

CHILDREN'S BODY POSTURE SCREENING PROTOCOL – A NEW DIAGNOSTIC TOOL FOR PAEDIATRICIANS, PHYSIOTHERAPISTS AND PE TEACHERS

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Abstract

Analysis of the general health of children and adolescents indicates an increasing risk of metabolic diseases resulting from excess body weight and lack of physical activity, the widespread occurrence of poor posture, and poor mental well-being. These data confirm the need to promote postural hygiene, which should be considered an essential element of healthcare. Postural hygiene includes maintaining correct body posture in static positions and while moving, the habit of regular physical activity, and a healthy diet that ensures a healthy body weight. Correct body posture not only affects physical health, but also supports mental, emotional and social functioning through better self-esteem, especially body self-esteem. Regular assessment of body posture is particularly important in children and adolescents, because at this age, due to rapid growth, plasticity of the musculoskeletal system and sensitivity to stimuli, the occurrence of body posture defects is particularly frequent. Posture screening for children and adolescents is implemented in every European country, but it does not lead to a reduction in the incidence of musculoskeletal deformities. Social campaigns encouraging healthy habits of physical activity and healthy eating also fail to achieve their intended purpose. It seems that one of the gaps that needs to be improved is communication between healthcare providers, parents, and the school community. To facilitate this communication, we are proposing a simple tool - body posture screening protocol. The goal was to guide a paediatrician or other specialist through a posture assessment in a user-friendly manner: the protocol is only two pages long and requires no manual entry of the diagnosis, but only the appropriate option selection. The assessment using the protocol takes no more than a few minutes and requires no equipment other than a scoliometer. All body segments are assessed in the habitual standing position, viewed from the front, back, and side, as well as trunk rotation in a forward bend. To make the protocol easy for parents to interpret, graphics have been added to help understand which body segments were assessed and how. The parent also receives information on whether the child's body posture is correct or requires correction or further diagnosis. Such a protocol could be transferred to the school environment, for teachers to introduce appropriately selected elements of corrective gymnastics during PE lessons or in-class activities. The method of conveying knowledge about postural hygiene to school children and how to carry out exercises that shape the habit of correct body posture is being developed, for example, in the project "Spine-Friendly Teacher, Spine-Friendly School" (2025-1-PL01-KA220-SCH-000350791).

Keywords: *Children's health, body posture, faulty body posture prevention, posture hygiene, health care.*

1. Introduction

It has long been known that poor posture is not only an aesthetic defect, but also affects physical and mental health and the quality of functioning in every sphere of life (Delarue, 1957). Poor posture can cause musculoskeletal dysfunction associated with chronic pain, impaired functioning of internal organs (e.g., respiratory disorders), as well as low self-esteem and depression (Kounter, 2015). Poor posture causes muscle imbalance (Nagymáté et al., 2018). This is related to the modern lifestyle, which is characterized by spending time in a seated position and a lack of physical activity among people of all ages (Dedaj, 2020). Healthcare professionals, teachers, and educators should teach children to maintain correct posture, encourage them to increase their level of physical activity, and promote a healthy lifestyle. Projects such as MOV-e (Development of Intercultural Communication Skills in Physiotherapy Practice through an E-Learning Course on Movement Analysis and Therapy, <https://mov-e.education/>), which are openly accessible to medical students and focus on the importance of postural hygiene and how to shape it in younger and older patients while respecting their cultural diversity and differences in views.

2. Design

Despite improved economic conditions, advances in technology and medical science, and growing awareness of the importance of postural hygiene and access to public health care, the incidence of poor posture in children is not decreasing (Slováková & Mandžáková, 2024). The analysis of the quality of institutionalized care for the development of posture in European countries leaves much to be desired. Screening tests for posture in children and adolescents are carried out, but the results of the assessment performed by a pediatrician are not explained to parents and do not translate into further action, such as referral for rehabilitation. Most European countries lack a standardized, simple, pediatrician-friendly, and clear assessment form that is understandable to parents. It seems that the introduction of such a form could translate into better cooperation between doctors and parents with the school environment, which would have a real impact on the quality of posture and, consequently, on the level of psychosocial functioning. The study focused on pilot testing a proprietary protocol for assessing body posture and estimating the prevalence of abnormalities in the alignment of individual segments of the torso and lower limbs in preschool children. The results of the study will be used to refine the procedure before its wider dissemination.

3. Objectives

The aim of the study was to estimate the prevalence of postural abnormalities in preschool children using a new tool, a protocol for screening posture assessment. The quality of the protocol (ease of use, user-friendliness) was evaluated. The study was piloted to test the protocol and introduce improvements before its validation.

4. Methods

Two physical therapists with many years of experience in assessing and correcting the posture of children and adults have prepared a two-page protocol for screening posture assessment. The protocol guides the user through a visual assessment of the child's silhouette from the front, back, and side, as well as an examination of trunk rotation in forward bending (Adams test, assessment of rotation in degrees using a Bunnell scoliometer). This protocol was used to assess the posture of preschool children from one of the public preschools in Tarnów, a medium-sized city in south-eastern Poland. The study involved 66 six-year-old children (6.16 ± 0.063 years), including 29 girls (43.9%) and 37 boys (56.1%). None of the children had a certified disability; all children were healthy and felt well on the day of the study.

The children's parents gave their written consent for their children to participate in the study (they could be present during the study if they wished) and the results of the study were discussed with them in detail. The Bioethics Committee at the University of Applied Sciences in Tarnow gave its consent for the study to be conducted.

Before assessing body posture, the children's body weight was measured using TANITA scales (accurate to 0.1 kg) and their height was measured using a calibrated anthropometer (accurate to 1 mm). Based on these data, BMI was calculated and body weight status was estimated using the cut-off points for overweight and obesity in children developed by Cole et al. (2000).

During the posture examination, the child was wearing only underwear, and girls had their hair tied back to facilitate the assessment of head and shoulder position. The children stood in their habitual position against a grid with 5 cm x 5 cm squares. Their feet were aligned and shoulder-width apart. First, the silhouette was assessed from the front, then from the back and from the side. Finally, the child performed a free forward bend and the researcher assessed the rotation of the torso.

5. Results

The average height of the children examined was 118.51 ± 7.44 cm (Min=93.4, Max=145.80, Me=119.20). The average body weight was 22.40 ± 4.37 kg (Min=15.15, Max=39.20, Me=21.87). The average BMI was 15.90 ± 2.42 (Min=12.98, Max=23.73, Me=15.50). Normal weight and height ratios were recorded in 58 children, overweight in 1 boy, and obesity in 4 girls and 3 boys.

The assessment of habitual posture in the frontal plane, viewed from the front, showed that most abnormalities concerned the position of the shoulders. In contrast to the pelvis, higher shoulder position was observed more often on the left side. The fewest abnormalities were diagnosed in the chest area. In the assessment of the knees, valgus was observed much more frequently than varus (Table 1).

Table 1. Assessment of body posture – front view.

Head – tilt (n=66)				
tilted to the right	correct		tilted to the left	
15 (22.7%)	33 (50.0%)		18 (27.3%)	
Head - rotation (n=66)				
rotated to the right	correct		rotated to the left	
13 (19.7%)	47 (71.2%)		6 (9.1%)	
Shoulders (n=66)				
right shoulder significantly higher	right shoulder slightly higher	correct	left shoulder slightly higher	left shoulder significantly higher
1 (1.5%)	17 (25.8%)	19 (28.8%)	25 (37.9%)	4 (6.1%)
Chest (n=66)				
correct	pectus excavatum	pectus carinatum	asymmetrical	
64 (97.0%)	0 (0.0%)	1 (1.5%)	1 (1.5%)	
Waist triangles (n=66)				
symmetrical	slightly asymmetrical		significantly asymmetrical	
25 (37.9%)	38 (57.6%)		3 (4.5%)	
Pelvic (n=66)				
right side significantly higher	right side slightly higher	correct	left side slightly higher	left side significantly higher
5 (7.6%)	10 (15.2%)	47 (71.2%)	3 (4.5%)	1 (1.5%)
Knees (n=66)				
significantly valgus	slightly valgus	correct	slightly varus	significantly varus
4 (6.1%)	16 (24.2%)	43 (65.2%)	3 (4.5%)	0 (0.0%)

In the frontal plane, when viewed from behind, most of the abnormalities observed concerned the position of the shoulders. As when viewed from the front, a higher position of the left side was also more frequently noted here. The diagnosed lateral curvatures of the spine were mostly left-sided. The position of the hindfoot was valgus in more than half of the subjects. No clubfoot was observed in any of the children (Table 2).

Table 2. Assessment of body posture – back view.

Shoulders (n=66)				
right shoulder significantly higher	right shoulder slightly higher	correct	left shoulder slightly higher	left shoulder significantly higher
1 (1.5%)	25 (37.9%)	8 (12.1%)	26 (39.4%)	6 (9.1%)
Waist triangles (n=66)				
symmetrical		slightly asymmetrical		significantly asymmetrical
13 (19.7%)		45 (68.2%)		8 (12.1%)
Pelvic (n=66)				
right side significantly higher	right side slightly higher	correct	left side slightly higher	left side significantly higher
5 (7.6%)	7 (10.6%)	47 (71.2%)	6 (9.1%)	1 (1.5%)
Thoracic spine (n=66)				
right-hand curvature		correct		left-hand curvature
2 (3.0%)		53 (80.3%)		11 (16.7%)
Lumbar spine (n=66)				
right-hand curvature		correct		left-hand curvature
0 (0.0%)		64 (97.0%)		2 (3.0%)

Right hindfoot (n=66)				
significantly valgus	slightly valgus	correct	slightly varus	Significantly varus
18 (27.3%)	24 (36.4%)	24 (36.4%)	0 (0.0%)	0 (0.0%)
Left hindfoot (n=66)				
significantly valgus	slightly valgus	correct	slightly varus	Significantly varus
13 (19.7%)	33 (50.0%)	20 (30.3%)	0 (0.0%)	0 (0.0%)

Almost two-thirds of the children had shoulders that were too far forward, and almost half also had their heads protruding forward. The physiological curves of the thoracic and lumbar spine were more often deepened than flattened. One-third of the children had hyperextended knees and almost half had feet with reduced arching (most often slightly reduced) (Table 3).

Table 3. Assessment of body posture – side view.

Head (n=66)			
correctly in line with the body's axis	slightly protruding forward	significantly protruding forward	
35 (53.0%)	27 (40.9%)	4 (6.1%)	
Shoulders (n=66)			
correct	slightly protruding forward	significantly protruding forward	
17 (25.8%)	42 (63.6%)	7 (10.6%)	
Thoracic kyphosis (n=66)			
correct	Flat	Round	
46 (69.7%)	5 (7.6%)	15 (22.7%)	
Lumbar lordosis (n=66)			
correct	Flat	Round	
28 (42.4%)	0 (0.0%)	38 (57.6%)	
Knees(n=66)			
correct	hyperextension		
43 (65.2%)	23 (34.8%)		
Foot arch (n=66)			
follow feet	correct	reduced longitudinal arch	flat
0 (0.0%)	34 (51.5%)	29 (43.9%)	3 (4.5%)

Trunk rotation during forward bending occurred almost equally often to the right and to the left, but more than twice as often in the lumbar region than in the thoracic region (Table 4). The average rotation was $2.31 \pm 1.68^\circ$ (Min=0, Max=5, Me=3).

Table 4. Assessment of body posture – trunk rotation in forward bend.

Direction of rotation (n=66)			
to the right	to the left	no rotation	
24 (36.4%)	27 (40.9%)	15 (22.7%)	
Level of spinal rotation (n=66)			
thoracic spine	lumbar spine	both parts of the spine	no rotation
16 (24.2%)	24 (36.4%)	11 (16.7%)	15 (22.7%)

6. Discussion

A screening assessment of body posture revealed that the most common posture errors are incorrect positioning of the shoulders in the sagittal and frontal planes, the pelvis in the frontal plane, and foot valgus. The occurrence of lateral curvature of the spine and trunk rotation in every fifth 6-year-old is a cause for concern. These results are consistent with the observations of Peulić et al. (2024), who also studied preschoolers and noted scoliosis in 73.5%, foot defects in 75.4%, and abnormal shoulder alignment in 59.8%. Unfortunately, the incidence of scoliosis increases with age and is as high as 50% in primary

school children (Wilczyński et al., 2020). These observations indicate the need for greater awareness and optimization of public health measures aimed at improving children's posture.

One such measure could be the introduction of a more detailed assessment of posture as part of the so-called check-ups carried out periodically by family doctors. Screening assessments of posture are carried out in all European countries, but the principles are not consistent and, above all, are not optimal (see the project entitled: *Prevention of postural defects in children and adolescents in public health care on the example of selected European countries*, which is described in another paper in this monograph).

The situation could be improved by introducing a structured protocol for assessing body posture, making it easier for doctors to conduct examinations and for parents to understand the results. To meet these needs, we have developed such a protocol. The tool is simple, easy to translate into other languages, and designed so that it can be used in the future to examine children from different backgrounds and cultural contexts, which may reveal possible differences and developmental trends and thus help to more effectively protect children from developing and perpetuating poor posture. An approach that takes into account the diversity of the study groups is recommended by researchers (Kapo-Gurda et al., 2025).

Assessing posture in accordance with the protocol requires a visual assessment of the silhouette from the front, back, and side. The examination is supplemented by an assessment of trunk rotation in forward bending using a scoliometer. The protocol takes up two pages of paper, and an electronic version can also be used. The doctor or other person conducting the examination (e.g., a physical therapist) does not need to write anything on the card, but only marks the appropriate options, which facilitates and shortens the time needed to complete the protocol (there is also no risk that the parent will have difficulty reading illegible handwriting). The protocol has been enriched with simple graphics (a silhouette of a child from the front, back, and side, and a forward bend test) illustrating which elements of body posture are assessed. The protocol was inspired by existing body posture assessment tools such as the Back Pain and Body Posture Evaluation Instrument (BackPEI) (Miñana-Signes et al., 2021) or REEDCO Posture Score (Vongsirinavarat et al., 2025), which are, however, more complex and serve slightly different purposes.

7. Conclusions

Postural abnormalities are common in 6-year-old children. These are not usually structural defects, but rather errors in the positioning of the torso and lower limbs, which should be corrected so as not to affect the quality of mental and physical health and well-being in the future. The introduction of a simple, doctor-friendly, and parent-friendly posture screening protocol could be valuable in optimizing posture development care and strengthening cooperation between doctors, schools, and families.

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