring during this stage of life and the progressive development of bodily systems, the following guidelines are essential in designing appropriate strength programs:

Strength training exercises for adolescents should be tailored to their age and stage of physical development. For younger individuals, bodyweight exercises such as push-ups, planks, and squats are more suitable. As adolescents grow older, resistance training using weights can be gradually introduced, but only in accordance with the individual's readiness and physical condition.

Effective strength training should involve the uniform development of all major muscle groups. Therefore, multi-joint or compound exercises — such as squats, deadlifts, and bench presses — should be prioritized, as they engage multiple muscle groups and contribute to overall strength improvement. Additionally, preventing muscular imbalances is especially important in adolescent athletes.

Executing exercises with correct technique is a critical aspect of strength development. Improper form not only diminishes effectiveness but can also lead to injuries, which may negatively affect growth. Adolescents and young athletes should first master proper technique before increasing intensity or complexity of training.

Balancing training load with adequate recovery is crucial in strength development. Excessive loading can damage muscles, especially in adolescents, whose bones and connective tissues are still maturing. Adequate rest between sessions is essential, and athletes should be encouraged to include regular recovery periods to support safe and effective strength gains.

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