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The comparison of the relationship between body composition and physical fitness in students of sports championship classes in early specialized (gymnastics) and late specialized (judo) sports

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Abstract

Backgrounds The purpose of this study is to compare the level of physical fitness and the effect of body composition on the level of physical fitness in boys training in sports at the elementary school level in early specialization sports (gymnastic sports), non-early specialization sports (judo) and in classes not training in competitive sports.

Material and methods. The study included students in the gymnastics-sports-jumping trampoline classes (n=8), with an average age of 11.54; judo classes (n=11) with an average age of 12.66; and general classes (n=25) with an average age of 12.21 at the elementary school level.

Results. Among the subjects, the highest level of physical fitness was shown in students participating in gymnastic sports, followed by those training judo and students not participating in competitive sports. There was a significant difference in fitness levels between students of early specialty sports and non-sports students, as well as the effect of body composition on fitness levels in all the groups studied.

Conclusion. In order to optimize the training process, it is necessary to introduce individualized diets adapted to the training process in the sports championship classes, as well as classes on proper nutrition in sports and everyday life taking into account the puberty process.

Key words: gymnastics, judo, sports championship school, body composition, physical fitness

1. Introduction

According to Word Health Organization (WHO) recommendations, children and adolescents between the ages of 5 and 17 should spend at least 60 minutes a day in moderate to vigorous intensity physical activity. In addition, WHO recommends that children and adolescents of this age should engage in high-intensity aerobic exercise that strengthens muscles and the musculoskeletal system a minimum of 3 days a week (WHO, 2020). Children and adolescents wishing to participate in sports at a competitive level must undertake a training process that is properly organized and tailored to their age and abilities. Many times a child's coordination capabilities or body structure are one of the factors that determine his or her potential for success in a given sport.

Judo is an Olympic sport of speed and strength. Practicing this sport at the competitive level requires a high level of all-around physical fitness that gives the ability to efficiently execute movement-complex techniques in a short period of time, with resistance and increasing physical and mental strain associated with direct competition with an opponent (Baginska, et al., 2022, Witkowski, et al., 2021, Piepiora, et al., 2020, Franchini, et al. 2011). According to the International Judo Federation (IJF) regulations, the youngest group in which international competition takes place is the cadet group - under the age of 18. It is open to athletes aged 15-17 (Sport and Organization Rules, 2023). In Poland, according to the Sport Regulations of the Polish Judo Association, sports competition is held for those who will be at least 11 years old in a given calendar year (Sport Regulations of the Polish Judo Association, 2024).

Gymnastics - trampoline jumping is also a sport included in the Summer Olympics program. As a sport, it does not have a defined motor profile, but previous research shows that undertaking training significantly increases speed, jumping and anaerobic capacity. In addition, early initiation of regular sports training, which results in physiological and psychological

adaptive changes in the athletes' bodies, is necessary to achieve sports performance (Piepiora and Naczynska, 2023, Aslan, et al., 2015, Mohammed and Joshi, 2015). In gymnastics - trampoline jumping, sports competition begins much earlier. According to the Rules for Junior and World Age Group Competition (WAGC) Trampoline Gymnastic, Fédération Internationale de Gymnastique (2020), the youngest age group competing at the international level are athletes who are 11-12 years old in a given calendar year. In Poland, on the other hand, competition begins in the categories approved by the Regulations of the Youth Sports System for the sport of gymnastics - trampoline/track jumping, where the youngest age group (youngster) starts at age 7 (Polish Sport Institute, 2024).

In Poland, in order to enable the process of identifying children with predispositions to a particular sport and give them the opportunity to combine sports training with regular statutory education, there is the possibility of creating sports championship classes for various sports. In order to create such a class, it is necessary to conclude an agreement between the school in question and the Polish sports association and sports club overseeing the training process being carried out. In addition, it is necessary to hire coaching staff and have a long-term sports training program approved by the minister responsible for physical culture. Classes of sports mastery in elementary schools implement in parallel an educational program in accordance with the core curriculum and a sports training program that amounts to at least 16 lessons per week, including 4 lessons of physical education and 12 lessons of training in a given sport discipline, (Regulation of the MEiN of 27.03.2017, Ministry of Sport and Tourism, 05.03.2018). The task of such classes is to adequately prepare wards for success in sports competition at the national and international level, which is an integral part of education in sports championship classes (Kurzyna-Chmiel, 2021).

For both sports under study, multi-year training plans are created by their sports associations to be implemented in the assumed sports classes. What, importantly, in the sport of gymnastics - trampoline jumping the student of the class can be a person who has reached the age of 7, while in the judo class a person who has reached the age of 10 (Polish Gymnastics Association, 2017, Czajka, 2017).

Considering the nature and age from which sports competition begins in gymnastics and judo, the authors considered them as early-specialized sports (gymnastics profile) and late-specialized sports (judo).

The purpose of the study was to compare the level of physical fitness in boys in sports championship classes and general classes, and to analyze the effect of body composition on their level of physical fitness. The authors set the following research hypotheses:

1. Students of early specialty sports have a higher level of physical fitness than students of late specialty sports and non-sports classes.
2. In all children, body composition shows a significant impact on the results obtained in fitness tests.

2. Material

In sports championship classes with a profile of gymnastics - trampoline jumping, 8 boys were examined, the average age of the subjects was 11.54 years (SD= 1.371), body height was 150.75 cm (SD= 10.47), and the average weight was 38.74 kg (SD= 8.493). In the judo-profiled sports championship classes, 11 boys were examined, the average age of the subjects was 12.66 years (SD= 1.11), the average body height was 160.46 cm (SD= 8.501), and the average body weight was 53.55 kg (SD= 12.561). In the general profile classes, 25 boys were examined, the average age was 12.21 years (SD= 1.443), the average body height was 155.08 cm (SD= 9.104), and the average weight was 45.99 kg (SD= 14.338).

3. Methods

EUROFIT Test

To measure the level of physical fitness, selected tests from the test created by the Council of Europe to measure the level of physical fitness in children and adolescents aged 6 to 17 years - EUROFIT (Council of Europe, Committee of Ministers, 1987) were used.

Due to the specificity of the sports analyzed, the following 6 fitness tests were included in the study, excluding tests that could be biased due to the motor characteristics of the sports studied:

1) Sit and reach test (SAR) [cm] – Flexibility test
2) Standing broad jump (SBJ) [cm] – Explosive strength test
3) Sit-ups (SUP) [number] for 30 seconds – Trunk strength test
4) Bent arm hang – Functional strength test
5) Shuttle run 10x 5m [s]– Running speed – agility test
6) Endurance shuttle run (Beep-Test) – Cardio-respiratory endurance test

All of the above fitness tests were conducted in accordance with the guidelines for the EUROFIT test.

In addition, during the execution of the beep -test, the level of aerobic capacity was estimated using the formula for children and adolescents aged 6-18 years old:

VO_2max [ml/kg/min] = $-31.025 + 3.328X_1 - 3.248X_2 + 0.1536X_1X_2$, where:

X_1 – maximum aerobic shuttle run speed

X_2 – age (as a rounded down integer), (Leger et al., 1988).

Body composition analysis was performed with a TANITA MC- 780 P MA body composition analyzer, using the electrical bioimpedance method. During the conduct of each test, the tare was zeroed, and the sex, age and height of the subject were selected in sequence. After the subject entered the device, the analyzer collected the body weight reading, and then the subject took the sensors, one in each hand, and inverted the straightened arms to the side. The test ended with a beep issued by the device and a request to put down the sensors and step off the scale (Body Composition Analyzer MC- 780MA-N III Instruction Manual, 2018). The tests conducted included measurement of body weight, FM [kg], FM [%], FFM [kg], FFM [%], TBW [kg], TBW [%], MM [kg], MM [%].

Statistical analysis

Descriptive statistics were used to calculate the arithmetic mean, minimum, maximum and standard deviation. Normality distribution was calculated using the Shapiro-Wilk test. Comparison of the study variables among themselves was performed using one-way ANOVA analysis of the Tukey post-hoc test for unequal N. Pearson correlation was used to analyze the relationship between the study variables. A relationship was considered significant when $p<0.05$. Statistical analysis was performed using Statistica 13.3 program.

4. Results

Tables 1-3 show the descriptive characteristics of the variables studied in gymnastics profile sports championship classes (table no. 1), judo profile sports championship classes (table no. 2) and general classes (table no. 3). It was shown that the lowest levels of body fat and the highest levels of fat-free tissue, muscle tissue and total body water were found in students of sports championship classes with a gymnastics profile. Also, in all of the fitness tests studied, the best results were obtained by students of gymnastics-specific sports championship classes. However, it was not noted that the students of each class differed significantly in body composition. On the other hand, it was shown that gymnastics students performed significantly better in sit and reach test, sit-ups, shuttle run 10x 5m, distance in beep - test, maximum aerobic speed of the last level of beep - test, and had a higher level of estimated VO_2max [ml/min/kg] than students in general classes, and had a significantly higher level of estimated VO_2max [ml/min/kg] than

students in judo classes. In contrast, there were no significant differences in fitness levels between students in judo and general classes, (Table no. 4)

Table 1. Descriptive characteristics of students in sports championship classes with a profile of gymnastics - trampoline jumping

Variable	M	Min	Max	SD
Body weight [kg]	38.737	28.300	50.500	8.493
FM [kg]	6.800	5.300	9.600	1.489
FM [%]	17.925	14.700	23.100	3.359
FFM [kg]	31.937	21.800	43.100	7.631
FFM [%]	82.167	77.032	85.347	3.331
TBW [kg]	23.388	16.000	31.500	5.556
TBW [%]	60.186	56.532	62.376	2.392
MM [kg]	30.250	20.600	40.900	7.280
MM [%]	77.799	72.792	80.990	3.206
Sit and reach test (SAR) [cm]	5.250	0.000	14.000	4.862
Standing broad jump (SBJ) [cm]	193.875	165.000	227.000	24.068
Sit-ups (SUP) [number]	33.250	28.000	38.000	3.655
Bent arm hang (BAH) [s]	17.495	3.700	37.230	13.419
Shuttle run 10x 5m [s]	19.843	17.150	22.310	1.785
Beep - test - distance [m]	1230.000	720.000	1660.000	347.069
Maximum aerobic speed of the last level of Beep-Test [km/h]	11.688	10.500	12.500	0.799
VO_2max [ml/min/kg]	52.790	48.672	58.220	3.108

Table 2. Descriptive characteristics of subjects in sports championship classes with a profile of judo

Variable	M	Min	Max	SD
Body weight [kg]	53.545	36.200	70.300	12.561
FM [kg]	12.518	4.700	22.200	6.285
FM [%]	22.245	12.600	33.600	7.492
FFM [kg]	41.027	30.000	55.900	7.788
FFM [%]	77.719	66.314	87.500	7.492
TBW [kg]	30.027	22.000	40.900	5.688
TBW [%]	56.888	48.501	63.971	5.509
MM [kg]	38.891	28.400	53.100	7.428
MM [%]	73.656	62.787	82.843	7.083
Sit and reach test (SAR) [cm]	1.647	-20.000	23.000	11.319
Standing broad jump (SBJ) [cm]	169.235	115.000	232.000	27.103
Sit-ups (SUP) [number]	27.706	21.000	38.000	4.120
Bent arm hang (BAH) [s]	8.908	0.540	37.620	9.480
Shuttle run 10x 5m [s]	21.733	18.200	30.170	2.962
Beep - test - distance [m]	876.471	380.000	1760.000	435.789
Maximum aerobic speed of the last level of Beep-Test [km/h]	10.882	9.500	13.000	1.125
VO_2max [ml/min/kg]	48.752	31.025	73.119	13.431

Table 3. Descriptive characteristics of the variables studied in classes with a general profile.

Variable	M	Min	Max	SD
Body weight [kg]	45.985	28.200	86.200	14.338
FM [kg]	10.058	2.600	26.300	6.245
FM [%]	20.415	7.000	39.200	7.323
FFM [kg]	35.927	23.700	64.400	9.252
FFM [%]	79.575	60.746	92.954	7.328
TBW [kg]	26.296	17.300	47.100	6.767
TBW [%]	58.246	44.478	68.022	5.372
MM [kg]	34.035	22.400	61.200	8.827
MM [%]	75.350	57.612	88.076	6.884
Sit and reach test (SAR) [cm]	-2.688	-24.000	23.000	9.773
Standing broad jump (SBJ) [cm]	158.063	90.000	217.000	29.519
Sit-ups (SUP) [number]	23.969	13.000	44.000	6.276
Bent arm hang (BAH) [s]	12.116	0.000	53.720	13.722
Shuttle run 10x 5m [s]	23.188	18.910	32.780	3.024
Beep - test - distance [m]	668.125	200.000	1760.000	368.532
Maximum aerobic speed of the last level of Beep-Test [km/h]	10.266	9.000	13.000	1.008
VO_2max [ml/min/kg]	45.937	31.025	73.119	10.675

Table 4. Comparison of body composition and physical fitness of students in different types of classes.

Variable	Class type	Judo	Gymnastics
FM [kg]	Judo		
	Gymnastics	0.118	
	General	0.478	0.563
FM [%]	Judo		
	Gymnastics	0.387	
	General	0.653	0.834
FFM [kg]	Judo		
	Gymnastics	0.108	
	General	0.381	0.625
FFM [%]	Judo		
	Gymnastics	0.367	
	General	0.648	0.817
TBW [kg]	Judo		
	Gymnastics	0.108	
	General	0.380	0.626
TBW [%]	Judo		
	Gymnastics	0.358	
	General	0.648	0.808
MM [kg]	Judo		
	Gymnastics	0.110	
	General	0.382	0.628
MM [%]	Judo		
	Gymnastics	0.374	

	General	0.660	0.816
Sit and reach test (SAR) [cm]	Judo		
	Gymnastics	0.071	
	General	0.781	**0.018**
Standing broad jump (SBJ) [cm]	Judo		
	Gymnastics	0.232	
	General	0.667	0.054
Sit-ups (SUP) [number]	Judo		
	Gymnastics	0.292	
	General	0.083	**0.004**
Bent arm hang (BAH) [s]	Judo		
	Gymnastics	0.212	
	General	0.543	0.700
Shuttle run 10x 5m [s]	Judo		
	Gymnastics	0.337	
	General	0.466	**0.049**
Beep - test - distance [m]	Judo		
	Gymnastics	0.112	
	General	0.201	**0.003**
Maximum aerobic speed of the last level of Beep-Test [km/h]	Judo		
	Gymnastics	0.221	
	General	0.149	**0.005**
VO_2max [ml/min/kg]	Judo		
	Gymnastics	**0.035**	
	General	0.192	**0.001**

Note: $p<0.05$ values are in bold;

In the group of gymnastics master classes studied, two fitness tests showed associations with the body composition of the subjects. Standing broad jump significantly positively related to FFM [kg], FFM [%], TBW [kg], TBW [%], MM [kg], MM [%] and significantly negatively related to FM [%], and bent arm hang significantly positively related to FFM [kg], FFM [%], TBW [kg], MM [kg], MM [%] and significantly negatively related to FM [%], (Table no. 5).

Table 5. Correlations between fitness variables and body composition in a group of boys in sports championship classes with a profile of gymnastics - trampoline jumping (Pearson correlations).

Variable	FM [kg]	FM [%]	FFM [kg]	FFM [%]	TBW [kg]	TBW [%]	MM [kg]	MM [%]
Sit and reach test (SAR) [cm]	-0.018	-0.032	-0.004	0.027	-0.005	0.021	-0.006	0.013
Standing broad jump (SBJ) [cm]	0.019	**-0.817**	**0.803**	**0.813**	**0.803**	**0.799**	**0.802**	**0.829**
Sit-ups (SUP) [number]	0.399	0.559	-0.065	-0.559	-0.065	-0.567	-0.063	-0.543

Bent arm hang (BAH) [s]	0.082	**-0.716**	**0.773**	**0.709**	**0.773**	0.693	**0.772**	**0.721**
Shuttle run 10x 5m [s]	0.306	0.197	0.040	-0.196	0.042	-0.196	0.042	-0.179
Beep - test - distance [m]	0.186	0.016	0.277	-0.022	0.276	-0.036	0.277	-0.010
Maximum aerobic speed of the last level of Beep-Test [km/h]	0.084	-0.077	0.262	0.072	0.261	0.060	0.262	0.080
VO_2max [ml/min/kg]	0.034	0.306	-0.136	-0.308	-0.137	-0.313	-0.136	-0.307

Note: $p<0.05$ values are in bold;

The judo profile sports championship classes showed significant correlations between body composition and 5 fitness tests. The sit-ups test showed significant positive associations with FFM [kg], TBW [kg], MM [kg]. Bent arm hang significant negative association with FM [%] and positive association with FFM [%], TBW [%], and MM [%]. Distance of beep-test was positively associated with FFM [%] and TBW [%] and significantly negatively associated with FM [kg] and FM [%].Maximum aerobic speed of the last level of beep-test showed significant positive association with FFM [%], TBW [%], MM [%] and significant negative association with FM [kg] and FM [%]. VO_2max showed a significantly positive association with FFM [%], TBW [%], and MM [%], and a significant negative association with FM [kg], FM [%], FFM [kg], TBW [kg], MM [kg], (Table no. 6).

Table 6. Correlations between fitness variables and body composition in a group of boys in sports championship classes with a judo profile (Pearson correlations).

Variable	FM [kg]	FM [%]	FFM [kg]	FFM [%]	TBW [kg]	TBW [%]	MM [kg]	MM [%]
Sit and reach test (SAR) [cm]	0.423	0.334	0.374	-0.334	0.373	-0.338	0.372	-0.334
Standing broad jump (SBJ) [cm]	-0.396	-0.543	0.134	0.547	0.134	0.543	0.133	0.546
Sit-ups (SUP) [number]	0.101	-0.111	**0.652**	0.111	**0.653**	0.109	**0.653**	0.119
Bent arm hang (BAH) [s]	-0.561	**-0.667**	0.045	**0.665**	0.047	**0.666**	0.046	**0.667**
Shuttle run 10x 5m [s]	0.437	0.505	0.013	-0.507	0.012	-0.506	0.013	-0.506
Beep - test - distance [m]	**-0.624**	**-0.604**	-0.520	**0.603**	-0.518	**0.608**	-0.520	0.595
Maximum aerobic speed of the last level of Beep-Test [km/h]	**-0.637**	**-0.647**	-0.440	**0.647**	-0.438	**0.651**	-0.440	**0.640**
VO_2max [ml/min/kg]	**-0.703**	**-0.651**	**-0.607**	**0.649**	**-0.605**	**0.654**	**-0.607**	**0.641**

Note: $p<0.05$ values are in bold;

In the general profile classes, there was a significant positive relationship between bent arm hang and FFM [%], TBW [%] and MM [%], and a significant negative one with FM [kg] and FM [%]. At the same time, the 10x5m shuttle run test showed a significant positive association with FM [kg] and FM [%], and a significant negative association with FFM [%], TBW [%] and MM [%], (Table no. 7).

Table 7. Correlations between fitness variables and body composition in a group of boys in general education classes (Pearson correlations).

Variable	FM [kg]	FM [%]	FFM [kg]	FFM [%]	TBW [kg]	TBW [%]	MM [kg]	MM [%]
Sit and reach test (SAR) [cm]	0.057	0.018	0.039	-0.016	0.037	-0.020	0.039	-0.014
Standing broad jump (SBJ) [cm]	-0.153	-0.356	0.271	0.355	0.271	0.354	0.270	0.362
Sit-ups (SUP) [number]	-0.156	-0.192	0.011	0.191	0.011	0.191	0.011	0.195
Bent arm hang (BAH) [s]	**-0.494**	**-0.546***	-0.335	**0.547***	-0.335	**0.545***	-0.335	**0.545***
Shuttle run 10x 5m [s]	**0.453**	**0.610***	0.041	**-0.610***	0.041	**-0.611***	0.043	**-0.612***
Beep - test - distance [m]	-0.123	-0.314	0.308	0.313	0.308	0.314	0.308	0.322
Maximum aerobic speed of the last level of Beep-Test [km/h]	-0.120	-0.314	0.306	0.312	0.307	0.313	0.306	0.320
VO_2max [ml/min/kg]	-0.244	-0.301	-0.025	0.300	-0.025	0.301	-0.026	0.303

Note: $p<0.05$ values are in bold; *-$p<0.01$;

5. Discussion

In the conducted research, the levels of flexibility, explosive strength, trunk strength, functional strength, running speed - agility and cardio-respiratory endurance of students of sports championship classes in early-specialization sports (gymnastic sports), late-specialization sports (judo) and general classes (not training in competitive sports) were analyzed. The first research hypothesis was confirmed, assuming that students in sports championship classes in early specialty sports have a higher level of physical fitness than students in sports championship classes in late specialty sports and in general classes. The study showed that the best results in all fitness tests were obtained by students in gymnastics sports. They have significantly higher levels of flexibility, trunk strength, running speed - agility and cardio-respiratory endurance than students in classes that do not participate in competitive sports, and significantly higher levels of cardio-respiratory endurance than students in judo sports championship classes. Similar results were obtained in a study by Bartosz Hes, where it was

shown that gymnastics class athletes were characterized by lower body weight and higher physical fitness than their non-training peers (Hes, 2018). Consecutively, in all fitness tests, with the exception of the bent arm hang test, the best results were achieved by students from judo sports classes. However, in the fitness tests studied, there was no significant difference between the fitness levels of students in judo and general classes. This is consistent with previous research, which has shown that athletes who train judo and other combat sports at school age have a higher level of physical fitness than peers who do not train, but it is not higher than population norms (Witkowski et al., 2018, Plona et al., 2014). It should be noted, however, that studies analyzing the fitness level of judo athletes show that as they age, judo players achieve higher fitness levels (Detanico and Kons, 2023, Osipov et al., 2017). This may indicate that judo practiced at school age by boys in the sports championship class significantly affects their fitness level only at a later age. Judo as a sport requires correct posture, good propioceptive sensation related to balance, and strength and speed (Kujach et al., 2022). The sport of gymnastics, requires athletes to quickly adapt to special training loads that significantly affect speed, jumping and anaerobic capacity (Aslan et al., 2015). Bearing in mind that in the comparison of students of gymnastics classes and judo classes, and that a significant difference in the level of cardio-respiratory endurance was noted between these groups, this may indicate that the level of physical fitness of students of judo classes is increasing. This indicates that in order to be able to develop the maximum potential of the athlete in the training process of school-age boys in combat sports, as well as other late specialty sports, movement patterns tailored to the sport should be shaped, and physical fitness should be shaped with the development of specific motor characteristics important in a given sport in a manner adapted to the age and sensitive periods of the athlete.

It has been proven that an athlete's athletic performance is dependent on his body composition. Body mass affects an athlete's speed, endurance and strength and body composition affects strength and agility (Masanovic et al., 2019). In the conducted research, the body composition of the students in the sports championship classes had a significant impact on their performance in individual fitness tests in all the studied groups. In gymnastics classes it influenced the results in standing broad jump, bent arm hang, in judo classes it influenced the results in sit-ups, bent arm hang and beep - test, while in general classes it significantly influenced the results obtained in bent arm hang and shuttle run 10x 5m. This confirms the second research hypothesis. In the analyzed studies, it was shown that the results in fitness tests by students of gymnastics classes were influenced by the level of fat, lean muscle mass, body hydration and muscle mass. It was also shown that among the groups studied, gymnasts had the lowest levels of body fat. This is

consistent with previous studies showing that gymnasts are leaner than other athletes, and that their levels of body fat and muscle mass affected the quality of gymnasts' performance of technical elements and their level of fitness (Söğüt et al., 2019, Donti et al., 2015, Damsgaard et al., 2001). The relationships shown in the group of judokas in the study conducted by the Authors also have confirmation in previous research. It has been proven so far that body composition influences the level of fitness preparation of young judokas and a decrease in body fat, an increase in fat-free tissue and an increase in muscle mass are factors indicating an increase in motor potential in the sport of judo (Witkowski et al., 2021, Lech et al, 2011).In the studies conducted to date, there were no significant differences in body composition between adolescent young athletes and non-athletically trained students, while in the long-term studies conducted in sports classes, there were tendencies to reduce lean body mass and muscle mass, indicating inadequate nutrition ((Nowosielka - Swadźba et al., 2016, Stańczyk et al., 2013). In addition, the results obtained in fitness tests were influenced by the level of hydration in all the groups studied. Students in sports championship classes having higher levels of total body water obtained higher results in the tests, while in general classes higher levels of body hydration influenced better results in the functional strength test and lower levels of total body water influenced lower results in the running speed - agility test. Studies show that hypohydration often occurs in young athletes, which worsens during a training unit. It has also been proven that inadequate nutrition and hydration can cause disorders in the process of maturation and proper development (Arnaoutis et al., 2015, Bergeron,2015, Smith et al., 2015). This indicates the need not only for proper nutrition and muscle mass building, but also for attention to adequate hydration levels throughout the day and during training units. It is important that both nutrition and hydration are adapted to the age and training loads of young athletes. In order to be able to achieve the maximum possible results in schools training for sports championship profiles, it would be reasonable to provide diets for athletes, tailored to the sports process and individualized energy requirements. At the same time, it would be necessary to conduct regular monitoring of the body composition of athletes and education on nutrition and its impact on the effectiveness of the training process and functioning in everyday life.

6. Conclusion

In late specialty sports, movement patterns tailored to the sport should be shaped, and physical fitness should be shaped with the development of specific motor characteristics important in a given sport in a manner adapted to the athlete's age and sensitive periods. In order to maximize performance, individualized diets tailored to the training process and education on proper nutrition in daily life should be introduced in sports championship schools.

Disclosure

Author's Contribution

Conceptualization, G.K. and A.P.; methodology, G.K. and A.P.; software, G.K and A.P.; validation, G.K. and A.P.; formal analysis, G.K.; investigation, G.K.; resources, G.K.; data curation, G.K.; writing—original draft preparation, G.K.; writing—review and editing, G.K. and A.P.; visualization, G.K.; supervision, G.K. and A.P; project administration, G.K. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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