UNIVERSITY ARENA – Journal of Physical Education, Sport and Health, vol. 8, issue 5, 2025, p. 8-19
ISSN 2602-0440, ISSN-L 2602-0440
DOI: https: //doi.org/10.62229/UaViii_5_25-1

HEALTH-ORIENTED FITNESS IN THE CONTEXT OF THE "ACTIVE SCHOOL"

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Abstract. *Background.* In Slovakia, less than one-third of the school population meets the requirement of physical activity of 1 hour per day at medium and higher intensity levels according to WHO global recommendations. This fact gradually manifests in the quality of pupils' health-oriented fitness as an indicator of their physical health. Gradually, there is an increase in various chronic non-communicable diseases, which are directly proportional to the lifestyle of pupils. School, as a setting, is suitable for fostering a positive attitude toward physical activity, cultivating movement habits, and promoting physical activity within the framework of an active school.
Objectives. The aim of the research was to determine the current level of the physical, functional, and movement system in non-exercising 4th-grade primary pupils and subsequently apply a health-oriented program through the Active School initiative to improve overall posture concerning the dynamic function of the spine.
Methods. Regarding the methods of obtaining somatometric data, the HW-900B device was used. Functional development was monitored using the Ruffier test (sport tester), and the movement system was evaluated through standardized tests for assessing the dynamic function of the spine (Th, Sch, St, Ott, L-test; body posture – Thomas, Klein mod. Mayer). The pupils (N = 117) completed a 12-week movement program composed of 15-minute exercises performed 5 days per week during a long break.
Results. Our findings in the area of functional fitness of younger school-age pupils via the Ruffier test showed that both girls and boys fell into the range of weak fitness. In the area of somatometry, average body height and weight, as well as BMI, were similar, but significantly higher ($p<0.01$) compared to 25 years ago. Regarding posture, pupils were classified into the 3rd qualitative level, which characterizes poor posture. This was also reflected in the quality of the dynamic function of the spine. Through the health-oriented program under the Active School initiative, we observed significant ($p<0.01$) improvements in our group of pupils, both girls and boys, in terms of individual aspects of posture, overall posture, and the dynamic function of the spine. Significant ($p<0.01$) improvement was also noted in the area of functional fitness, with pupils moving from the "weak" category to the "average" category. Additionally, pupils were reclassified to the 2nd qualitative level, indicating good posture.
Conclusion. Our findings indicate that the Active School initiative is one of the viable options for improving health-oriented fitness in non-exercising pupils, whether in terms of physical development focusing on body weight, functional development, or the movement system (dynamic function and posture). *The listed study is part of the research project VEGA 1/0301/25 titled "Active School Promoting the Quality of Health-Oriented Fitness Focused on Postural Health of Pupils".*

Key words: Active School, fitness, body posture, health, pupils.

Introduction

Regular, long-term physical activity is a fundamental pillar of success in maintaining a healthy population. The concept of the so-called *Active School*, which has been gaining popularity in neighbouring countries, is gradually finding acceptance in Slovakia as well. In this context, a key factor is health-oriented fitness, which differs from performance-oriented fitness in that it is not based on performance norms but on the individual needs and abilities of each person for a healthy and active life.

Health-oriented fitness consists of several components such as muscular fitness, flexibility, aerobic (cardiorespiratory) fitness, and posture–forming the foundation of active health through the lens of active rest.

The *Active School* initiative responds to the alarming lack of physical activity (hypokinesia) and sedentary lifestyle (WHO, 2018, 2020) among children both abroad and in Slovakia, as well as to the deteriorating state of their physical and mental health (Reillz, 2008).

The primary goal of the Active School is to increase the amount of physical activity within the daily routine of school-aged children, thereby improving their overall fitness, developing physical literacy, cultivating health-oriented fitness, and ultimately also enhancing mental health as part of pupils' overall educational well-being (Bendíková, Šagát, 2024).

The primary task of the Active School is to create conditions and encourage active transport to and from school, as well as to implement various physical activities through morning warm-ups, active breaks, or exercise moments–before, during, and after lessons–linked to the subject of Physical and Sports Education. All these activities influence the overall physical and mental health of pupils throughout the school week.

In Slovakia, Physical and Sports Education is currently allocated a minimum of two lessons per week, as recommended by the State Educational Program, which in practice means about 66 hours per school year. Increasing this number is possible through discretionary hours within the School Educational Program, but this is rarely applied in practice. Therefore, as of June 2025, the Ministry of Education of Slovakia introduced the national project *"Well-being through Movement"* under the concept of *Active School*.

The project consists of five interrelated pillars, forming a compact whole, targeting lower secondary school pupils (aged 10–15), with the ambition to reach approximately 60,000 pupils across all regions of Slovakia (500 schools).

The essence of the Active School within these pillars includes Testing general motor skills (legs/36, arms/15, trunk/12 – 63 max score) in order to provide feedback to schools, pupils, and parents. Identifying opportunities to increase physical activity in the school environment.

Methodological support and school scoring, aimed at identifying each school's strengths and weaknesses and providing methodological assistance. Teacher training, focusing on modern teaching methods, approaches, and styles integrating physical activity into the educational process. Experts in school clubs, fostering a positive relationship with and interest in movement activities. Applying the Active School concept into regular school practice.

According to WHO (2020), children and adolescents aged 6–17 should engage in at least 1 hour of moderate-to-vigorous activity per day. There are recommendations suggesting that physical activity can be divided into shorter segments of at least 10 minutes, with a total of at least 90 minutes daily at moderate intensity (Sigmundová, 2012).

Improvement in general physical performance can also be achieved through intermittent activities of 20–35 minutes, three times per week, at submaximal intensity (above 80% of maximum heart rate).

Another criterion for optimizing the recommended daily activity is step count: children aged 5–19 should take at least 12,000 steps per day (Silva et al., 2015).

Enríquez-Del-Castillo et al. (2022) showed that moderate-intensity exercise improves muscle strength, cardiorespiratory fitness, and motor skills in school populations. In general, the qualitative level of physical fitness is influenced by intensity of load and its duration (Bendíková et al., 2023).

The *Active School* concept should be viewed as both a diversification of subject content and a change in one's approach to personal physical and mental health, as well as lifestyle. Lifelong physical activity should be an inseparable part of prevention against non-communicable diseases (Lavie et al., 2019; Bendíková, 2020), which are on the rise not only among adults but also among school-aged populations (Freedman et al., 2017; Koedijk et al., 2017).

The level of physical activity also reflects the stage of a child's psychological and motor development. It is proven that movement during school age affects the child physiologically and motorically, but also psychologically and socially (Ekeland et al., 2005). Research findings (Jago et al., 2005; Graf et al., 2014) indicate a strong relationship between regular physical activity and health markers (Clemente et al., 2022), such as body composition, cardiovascular and metabolic health (Seabra et al., 2020; Vermeiren et al., 2021), motor performance, posture (Hricková, Junger, 2016), and quality of life even in preschool and early school age.

Postural health is a fundamental pillar of overall health. Its most common symptom is pain, manifested through poor posture. Incorrect posture is now observable even in young children, and its occurrence increases with age. This condition is attributed to adaptation of the musculoskeletal system to reduced movement stimuli, accompanied by repetitive, one-sided movements and static overloading of muscles during prolonged sitting or standing in improper positions. If imbalances persist, the disproportion between antagonistic and agonistic muscles increases. Postural muscles take over stabilizing functions, which leads to muscle shortening the most serious consequence of muscular imbalance. On the opposite side of the shortened muscle, functional inhibition develops, with muscles becoming stretched, weakened, and losing strength (Bendíková et al., 2023).

Posture is influenced by many factors: spinal shape, muscle function, joint mobility, ligament flexibility, musculoskeletal load, and psychological condition. Correct posture assumes muscular balance, where every movement is performed economically. According to Čermák et al. (2008), posture is an individually specific way of solving the classical task of coping with gravity and maintaining body balance.

Muscle groups involved in posture are divided into postural (tonic) and phasic. Postural muscles (usually slow red fibers) ensure stability, body fixation, and posture in space. They are deeper, more fatigue-resistant, and recover more quickly. However, they tend to shorten and stiffen and often take over the work of weakened muscles. Phasic muscles (usually fast white fibres), by contrast, are responsible for movement, are more superficial, fatigue easily, and require strengthening, as they tend to weaken and stretch (Véle, 2006).

Awareness of posture is therefore essential. Correct, active posture has a preventive function, protecting against spine disorders in adulthood. Schools, where pupils spend on average 6 to 6.5 hours daily, offer an important space to cultivate quality postural health (Vidal et al., 2011).

The aim of the research was to determine changes in non-exercising fourth-grade elementary school pupils by applying an exercise program within the Active School in experimental group, focusing on:

– the overall functional state of the cardiovascular system as a manifestation of the organism's readiness for stress,

– primary somatometry with an intention for body weight,

– overall posture and dynamic spine function as a manifestation of the functionality of the muscular system.

Methods

Participants

The group we monitored consisted of 384 younger school-age pupils who attended the 4th grade of primary schools. For the purposes of the research, we selected and evaluated only the pupils from the Active School program, in whom incorrect posture and higher body weight were recorded, in a total number of N = 117, of which 60 were girls and 57 were boys. The pupils were willing to participate in the research with the consent of their legal guardians and in compliance with GDPR. The primary characteristics of the group are presented in Table 1.

Table 1. Total body posture of younger school-age pupils (N = 384)

Factors/gender	Correct body posture	Good body posture	Bad body posture	Incorrect body posture
Girls (N = 208)	N = 35 (16.83 %)	89 (42.79 %)	60 (28.85 %)	24 (11.53 %)
Boys (N = 176)	N = 25 (14.20 %)	79 (44.90 %)	57 (32.38 %)	15 (8.52 %)

Legend: N – numbers, % – percentage

Data collection

The experiment we conducted was a pedagogical, field-based, two-group, and multi-factor study. The pupils (N = 117) completed a 12-week movement program consisting of 15-minute exercises performed 5 days per week during a long break. Additionally, twice a week (Monday and Wednesday), before lessons, the pupils attended brief 10-minute lectures on health, with a focus on the cardiovascular, metabolic, and postural systems.

Example from an exercise program focusing on the cervical spine: Sit upright on a fitball, arms along the body, lower limbs at a right angle. Rotation of the head right, left 6x, bend head to the right, left 6x, half circle of the head in forward bend 6x, pressing the chin to the chest 6x, nodding the head right, left 6x, Repeat all 4x. Plus breathing exercises.

We obtained information on the qualitative effectiveness of the program from the pupils through a questionnaire that was created for the needs of the research and validated through a test/retest. Regarding the methods for obtaining somatometric data, the HW–900B device was used (Table 2). Functional development was monitored using the Ruffier test (sport tester) (Table 3), and the movement system was evaluated through standardized tests for assessing the dynamic function of the spine (Th, Sch, St, Ott, L-test) and body posture (Thomas, Klein mod. Mayer).

Test1: Basic Somatometry

The body weight and the body height were measured using HW-900B device. Subsequently, the pupils were divided into the groups listed below (table 2).

Table 2. BMI Rating and Percentile Range

Weight category (BMI)	Percentile range (%)
1. underweight (16.5 – 18.5)	< 5.0 percentile
2. normal body weight (18.5 – 25)	5.1 - 85.0 percentile
3. overweight (25.1 – 30.0)	85.1 - 95.0 percentile
4. obesity (> 30.1)	> 95.1 percentile

Test 2: Ruffier Test

The Ruffier test determines the functional state of the cardiovascular system and the body's readiness for physical exertion. This test consists of three parts. In the first part, a 2-minute observation of resting heart rate (HR) is performed while sitting. This is followed immediately by the second part, which involves performing 30 squats in 30 seconds. The final part of the test is a 2-minute cool-down, again while sitting. There is no break between the two 2-minute observation periods; they follow immediately after each other.

Measurements:
S1 – The lowest HR value during the first sitting period when fully at rest.
S2 – The highest HR value after the squats.
S3 – The lowest HR value during the second sitting period when fully at rest.
Index Calculation: IR=((S1+S2+S3)−200)/10

Table 3. Ruffier Test Index Values

	Ruffier test index
1. ≤ 3.0	excellent functional condition
2. 3.1 – 7.0	good functional condition
3. 7.1 – 12.0	average functional condition
4. 12.1 – 15.0	poor functional condition
5. ≥ 15.1	very poor functional condition

Test 3: Dynamic Spine Function

The last data acquisition method was the evaluation of dynamic spine function. It is a standardized method, typical for clinical and Physical Education (PaSE) practice, which consists of the following tests (the underlined tests were used) (Labudová, Vajcziková 2009): 1. Thomayer's test, 2. Schober's test, 3. Stibor's test, 4. Otto's test, 5. Test of lateroflexion.
Thomayer's Test (Total spinal flexibility)

Description: A deep forward bend with reach is performed while standing. The standard is for the hands to touch the mat with the fingertips. Reduced flexibility is noted by subtracting the number of centimetres the fingertips are from the mat.

Schober's Test (Lumbar Spine)

Description: A mark is made 10 cm above the 5th lumbar vertebra. Norm: When bending forward, the distance increases by 4–6 cm. Decreased flexibility: If the increase is less than the norm.

Stibor's Test (Lumbar and Thoracic Spine)

Description: The distance from the 7th cervical vertebra to the 5th lumbar vertebra is measured. Norm: When bending forward, the distance increases by 7.5–10 cm. Decreased flexibility: If the increase is less than the norm.

Otto's Test (Thoracic Spine)

Description: A mark is made 30 cm below the 1st thoracic vertebra. Norm: When bending forward, the distance increases by 2–3 cm. When leaning backward, the distance decreases by 2.5–3 cm, as the total variation should be 6 cm. Decreased flexibility: If the variation is less than the norm.

Test of Lateroflexion (Flexibility of the Lumbar Spine to the Sides R, L)

The depth of bending to the right and left is measured by the distance the middle finger of the hand moves down the thigh in a standing position after performing the maximum possible torso bend.

- ✓ Physiological norm: 20–22 cm.
- ✓ Reduced flexibility: If the extension is less than the established norm.
- ✓ Increased flexibility: If the extension is greater than the established norm.

Test 4: Overall Posture

The method for evaluating body posture is based on Bendíková et al. (2023). It is a visual evaluation method according to Klein and Thomas, modified by Mayer. The evaluation of individual areas was expressed as the sum of points, with each area scored 1, 2, 3, or 4 according to the current level of body posture. This was followed by a classification into qualitative body posture levels. The evaluation focused on: I. Head and neck posture II. Chest (shape) III. Abdomen and pelvic inclination IV. Spine curvature V. Frontal body posture (Evaluation of shoulders – Shoulder blades/scapulas).

Evaluation of body postures:

- ✓ I. Correct body posture: 5 points
- ✓ II. Good (almost correct) body posture: 6–10 points
- ✓ III. Bad body posture: 11–15 points
- ✓ IV. Incorrect body posture: 16–20 points

Data Analysis

In terms of data processing, we used descriptive statistical methods defined for the research based on the normality of the sample distribution: arithmetic mean (x), standard deviation (s), percentage frequency analysis (%), range (Vrmin - max), paired T-test (for comparison within the sample between V1 and V2), and unpaired T-test (between genders). We also used the chi-square goodness-of-fit test ($\chi 2$, $p < 0.01$) to express the pupils' understanding of the importance of health education (survey method: test/retest). The statistical analyses were performed using MS Excel 2016, IBM SPSS 22, and JASP 0.16.4.0 software with significance levels of $p < 0.01$ ($p < 0.05$).

Results

Our findings in the area of functional fitness of younger school-age pupils via the Ruffier test V1 (input) showed that both girls and boys were into the range of weak fitness (table 4). By completing the active school program, we noted significant improvements in the final evaluation (V2) of pupils (both girls $T_{-test} = 2.523$, $p < 0.01$ and boys $T_{-test} = 4.47$, $p < 0.01$).

Table 4. Ruffier test of pupils (N = 117)

Factors	V1/V2	x	s	min	max	$Vr_{min-max}$	T_{-test}
Ruffier test/Girls (N = 60)	V1	14.89	4.56	12.50	26.48	13.98	
	V2	12.21	3.09	12.30	20.79	8.49	< 0.01
Ruffier test/Boys (N = 57)	V1	14.21	4.38	13.22	27.50	14.28	
	V2	12.89	3.74	11.90	21.81	9.91	< 0.01

Legend: arithmetic mean (x), standard deviation (s), variation range ($Vr_{min-max}$), paired T_{-test}

In terms of body weight and BMI we recorded significant improvements in both girls (BW/T_{-test} = 2.354 $p < 0.01$) (BMI%T_{-test} = 2.121 $p < 0.01$) and boys (BW/T_{-test} = 2.442 $p < 0.01$) (BMI%T_{-test} = 2.232 $p < 0.01$) after the active school program (table 5, 6). In the area of somatometry, average body height and weight, as well as BMI, were similar, but significantly higher ($p < 0.01$) compared to 25 years ago.

Table 5. Primary somatometry of girls (N = 60)

Somatometry factors	V1/V2	x	s	min	max	$Vr_{min-max}$	T_{-test}
Body weight/(kg)	V1	42.71	8.95	39.21	50.91	11.7	< 0.01
	V2	37.18	6.88	36.42	49.20	12.78	
Body height/(cm)	V1	143.17	7.36	130.52	144.23	14.03	< 0.01
	V2	145.67	6.50	133.20	147.81	14.61	
BMI /(percentil)	V1	27.40	4.58	28.09	30.53	2.44	< 0.01
	V2	25.16	2.37	22.86	26.48	3.62	

Legend: arithmetic mean (x), standard deviation (s), variation range ($Vr_{min-max}$), paired T_{-test}

Table 6. Primary somatometry of boys (N = 57)

Somatometry factors	V1/V2	x	s	min	max	$Vr_{min-max}$	T_{-test}
Body weight/(kg)	V1	38.97	8.55	39.6	49.0	9.4	< 0.01
	V2	34.45	9.29	35.4	45.5	10.1	
Body height/(cm)	V1	144.78	6.18	133.2	145.7	12.5	< 0.01
	V2	147.24	8.7	136.7	149.8	13.1	
BMI /(percentil)	V1	27.49	3.24	26.4	29.9	3.5	< 0.01
	V2	25.21	2.69	25.9	27.9	2.0	

Legend: arithmetic mean (x), standard deviation (s), variation range ($Vr_{min-max}$), paired T_{-test}

Regarding posture, pupils were classified into the 3rd qualitative level, which characterizes poor posture. This was also reflected in the quality of the dynamic function of the spine.

Through the health-oriented program under the Active School initiative, we observed significant ($p < 0.01$) improvements in our group of pupils, both girls (N = 60) (T_{test} = -6.16**) and boys (N = 57) (T_{test} = -7.42**), in terms of individual aspects of posture, overall posture (table 7), and the dynamic function of the spine (Girls/T_{test} $p < 0.01$, Th = 6.25, Scho = 4.37; St = 4.41, Ott = 3.78, LR/LF = 3.61) (Boys/T_{test} $p < 0.01$, Th = 6.05, Scho = 4.21; St = 4.11, Ott = 3.77, LR/LF = 3.70) (table 8, 9).

Table 7. Overall posture of pupils (N = 117)

Overall posture of pupils	V1/V2	x	s	min	max	$Vr_{min - max}$	T_{-test}
Girls (N = 60)	V1	11.4	1.8	9.0	15.0	6.0	< 0.01
	V2	9.4	1.5	6.0	12.0	6.0	
Boys (N = 57)	V1	12.4	1.9	9.0	17.0	8.0	< 0.01
	V2	10.4	1.6	8.0	15.0	7.0	

Legend: arithmetic mean (x), standard deviation (s), variation range ($Vr_{min - max}$), paired T_{-test}

Significant ($p<0.01$) improvement was also noted in the area of functional fitness, with pupils moving from the "weak" category to the "average" category. From a gender perspective, we did not find significant changes between girls and boys during the initial and final measurements (Unpaired T-test $p=0.0027$). Additionally, pupils were reclassified to the 2nd qualitative level, indicating good posture.

Our secondary findings suggest that the 10-minute lectures on health before class, which focused on the cardiovascular, metabolic, and postural systems, were a suitable supplement and clarification for pupils with increased body weight in understanding the importance of health ($df=3$, $\chi 2=8.58$, $p<0.01$). We see a positive impact through a reduction in body weight, BMI, and an improvement in the Ruffier test.

Table 8. The dynamic function of the spine of girls (N = 60)

Factors/Girls	V1/V2	x	s	min	max	$Vr_{min - max}$	T_{-test}
$Thomayer_{-test}$	V1	15.5	2.84	-2.0	21.3	23.3	< 0.01
	V2	3.8	1.38	-2.0	4.6	6.6	
$Schober_{-test}$	V1	2.8	2.46	1.5	3.5	5.0	< 0.01
	V2	5.8	1.15	3.1	6.1	9.2	
$Stiibor_{-test}$	V1	7.1	3.35	5.2	8.0	13.2	< 0.01
	V2	9.4	1.76	9.3	10.1	19.4	
Ott_{-test}	V1	3.6	3.29	3.1	4.3	7.4	< 0.01
	V2	6.0	1.42	3.4	6.1	9.5	
$Lateroflexion^{R}_{-test}$	V1	18.5	3.13	17.0	23.2	40.2	< 0.01
	V2	22.1	2.0	18.0	23.2	41.2	
$Lateroflexion^{L}_{-test}$	V1	18.5	3.13	17.0	23.0	40.0	< 0.01
	V2	22.1	2.0	18.9	23.0	40.9	

Legend: arithmetic mean (x), standard deviation (s), variation range ($Vr_{min - max}$), paired T_{-test}

Table 9. The dynamic function of the spine of boys (N = 57)

Factors/Boys	V1/V2	x	s	min	max	$Vr_{min - max}$	T_{-test}
$Thomayer_{-test}$	V1	16.9	2.92	−1	22.8	23.8	< 0.01
	V2	4.1	1.56	−2	3.5	5.5	
$Schober_{-test}$	V1	2.9	2.46	1.9	3.7	5.6	< 0.01
	V2	5.7	1.15	3.3	6.0	9.3	
$Stiibor_{-test}$	V1	7.4	3.18	5.4	8.0	13.4	< 0.01
	V2	9.4	1.76	9.2	10.0	19.2	

Ott-test	V1	3.7	3.29	3.2	4.2	7.4	< 0.01
	V2	6.0	1.42	3.5	6.0	9.5	
Lateroflexion^{R}-test	V1	18.1	3.13	16.5	22.5	39. 0	< 0.01
	V2	22.0	2.0	20.9	22.5	43.4	
Lateroflexion^{L}-test	V1	18.3	3.13	16.5	22.5	39.0	
	V2	22.0	2.0	< 0.01	22.4	42.4	

Legend: arithmetic mean (x), standard deviation (s), variation range ($Vr_{min - max}$), paired T-test

Discussion

Insufficient physical fitness and postural deviations are a common problem among children, caused by the long-term effects of poor posture stemming from various factors of a modern lifestyle, which undoubtedly include watching television, motorized transport, and a lack of physical activity (Bull et al., 2020). Children first experience functional changes within the cardiovascular, metabolic, and motor systems (Binkley, Specker, 2016; Chung et al., 2018), which are the basis for many (structural) health disorders in adulthood (Simmonds et al., 2016).

Similarly, the findings of Bendíková et al. (2024) point to changes in health-oriented fitness through somatic indicators and body posture in female pupils of younger school age. Migueles et al. (2023) confirm the positive effect of an exercise program in overweight children concerning cardiovascular and mental health.

Many health benefits are associated with musculoskeletal fitness, such as reduced coronary risk factors, increased bone mineral density (reduced risk of osteoporosis), increased flexibility, improved glucose tolerance, and greater success in activities of daily living (ADL) (Kell et al., 2001; Bouchard et al., 2007).

In the context of our findings, it is necessary to realize that the "Active School" concept should be part of the curriculum reform of every school in Slovakia. The vision is for pupils to be physically active at school for at least one hour every day. This is an achievable goal if we include pupils' transportation to school by their own effort, such as cycling or walking, and assume the active use of breaks between lessons. This could be done by transforming schoolyards and hallways into motivating exercise spaces, and by including school sports days or nature trips as part of the school's identity.

The solution is hidden in the very name, "Active School." The strength of the project lies in applying all available options that a school can use to "get pupils moving". This reality represents one of the forms of solving the current problem, which is a lack of movement among the school population with a direct impact on their health.

According to Wang (2006), it is extremely important how a pupil approaches their health even in the first grade of elementary school, as this behaviour will significantly affect their future health.

Currently, as Sachi and Vikas (2023) state in their study, postural disorders are no longer limited to the field of medicine but affect society as a whole. They play a significant role in defining an individual's social personality and are responsible for their upbringing. Since these disorders are widespread in children, the importance of preventive programs needs to be emphasized. Therefore, children should be taught correct posture, encouraged to increase physical activity, and supported in leading a healthy lifestyle. We similarly agree with this view based on our findings and confirm the possibility of improving postural health in the school environment for pupils with higher body weight and incorrect posture.

Conclusion

Our findings within the Active School research present a way of enhancing pupils' health through improvements in the cardiovascular, metabolic, and postural systems. This is evidenced by the significantly achieved results in the Ruffier test, as well as in body weight, BMI, overall posture, and with a positive impact on their spinal flexibility.

In relation to these findings, we can conclude that an appropriately and purposefully designed healthy oriented exercise program aimed at preventing and correcting postural health disorders can substantially reduce future problems with the musculoskeletal system as well as overall pupil health. The improvement in the Ruffier test, as an indicator of cardiovascular functionality, demonstrates that for pupils with higher body weight, every regularly implemented physical activity – even within the school environment – plays a crucial role. Therefore, in preschool and younger school-aged populations, it is essential to emphasize the promotion of physical activity as a source of support for health-oriented fitness.

The results indicate that correct posture and even mild postural deviations need to be identified and addressed already at this early age, since treatment and management of the consequences of such problems are not only financially, but also time-wise far more demanding in the future, with significant economic implications for health insurance systems.

Limitations of the study:

- ✓ The experimental group consisted of pupils who had poor posture and higher body weight. At the same time, they were non-exercising pupils who did not perform physical activity in the school and extracurricular environment. In this research, we did not monitor dietary factors and their impact on the monitored factors. Our research is currently larger in terms of the number of experimental groups and has a control group in terms of future generalization of the results.
- ✓ During squats, the frequency of 30 squats in 45 seconds was maintained. However, this often resulted in a potentially non-objective SHR2 measurement.
- ✓ We avoided testing immediately after prior physical exertion.
- ✓ The repeated test was carried out under the same conditions as the initial one (e.g., in the morning during the first lesson). If this standardization is not maintained, the index differences may be larger.

Acknowledgment

The listed study is part of the research project VEGA 1/0301/25 titled "Active School Promoting the Quality of Health-Oriented Fitness Focused on Postural Health of Pupils". "KEGA project 014KU–4/2025 "Pre-graduate education of physical education and sports teachers from the perspective of developing their movement literacy with an intention for postural health."

The study was conducted in accordance with the ethical standards set forth in the Declaration of Helsinki.

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