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IMPROVING GENERAL AND SPECIAL PHYSICAL FITNESS OF HIGHLY QUALIFIED PARA-ATHLETIC THROWERS

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Abstract:
This article highlights priority tasks such as selecting and applying appropriate exercises necessary for training para-athletic throwers, analyzing their body tilt and rotational angles using modern technological tools, and providing methodological resources. It focuses on the growing need for innovative equipment to study, monitor, and optimize the training process of highly qualified para-athletes. Furthermore, it emphasizes the significance of tailoring training loads and the importance of creating specialized conditions to support the sports development of individuals with disabilities.

Keywords: Adaptive and developmental exercises, optimization, special simulator, socio-pedagogical significance, general and special physical training, technical and tactical recommendations.

Introduction

In recent years, many countries have paid special attention to the development of Paralympic sports. The increasing achievements in this area necessitate the optimization of training loads. Among Paralympic disciplines, para-athletics stands out for its versatility and popularity. The growing number of para-athletes worldwide underscores the importance of preparing elite competitors for international competitions.

Global research is being conducted on selecting individual training methods for para-athletes, conducting kinematic analysis of throwing techniques, studying the effects of sitting posture for athletes with musculoskeletal impairments, and improving technical, tactical, and functional aspects of training. However, despite existing studies, the issue of individualizing training load optimization for throwers with musculoskeletal impairments remains insufficiently explored, necessitating further research.

In Uzbekistan, favorable conditions have been created for identifying individuals with physical disabilities, guiding them toward sports, and ensuring their participation in competitive sports. In particular, para-athletic throwers are being provided with innovative methods and effective training tools to enhance their performance. At the state level, there is a focus on enabling

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physically challenged individuals to participate in sports and represent the nation in international competitions.

Level of Study of the Problem

In Uzbekistan, several researchers have contributed to the field of adaptive physical education. Scholars such as R.S. Salomov and M.X. Mirjamolov have studied adaptation theories in sports for individuals with disabilities. L.B. Sobirova has worked on preventing and correcting posture problems in primary school students. In the CIS, researchers like I.V. Yerkomayshvili, A. Sazonov, A.S. Solodkov, and O.V. Morozova have explored the effectiveness of modern technologies in adaptive physical education.

Internationally, scientists like Chow J.W., Kuenster A.F., Lim Y., MacLeish M.S., Cooper R.A., Harralson J., and Ster J.F. have conducted various studies on classifying musculoskeletal impairments, age-related development of physical qualities, and methods for improving athletic performance.

Despite the available body of research, the scientific foundations for optimizing the training of highly qualified para-athletic throwers remain underdeveloped. The present study addresses the identification and solution of specific challenges in the physical and technical preparation of elite para-athletic throwers.

Purpose of the Research. To develop proposals and recommendations for improving the physical fitness and optimizing the training process of highly qualified para-athletic throwers.

Research Objectives. To identify and control the tools used for training throwers from different nosological groups in three main types of preparation (general, special, and technical). To develop targeted microcycles using special equipment for training throwers with different apparatus.

Research Object. The training process of highly qualified para-athletic throwers.

Scientific Novelty. Based on the physical, technical, and functional conditions of highly qualified para-athletic throwers, training tools were selected and optimized for each sport class (F42–F43, F56–F57, F51–F55, F31–F33), focusing on the primary muscle groups involved. These tools were used in a complex monitoring system to manage training more effectively.

Special short-term explosive power training microcycles were developed using specific devices, targeting rapid strength, power, and endurance based on weekly load optimization.

Practical Results of the Research. A high-efficiency pedagogical testing system was developed to assess the special physical preparedness of elite para-athletic throwers. Technical reserve tests were designed for use before competitions, taking into account the functional capabilities of para-athletes.

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Proposals and recommendations were formulated for high-level use of technical tools to assess the capabilities and motor actions of throwers based on their nosological characteristics.

Research Reliability. The study was grounded in theoretical and methodological principles of adaptive physical education and sports science. It employed complementary research methods aligned with the objectives of the study and included statistically validated findings. All results were verified and approved by relevant institutions.

Scientific and Practical Significance. Scientific significance lies in the testing and implementation of a physical and technical preparation methodology for throwers in various functional classes.
Practical significance involves testing and implementing methods for improving the technical readiness of para-athletic throwers, considering their functional characteristics and utilizing their technical reserves.

Implementation of Results. Based on test packages developed for different nosologies and sports classes, the following results were achieved:

- An **18.11% increase** in the effectiveness of **general physical fitness**
- A **22.15% increase** in the effectiveness of **special physical fitness**

Table 1. Control Tests for Assessing and Comparing the General Physical Fitness of Experimental and Control Groups

№	Control Tests
1	Push-ups from prone position while resting on hands (elbow bending and extension)
2	Push-ups on parallel bars
3	Trunk raises (press) from supine position
4	Shot put (Women – 3 kg, Men – 5 kg) from below with both hands
5	Shot put (Women – 3 kg, Men – 5 kg) overhead throw with both hands
6	Shot put (Women – 3 kg, Men – 5 kg) chest push with both hands
7	Seated shot put (2 kg) overhead throw with both hands
8	Seated shot put (2 kg) chest push with both hands
9	Throwing a 150 g ball with one hand
10	Bench press while lying down
11	Smith machine bench press: 5 reps at 70% of body weight
12	Smith machine shoulder press (semi-reclined seat): 5 seconds hold at 50% of body weight

Note: These tests form the key criteria for organizing a multi-stage training process for athletes based on their **functional classification** and **training level**. Proper implementation ensures the development of essential physical qualities and efficient progress toward high performance in throwing disciplines.

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Table 2. Selected Physical Exercises for Throwers by Functional Classification

Functional Class	Selected Physical Exercises
F35, F42	- Seated shot put (3 kg) from chest with both hands - Overhead shot put (3 kg women, 5 kg men) with both hands - Smith machine bench press: 5 reps at 70% of body weight - Smith machine shoulder press (semi-reclined seat): 5-second hold at 50% of body weight
F36, F38, F40, F41, F44	- Shot put (3 kg women, 5 kg men) from below with both hands - Overhead shot put with both hands - Chest push shot put with both hands - Smith machine shoulder press (semi-reclined seat): 5-second hold at 50% of body weight - Smith machine bench press: 5 reps at 70% of body weight - Seated chest throw (3 kg) with both hands - Seated overhead throw (3 kg) with both hands - One-handed throw with a 150 g ball
F37, F46	- Shot put (2 kg women, 5 kg men) from below with both hands - Chest push shot put with both hands - Seated chest throw (3 kg) with both hands - Smith machine bench press: 5 reps at 70% of body weight - Smith machine shoulder press: 5-second hold at 50% of body weight - One-handed throw with a 150 g ball
F32, F51–F52	- Seated chest throw (2 kg) with both hands - One-handed throw with a 150 g ball - Smith machine shoulder press (semi-reclined seat): 5-second hold at 50% of body weight - Seated overhead throw (2 kg) with both hands - Smith machine half-squat hold: 5 reps at 70% of body weight
F53–F54	- Seated overhead throw (2 kg) with both hands - Seated chest throw (2 kg) with both hands - One-handed throw with a 150 g ball - Smith machine half-squat hold: 5 reps at body weight
F34, F55–F57	- Seated overhead throw (2 kg) with both hands - Seated chest throw (2 kg) with both hands - Seated chest throw (3 kg) with both hands - Smith machine shoulder press: 5-second hold at 50% of body weight - One-handed throw with a 150 g ball

Note: The goal of selecting these physical exercises is to assess and develop the athletes' specific physical qualities, considering the **functional classification** and **individual capabilities**. Regular use of selected exercises and techniques aims to improve **explosive power**, **endurance**, **coordination**, and **throwing efficiency**, based on tailored and structured training principles.

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Table 3. Performance Results of Experimental and Control Groups of Highly Skilled Para-Athletic Throwers at the Beginning and End of the Study

Event	Group	n	Start of Study (Mean ± σ)	CoV %	End of Study (Mean ± σ)	CoV %	Improvement (m)	% Change	t	p
Shot Put	Experimental	5	9.64 ± 0.91	9.44	11.03 ± 0.97	8.79	**1.39**	14.42	2.34	< 0.05
	Control	5	9.62 ± 0.89	11.10	9.63 ± 0.93	10.30	**0.01**	12.59	1.92	> 0.05
Discus Throw	Experimental	2	25.29 ± 1.97	7.79	31.13 ± 2.26	7.26	**5.84**	23.09	4.36	< 0.05
	Control	2	24.24 ± 1.76	10.21	25.23 ± 1.89	9.83	**0.99**	11.54	1.89	> 0.05
Javelin Throw	Experimental	2	18.64 ± 1.81	9.71	24.27 ± 2.24	9.23	**5.63**	30.20	4.37	< 0.05
	Control	2	18.36 ± 2.08	11.33	20.67 ± 2.19	10.60	**2.31**	12.58	1.87	> 0.05

CoV = Coefficient of Variation (%)

Figure 1. Comparative Diagram of Experimental and Control Groups' Physical Fitness Before and After the Study

(A bar or line graph comparing pre/post-test performance in shot put, discus, and javelin for both groups.) Visual not shown here – I can generate one upon request.

Pedagogical Testing and Evaluation

At the beginning and end of the study, a series of **pedagogical tests** were conducted to evaluate the **special physical fitness level** of the athletes. The application of a specialized testing system tailored to para-athletic throwing disciplines allowed for more effective measurement of progress.

The experimental group demonstrated significant improvements due to enhanced **technical training**, and a systematized approach taking into account **nosological characteristics** and **functional classification**.

Additional Test Results and Improvement Indicators (Experimental Group)

Test Description	n	Pre-Test Result (Mean ± σ)	Post-Test Result (Mean ± σ)	Improvement	p-value
Overhead shot put (2 kg, both hands)	6	8.09 ± 2.06 m	9.72 ± 0.91 m	+1.63 m	$p < 0.01$
Chest pass shot put (2 kg, both hands)	6	8.61 ± 0.89 m	9.88 ± 0.97 m	+1.27 m	$p < 0.05$
Smith machine bench press	6	98.79 ± 10.16 kg	119.3 ± 11.26 kg	+20.51 kg	$p < 0.01$
Smith machine shoulder press (5 reps, 50% BW)	6	4.72 ± 0.44 s	3.97 ± 0.34 s	-0.75 s	$p < 0.01$
Smith machine bench press (70% BW, 5 reps)	6	5.03 ± 0.56 s	4.33 ± 0.45 s	-0.70 s	$p < 0.05$
150 g ball throw (one-handed)	6	38.66 ± 4.26 m	47.63 ± 4.89 m	+8.97 m	$p < 0.01$

Conclusions

After the intervention, the **experimental group** showed a statistically significant improvement in all indicators of **special physical preparedness** compared to the control group.

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The most notable performance gains were observed in **overhead shot put**, **chest throw**, and **ball throw**, as well as in **strength and power endurance** exercises using the **Smith machine**. The average improvement in special physical preparedness was measured at 22.15% for throwing events, and 18.11% for general physical fitness indicators.

This confirms the effectiveness of a training system tailored to the functional and nosological characteristics of para-athletes, incorporating targeted biomechanical optimization, progressive loading, and specialized equipment.

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