

ANALYSIS OF THE RESULTS OF STRENGTH PHYSICAL QUALITY IMPROVEMENT IN STUDENTS ENGAGED IN PARALYMPIC SPORTS

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Annotation: This article analyzes the results of experimental research aimed at improving the strength physical quality of students engaged in Paralympic sports. A pedagogical program based on adaptive and individualized approaches was developed and tested in practice. The findings revealed that students in the experimental group achieved a significant improvement in strength indicators compared to the control group. The effectiveness of individualized training loads, adaptive exercises, and psychophysiological monitoring was confirmed. The results contribute to the scientific foundation of strength development for Paralympic athletes and highlight the importance of adaptive pedagogical technologies in higher education.

Keywords: Paralympic sports, strength quality, adaptive training, individualized approach, pedagogical experiment, physical preparedness.

Аннотация: В статье представлен анализ результатов экспериментального исследования по совершенствованию силовых физических качеств студентов, занимающихся паралимпийским спортом. Разработана и апробирована педагогическая программа, основанная на адаптивных и индивидуальных подходах. Результаты показали, что у студентов экспериментальной группы наблюдалось значительное улучшение силовых показателей по сравнению с контрольной группой. Подтверждена эффективность индивидуальных нагрузок, адаптированных упражнений и психофизиологического мониторинга. Полученные данные укрепляют научные основы развития силовых качеств у паралимпийцев и подчеркивают значение адаптивных педагогических технологий в системе высшего образования.

Ключевые слова: паралимпийский спорт, силовые качества, адаптивное обучение, индивидуальный подход, педагогический эксперимент, физическая подготовленность.

Annotatsiya: Mazkur maqolada paralimpiya sport turi bilan shug'ullanuvchi talabalarda kuch jismoniy sifatini rivojlantirish bo'yicha olib borilgan tajriba-sinov ishlarining natijalari tahlil qilingan. Tadqiqot jarayonida individual va adaptiv yondashuvlarga asoslangan pedagogik dastur ishlab chiqildi va amalda sinovdan o'tkazildi. Tadqiqot natijalari tajriba guruhi talabalari kuch ko'rsatkichlari nazorat guruhiga nisbatan sezilarli darajada oshganligini ko'rsatdi. Shuningdek, individual yuklama, moslashtirilgan mashqlar va psixofiziologik monitoringning samaradorligi isbotlandi. Olingan natijalar paralimpiya sportchilari tayyorgarligida kuch jismoniy sifatini takomillashtirishning ilmiy asoslarini yanada mustahkamlaydi.

Kalit so'zlar: paralimpiya sporti, kuch jismoniy sifati, adaptiv ta'lim, individual yondashuv, pedagogik tajriba, jismoniy tayyorgarlik.

INTRODUCTION

Paralympic sports have become a vital component of inclusive education and physical development, providing individuals with disabilities the opportunity to achieve self-realization through athletic performance. Strength, as one of the primary physical qualities, plays a

decisive role in determining functional efficiency, coordination, and endurance during sports activity¹. In Paralympic disciplines, where athletes often face specific physical limitations, the development of strength qualities acquires even greater significance. A well-structured strength training system enables students with disabilities to improve muscle function, optimize biomechanical movements, and prevent secondary health complications.

However, traditional physical education methods frequently neglect the individual psychophysiological and biomechanical characteristics of students with limited abilities. This gap often leads to lower progress in the development of strength qualities and reduces the overall effectiveness of physical training programs (M. Kudláček, 2019). In this context, adaptive physical education and individualized pedagogical technologies emerge as an effective means of enhancing students' strength qualities [2].

Recent studies in adaptive sports pedagogy emphasize that differentiated training programs, combined with scientific monitoring and progressive load control, yield significantly better results in developing motor abilities (L. Hutzler, 2020). Therefore, it is essential to design pedagogical mechanisms that not only ensure the safety and health of Paralympic athletes but also enhance their performance through individualized load distribution [4].

The purpose of this research is to analyze the outcomes of an experimental pedagogical program aimed at improving the strength physical qualities of Paralympic sports students. The study seeks to determine the pedagogical efficiency of adaptive and individualized training strategies by comparing experimental and control groups. The significance of this research lies in its contribution to the formation of scientifically based methods for strength development in Paralympic athletes, promoting a more inclusive and effective system of physical education in higher learning institutions [5].

METHODS

The research was conducted at the Faculty of Physical Education and Adaptive Sports, focusing on students who regularly participate in Paralympic sports disciplines such as wheelchair basketball, sitting volleyball, and athletics. The total number of participants was 30 students (15 males and 15 females) aged between 18 and 23 years, all officially classified as eligible for Paralympic sports participation.

The participants were divided into two groups: an experimental group (n=15) and a control group (n=15). Both groups underwent a six-month training period; however, the experimental group trained according to an adaptive and individualized strength development program, while the control group followed the traditional Paralympic physical education curriculum [5,6,7].

The research methods used included:

1. Pedagogical observation – to evaluate participation, motivation, and motor coordination throughout the experiment.
2. Physical testing – to measure indicators of strength quality such as hand-grip strength, the number of sit-ups in one minute, and bench press capacity.
3. Psychophysiological assessment – to monitor fatigue, pulse rate, and recovery time after training.

¹ Azizov, N. N., Gaziye, N. R., Boltobaev, S. A., & Zhakhangirov, S. Z. (2019). STUDYING THE ATTENTION AND SPECIFICALLY STRESSOGENOUS CONDITIONS OF SPORTSMEN. *Scientific Bulletin of Namangan State University*, 1(3), 303-306.

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4. Mathematical-statistical analysis – mean values, standard deviation, and Student’s t-test were calculated to determine the statistical significance of changes ($p < 0.05$)².

The experimental training model emphasized adaptive load distribution based on each student’s functional capability. Training sessions were organized three times per week, each lasting 90 minutes, and included a combination of dynamic and static strength exercises such as resistance band workouts, modified push-ups, and controlled weightlifting. The training intensity was gradually increased every two weeks following the principle of progressive overload.

All participants were medically supervised, and ethical guidelines for working with students with disabilities were strictly followed. The data obtained were analyzed to identify the pedagogical effectiveness of the adaptive strength training program in improving the physical qualities of Paralympic students.

RESULTS

The analysis of experimental data demonstrated a significant improvement in the strength physical qualities of students in the experimental group compared to the control group. The adaptive pedagogical program, which included differentiated loads and individualized exercises, had a positive impact on the development of muscular strength and endurance among Paralympic students³.

At the beginning of the study, both groups showed approximately similar baseline indicators of physical performance. After the six-month intervention, however, notable progress was observed in the experimental group across all measured parameters. The most substantial improvements were recorded in hand-grip strength and sit-up performance, which are essential indicators of upper-body and core muscle endurance.

The table below presents the comparative analysis of pre- and post-test results of both groups.

Table 1. Changes in Strength Indicators of Paralympic Students Before and After the Experiment

Indicator	Group	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Improvement (%)
Hand-grip strength (kg)	Experimental	28.4 ± 4.6	37.1 ± 4.3	+30.6%
	Control	27.9 ± 4.8	31.5 ± 4.4	+12.9%
Sit-ups (reps per 1 min)	Experimental	19.2 ± 3.5	27.8 ± 3.2	+44.8%
	Control	18.7 ± 3.8	22.4 ± 3.6	+19.8%
Bench press (kg)	Experimental	36.5 ± 5.2	48.3 ± 5.0	+32.3%
	Control	35.8 ± 5.0	40.1 ± 5.3	+12.0%

Statistical analysis confirmed significant differences between the post-test results of the two groups ($p < 0.05$). The mean improvement in the experimental group was between 30–45%,

² Boltobaev, S. A., Azizov, S. V., & Zhakhongirov, S. Z. (2019). THE STUDY OF THE PECULIARITIES OF INDIVIDUALLY-PSYCHOLOGICAL AND SPECIFICALLY STRESSOGENIC CONDITIONS OF SPORTSMEN. *Scientific Bulletin of Namangan State University*, 1(3), 307-312.

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³ Болтобаев, С. А., Азизов, С. В., Азизов, Н. Н., Рахманов, М. У., Жахангиров, Ш. Ж., & Мухторжонова, Н. (2020). СТРЕСС И ЕГО ВЛИЯНИЕ НА УСПЕШНОСТЬ СПОРТСМЕНОВ. In *Теоретические и прикладные проблемы современной науки и образования* (pp. 48-52). Болтобаев, С. А., Азизов, С. В., Азизов, Н. Н., Рахманов, М. У., Жахангиров, Ш. Ж., & Мухторжонова, Н. (2020). УПРАВЛЕНИЕ СТРЕССОМ ВЫСОКОКВАЛИФИЦИРОВАННЫХ СПОРТСМЕНОВ. In *Теоретические и прикладные проблемы современной науки и образования* (pp. 52-59).

whereas the control group's improvement did not exceed 20%. These findings suggest that the adaptive and individualized training program effectively enhanced muscular strength and endurance.

Similar results were observed in previous studies, where adaptive load regulation and individualized training contributed to higher performance gains in athletes with disabilities (G. Reina, 2020; L. Hutzler, 2020). Thus, the proposed pedagogical system can be considered a scientifically justified method for improving the strength qualities of Paralympic sports students.

DISCUSSION

The findings of the present study clearly demonstrate that the adaptive and individualized training model significantly improves the strength physical qualities of students engaged in Paralympic sports. The results align with the conclusions of previous researchers who emphasized the necessity of differentiated pedagogical approaches in adaptive physical education (R. Bailey, 2018; M. Kudláček, 2019). The improved performance indicators of the experimental group confirm that a scientifically structured training system based on individual physical capacities, functional assessment, and adaptive progression yields more efficient results compared to traditional methods.

The integration of adaptive strength exercises and progressive load control allowed the participants to train effectively without overexertion, ensuring safety and physiological balance. This is consistent with the findings of G. Reina (2020), who reported that adaptive training significantly enhances muscle coordination and recovery efficiency among athletes with disabilities. Moreover, the inclusion of psychophysiological monitoring during the experimental process provided timely feedback for load regulation, preventing fatigue and optimizing performance.

Another key factor contributing to success was the motivational effect of personalized programs. As noted by L. Hutzler (2020), when Paralympic students perceive their training as tailored to their individual needs and abilities, their intrinsic motivation and self-confidence increase substantially. This psychological component played an essential role in improving overall training adherence and consistency [4,5,6,7].

Furthermore, the study supports the view of S. Sherrill (2021), who argued that adaptive physical education should focus not only on physical enhancement but also on social and psychological adaptation. The implemented program achieved both — fostering physical strength and personal empowerment.

In summary, the adaptive pedagogical model used in this study can serve as an effective framework for strengthening the physical qualities of Paralympic sports students, ensuring safety, inclusivity, and measurable progress across multiple performance indicators.

CONCLUSION

The conducted research confirmed that an adaptive and individualized pedagogical approach is highly effective for improving the strength physical qualities of students engaged in Paralympic sports. The six-month experimental program, which was based on differentiated training loads, progressive resistance, and psychophysiological monitoring, led to significant improvements in hand-grip strength, sit-up performance, and bench press results. Statistical analysis demonstrated that the experimental group achieved 30–45% better outcomes than the control group, indicating the pedagogical efficiency of the developed model ($p < 0.05$).

The success of the program can be attributed to several factors: the systematic adaptation of training loads to the functional abilities of each participant, the integration of motivational and psychological support mechanisms, and the use of scientifically justified monitoring tools.

These findings are consistent with the conclusions of previous scholars who emphasized the value of individualized and adaptive training in Paralympic education (M. Kudláček, 2019; G. Reina, 2020; L. Hutzler, 2020).

The study also demonstrates that adaptive training not only enhances physical performance but also promotes inclusivity, confidence, and psychological well-being among students with disabilities. Thus, the developed pedagogical system represents a practical and theoretically grounded method for integrating adaptive strength development into the educational process.

Future research should focus on expanding the duration of the experiment, incorporating digital monitoring technologies, and exploring the long-term effects of adaptive training programs on the motor, psychological, and social development of Paralympic students.

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