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Active school and its role in promoting health of younger school-age children
La escuela activa y su papel en promover la salud de los niños en edad escolar más jóvenes

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Abstract. Background: A recent study has indicated a decline in the level of health-related fitness among school-age children. Active school offers and pursues various strategies to encourage children to engage in physical activity during the school day, with the objective of improving their behavioural, physical performance and literacy outcomes, among other benefits. The objective of the research was to examine the impact of a comprehensive movement programme implemented within a physically active school on the selected factors of general physical performance and posture as a manifestation of fitness in non-exercising pupils. The study employed a number of methodological approaches, including: A total of 25 school-age children, aged between six and seven years, participated in the study on a voluntary basis. The participants were divided into two groups, with six girls and seven boys in each. The pupils' physical fitness was evaluated through the administration of selected standardized tests, including the 4 x 10 m shuttle run, sit-ups in 60 seconds, standing long jump, bent-arm hangs, and a 20-metre multistage endurance shuttle run. The pupils' posture was assessed and classified using the standardised Klein and Thomas method, modified by Mayer. The exercise programme was conducted over a six-month period. The intervention was implemented on two occasions per day, once during a break and once during a lesson in the form of an exercise break, five times per week, and once per week through an after-school activity for 45 minutes. The results of the study are as follows: In the study sample, there was a significant improvement in scores between the entry and exit points for both girls and boys in each test. A comparison of the sexes revealed that boys exhibited superior ($p < 0.01$) values in all the selected tests compared to girls. With regard to overall posture, we observed an improvement in both genders ($p < 0.01$), with no gender-based differences.
Conclusion: In conclusion, the results of this study confirm that the chosen tactic of progression of physical activity, the programme for non-exercising/inactive students of younger school age, was an effective way of improving the physical, health-related fitness and overall posture of the participants, as well as motivating and creating interest in physical activities.
Keywords: Active school, Physical activity, Health-related fitness, Body posture, Pupils

Resumen. Objetivo: Un estudio reciente ha indicado un declive en el nivel de aptitud física relacionada con la salud entre los niños en edad escolar. La escuela activa ofrece y persigue diversas estrategias para animar a los niños a participar en actividad física durante el día escolar, con el objetivo de mejorar sus resultados conductuales, de rendimiento físico y de alfabetización, entre otros beneficios. El objetivo de la investigación fue examinar el impacto de un programa de movimiento integral implementado dentro de una escuela físicamente activa en los factores seleccionados del rendimiento físico general y la postura como manifestación de la aptitud física en alumnos no practicantes. El estudio empleó varios enfoques metodológicos, incluyendo: Un total de 25 niños en edad escolar, con edades entre seis y siete años, participaron en el estudio de manera voluntaria. Los participantes se dividieron en dos grupos, con seis niñas y siete niños en cada uno. La aptitud física de los alumnos fue evaluada mediante la administración de pruebas estandarizadas seleccionadas, incluyendo la carrera de ida y vuelta de 4 x 10 m, abdominales en 60 segundos, salto de longitud en posición de pie, suspensión de brazos doblados y una carrera de resistencia multietapa de 20 metros. La postura de los alumnos fue evaluada y clasificada utilizando el método estandarizado de Klein y Thomas, modificado por Mayer. El programa de ejercicio se llevó a cabo durante un período de seis meses. La intervención se implementó en dos ocasiones al día, una durante un descanso y otra durante una lección en forma de pausa para hacer ejercicio, cinco veces por semana, y una vez por semana a través de una actividad extracurricular durante 45 minutos. Los resultados del estudio son los siguientes: En la muestra de estudio, hubo una mejora significativa en las puntuaciones entre los puntos de entrada y salida tanto para niñas como para niños en cada prueba. Una comparación entre los sexos reveló que los niños exhibieron valores superiores ($p < 0,01$) en todas las pruebas seleccionadas en comparación con las niñas. Con respecto a la postura general, observamos una mejora en ambos sexos ($p < 0,01$), sin diferencias basadas en el género.
Conclusión: En conclusión, los resultados de este estudio confirman que la táctica elegida de progresión de la actividad física, el programa para estudiantes no practicantes/inactivos en edad escolar más jóvenes, fue una manera efectiva de mejorar la aptitud física relacionada con la salud y la postura general de los participantes, así como de motivar y crear interés en las actividades físicas.
Palabras clave: Escuela activa, Actividad física, Aptitud física relacionada con la salud, Postura corporal, Alumnos

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Introduction

The current educational environment in Slovakia, as well as other countries (Novak, 2021; Leão Pereira & Lorente-Catalán, 2024) can be currently characterized as a continuous search for new trends. Implementing those new trends is intended to transform education. This is also because societal changes necessitate corresponding alterations to educational initiatives. These challenges are associated with the efforts to expand and improve the level of students' competencies. Conversely, there is a need for innovative undergraduate education, as well as further lifelong learning of physical and sports education teachers aimed at acquiring new professional competencies. These trends focus on improving understanding of the factors linked to quality of life, lifestyle and health, socialisation, education and upbringing, which can be influenced and positively developed in the school environment through various forms, approaches and methods. It is the responsibility of educational institutions, such as schools, to educate students about the importance of protecting and preventing human health, as well as the importance of physical activity in a

physical activity regime (West et al., 2004; Kilgour et al., 2015; Birch et al., 2019; Pulimeno et al., 2020; Kuberski et al., 2024). In the context of the contemporary "modern over-technicised world," it is of paramount importance that all schoolchildren have access to a comprehensive understanding of health promotion, protection, and the significance of physical activity in their daily lives (Nemček, 2016; D'Isanto et al., 2017). This understanding, in turn, fosters the development of both educational and physical literacy (Kolbe, 2019; Videto & Dake, 2019). This is corroborated by the curricular transformation of primary and secondary education in the Slovak Republic, which has been attempting to address this issue since 2008.

It can be argued that reality shows that education should emphasise the so-called holistic (comprehensive) care for the health of the pupil. This implies that, upon entering the educational system, pupils should receive targeted education and training, whereby each pupil should learn to assume responsibility for their own health and the capacity to seek alternatives to a healthy lifestyle (Smoleňáková & Bendíková, 2017; Nemček & Ladecká, 2020). A holistic approach to health care necessitates a change in mindset, requiring a shift in the understanding of health care. In practice, this also means shifting the focus from the curative to the preventive component, which is more economically efficient and cost-effective for the state (Barrett et al., 2015) The field of health education places a strong emphasis on self-care, with a focus on providing support for various forms of physical activity, exercise programmes, and exercise. Additionally, it emphasises the importance of good nutrition, adequate sleep, maintaining good health, and abstaining from bad habits.

The concept of health can be understood as a relative commodity, a state of homeostasis between the internal and external environment, or the absence of disease. It is a state of physical, mental, and social well-being as defined by the World Health Organization (WHO, 2020).

It is therefore evident that the most significant health benefit currently available is the achievement of optimal levels of health-related fitness in the school population, which serves to promote both physical and mental health (Boreham & Riddoch, 2021) posit that physical fitness affects a person's health status, while Bendíková (2017) asserts that health-related fitness is the level of individual fitness required for a healthy and active lifestyle. Furthermore, she posits that fitness is the body's capacity to cope with stress over time and space, whether in a general or a specific form.

The assessment of health-oriented fitness through standardised methods enables the determination of its level in schoolchildren and the identification of critical groups or individuals from a health perspective in a given population. This, in turn, facilitates the prevention of the development of various diseases, whether functional or structural in nature, which frequently result from inadequate primary and secondary prevention and subsequently become chronic. The current research indicates the significance of physical activity, yet also confirms that without regular physical activity, it is not possible to sufficiently develop physical fitness or improve health (Ortega et al., 2008; Landry & Driscoll, 2012). Consequently, it is essential to conceptualise physical fitness as an integral component of a comprehensive movement programme, which should be directed towards the systematic education of pupils within the school environment and the acquisition of knowledge about the health significance of physical fitness and physical performance. Moreover, the findings of certain studies (Eveland-Sayers et al., 2009; Ganley et al., 2011) indicate a correlation between the components of physical fitness and academic achievement in school-age children.

Currently, there is a decline in pupils' interest in physical activities implemented in the school environment, whether in the framework of physical and sports education or its physical education forms. This phenomenon, which has an upward tendency, has been observed in school physical and sports education not only in Slovakia, but also in other countries. These are pupils who do not engage in physical exercise. The lack of physical activity in pupils' daily exercise regime is reflected not only in their health but also in their physical fitness and physical literacy (Wu et al., 2017; Chovanová et al., 2023; Al-Nemr & Reffat, 2024). This results in a discrepancy between their physical and motor development. Chronic non-infectious diseases emerge as a consequence of this phenomenon (WHO, 2018). Furthermore, a hypokinetic lifestyle in schoolchildren can give rise to musculoskeletal disorders (Jankowicz-Szymańska et al., 2019; Jankowicz-Szymańska et al., 2020; Bendíková & Balint, 2023).

The concept of an active school is based on the document Global Action Plan on Physical Activity 2018-2030 WHO (2018). A fully implemented effective policy measures four strategic areas: "Active Society, Active Environment, Active Life and Active System". The mentioned strategic areas support the creation of a critical subsystem such as the "Active School". According to the authors of Baylei et al. (2023), it creates opportunities and possibilities for physical activity in the school environment. In practice, this means that the "Active School" model integrates physical activity before, during, and after school for at least 60 minutes every day. The most important role in the "Active School" is played by the subject "physical education", which is complemented by regularly organized physical activities either during the teaching of other subjects or during breaks. An equally important role is also played by interest-based movement circles implemented in the school environment after classes. The importance lies both in psychohygiene and active rest, supporting the physiological health of pupils, among other things (Scheuer & Heck, 2021).

The active approach of educational institutions to the health of their pupils, as evidenced by various interventions (Eather et al., 2013; Blagojević et al., 2017; Valentine et al., 2017; Zarić, et al, 2018; Bendíková, 2020; Costa et al., 2021), is a valuable contribution to the field of health promotion. Such initiatives yield benefits such as increased physical activity, increased self-confidence, and improved

movement skills and posture, which collectively contribute to the overall development of physical literacy. This serves to highlight the significance of physical activity for the health of pupils.

A review of the literature reveals a dearth of evaluative scientific studies that examine the relationship between general movement performance and body posture of pupils as a manifestation of health-oriented fitness within an active school as a means of primary prevention of their health.

The aim of the study

A review of the literature reveals a dearth of evaluative scientific studies that examine the relationship between general movement performance and body posture of pupils as a manifestation of health-oriented fitness within an active school as a means of primary prevention of their health.

The objective of this study was to ascertain the impact of a comprehensive movement programme, implemented in a physically active school, on the selected factors of general physical performance and posture as a form of health-oriented fitness in non-exercising pupils of younger school age.

Material and methods

Study Design

This research employs a quasi-experimental design, specifically a two-group pretest and posttest design. At the same time, it is a pedagogical, field, multi-factorial, fake experiment.

The study initiates by conducting a pretest to assess the initial condition selected factors of general motor performance and posture on pupils through selected standardized tests. Subsequently, the exercise program intervention within the active school in the school environment. Following the six-month intervention phase, a final test (posttest) is conducted.

Participants

The sample consisted of a total of N = 25 young school-age children, including 12 girls and 13 boys from four first-grade classes participating in an active school movement programme. The pupils were selected deliberately due to their non-participation in physical and sports education classes, as well as their frequent excuses from physical and sports education classes.

In terms of pupils and parents [or legal representatives] participating in the research, there were 137 pupils of younger school age, attending the first year of primary school, of which only 76 pupils actually participated in the research. However, 61 pupils for various objective and subjective reasons such as (most frequently repeated) respiratory diseases, allergies, other extracurricular activities (playing the piano, foreign language lessons, painting, singing), injuries (bumped thumb, toes and hand, sprained ankle), passive approach to movement during breaks, etc.) no longer completed the full-fledged, uninterrupted movement program implemented by us. Only 25 pupils completed a complex movement program within the active school during six months. They did not perform or attend any other exercise and sports activities outside the school environment during the research.

Procedure and organization

The research was conducted in a series of progressive stages. The selection of the educational establishment and the students was entirely at the discretion of the school management, with the agreement of the legal guardians of the students. This was done in accordance with the General Data Protection Regulation (GDPR) and other relevant legislation and standards. Furthermore, the research was approved by the ethics committee of the university.

The initial testing and assessment of the basic somatometric and selected health-related fitness indicators was conducted twice, as part of input V1. Subsequently, the same indicators were reassessed after the six-month exercise intervention as part of outcome V2 (in one day). In terms of data collection, we employed standardised methods for school-based practice, which were as follows:

The basic somatic indicators, which included body weight and BMI, were obtained using a non-invasive method with a Tanita RD-953 body analyser. Body height was evaluated utilising an ADE MZ10023-1 telescopic anthropometer.

The following tests were employed to ascertain the qualitative level of general physical performance in pupils of a younger school age (Ružbarský & Perič, 2021). The following tests were employed to assess the pupils' general physical performance: a 4 x 10 m shuttle run (speed-coordination ability), sit-ups in 60 seconds (strength-endurance ability), standing long jump (speed-strength ability), bent-arm hang (strength-static ability) and a multi-stage endurance 20-metre shuttle run (the so-called Beep test) (endurance ability). Measurements strictly followed three criteria that can be tested - validity, reliability and objectivity of the test (accuracy of the examiners' measurements). Prior to the administration of each test and assessment, the pupils were provided with instructions and demonstrations for each movement.

To ascertain the qualitative level of posture, as well as to assess and classify it, the method developed by Klein and Thomas and modified by Mayer (Bendíková, 2017) was employed. The physiotherapist conducted a visual assessment of posture using five indicators, which were defined as dimensions. Each dimension was scored on a scale of 1 to 4. The final typology classified the pupils into four qualitative categories, namely posture grades. The four grades of posture were defined as follows: Grade 1: Perfect posture; Grade 2: Good (almost perfect) posture; Grade 3: Bad posture; Grade 4: Very bad posture (Note: The mentioned method is suitable in school practice. A qualified teacher can determine the level of the student's posture due to the method's quick availability, and application. This method is also used in physiotherapy practice alongside others as a method of first contact and

awareness of the state of functional body posture). A quasi-experimental design was employed. The duration of the exercise programme in the active school was six months. The intervention was implemented on two occasions per day, five times per week. It was administered during the designated "big break" of 15 minutes and during a lesson as an exercise break lasting seven minutes. The pupils utilised fitballs and overballs. Additionally, the programme included an after-school physical activity session (held once a week on Wednesdays) that lasted 45 minutes. This session focused on the development of basic motor skills (strength, speed, endurance, and agility) and the improvement of overall posture. The objective of the intervention was to promote health-related fitness and postural health in pupils as an asset for a healthy and economically active society.

Data analysis

The statistical analysis of the obtained data was conducted using MS Excel 2016 and IBM SPSS 22 software, with significance levels of $p < 0.05$ and $p < 0.01$. The following statistical methods were employed: descriptive statistics, including the arithmetic mean (x), standard deviation (s), frequency (N), minimal value (min), maximal value (max), and range of variation (R). The observed differences were evaluated at the level of statistical significance of $p < 0.01$, $p < 0.05$. The resulting coefficient (r) was then measured, with the following values indicating the effect size: r=0.10 – small effect, r=0.30 – medium effect, r=0.50 – large effect. The normality of the data distribution was evaluated using the Shapiro-Wilk test. In order to assess the difference between the initial and final assessments of the selected tests of general physical performance, we employed the paired t-test (t-test(P)) within one group (for both girls and boys). In contrast, the unpaired t-test (t-test/(UN)) was used to assess the difference between genders. To assess the qualitative level of posture, the Wilcoxon test (W-test, $p < 0.01$, $p < 0.05$) was employed. To compare the difference between the girls and the boys, the Mann-Whitney U test (Mann-Whitney U test, $p < 0.01$, $p < 0.05$) was utilised.

Results

The primary somatic characteristics of the sample are presented in Tables 1. These tables show the changes in the sample before and after the intervention through the physical activity programme in the physically active school. The tables show the changes in the girls and boys, respectively. It can be observed that there was a statistically significant change ($p < 0.01$) in BMI for both genders.

Table 1.
Descriptive statistics of the study group

Sex	Indicator	Factor	M	SD	Median	Mode	Min	Max	R	p
Girls	Decimal age (years)	V_1	6.48	0.53	6.46	6.35	6.10	6.94	0.84	< 0.05
		V_2	7.38	3.32	7.36	7.25	7.00	7.84	0.84	
		D	0.90	2.78	0.90	0.90	0.90	0.90	0.00	
	Body height (cm)	V_1	129.42	8.91	127.00	124.00	119.00	145.50	26.50	< 0.01
		V_2	133.75	9.28	131.50	127.00	122.00	151.00	29.00	
		D	4.33	0.38	4.50	3.00	3.00	5.50	2.50	
	Body weight (kg)	V_1	33.83	7.13	31.50	37.00	23.00	48.00	25.00	< 0.01
		V_2	31.71	7.00	31.00	31.00	21.50	46.00	24.50	
		D	2.13	0.13	0.50	6.00	1.50	2.00	0.50	
	BMI (kg/m^2)	V_1	19.38	1.82	18.91	19.20	15.45	21.05	5.60	< 0.01
		V_2	18.70	1.61	18.52	17.89	15.18	21.73	6.55	
		D	0.68	0.21	0.40	1.31	0.27	0.68	0.94	
Boys	Decimal age (years)	V_1	6.43	0.24	6.37	6.05	6.05	6.87	0.82	< 0.05
		V_2	7.33	0.24	7.27	7.27	6.95	7.77	0.82	
		D	0.90	0.00	0.90	0.90	0.90	0.90	0.00	
	Body height (cm)	V_1	124.23	7.93	124.00	120.00	112.00	139.50	27.00	< 0.01
		V_2	128.46	6.91	126.00	124.00	117.00	141.00	24.00	
		D	4.23	1.02	2.00	4.00	5.00	2.00	3.00	
	Body weight (kg)	V_1	32.08	6.66	33.00	24.00	24.00	45.00	21.00	< 0.01
		V_2	29.46	6.28	29.00	21.00	21.00	42.00	21.00	
		D	2.62	0.38	4.00	3.00	3.00	3.00	0.00	
	BMI (kg/m^2)	V_1	19.27	2.47	19.72	15.12	15.12	22.63	7.52	< 0.01
		V_2	18.96	2.77	18.90	14.58	14.58	22.60	8.01	
		D	0.30	0.29	0.82	0.53	0.53	0.04	0.49	

N - number, M - arithmetic mean, SD - standard deviation, Min - minimal value, Max - maximal value, R - range of variation (Max-Min), ES - experimental sample, V_1 - Input, V_2 - Output, D – difference

The results of the test battery, comprising five tests in the domain of motor performance assessment as a manifestation of health-oriented fitness, indicate that the aforementioned characteristics are present in school-age children (Figure 1A - E).

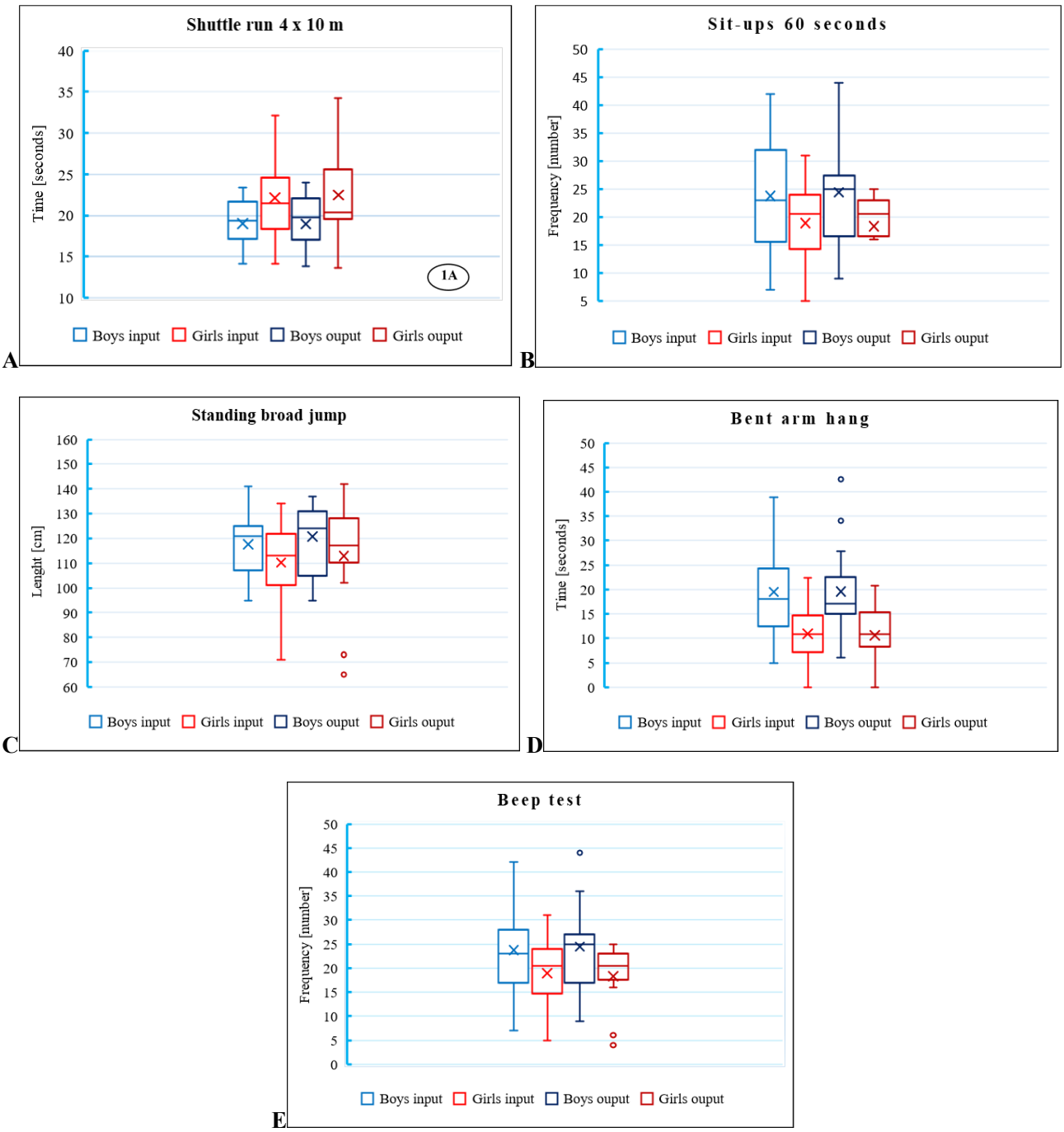

Figure 1. Changes in selected tests of general motor performance in girls and boys (A. Shuttle run, B. Sit-ups 60 sec, C. Standing broad jump, D. Bent arm hang, E. Beep test).

4 x 10 m shuttle run test

In the 4 x 10 m shuttle run test, the objective was to compare the average speed abilities of male and female students at the beginning and at the end of the observation period. The pupils' speed abilities were observed to have improved by an average of 0.04 seconds (x_1 = 19.02, x_2 = 18.98), which was found to be significant at the $p < 0.01$ level. A comparison of the mean speed abilities of female pupils revealed a deterioration in performance of 0.38 seconds (x_1 = 22.12, x_2 = 22.50), which was significant ($p < 0.01$). In terms of substantive significance, we employed the effect size metric, which yielded r = 0.060 for male pupils and r = 0.020 for female pupils. This analysis did not confirm the presence of a substantive effect.

The comparison of the differences in the mean values of the speed abilities of male and female students in the 4 x 10 m shuttle run test at the initial measurement (difference D = 2.9 s.) was found to be statistically significant at the 0.01 level. The final measurement of the mean values of the speed abilities of male and female pupils in the 4 x 10 m shuttle run test (difference D = 3.52 s.) was found to be significant at the 0.01 level of statistical significance (Figure 1A).

Sit-ups in 60 s

In the 60-second sit-ups test, the objective was to compare the mean values of abdominal and pelvic muscle strength between boys and girls at the beginning and end of the school year. The assessment of the strength of the boys' abdominopelvic muscles revealed a mean improvement in performance of 0.69 (count), with a significant result for $p < 0.01$. A comparison of the mean abdominal and pelvic muscle strength values of girls ($x_1 = 18.92$, $x_2 = 18.33$) revealed a performance impairment of 0.58 (count), which was significant ($p < 0.01$).

In terms of substantive significance, we employed the effect size metric, which revealed a small effect size for both boys and girls (Br = 0.036, Gr = 0.032). The results did not reach the threshold of statistical significance.

A comparison of the mean values of the strength of the abdominopelvic muscles of boys and girls in the 60-second sit-ups test (Figure 1B) at the initial measurement (difference D = 4.85 counts) demonstrated a significant difference at the 0.01 level of statistical significance. The final measurement of the difference in mean values of boys' and girls' endurance ability in the sit-ups test (difference D = 6.13 counts) was found to be statistically significant at the 0.01 level.

Standing long jump test

In the standing long jump test, the objective was to compare the mean values of dynamic lower limb strength in boys and girls at the beginning and end of the study period. When assessing the boys' dynamic strength, a mean performance improvement of 3.08 cm ($x_1 = 117.69$, $x_2 = 120.77$) was observed, which was significant ($p < 0.01$). When the mean lower limb dynamic strength values of girls were compared with each other ($x_1 = 110.17$, $x_2 = 112.83$), a 2.67 cm improvement in performance was observed, which was significant ($p < 0.01$).

With regard to the substantive significance of the effect size, a small effect size was observed in boys (Br = 0.109) and a small effect size was observed in girls (Gr = 0.030). However, the observed effect sizes did not confirm substantive significance.

A comparison of the mean values of boys' and girls' dynamic strength in the long jump test (Figure 1C) at the initial measurement (difference D = 7.52 cm) revealed a significant difference at the 0.01 level of statistical significance. The final measurement of the mean values of boys' and girls' dynamic strength in the standing long jump test (difference D = 7.94 cm) was found to be statistically significant at the 0.01 level.

Bent arm hang endurance test

In the bent-arm hang endurance test, the objective was to compare the average static strength values of boys and girls at the beginning and end of the period. The results indicated the following. When assessing the boys' static strength, we observed a mean improvement in performance between the initial and final measurements of 0.07 (s. s.) ($x_1 = 19.53$, $x_2 = 19.60$), which was statistically significant ($p < 0.01$). A comparison of the mean static strength values of the girls ($x_1 = 10.91$, $x_2 = 10.63$) revealed a deterioration of 0.27 (s) between the input and output measurements, which was significant ($p < 0.01$).

In terms of substantive significance, a small effect was observed in boys (br = 0.003) and similarly, in girls, the difference in mean static strength values showed a small effect (gr = 0.021). However, substantive significance was not confirmed in either boys or girls.

A comparison of the mean values of static strength in boys and girls in the bent arm hang endurance test (Figure 1D) at the initial measurement (difference D = 8.62 s.) yielded a statistically significant result at the 0.01 level. The final measurement of the mean static strength values of boys and girls in the bent arm hang endurance test (difference D = 8.97 s.) was found to be statistically significant at the 0.01 level.

20-metre endurance shuttle run

In the endurance 20-metre shuttle run test, the objective was to compare the mean values of boys' and girls' endurance abilities at the beginning and end of the school year. When assessing the endurance abilities of boys, a mean improvement in performance of 1.77 (counts) was observed ($x_1 = 19.92$; $x_2 = 21.69$), which was significant at the $p < 0.01$ level. A comparison of the mean endurance abilities of girls ($x_1 = 17.58$; $x_2 = 17.25$) revealed a deterioration in performance of 0.33 (count), which was significant ($p < 0.01$).

With regard to the issue of substantive significance, we employed a small effect size for both boys and girls (Br = 0.119; Gr = 0.019). However, the evidence did not support the conclusion of substantive significance in this case.

A comparison of the difference between the mean values of boys' and girls' endurance abilities in the beep test (Figure 1E) at the initial measurement (difference D = 2.34 counts) revealed a significant difference at the 0.01 level of statistical significance. The output measurement of the difference in mean values of boys' and girls' endurance abilities in the beep test (difference D = 4.44 counts) was found to be statistically significant at the 0.01 level.

Body posture

The quality of posture is presented in Tables 2 and 3 as a factor in health-oriented fitness. The application of the movement programme in the active school resulted in overall positive changes in both genders (W-test, $p < 0.01$). Conversely, no significant differences were observed between the sexes in either the initial or final assessments of overall posture (Mann-Whitney U test, $p > 0.05$).

Table 2.
Overall body posture and posture of its segments in study group

Gender	Test	V_1		V_2		Wilcoxon	
		M	SD	M	SD	Z	p
Girls	Overall body posture	12.121	2.102	8.053	1.437	-4.417	< 0.01
	Head - neck	2.884	0.775	1.757	0.628	-4.707	< 0.01
	Thoracic region	1.487	0.476	1.311	0.358	-2.110	0.05
	Abdomen - pelvis	2.989	0.574	1.661	0.635	-4.625	< 0.01
	Spinal curvature	2.460	0.399	1.690	0.634	-4.359	< 0.01
	Position of shoulders and scapulae	2.301	0.550	1.634	0.601	-3.448	< 0.01
Boys	Overall body posture	12.131	2.113	8.153	1.311	-4.382	< 0.01
	Head - neck	2.949	0.765	1.645	0.542	-4.430	< 0.01
	Thoracic region	1.361	0.349	1.202	0.322	-2.086	0.05
	Abdomen - pelvis	2.877	0.563	1.523	0.588	-4.720	< 0.01
	Spinal curvature	2.502	0.400	1.576	0.572	-4.271	< 0.01
	Position of shoulders and scapulae	2.262	0.487	1.612	0.567	-3.242	< 0.01

M - arithmetic mean, SD - standard deviation, ES - experimental sample, V_1 - Input, V_2 - Output

A comparison of the results of the tests revealed significant differences ($p < 0.01$) between the initial and final scores between genders (girls having worse results). Furthermore, the implementation of the movement programme within the active school demonstrated a substantive significance and effectiveness (Table 3).

Table 3.
Comparison of differences between V_1 and V_2

Tests	t-test /(UN)	p	Effect size (r)	p
4 x 10 m shuttle run	1.766	<0.01	0.444	<0.05
Standing long jump	1.016	<0.01	0.577	<0.01
Sit-ups in 60 s	1.922	<0.01	0.470	<0.05
Bent arm hang endurance	2.611	<0.01	0.586	<0.01
20-metre endurance shuttle run (Beep test)	1.652	<0.01	0.416	<0.01

r - effect size, p - significance level p <0.01, p <0.05, t-test/(UN) - unpaired t-test

Discussion

The early years of school age are still regarded as a period of childhood in terms of developmental psychology. Consequently, the growth in height and body weight of both genders should be characterised by an even pattern. In the case of the female subjects, the mean body weight values observed at the initial assessment (33.83 ± 7.13 kg) were found to be higher than those observed at the final assessment (31.71 ± 7.00 kg). The mean difference between the two assessments was 2.13 ± 0.13 kg. The girls were found to be 129.42 ± 8.91 cm tall at the initial assessment (V_1), and 133.75 ± 9.28 cm tall at the final assessment (V_2). The difference between V_1 and V_2 was 4.33 ± 0.38 cm. The mean BMI was 18.70 ± 1.82 kg/m^2 in V_1 and 18.70 ± 1.61 kg/m^2 in V_2, with the difference D = 0.01 ± 0.21 kg/m^2. A significant difference ($p < 0.01$) was observed in BMI between V_1 and V_2 in girls.

In boys, we observed a lower initial (32.08 ± 6.66 kg) and final (29.46 ± 6.28 kg) body weight than in girls, with a mean difference of 2.62 ± 0.38 kg. The same was true for body height, with a mean difference of 4.23 ± 1.02 cm between V_1 (124.23 ± 7.93 cm) and V_2 (128.46 ± 6.91 cm). The following table presents the BMI values: The mean body mass index (BMI) for V_1 was 19.27 ± 2.47 kg/m^2, while that for V_2 was 18.96 ± 2.77 kg/m^2, resulting in a difference of D = 0.30 ± -0.29. The analysis revealed a statistically significant improvement in the BMI of boys ($p < 0.01$). A comparison of the sexes revealed that the boys exhibited superior outcomes. The girls were taller, but heavier.

In order to ascertain whether our findings regarding body weight, body height and BMI align with national averages, we conducted a comparative analysis with the data presented in the study by Ružbarský & Perič (2021). This analysis revealed that the mean body weight of girls in our study was 23.8 ± 4.7 kg, which is comparable to the mean body weight of girls in the aforementioned study (25.0 ± 5.32 kg). V_1: 23.8 ± 4.7 kg, V_2: 25.0 ± 5.32 kg. Boys' body weight: V_1: 24.4 ± 4.7 kg; V_2: 25.7 ± 5.47 kg; girls' body height: V_1: 121.8 ± 5.8 cm, V_2: 124.0 ± 6. V_1: 122.9 ± 5.8 cm, V_2: 125.3 ± 6.24 cm, girls' BMI: V_1: 16.0 ± 2.41 kg/m^2, V_2: 16.2 ± 2.63 kg/m^2, boys' BMI: V_1: 16.1 ± 2.36 kg/m2, V_2: 16.3 ± 2.57 kg/m^2.

The aforementioned comparison demonstrates that the sample (N = 25) exhibited inferior input and output values in the monitored parameters of somatic indicators in both girls and boys, when compared to the national average of pupils in the first grades of primary school.

In terms of the results of the tests focused on general locomotor performance as a form of health-oriented fitness, we observed that the girls exhibited inferior initial (22.12 ± 5.57 s) and final (22.50 ± 6.09 s) values in the 4 x 10 m shuttle run test (V_1 19.02 ± 3.00 s, V_2 18.98 ± 3.31 s) in comparison with the boys. Furthermore, the mean of the differences between V_1 and V_2 was found to be greater in the female participants (0.38 ± 0.52 s) than in the male participants (0.04 ± 0.31 s).

A comparison of the data obtained in this test with the national values of Ružbarský, Perič (2021) (girls: V_1: 16.3 ± 3.36 s, V_2: 16.4 ± 3.8 s, boys: The results obtained in the V_1 and V_2 tests were found to be inferior to the national values of Ružbarský & Perič (2021). In the 60-second sit-ups test, the girls demonstrated superior performance (V_1 18.92 ± 7.14 s, V_2 18.33 ± 6.81 s) compared to the boys (V_1 23.77 ± 10.04 s, V_2 ± 24.46 ± 9.04 s). However, the observed differences were significant in both genders. At the final assessment, the boys demonstrated inferior results

(0.69 ± 1.00 s), while the girls exhibited superior scores (0.58 ± 0.32 s). In comparison to the findings of Ružbarský & Perič (2021), the girls in our sample demonstrated superior performance in both the initial and final tests. Conversely, the mean of the difference between input and output indicated poorer outcomes for the boys. It can be observed that the girls in the group of five-year-old children exhibit superior motor skills (p = 0.012) in comparison to the boys. The results of the standing long jump tests (V_1 117.69 ± 13.37 cm) (V_2 120.77 ± 14.52, D = 3.08 ± 1.15) demonstrated superior performance by the boys in comparison to the girls (V_1 110.17 ± 20.70, V_2 112.83 ± 23.18, D = 2.67 ± 2.48). In contrast to the findings of Ružbarský, Perič (2021), the boys demonstrated superior performance in both standing long jump tests. Nevertheless, the sample size of 25 demonstrated more favourable outcomes in this test. In the bent arm hang endurance test, the boys (V_1 19.53 ± 10.37 s, V_2 19.60 ±10.47 s) demonstrated superior performance compared to the girls (V_1 10.91 ± 6.53 s, V_2 10.63 ± 6.35 s), corroborating the findings of Ružbarský & Perič (2021). This may be indicative of the higher body weight observed in the female participants in comparison to their male counterparts. The final test conducted was the multi-stage 20-metre shuttle run. In both the initial and final tests, the boys demonstrated superior performance (V_1 19.92 ± 7.26, V_2 21.69 ± 7.42, D = 1.77 ± 0.16) compared to the girls (V_1 17.58 ± 6.22, V_2 17.25 ± 5.99). Moreover, the girls demonstrated a decline in performance in the final assessment relative to the initial one (D = 0.33 ± 0.23). In general, the male participants were able to complete more laps than the female participants. It is once more evident that this may be attributed to the higher body weight of the girls, in addition to other factors.

In our opinion, body weight is one of the health factors that may have contributed to the quality of tests in girls to a large extent. In this context, the hidden trend of earlier onset of puberty in children is indirectly shown, which is probably related to the diet and overall lifestyle of the school population, which is the subject of more exact monitoring. At the same time, we think a higher body weight during a single movement in the long jump test can be productive, but not authoritative. This means that the increased explosive muscle strength could have a positive effect on the strength of the pupils' lower limbs in the standing long jump test.

The findings of Ružbarský & Perič (2021), which compared the performance of boys and girls in our sample (N=25) with the average national performance of their peers, demonstrated that both groups exceeded this average. Our findings also corroborate those of Carminato (2010), who posits that girls exhibit diminished levels of motor performance in comparison to boys.

At the same time, a high (qualitative) degree of general movement endurance during the younger school age, supported by movement games and activities in the school environment, is a basic prerequisite for the development of other movement skills, which contributes to the improvement of the student's overall physical development, reflected in his cardio-respiratory, metabolic, or the central nervous system, as well as the cognitive side .(Polevoy, 2024; Septianto et al., 2024; Suryadi et al., 2024). With regard to overall posture, the programme implemented had a positive influence on both girls and boys, with no discernible difference between them in the initial and final measurements. In both cases, the pupils (N = 25) were initially classified as having poor posture, which is defined as qualitative posture level III. The critical areas include head posture, abdominal areas, shoulder and scapular posture, and others. In the final assessment, the pupils in our sample (N = 25) were classified in qualitative level II, which we consider to be a positive result, indicating good posture.

In light of these findings, it is evident that the qualitative level of physical fitness of pupils of younger school age, both girls and boys, has improved following the implementation of the physical activity programme in "active school". Similarly, an improvement was observed between the initial and final assessments in overall posture, as well as in its individual segments. The muscles that are active are stronger, more agile, faster, and more powerful. Similar findings in overweight and obese children are indicated by Molina-Garcia et al. (2020).The results indicated that physical fitness and functional movement were associated with better overall posture.

It is our contention that intervention in younger school-age students beyond the aforementioned exercise programme is necessary due to their higher body weight, motor skills, and the quality of their posture. Chui Betancur et al. (2024) Chui Betancur et al. (2024) point out the importance of implementing recreational physical activities already in children of an early age, with a positive effect on their psychomotor and anatomical development. This means that the performance of playful movement activities in childhood is associated with improving physical (physiological) health and movement skills, which are essential from the point of view of primary prevention of health in later life against various civilizational diseases.

Consequently, from a preventative perspective, any physical activity conducted within the school or extracurricular environment (physical and sports education, exercise before school, movement time, exercise breaks, interest-based physical education, outdoor, recreational activities etc.) plays an irreplaceable role in younger school-age students (Senturek et at., 2015; Beni et al., 2019; Castillo-Retamal et al., 2022; Bendíková et al., 2024). The primary objective of this initiative is to cultivate an interest in and a positive attitude towards physical activity among pupils, preparing them for the demands of everyday life. Additionally, it aims to instill in them an understanding of the necessity of physical activity for their health and overall development, encompassing physical, motor, psychological, and social aspects.

Conclusion

The presented empirical research contributes to the expansion of knowledge on the possibilities of using an exercise programme and targeted exercises with a health aspect on the observed factor of health-oriented fitness of pupils in the framework of "Active School". This emphasises the significance of motivation in fostering interest in physical activities among pupils. The findings indicate that, in terms of somatic indicators, both male and female pupils were taller and heavier in terms of weight. The girls demonstrated a general tendency to perform less well than the boys on tests of general physical performance. From the physical development and physiology point of view, several factors could result in the poorer performance of girls compared to boys. Analyzes of growth curves show that during childhood, the growth acceleration phase repeats approximately in the two-year cycles. Both monitored groups were present in one of these cycles. Body weight was higher in girls at pre- and post-assessment stages, along with BMI, even though girls showed improvement. The total vital capacity of the lungs is also lower in girls than in boys. A lower fitness level could also be a symptom showing a hidden disease process ongoing in the organism. To a large extent, socio-psychological factors could influence their performance, among others.

To a large extent, socio-psychological factors, among others, could have influenced their performance. Moreover, posture (movement stereotype) was also included in the assessment. By examining postural stereotypes, we gained insights into the postural status of younger school-age pupils. The qualitative findings were identical for both sexes, with no discernible differences between the initial and final assessments. However, there was a notable qualitative and positive change in overall posture. Due to the limited size of the sample, it is crucial to emphasise that the findings cannot be generalised. However, they do offer valuable insights into the health, preventive, educational, and informative aspects of the issue. Our findings indicate that early, effective, and especially primary prevention, which can be implemented in the school environment, is more crucial than treatment.

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Conflicts of interest

The authors declare no conflict of interest.

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