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THE IMPACT OF PHYSICAL EDUCATION CLASSES ON THE DEVELOPMENT OF EXPLOSIVE STRENGTH OF LEG EXTENSOR MUSCLES IN YOUTH WITH DEVELOPMENTAL DISABILITIES

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ABSTRACT

Children with developmental disabilities often spend most of their day engaged in activities that require little or no physical effort, which negatively affects their development. The introduction of structured and adapted forms of physical activity can significantly improve their motor and overall physical status. The aim of this paper is to assess the effects of regular participation in physical education classes by analyzing the explosive strength of the lower-limb extensors in youth with developmental disabilities. The sample consisted of 30 participants of both sexes, aged 15, with mild intellectual disabilities. In addition to standard physical education classes, participants in the experimental group underwent an additional three-month training protocol. The results obtained through the paired samples t-test showed a statistically significant difference after the applied experimental treatment in the variables: Body mass (p = .000), Thigh circumference (p = .000), and Calf circumference (p = .000), where a reduction in average values was recorded. A significant difference was also found in the variables Standing long jump (p = .000) and Vertical jump (p = .000), where the average values increased. The repeated-measures ANOVA results indicate that the experimental treatment showed a significant positive effect on the following variables: Body mass (p = .000), Thigh circumference (p = .000), Calf circumference (p = .003), Standing long jump (p = .000), and Vertical jump (p = .000). The introduction of structured and adapted forms of physical activity can significantly improve the motor and overall physical status of children with developmental disabilities.

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UTICAJ NASTAVE FIZIČKOG VASPITANJA NA RAZVOJ EKSPLOZIVNE SNAGE MIŠIĆA OPRUŽAČA NOGU KOD MLADIH SA RAZVOJNIM TEŠKOĆAMA

APSTRAKT

Deca sa smetnjama u razvoju često provode veći deo dana u aktivnostima koje zahtevaju malo ili nimalo fizičkog angažovanja, što ima negativan uticaj na njihov razvoj. Uvođenjem strukturiranih i prilagođenih oblika fizičke aktivnosti može se značajno unaprediti njihov motorički i opšti fizički status. Cilj rada je da se putem analize eksplozivne snage ekstenzora donjih ekstremiteta kod mladih sa razvojnim smetnjama, procene efekti redovnog uključivanja u nastavu fizičkog vaspitanja. Uzorak je činilo 30 ispitanika oba pola, uzrasta 15 godina, sa lakim intelektualnim ograničenjima. Pored standardne nastave fizičkog vaspitanja, ispitanici eksperimentalne grupe bili su tri meseca podvrgnuti dodatnom trenažnom protokolu. Rezultati dobijeni putem T-testa uparenih uzoraka su pokazali statistički značajnu razliku nakon primenjenog eksperimentalnog tretmana, u varijablama: Telesna masa (p=.000), Obim natkolenice (p= .000) i Obim potkolenice (p=.000), gde je došlo do redukcije prosečnih vrednosti u ovim varijablama. Razlika je takođe utvrđena u varijablama Skok udalj iz mesta (p= .000) i Skok uvis iz mesta (p=.000), gde je ošlo do povećanja prosečnih vrednosti. Vrednosti pokazatelja ANOVA analize za ponovljena merenja ukazuju da je eksperimentalni tretman pokazao značajan pozitivan efekat na sledeće varijable: Telesna masa (p=.000), obim natkolenice (p=.000), Obim potkolenice (p=.003), Skok u dalj iz mesta (p=.000) i Skok u vis iz mesta (p=.000). Uvođenjem strukturiranih i prilagođenih oblika fizičke aktivnosti može se značajno unaprediti motorički i opšti fizički status dece sa smetnjama u razvoju.

Ključne reči: populacija sa razvojnim smetnjama, motoričke funkcije, fizičko angažovanje, školska nastava

Introduction

The terminology introduced by the *Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association* defines intellectual disability/intellectual developmental disorder (ID/IDD) as part of the neurodevelopmental disorders, characterized by deficits in intellectual and adaptive functioning across conceptual, social, and practical domains, originating during the developmental period (APA, 2013).

The common diagnostic criteria for individuals with developmental disabilities include cognitive, behavioral, and developmental components. For an individual to be classified as having an intellectual disability, they must first demonstrate below-average intellectual functioning, typically identified by an IQ score lower than 70. Levels of cognitive impairment are associated with the following IQ ranges:

- profound: IQ < 20
- severe: IQ 20–34
- moderate: IQ 35–49
- mild: IQ 50–69
- borderline intellectual functioning: IQ 70–84 (Chadwick, Wesson & Fullwood, 2013).

Physical activity, particularly for children with developmental disabilities, represents a key determinant of quality of life. It has a strong impact on health status, self-confidence, socialization processes, and many other dimensions of everyday functioning. Empirical research consistently confirms the importance and multiple benefits of exercise and participation in various forms of physical activity for this population (Zhao & Chen, 2018). At the same time, the factors contributing to reduced participation of youth with developmental disabilities in physical activities are complex and result from the interaction of several interrelated influences (Heah, Case, McGuire, & Law, 2007). A lack of movement in these children is most often reflected in delayed gross motor development, reduced endurance, and poorly developed coordination and balance skills (Shields & Synnot, 2016).

Research shows that engaging in sports and physical activities has an even greater positive impact on individuals with developmental disabilities than on their typically developing peers (Maksimović, Golubović & Jablan, 2015; Franciosi, Baldari, Gallotta, Emerenziani, & Guidetti, 2010). Continuous participation in physical activity contributes to reducing health risks associated with excess body weight and chronic disease development among children with developmental disabilities. Moreover, empirical evidence indicates a positive influence of increased physical activity levels on cognitive functions in older children and adolescents with developmental disabilities, with particular emphasis on improvements in executive functioning (Tomporowski, McCullick, Pendleton & Pesce, 2015; Gao, Chen, Sun, Wen & Xiang, 2018).

Višnjić et al. (2011) state that a sedentary lifestyle is not only characteristic of the older population but is increasingly becoming a defining feature among children. Spending most of their time indoors, lacking natural environmental conditions, and engaging in numerous passive forms of play lead to serious disturbances in growth and development, with the spinal column being particularly affected. One of the key opportunities for incorporating these children into physical activity is physical education classes, which have the potential to contribute to the development of motor abilities and social integration. The goal of physical education is to improve students' motor status through organized and adapted instruction, as well as through the application of tools and methods that support skill development, all conducted in a structured and professional manner (Milenković, 2021; Pill, 2009; Kolovelonis & Goudas, 2013).

Introducing structured and adapted forms of physical activity can significantly enhance the motor and overall physical status of youth with developmental difficulties. The developmental trajectory of children and adolescents with specific limitations is often accompanied by numerous factors that hinder the progression of their motor functions. Within this research, attention is directed toward examining the physical indicators and motor abilities of 15-year-old youth with developmental difficulties.

Based on the analytical framework, the following hypotheses were formulated:

- **H:** the introduction of a specially designed exercise program focused on strengthening the explosive power of the leg extensor muscles will result in significant improvements in this ability among youth with developmental challenges.
- **H1:** the anthropometric profile of the participants corresponds to the reference values for their ageandsex
- **H2:** After the implementation of the experimental program, statistically significant positive changes are expected in the anthropometric indicators of body volume and mass between the initial and final measurements.

This study aims to determine the effectiveness of a three-month physical education program in improving the explosive strength of leg extensor muscles in adolescents with developmental difficulties, as well as to examine whether the program produced changes in anthropometric measures.

Method

Before the empirical phase of the research began, the necessary approvals were obtained from the school principal, parents, and students, in accordance with the provisions of the Helsinki Declaration regarding the rights of minors participating in scientific studies. The research was conducted at the specialized school "Middle Vocational School" in Belgrade. The experimental treatment consisted of 36 physical education classes implemented over a period of three months. The study was carried out during regular physical education classes and within the school's sports club, following a weekly 2+1 system. In addition to the two physical education classes mandated by the Ministry of Education, students participated in one additional class per week.

The research was conducted at two time points: before the implementation of the experimental treatment and after its completion. The experimental program lasted 12 weeks. After the twelfth week, all measurements conducted at the beginning of the study were repeated. Each measurement was conducted at approximately the same time of day and under similar conditions as during the initial testing. All testing took place in a well-lit and ventilated gymnasium with a safe, flat surface and sufficient space for activity.

Specific exercises aimed at increasing the strength of the lower-limb extensor muscles were incorporated throughout all phases of the instructional process.

To assess the anthropometric status of the participants, the following variables were measured: body height (cm), body mass (kg), calf circumference (cm), and thigh circumference (cm). Additionally, variables for determining and evaluating motor characteristics, specifically explosive strength of the leg extensors, were assessed through the standing long jump (cm) and vertical jump (cm).

Measurements were performed according to the International Biological Program (IBP) methodology. Participants attended testing in groups of six. Each group received instructions on how the specific motor tests would be conducted. Prior to measurement, all participants completed an identical warm-up and performed the tasks in sports attire.

The order of testing was the same for all groups. One evaluator consistently measured the same tests throughout the study, and all evaluators were specially trained for implementing the measurement protocol.

The instruments used in the research were: a digital scale (Body Fat Monitor – Body Composition Monitor, TANITA UM-72) for measuring body mass, an anthropometer (stadiometer), a measuring tape for assessing circumferences, and equipment for measuring standing long jump distance and vertical jump height.

For all variables, the following basic measures of central tendency and dispersion were calculated: mean value (M), standard deviation (SD), minimum and maximum measurement values, and range. The significance of differences between measurement points and the effect of the experimental treatment were tested using a paired samples t-test. The effect of the experimental treatment on the analyzed variables was further examined using one-way repeated measures ANOVA, with the significance level set at $p \leq .05$.

Results

Table 1. Basic statistical indicators of the participants' anthropometric characteristics at the initial measurement

Variable	**AS**	**SD**	**Min**	**Maks**	**Range**
Body height (cm)	169.9	9.2	152.0	187.0	35.0
Body mass (kg)	61.69	13.15	41.0	92.80	51.80
Thigh circumference (cm)	46.23	7.34	37.00	65.00	28.00
Calf circumference (cm)	34.4	4.88	29.00	48.00	19.00

Legend: AS – mean value, SD – standard deviation, Min – minimum value, Maks – maximum value, Range – the range between the minimum and maximum values in the sample

Based on the results, noticeable individual differences in the morphological structure of the participants can be observed. A wide range between minimum and maximum values is also evident, particularly in the variable Body Mass, which ranges from 41 kg to 92.8 kg.

Table 2. Basic Statistical Indicators of the Anthropometric Characteristics of the Participants at the Final Measurements

Variable	**AS**	**SD**	**Min**	**Maks**	**Range**
Body height (cm)	170.00	9.16	152.50	187.00	34.50
Body mass (kg)	60.24	12.51	40.40	88.00	47.60
Thigh circumference (cm)	45.55	7.15	27.0	64.00	27.00
Calf circumference (cm)	34.27	4.74	29.0	47.50	18.50

Legend: AS – mean value, SD – standard deviation, Min – minimum value, Maks – maximum value, Range – the range between the minimum and maximum values in the sample

A decrease in the mean values at the final measurement is observed in the variables Body Mass (initial 61.69 ± 13.15 kg → final 60.24 ± 12.51 kg), Thigh Circumference (initial 46.23 ± 7.34 cm → final 45.55 ± 7.15 cm), and Calf Circumference (initial 61.69 ± 13.15 cm → final 60.24 ± 12.51 cm). It can be concluded that the participants achieved better results at the final measurement, particularly in terms of reduced body mass and subcutaneous fat, which is reflected in the decrease of certain body circumferences.

Table 3. Differences Between Initial and Final Measurements in Relation to the Participants' Anthropometric Characteristics

Variable	Mean	Sd	t	df	p
Body height (cm)	-.033	.13	-1.44	29	.161
Body mass (kg)	1.44	1.48	5.34	29	.000
Thigh circumference (cm)	.68	.48	7.76	29	.000
Calf circumference (cm)	.18	.31	3.27	29	.003

Legend: Mean – average value of results from initial and final measurements; SD – standard deviation of the mean results from initial and final measurements; T – T-test value; df – degrees of freedom; p – statistical significance of the experimental treatment effect.

The results presented in this table indicate that the paired-sample T-test revealed a statistically significant difference due to the applied experimental treatment in the following variables: Body Mass (p = .000), Thigh Circumference (p = .000), and Calf Circumference (p = .000). The applied treatment had no effect on the variable Body Height, as the p-value was .161.

Table 4. Values of One-Way Repeated Measures Analysis of Variance (ANOVA) Indicators

Varijabla	Wilks' Lambda	F	p	Eta
Body height (cm)	.933	2.071	.161	.067
Body mass (kg)	.504	28.571	.000	.496
Thigh circumference (cm)	.325	60.258	.000	.675
Calf circumference (cm)	.731	10.666	.003	.269

Legend: Wilks' Lambda – Wilks' Lambda statistic, F – F-test value, p – statistical significance of the effect, Eta – effect size of the experimental treatment

The analyzed results indicate that the experimental treatment had a significant positive effect on the following variables: body mass (p = .000; Eta = .496). The largest effects were observed for thigh circumference (p = .000; Eta = .675) and calf circumference (p = .003; Eta = .269). The experimental treatment did not show a significant effect on the variable of body height (p = .161).

Table 5. Basic statistical indicators of the participants' motor abilities at the initial measurement

Variable	**AS**	**SD**	**Min**	**Maks**	**Range**
Long jump from a standing position (cm)	151.33	36.39	70.00	200.00	130.00
Vertical jump from a standing position (cm)	249.67	18.05	210.00	275.00	65.00

Legend: AS – mean value, SD – standard deviation, Min – minimum result, Max – maximum result, Range – the range between the minimum and maximum result in the sample

The results of this study indicate that participants jumped a distance ranging from 70 cm to 200 cm in the long jump and from 210 cm to 275 cm in the vertical jump. The large individual differences in results are due to the sample including both male and female participants who are in a phase of intensive growth and development.

Table 6. Basic Statistical Indicators of Participants' Motor Abilities at the Final Measurement

Varijabla	**AS**	**SD**	**Min**	**Maks**	**Range**
Long jump from a standing position (cm)	159.60	37.21	75.00	215.00	140.00
Vertical jump from a standing position (cm)	256.60	18.49	218.00	285.00	67.00

Legend: AS – mean value, SD – standard deviation, Min – minimum result, Max – maximum result, Range – range between the minimum and maximum results in the sample

An increase in the mean values at the final measurement is observed in the variables Standing Long Jump (initial 151.33 ± 36.39 cm / final 159.60 ± 37.21 cm) and Standing Vertical Jump (initial 249.67 ± 18.05 cm / final 256.60 ± 18.49 cm). It can be concluded that the participants achieved better results at the final measurement.

Table 7. Difference between initial and final measurements in relation to participants' motor skills

Variable	Mean	Sd	t	df	p
Long jump from a standing position (cm)	-8.267	4.28	-10.573	29	.000
Vertical jump from a standing position (cm)	-6.933	3.33	-11.399	29	.000

Legend: Mean – average value of results from initial and final measurements, SD – standard deviation of the mean results from initial and final measurements, T – T-test value, df – degrees of freedom, p – statistical significance of the experimental treatment effect

The results presented in Table 7 indicate that, based on the paired-sample T-test, a statistically significant difference was found in the variables: Standing Long Jump (p = .000) and Standing High Jump (p = .000).

Table 8. Values of One-Way Repeated Measures Analysis of Variance (ANOVA) Indicators

Variable	Wilks' Lambda	F	p	Eta
Long jump from a standing position (cm)	.206	111.783	.000	.794
Vertical jump from a standing position (cm)	.182	129.935	.000	.818

Legend: Wilks' Lambda – Wilks' Lambda indicator, F – F-test value, p – statistical significance of the effect, Eta – effect size of the experimental treatment

Analysis of the results in Table 8 indicates that the experimental treatment had a significant effect on the following variables: Standing long jump (p = .000; Eta = .794) and Standing high jump (p = .000; Eta = .818).

Discussion

Based on the results of the study, noticeable individual differences in the morphological structure of the participants can be observed, specifically in indicators of skeletal longitudinal dimensions. These findings are complementary and consistent with the results previously reported by Sarı and colleagues (Sarı, Yılmaz, Serin, Kısa, Yesiltepe, Tokem et al., 2016). The variability of the results partly stems from the limited population of adolescents with developmental disabilities, which included both male and female participants within a single sample. Based on the presented results, hypothesis H1 is accepted, indicating that the anthropometric status corresponds to reference values for age and gender. The strongest correlation between height and body mass occurs at age 15, when body mass largely depends on growth-regulating factors (Kurelić et al., 1975). It may happen that during the period of physical growth and development, certain body parts change, reaching their maximum at different points in time. For this reason, cases of acceleration can be observed in certain children, whose anthropometric characteristics deviate significantly from the average values for a given age.

The study results indicate a reduction in mean values for anthropometric measures assessing body volume and mass after the applied intervention. In addition to significant differences, a notable effect of the experimental treatment was found, with the greatest impact observed on body mass and thigh circumference. Based on these findings, hypothesis H2 is accepted, suggesting statistically significant positive differences in anthropometric indicators of body volume and mass between initial and final measurements following the experimental treatment. Given that the results indicate a reduction in body mass and lower limb circumferences after the intervention, these findings align with those of Sarı et al. (2016) and Hinckson et al. (2013), which also reported trends of decreased body mass and body circumferences as a result of physical activity programs. Furthermore, variability in parameters evaluating body volume and mass may be influenced by external factors such as differences in dietary habits and predominantly sedentary lifestyles, which are key contributors to increased subcutaneous fat accumulation. In the population of children with developmental disabilities, obesity is recognized as a primary etiological factor contributing to the occurrence and/or progression of comorbid health conditions arising from the underlying functional impairment.

Systematic health-epidemiological studies indicate that the prevalence of obesity among adolescents with developmental disabilities is at least equal to, and often higher than, that of their typically developing peers (Curtin, Anderson, Must & Bandini, 2010). Differences in overweight prevalence between children with and without developmental delays are evident as early as age three, with further increases by age five and continuation of this trend into adulthood (Reinehr, Dobe, Winkel, Schaefer & Hoffmann, 2010). It is also concluded that the most pronounced bodily transformations resulting from physical activity can be observed in the reduction of subcutaneous fat tissue, followed by changes in body volume, while changes in the longitudinal dimensions of the skeletal system are minimal or statistically negligible. These results have important practical implications for designing and implementing physical activity programs for children and adolescents with developmental disabilities. Given the limited influence on skeletal morphological parameters, interventions should be designed to emphasize the reduction of subcutaneous fat and improvement of body composition, while simultaneously enhancing motor abilities and functional mobility. It is important that physical activities are individually adapted to each participant's abilities, taking into account the type and severity of developmental disabilities, as well as age and gender.

Analysis of the results revealed statistically significant differences between initial and final measurements regarding the participants' motor abilities, specifically the strength of lower limb extensor muscles. In addition to these differences, a statistically significant positive effect of the experimental treatment on motor abilities was identified. Therefore, hypothesis H – stating that the application of a specialized experimental program focused on developing explosive lower limb extensor strength would result in statistically significant improvements in this motor ability among adolescents with developmental disabilities – is accepted. The results of this study are consistent with findings by Houwen et al. (2014), who demonstrated that specific physical activity interventions led to statistically significant improvements in participants' motor abilities at the final measurement. Moreover, these findings support numerous studies (Giagazoglou et al., 2013; Fotiadou et al., 2017; Lee, Lee & Song, 2016; Bishop & Pangelinan, 2018), which indicate that despite musculoskeletal difficulties and other physical limitations, adolescents with developmental disabilities can achieve significant improvements in physical fitness, activity levels, and motor skill development. These results further emphasize the importance of systematically planned and professionally supervised interventions aimed at motor development in this population.

During motor activities, youth with developmental disabilities often experience difficulties in movement control, executing movements incorrectly (Tudor, Montana, Ghitescu & Triscas, 2014), which may be associated with reduced brain volume, impaired maturation processes of the central nervous system, and the presence of various pathophysiological mechanisms affecting neuromotor function (Malak, Kostiukow, Krawczyk-Wasielewska, Mojs & Samborski, 2015). Since low cognitive and motor skills limit participation in physical activities (Barr & Shields, 2011), it is essential to adapt activities or motor tasks to achieve the ultimate goal of improving motor abilities (Tudor et al., 2014). Participation in physical activity has a beneficial effect on motor competence in children and youth with developmental challenges (Rapaić & Nedović, 2007; Franciosi et al., 2010; Golubović et al., 2012).

Institutionally organized physical education, initiated in early childhood through preschool programs and continued throughout primary and secondary education, represents one of the few structured frameworks where children can acquire knowledge, motor skills, and healthy behavior patterns related to sports and physical activity. These competencies are crucial for fostering positive attitudes toward an active lifestyle, which can persist into adulthood. The primary school period encompasses a phase of intensive developmental changes, including physical, emotional, cognitive, and social spheres of a child's development. In this context, physical education plays a fundamental role in promoting and shaping psychophysical traits, contributing to overall health, functional abilities, and quality of life (Pavlović, Marinković & Mitrović, 2020).

Initial measurements indicated that mean values in the analyzed strength indicators were statistically significantly lower than those of typically developing adolescents, consistent with previous findings (Protić-Gava & Uskoković, 2016). Reduced muscle strength in individuals with developmental disabilities arises from a deficit in voluntary neuromuscular recruitment, as neurophysiological mechanisms in this population show limited motor unit activation. Individuals with developmental disabilities activate only about 65% of quadriceps motor units, compared to approximately 85% in typically developing individuals (Borji, Zghal, Zarrouk, Sahli & Rebai, 2014). Additionally, coactivation anomalies in leg muscles are observed, where agonist-antagonist coactivation is used to stabilize posture, while generally, increased muscle strength through training corresponds with decreased antagonist coactivation (Enoka, 1997).

It is well documented that children, adolescents, and adults with intellectual disabilities have suboptimal cardiovascular fitness compared to typically developing individuals. This impaired fitness is most commonly due to a sedentary lifestyle and syndrome-specific pathophysiological factors, including hypotonia, muscle weakness, and increased prevalence of cardiovascular diseases. Reduced muscular and aerobic capacity, coupled with increased body fat percentage, correlate with impaired metabolic status, particularly an unfavorable lipid profile. Consequently, this population is at elevated risk for obesity, diabetes, and cardiovascular diseases (Flore et al., 2008).

Conclusion

Physical education classes, especially when adapted to the needs of adolescents with developmental disabilities, have a significant positive impact on the development of their motor skills. Regular and purposefully guided physical activity contributes to increased strength and reduced body mass, directly affecting the quality of life and independence of this population. Furthermore, structured physical education can mitigate the negative consequences of sedentary habits and help prevent secondary health problems. These findings highlight the importance of incorporating systematic and tailored physical

education programs into the educational and rehabilitation processes for adolescents with developmental disabilities. Based on the conducted study, it can also be concluded that the implemented experimental physical activity program has a significant and multifaceted positive effect on the anthropometric and motor characteristics of adolescents with developmental challenges.
The results clearly confirm the importance of a planned and professionally supervised physical activity program for adolescents with developmental disabilities. The three-month experimental treatment, based on specific exercises aimed at developing the explosive strength of the lower limb extensor muscles, resulted in statistically significant improvements in nearly all analyzed motor and anthropometric indicators, except for body height, which, as expected, is not affected by short-term interventions.

Regarding anthropometric status, it was confirmed that participants' values aligned with reference parameters for their age and sex, confirming hypothesis H1. After the treatment, reductions in body mass, thigh circumference, and calf circumference were recorded, indicating positive changes in body composition and a reduction of subcutaneous fat. These findings are consistent with numerous studies showing that physical activity primarily affects subcutaneous fat reduction, while changes in longitudinal body dimensions are minimal. These results support hypothesis H2 and confirm that systematic physical activity can be an effective method for improving body composition in adolescents with developmental disabilities.

The most notable results concern the improvement of motor skills, particularly explosive lower limb strength, where the experimental program showed a very high effect. Statistically significant improvements in standing long jump and vertical jump results confirm the primary research hypothesis (H) and align with previous studies, emphasizing that children with developmental disabilities, despite numerous physical limitations, can achieve significant progress when exposed to properly structured training.

Overall, the findings indicate that physical education, especially when adapted to individual student needs, is a key factor in enhancing their motor, health, and functional status. Exercise programs focused on motor development and reduction of subcutaneous fat have the potential to reduce health risks, improve psychophysical abilities, and contribute to a healthier and higher-quality upbringing of adolescents with developmental disabilities.

Given the high prevalence of sedentary lifestyles and increased susceptibility to obesity in this population, these results provide a strong impetus for the further development and implementation of specialized physical education programs in schools and rehabilitation institutions. Systematic inclusion of such programs can have long-term positive effects on physical health, motor competencies, and overall well-being of adolescents with developmental challenges.

Analysis of the research results highlights that adolescents with developmental disabilities are at increased risk of obesity, metabolic disorders, and cardiovascular diseases. The findings underscore the critical importance of targeted physical activity programs in preventing health complications and improving overall functional status. It is especially important to individualize physical activities, adapt them to the type and degree of disability, and ensure continuous professional supervision to optimally stimulate motor skill development and enhance the quality of life of this vulnerable population.

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