



Influence of Combined Fitness Classes on Physical Preparedness and Posture Formation in Primary School Children

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Abstract

The aim of the study was to reveal the effectiveness of combined fitness classes for primary school children, organized considering their physical preparedness level and peculiarities of posture formation.

Materials and methods. The research involved 56 children who were 8-9 years old at the beginning of the experiment, among them 32 girls and 24 boys. Four groups were formed: two experimental EG1 (13) and EG2 (16) and two control CG1 (11) and CG2 (16). Participants of the experimental groups attended fitness classes, and children in the control groups exercised only during physical education classes. The following methods were used in the study: study and analysis of literature; analysis of video recordings of fitness programs; pedagogical testing; visual screening of biogeometric posture profile; pedagogical experiment, and mathematical statistics.

Results. Measurement of physical ability development at the end of the experiment showed significant improvement in groups where children attended specially organized combined fitness classes in addition to main physical education classes at school. The most positive results of the study were changes in the level of the biogeometric posture profile of the studied EG1. Thus, if at the beginning of the experiment in EG1 there were 2 children with low level and 11 children with medium level, at the end of the experiment 6 children had medium level and 7 children improved their posture to high level.

Conclusions. It has been experimentally proved that for children with posture defects and low level of physical preparedness, fitness classes should be filled mainly with low-impact strength exercises that have a corrective effect. High-impact aerobic exercises should be included in the combined classes for children with normal posture and organized according to the classical scheme: warm-up, aerobic peak, hitch, power block, and stretching.

Keywords: aerobics, primary school children, posture, physical abilities, fitness.

Introduction

Recently, the world has been facing challenges that have led to a significant decrease in the level of physical activity of children of all ages. The COVID-19 pandemic, the growing negative impact of Internet addiction on juniors, the unsatisfactory organization of physical education in educational institutions, and many other factors lead to negative consequences for children's health (Chen I, Chen C et al., 2021; Picca, Manzoni et al., 2021).

For example, low levels of physical activity in children lead to several health problems (Sunanto, Asmara, Himawan, & Purwoto, 2022; Adamčák, Štefan, Marko, & Bartík, 2023). Among the most common are the problem of obesity (Gjonbalaj, Morina, Gontarev, & Georgiev, 2022; Strotmeyer, Kehne, & Herrmann, 2020), and poor mental health (Andermo, Hallgren, Nguyen, et al., 2020; Chen, Gu, Chen, & Wang, 2022). Weak, un-

trained muscles often cause poor posture, especially in primary school age, when children spend more time studying (Shchyryba, 2016; Lukianchuk & Tymoshenko, 2021; Spitsyn, 2016).

A decrease in physical activity inevitably causes deterioration in physical preparedness. The following studies (Nesen, 2022; Sopa & Pomohaci, 2021; Dunton, Do & Wang, 2020) confirm that children of different ages have a low level of development of individual physical abilities and motor fitness in general, caused by unfavorable factors.

One of the solutions to the problem of decreased physical activity of children and youth may be to involve them in various sports in their spare time (Morina, Gjonbalaj et al., 2022) and improve the organization of physical education at school (Kashuba, Goncharova, & Butenko, 2016; Goncharova, 2017; Samsudin, Gani et al., 2022).

Effective means of increasing the level of physical activity, improving health and improving physical abilities are exercises of various types of fitness, including body ballet

(Kravchuk & Kurochka, 2013), yoga aerobics (Mykhno & Loza, 2016) and complex fitness technologies (Kibalnyk, 2009; Stepanova, 2013). Nowadays, most health clubs offer children's fitness classes, but they do not always consider the state of physical development and physical preparedness of children when organizing classes.

The study hypothesis. The efficiency of children's fitness classes will increase if they are organized considering peculiarities of children's posture and physical preparedness level.

The aim of the study. To determine the effectiveness of combined fitness classes for primary school age children, organized considering their physical fitness level and the peculiarities of posture formation.

Materials and methods

Participants of the study

The study involved 56 children who were 8-9 years old at the beginning of the experiment, including 32 girls and 24 boys. Four groups were formed: two experimental EG1 (13) and EG2 (16) and two control CG1 (11) and CG2 (16). Participants of the experimental groups attended fitness classes, and children in the control groups did physical exercises only during physical education classes and did not attend any additional sections or clubs.

Research methods

Study and analysis of pedagogical and scientific-methodical literature; analysis of video recordings of different fitness programs; pedagogical testing; visual screening of biogeometric posture profile; pedagogical experiment; methods of mathematical statistics.

The design of the study

The study was conducted on the basis of the fitness club "Sport life" and Kharkiv gymnasium №55. At the beginning of the pedagogical experiment, the following indicators were measured in all participants: flexibility development level, power and speed power abilities, agility, and quickness.

To determine the development level of the abovementioned abilities, we chose the tests proposed by the physical education curriculum for grades 1-4. These include: seated forward bend (flexibility), lie down push-ups (strength), standing long jump (speed and power abilities), 4x9 m shuttle run (agility), and 30 m run (quickness).

The posture was also assessed using a visual screening card of the biogeometric posture profile (Kashuba et al., 2017). According to this method, the participants posture was assessed on a 33-score scale. In particular, six posture indicators were evaluated in the sagittal plane (head and trunk position, presence of kyphosis or lordosis, abdominal shape, position of the hips and shins) and five in the frontal plane (position of the shoulders, angles of the scapulae and pelvic bones, waist triangles, foot position). For each indicator, the participant could score a maximum of 3 scores. According to the scores received for posture, children were divided into three levels of biogeometric posture profile "low" – 11-16 scores, "medium" – 17-23 scores, and "high" – 24-33 scores.

After measuring the level of physical abilities development and visual screening of the biogeometric posture profile, the participants were divided into four groups. EG1 included children who attended fitness classes and had a low and medium level of biogeometric posture profile (6 boys and 7 girls in total). EG2 included children with a high level of biogeometric posture profile (7 boys and 9 girls in total). The control groups were filled in the same way. Thus, CG1 included children with various posture disorders (6 boys and 5 girls in total) and CG2 included children with correct posture (9 boys and 7 girls in total).

Based on the composition of the experimental groups, we determined the main tasks of fitness classes for them, selected appropriate means and their appropriate combination in one and a series of classes. Thus, for the participants of EG1, we chose mainly non- or low-impact exercises of power orientation, which should help improve posture indicators. Most exercises had to be performed from the lying and sitting positions. High-impact exercises, which create a high load on the musculoskeletal system and could negatively affect the formation of posture of the participants, were not used in the classes.

Exercises of predominantly aerobic orientation with the inclusion of high-impact basic exercises (hops and jumps) were used for the participants of EG2. They were combined with strength and stretching exercises (see Table 1).

The participants of experimental groups were trained according to the above methodology for 3 months from February to April 2023. After that, we measured the indicators of the level of physical ability development and the level of the biogeometric posture profile. The probability of the difference in the results at the beginning and at the end of the experiment was processed using the statistical package for social sciences (SPSS).

Results

The results of the research showed that at the beginning of the experiment the level of physical abilities development in the studied EG1 and CG1 as well as EG2 and CG2 did not differ significantly both among boys and girls (see Tables 2-5). At the same time, indicators of participants of EG1 and CG1, which included children with low and middle levels of biogeometrical posture profile, were lower than those of participants of EG2 and CG2, which included participants with high levels. This was especially true for power and speed power abilities.

Testing of physical abilities of the studied children at the beginning of the experiment also showed that according to the indicative standards presented in the curriculum for primary school, they were in most cases at the primary and secondary levels of academic achievement of pupils of the corresponding age. This was especially observed in EG1 and CG1, which included participants with a low level of biogeometric posture profile. Thus, at the beginning of the experiment, there were more than 80% of such children in these groups.

Measurement of the physical abilities level at the end of the experiment showed a significant improvement in the groups where children, in addition to basic physical education at school, were involved in a fitness club. However, it was significant only for the indicators of flexibility and strength of girls of EG2 and boys of EG1 as well as flexibility of boys of EG2. Although the physical abilities of the control groups improved, the level of improvement was much lower than that of the children in the experimental groups. The data

Table 1. Features of the organization of combined fitness classes for the studied experimental groups

EG №1 (participants with a low and medium level of biogeometric profile)	EG №2 (participants with a low level of biogeometric profile)
The main focus of the classes	
Health promotion, posture correction	Improving physical and functional preparedness.
The tasks to be solved by fitness classes	
1) Improving health. 2) Correction of the main indicators of posture. 3) Instilling the skill of correct posture. 4) Development and improvement of physical abilities necessary for maintaining correct posture (mainly strength, coordination and flexibility).	1) Improving health. 2) Increasing the level of development of physical abilities (strength, speed, power and coordination abilities, flexibility, agility and aerobic endurance. 3) Improvement of functional indicators of physical development. 4) Reducing excess weight.
Means (exercises of different types of fitness) used in fitness classes	
Exercises with fitballs, body ballet exercises (on the floor and at the bearing), Pilates, stretching, children's yoga, rhythmic gymnastics exercises, and non- and low-impact basic movements of classical aerobics.	Basic moves of classical (including high-impact) and step aerobics combined with dance moves (Latin aerobics, zumba, rock and roll aerobics), rhythmic gymnastics exercises, strength exercises, and stretching exercises.
Type and duration of classes	
Combined classes last 40-45 minutes	Combined classes last 40-45 minutes
Class design	
Preparatory: – non-impact and low-impact basic movements of classical aerobics; – rhythmic gymnastics exercises; Main: – corrective block (exercises with fitballs, body ballet, Pilates, and yoga in various combinations) Final: – stretching and breathing exercises	Preparatory: – basic movements of classical or step aerobics; – rhythmic gymnastics exercises; Basic: – aerobic top (basic movements of classical, step and dance aerobics in various combinations) – hitch (isolated basic aerobics exercises of medium intensity and low impact – strength block (strength exercises in the floor and standing position) Final: – stretching and breathing exercises
Musical accompaniment	
Depending on the part of the class, from 40 to 110 beats per minute.	Depending on the part of the class, from 90 to 145 beats per minute.
The number of classes per week	
3 classes per week for 40-45 minutes	3 classes per week for 40-45 minutes

obtained indicate the need for additional specially organized fitness classes for primary school children, which will bring their physical fitness indicators to a sufficient level.

It should be noted that the most positive results of the study were changes in the level of the biogeometric posture profile of the studied EG1. Thus, if at the beginning of the experiment in EG1 there were 2 children with low level and 11 children with medium level, at the end of the experiment 6 children had medium level and 7 children improved their posture to high level. In CG1, the posture score for some participants also increased, but this increase was much less than in the control group. At the same time, there were also decreases in scores, which indicates the progression of children's posture disorders under the influence of negative environmental factors and unsatisfactory organization of physical education at school.

Discussion

The results of the study confirmed our hypothesis about increasing the effectiveness of children's fitness classes considering the level of physical fitness and peculiarities of chil-

dren's posture formation. We fully confirm the definitions of the studies (Kashuba, Goncharova & Butenko, 2016; Goncharova, 2017; Samsudin, Gani et al., 2022; Spitsyn, 2016) that the aim, means, structure, and features of class organization should meet the needs of the body and have a health-improving and corrective effect on it.

The data obtained coincide with the results of modern scientific studies (Nesen, 2022; Sopa & Pomohachi, 2021; Dunton, Do & Wang, 2020) and show that most of the primary school children who participated in the study had an unsatisfactory level of basic physical abilities development. Due to a sedentary lifestyle and other negative factors in the organization of children's lives, significant violations of their posture were found, which confirms the results of the study by Shchyrba (2016); Lukiyanchuk & Tymoshenko (2021). Our opinion on the expediency of saturating programs aimed at forming correct posture with strength exercises coincides with the opinion of Spitsyn (2016); Omelchenko & Kravchuk (2011).

During organizing and conducting the study, the positive impact of body ballet (Kravchuk & Kurochka, 2013), yoga aerobics (Mykhno & Loza, 2016), and other types of fitness technologies (Kibalnyk, 2009; Stepanova, 2013) on the health of chil-

Table 2. Indicators of physical abilities development level and biogeometric posture profile of girls in experimental groups at the beginning and at the end of the experiment

№	Test name	EG 1 (girls) n=7				t	p	Δx	EG 2 (girls) n=9				t	p	Δx
		before		after					before		after				
		X	s	X	s				X	s	X	s			
1.	State of biogeometric posture profile, score	18.3	2.69	22.0	2.52	2.5	<0.05	-1.7	28.9	2.37	29.6	2.07	0.6	>0.05	-0.7
2.	Seated forward bend, cm	5.1	1.77	7.1	1.68	2.0	>0.05	-2	5.8	2.28	8.6	2.30	2.4	<0.05	-2.8
3.	Lie down push ups, number of times	6.3	4.03	10.6	4.31	1.8	>0.05	-4.3	7.6	3.24	11.8	4.02	2.3	<0.05	-4.2
4.	Standing long jump, cm	104.7	6.73	108.3	7.45	0.9	>0.05	-3.6	107.7	6.12	111.2	5.40	1.2	>0.05	-3.6
5.	4×9 m shuttle run, s	13.8	0.43	13.6	0.54	0.7	>0.05	0.2	13.8	0.59	13.5	0.55	0.9	>0.05	0.3
6.	30 m run, s	7.2	0.45	7.1	0.46	0.4	>0.05	0.1	7.1	0.38	6.9	0.27	0.8	>0.05	0.2

Table 3. Indicators of physical abilities development level and biogeometric posture profile of girls in control groups at the beginning and at the end of the experiment

№	Test name	CG 1 (girls) n=5				t	p	Δx	CG 2 (girls) n=11				t	p	Δx
		before		after					before		after				
		X	s	X	s				X	s	X	s			
1.	State of biogeometric posture profile, score	20.8	1.79	21.0	2.45	0.1	>0.05	-0.2	28.9	2.02	28.7	1.74	0.2	>0.05	0.2
2.	Seated forward bend, cm	4.6	2.30	5.8	1.92	0.8	>0.05	-1.2	5.5	1.81	5.8	1.72	0.5	>0.05	-0.4
3.	Lie down push ups, number of times	7.2	3.11	8.0	2.65	0.4	>0.05	-0.8	8.0	2.37	9.0	2.00	1.0	>0.05	-1.0
4.	Standing long jump, cm	107.8	6.26	109.0	6.28	0.3	>0.05	-1.2	106.8	4.02	109.3	4.67	1.3	>0.05	-2.5
5.	4×9 m shuttle run, s	13.8	0.26	13.6	0.25	0.9	>0.05	0.2	13.8	0.41	13.7	0.32	1.0	>0.05	0.1
6.	30 m run, s	7.4	0.32	7.1	0.47	0.8	>0.05	0.2	7.2	0.41	6.9	0.46	1.5	>0.05	0.3

Table 4. Indicators of physical abilities development level and biogeometric posture profile of boys in experimental groups at the beginning and at the end of the experiment

№	Test name	EG 1 (boys) n=6				t	p	Δx	EG 2 (boys) n=7				t	p	Δx
		before		after					before		after				
		X	s	X	s				X	s	X	s			
1.	State of biogeometric posture profile, score	20.8	1.33	24.0	2.00	2.9	<0.05	-3.2	29.1	1.77	30.1	1.07	1.2	>0.05	-1
2.	Seated forward bend, cm	2.2	1.47	5.3	1.37	3.5	<0.02	-3.1	2.1	1.07	4.9	1.57	3.5	<0.01	-2.7
3.	Lie down push ups, number of times	7.8	2.14	13.5	2.88	3.5	<0.02	-5.7	13.3	4.96	16.0	4.73	1.0	>0.05	-2.7
4.	Standing long jump, cm	110.3	7.12	114.2	6.65	0.9	>0.05	-3.8	118.6	7.68	120.9	5.70	0.6	>0.05	-2.3
5.	4×9 m shuttle run, s	13.3	0.39	13.2	0.58	0.2	>0.05	0.1	12.8	0.54	12.7	0.44	0.3	>0.05	0.1
6.	30 m run, s	6.8	0.43	6.6	0.52	0.6	>0.05	0.2	6.6	0.45	6.5	0.39	0.3	>0.05	0.1

Table 5. Indicators of physical abilities development level and biogeometric posture profile of boys in control groups at the beginning and at the end of the experiment

№	Test name	CG 1 (boys) n=6				t	p	Δx	CG 2 (boys) n=5				t	p	Δx
		before		after					before		after				
		X	s	X	s				X	s	X	s			
1.	State of biogeometric posture profile, score	17.7	2.73	19.0	2.37	0.8	>0.05	-1.3	28.8	3.11	28.0	3.46	0.3	>0.05	0.8
2.	Seated forward bend, cm	2.2	1.72	3.2	1.47	1.0	>0.05	-1	2.8	1.30	3.4	1.52	0.6	>0.05	-0.6
3.	Lie down push ups, number of times	9.8	3.71	10.3	3.78	0.2	>0.05	-0.5	13.6	3.29	15.0	2.55	0.7	>0.05	-1.4
4.	Standing long jump, cm	112.2	5.98	112.5	6.47	0.1	>0.05	-0.3	114.0	5.24	114.8	6.22	0.2	>0.05	-0.8
5.	4×9 m shuttle run, s	13.3	0.55	13.2	0.59	0.5	>0.05	0.1	13.1	0.55	12.9	0.49	0.5	>0.05	0.2
6.	30 m run, s	6.9	0.46	6.7	0.44	0.4	>0.05	0.2	6.9	0.47	6.8	0.36	0.5	>0.05	0.2

dren of different ages in general and the level of development of their physical abilities and functional fitness was confirmed.

Experimentally proven improvement of primary school children's physical preparedness level by fitness and improvement of their biogeometric posture profile confirms the interconnection of physical activity, physical preparedness, and certain health indicators (Morina, Gjonbalaj et al., 2022; Samsudin, Gani et al., 2022).

The results of the study coincide with the results of Ivashchenko, Iermakov and Khudolii (2021), Kruglov and Khudolii (2022), Khudolii, Golovnin and Bartík (2020) on age and gender peculiarities of development of certain physical abilities in primary school children and their structure.

The practical significance of this study is to determine the content and structure of fitness classes for children with different levels of physical preparedness, considering the peculiarities of their posture formation. In our opinion, filling the content of fitness classes for children with posture defects with low-impact strength exercises will have a corrective effect and completely eliminate the possibility of harm to the body, in contrast to the use of high-impact aerobic exercises that create a large load on the musculoskeletal system. Instead, the use of high-impact aerobic exercises will be effective in improving the level of physical and functional fitness of children with correct posture.

Further prospects for the study are to improve the developed combined fitness programs and to test them in the organization of classes for senior and high schoolchildren.

Conclusions

The study has shown that one of the most acute problems of today is the decline in the level of physical activity and physical fitness of primary school children, as well as numerous postural disorders and other health problems. The analysis of literature sources and practical experience in organizing both school and out-of-school physical education and sports shows insufficient consideration of the peculiarities of children's physical development and preparedness.

This study presents a methodology for organizing and conducting combined fitness classes for primary school children, considering their level of physical preparedness and peculiarities of posture formation. It has been experimentally proved that for children with posture defects and low level of physical preparedness, fitness classes should be filled mainly with low-impact strength exercises that have a corrective effect. High-impact aerobic exercises should be included in the content of combined classes for children with normal posture and should be organized according to the classical scheme: warm-up, aerobic peak, hitch, power block, and stretching. It has been experimentally proven that classes that consider the peculiarities of children's development can have a health and developmental effect to a greater extent and will not harm the body by improper selection of exercises.

Conflicts of interest

The authors declare that they have no conflicts of interest.

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Вплив комбінованих занять з фітнесу на фізичну підготовленість та формування постави у дітей молодшого шкільного віку

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 5 табл., 27 джерел.

Мета дослідження – виявити ефективність впливу комбінованих занять з фітнесу для дітей молодшого шкільного віку, побудованих з урахуванням рівня їхньої фізичної підготовленості та особливостей формування постави.

Матеріали і методи. У дослідженні взяли участь 56 дітей, яким на початок експерименту виконалося 8-9 років, серед них 32 дівчини та 24 хлопця. Було сформовано чотири групи: дві експериментальних ЕГ1 (13) та ЕГ2 (16) та дві контрольні КГ1 (11) та КГ2 (16). Досліджувані експериментальних груп відвідували заняття фітнесом, а діти, що увійшли до контрольних груп займалися фізичними вправами лише під час уроків фізичної культури. У дослідженні були використані наступні методи: вивчення й аналіз літератури; аналіз відеозаписів фітнес програм; педагогічне тестування; візуальний скринінг біогеометричного профілю постави; педагогічний експеримент; методи математичної статистики.

Результати. Вимірювання рівня розвитку фізичних здібностей наприкінці експерименту показало їх значне покращення в групах, де діти додатково до основних занять фізичною культурою в школі відвідували спеціально організовані комбіновані заняття з фітнесу. Найбільш позитивними результатами дослідження стали зміни рівня стану біогеометричного профілю постави досліджуваних ЕГ1. Так, якщо на початку експерименту в ЕГ1 було 2 дитини з низьким та 11 дітей з середнім рівнем, то наприкінці вже 6 дітей мали середній, а 7 покращили свій рівень постави до високого.

Висновки. Експериментально доведено, що для дітей з вадами постави та низьким рівнем фізичної підготовленості фітнес заняття мають наповнюватися переважно низькоударними силовими вправами, які мають коригуючий вплив. До змісту комбінованих занять для дітей з нормальними показниками постави варто включати високоударні аеробні вправи та будувати заняття за класичною схемою: розминка, аеробна вершина, заминка, силовий блок та стрейтчинг.

Ключові слова: аеробіка, діти молодшого шкільного віку, постава, фізичні здібності, фітнес.

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