

UDC:616.71-007.24-07-085.825-053.6

[https://doi.org/10.32345/USMYJ.4\(134\).2022.-----](https://doi.org/10.32345/USMYJ.4(134).2022.-----)

Received: September 04, 2022

Accepted: October 20, 2022

Rehabilitation activities for children with posture disorders

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Abstract: according to the World Health Organization, 20-30% of people in the world have diseases and disorders of the musculoskeletal system, which are accompanied by: scootiness, discomfort, reduced walking amplitude and painful sensations. With scientific progress there are new perspectives, but there is another side of negative factors associated with a small-duty way of life and lack of manual activity. During the day: sitting at the table, in front of the computer, with the phone hand, violating the rule of “student position” by being in an uncomfortable position for more than 1 – 2 hours. These factors contribute to gipotonichy muscles and lead to the formation of imbalances of the spinal musculature, eventually develop degenerative-dystrophic diseases of the musculoskeletal apparatus. Analysis of skinning of early diagnostics of changes and deformations of the posture in adolescence. The problematics of the XXI century themes is not new. Analyzing scientific articles on the topic of postural disorders, one should pay attention to the fact that the main

efforts are aimed at improving health and preventing diseases. This will ensure the proper level of health and reduce the incidence of diseases in the population. *Objective description.* This publication analyzes the results of preventive and diagnostic examinations, carried out by preadolescent patients with postural disorders in the sagittal and frontal planes. *Materials and methods.* The results of prophylactic and diagnostic review were analyzed, in the city of Kiev, the Communal non-profit organization "Consultative and Diagnostic Center" of the Svyatoshinsky district, Phil 2, from May to July 2022. Participated 490 children of preadolescent age, 11 - 15 years, with impaired position in the sagittal and frontal areas. With consent of parents or guardians. The following examination methods were used: visual diagnostics, somatoscopy, manual and musculoskeletal testing, functional tests to determine the stages of positional disorders, X-ray and magnetic resonance imaging. For convenience, the documentation is formed, and the patient card is developed. The majority of the patients with impaired posture in the sagittal and frontal planes are treated by conservative methods. *Conclusions.* The main purpose of the preventive-diagnostic examination is to detect skeletal and muscular imbalances at the initial stage, to choose active procedures, to follow recommendations for elimination of negative body movements during the day. The child's health depends on the constant monitoring of parents and consultations of doctors. There should be cooperation of physicians, parents and children, observance of simple rules and prophylactic measures.

Key words: [development](#), [statistics](#), [physical therapy](#), [physical therapy techniques](#), [spine](#).

Introduction

During preventive examinations, according to the central medical statistics of the Ministry of Health of Ukraine in 2019, 99,467 children with scoliosis were identified. It is noted that in adult patients with osteochondrosis and radiculitis almost 90% are those who

have had scoliosis since childhood. According to data in 2020, more than 231,000 children are diagnosed with posture disorders, of which 92,000 are diagnosed with scoliosis. In 2021, the number of children with bad posture varies from 30% to 60%, scoliosis affects an average of 10 - 15%. The reason is low-active lifestyle, limited physical activity, inadequate organization of the workplace, overload during the period when the skeleton is not yet formed, congenital pathologies of the musculoskeletal tissue, etc.

Human posture undergoes significant changes from early childhood, most pronounced in preschool and school age. This topic is of clinical and scientific interest because changes in the axial plane can be associated with patient complaints, with discomfort and pain being frequent symptoms. Ideal posture provides biomechanical efficiency and reduces energy expenditure (Hazar Z., Karabicak G. O., et al., 2015).

The human spine is adapted to upright posture and is characterized by physiological distortions: cervical lordosis - forward bend (from 10° to 30°), thoracic kyphosis - backward bend (from 20° to 40°), lumbar lordosis (from 34° to 42°). In the sagittal plane, incorrect posture associated with an increase or decrease in physiological curvature of the spine, namely slouching, rounded back, round-curved, flat-curved, and flat back. In the frontal plane, types of posture disorders are divided into: asymmetric and scoliosis.

The spine performs a supporting, protective, and motor function, supports the load, and contributes to proper postural organization. Many children experience changes in the physiological curves of the spine, resulting in postural abnormalities. These changes have a multifactorial etiology and may be genetic, for example: adolescent idiopathic scoliosis (Jiang H., Yang F., et al., 2018) and hyperkyphosis (Yau M. S., Demissie S., et al., 2016).

Changes in the spine is a biomechanical process of segments determined by physical examination: the difference between the level of the shoulders, scapulae and pelvis associated with the progression of the curvature and may indicate that the musculature in these

structures, have impairments or compensatory changes caused by the deformity. , or as a result of structural changes (M de Ceze, Cugy E., et al., 2012; Nergini S. Aulisa A. G., et. al., 2012; Stylianides G.A., Beaulieu M., et.al. 2012).

In the Communal non-profit enterprise "Consultative and Diagnostic Center" Svyatoshinsky district, Branch 2, Department of Physical and Rehabilitation Medicine, due attention is paid to training, prevention of posture, rehabilitation activities to maintain a young body and the musculoskeletal system in a weighty state. Causes: decreased motor activity, prolonged computer use from early childhood, improper posture at school at the desk, heavy backpacks, improper nutrition, increased trauma, congenital anomalies of the spine, sedentary lifestyle (Mitova S., Popova D., et. al., 2014). As a consequence of these causes, there is fatigue of the spinal musculature, children adopt an incorrect posture, which becomes a habit.

Early detection, diagnosis, preventive actions, adequate treatment and rehabilitation, recreation regime, active physical activity can prevent the adverse effects of spinal disorders and deformities, will ensure the normal functioning of the adolescent body (Okabu T., Kawakami N., et al., 2019).

Increased attention to the study and research of posture disorders and spinal deformities in schoolchildren is necessary. Due to slow development, undetected onset, and weak clinical symptoms, children with postural abnormalities are detected late in diagnosis. Frequent follow-up is needed to confirm whether the spinal curvature worsens during developmental periods (Sudo H., 2018).

The posture depends on the correct formation of the ridge, on the equal distribution of muscular force, i.e. on the well-organized work of all muscles that take part in the musculoskeletal apparatus. Disturbance of the stance is a change in the rucus structure. Changes in the posture are functional in nature; in the absence of correction, stable structural changes in the spine occur (Ko J.Y., Suh J.H., et. al., 2018).

In order to determine the diagnosis and the selection of rehabilitation methods, it is necessary to collect the anamnesis, perform an examination, determine spinal mobility, palpation and apply special tests (Rusnák, R., Kolarová, M. 2019).

The prognosis of spinal deformities depends on the age of the child, the etiology of the disease, the degree of anatomical distortion, localization, and other factors that can aggravate spinal deformity (Newton P. O. 2020). Timely diagnosis and quality selection of effective rehabilitation methods, recommendations of orthopedic traumatologist for orthopedic treatment, when using corsets and insoles. The corset is an auxiliary conservative tool used to prevent curvature of the spine (Hawary R.E., Zaaroor-Regev D., 2019).

Aim

The purpose of this study is to diagnose early changes and deformities of the musculoskeletal system in adolescent children.

Materials and methods

The research protocol fully complies with the ethical principles of the Declaration of Helsinki, supported and reflected by the Human Rights Committee. Preventive diagnostic examination involved 490 adolescent children (11-15 years old), with posture disorders in the sagittal and frontal planes. Counseling and examination was conducted in KNP "KDC", Svyatoshinsky district, Branch 2, from May - July 2022, after the parents signed a voluntary written consent.

Diagnostic assessment of posture in school-age children was carried out using: physical and instrumental studies. Physical methods: on examination, posture disorders, spinal deformities, asymmetry of the shoulders, asymmetry of the supra-shoulders, asymmetry of shoulder blades angles, asymmetry of the waist triangle, asymmetry of the cuboid bones axis or the presence of a rib hill were revealed.

Adams forward tilt test to determine paravertebral asymmetry; Plumb test allows rapid visual diagnosis of scoliotic spinal deformity and monitoring of its dynamics;

To determine the existing postural abnormalities we used: - collection of anamnesis; Somatoscopy (projection); Palpation (on palpation, there is usually pain along the spine); Functional tests to determine the level of postural impairment; Manual and muscle testing; Visual analogue pain scale if needed, goniometry.

Instrumental methods were used: X-rays, computer and magnetic resonance imaging.

Physical therapist implemented and developed a referral in the Communal non-profit enterprise "Consultative and Diagnostic Center" of Svyatoshinsky district, branch 2, Department of Physical and Rehabilitation Medicine.

The subject of study: Adolescent children of 11 - 15 years of age with postural abnormalities in the sagittal and frontal planes. The consultative examination was conducted from May to July 2022 in the Communal non-profit enterprise "Consultative and Diagnostic Center" of Svyatoshinsky district, Branch 2, Kiev. The attending physician: Pediatrician, Orthopedist Traumatologist, Surgeon, after signing a voluntary consent, conducted an outpatient consultation, examined, and, if necessary, referred to a physical therapist. Therapeutic and rehabilitative measures were coordinated with the doctor, and selected individually according to the anamnesis and the request of the child's parents.

Discussion

The preventive diagnostic examination was carried out in the communal non-commercial enterprise "Consultative Diagnostic Center" of the Svyatoshinsky District, Branch 2. There were 490 adolescent children aged 11-15 years old, with 246 boys and 244 girls among them (Table 1). Parents gave their written consent to participate in the examination, treatment, and rehabilitation measures.

Table 1. Distribution of children in the communal non-profit enterprise "Consultative Diagnostic Center" of Svyatoshinsky district, Kyiv, Branch 2.

Communal non-profit enterprise "Consultative and Diagnostic Center" of Svyatoshinsky district of Kyiv, branch 2.	Number of schoolchildren	Total
Boys	246	490
Girls	244	

The results are given in Table 2, concerning the distribution of the wrong posture of adolescent children, in the sagittal and frontal planes, the number of young men - 236 and girls - 254. There were 226 children with bad posture in the sagittal plane and 158 in the frontal plane, that is 48 boys and 58 girls.

Table 2. Posture disorders in the sagittal and frontal planes depend on the article in the examined children.

Type	Number of cases detected	Number of boys	Number of girls
Improper posture in the sagittal planet	226	114	112
Improper posture in the frontal planet	158	74	84
Normal posture	106	48	58
Total	490	236	254

The data obtained in Table 3, when examined, indicate the number of deviations from the correct posture by age, gender, and type of violation in the sagittal and frontal planes. Significant problems with incorrect posture are identified in adolescence, a total of 384 children. The number of deviations from correct posture, all identified cases in the frontal

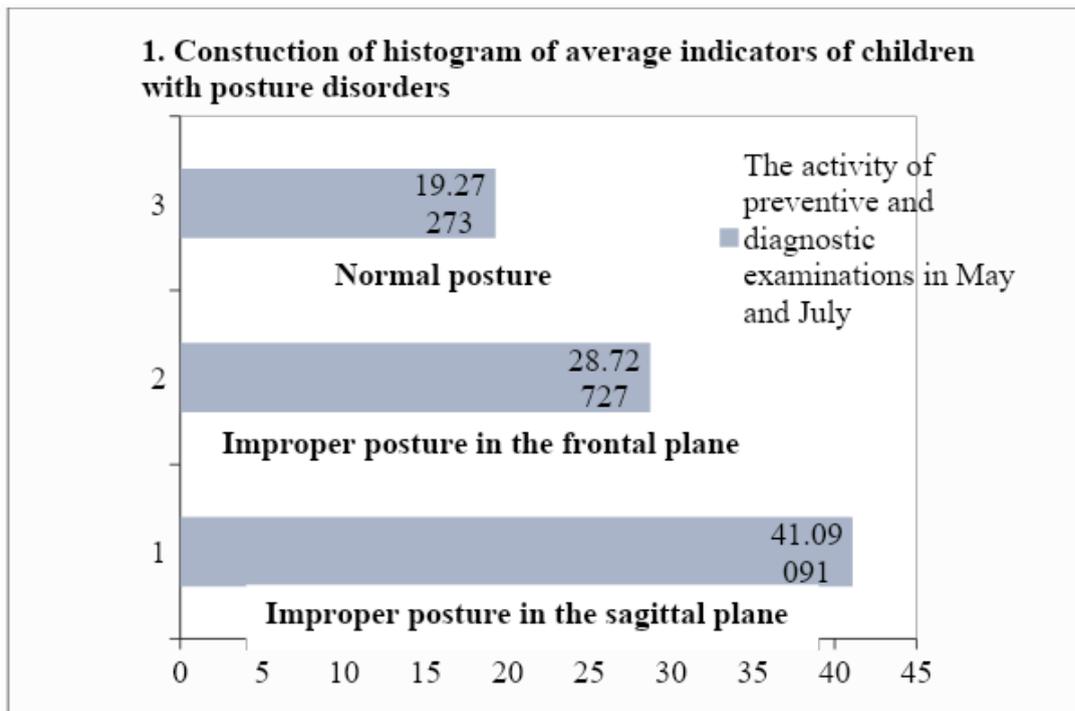
plane total - 158 children, including 84 girls and 74 boys. The highest percentage of incorrect posture is in girls.

Of all the diagnosed cases, the highest percentage of incorrect posture in the sagittal plane, a total of 226, among girls 112 and boys 114. The number of adolescent children with normal postures, 106 in total, of whom 43 were girls in the sagittal and frontal planes, is alarming.

Table 3. Prevalence of abnormal posture by age and sex in the examined children.

Age	Gender	Improper posture in the sagittal planet	Improper posture in the frontal planet	Normal posture
11 years old	Girls	15	12	5
	Boys	17	10	7
12 years old	Girls	18	11	10
	Boys	21	9	14
13 years old	Girls	24	21	9
	Boys	23	16	8
14 years old	Girls	28	19	13
	Boys	25	18	18
15 years old	Girls	27	21	6
	Boys	28	21	16
Total		226	158	106

Statistical data were processed using Statistica 8 to determine the average child population with impaired posture in the sagittal plane - 41.09 and in the frontal plane, two times less - 28.72. As for the normal posture of adolescent children - 19.27 is significantly less.



Histogram 1. depicts the average number of 490 adolescent children from 11 to 15 years of age with posture disorder, for the period from May to July 2022, conducted preventive diagnostic examinations.

Research Findings. Posture disorder highlights the prevalence of spinal deformities in 384 adolescent children, from May to July 2022, during preventive and diagnostic examinations in the Communal non-profit enterprise "Consultative and Diagnostic Center" of Svyatoshinsky district, Branch 2. For children from 11 - 15, the number of incorrect postures in the sagittal plane counted 226, in the frontal plane 158 were identified, and only 106 adolescents had a normal physique. The number of abnormalities with bad posture is of concern - 384 children in total. In the sagittal plane - 226 in total, including 112 girls and 114 boys. As for incorrect posture in the frontal plane - 158, including 84 girls and 74 boys. There were 106 with normal posture, of which 43 were girls and 63 were boys. Of the total number of cases of spinal deformity, improper posture in the sagittal plane accounts for the largest percentage - 226.

The treating orthopedist-traumatologist, after an outpatient consultation at the Communal Non-Commercial Enterprise "Consultative Diagnostic Center" of the Svyatoshinsky District, Branch 2, performed an orthopedic corset, individually for each patient at the Antis-Orto Prosthesis Center, according to indications. The corset has two functions - corrective and stabilizing. Corsets of the following types have been used: Boston, Chenault, Milwaukee, etc. A large number of corsets combine a cosmetic and corrective effect.

Preventive activities carried out in the Department of Physical and Rehabilitation Medicine:

- Therapeutic and preventive massage, teaching massage techniques to parents and caregivers from 15 - 30 min;
- Therapeutic physical training, individual sessions of 30 minutes, group sessions of 45 minutes;
- speech therapy classes;
- physiotherapeutic procedures from 15 - 20 min;
- mechanotherapy 15 - 20 minutes;
- Therapeutic exercises 20 - 30 min;
- Manual therapy 30 minutes;
- Post isometric relaxation 15 - 30 minutes;
- Spinal mobilization 15 - 30 minutes;
- building a home program for self-performance.

The attending physician consults with the patient and parents and makes a recommendation for the selection of rehabilitation measures. A physician of physical and rehabilitative medicine and a therapist examine, consult, and plan an individual rehabilitation program. Nurses for physical therapy, therapeutic massage, and physical therapy instructor

implement the therapeutic or rehabilitation program. Specialists work closely together to address patient and parent goals. The multidisciplinary outpatient treatment team includes The attending physician: orthopedic traumatologist, surgeon, pediatrician, physical and rehabilitation physician, physical therapist, speech therapist, psychologist, therapeutic and physical education instructor, massage therapist, and nurses.

The scheme of procedures is tailored to the problem of each patient and is carried out once a day. There should be preventive measures against distortions and deformities of the spine in daily life. Parents should closely monitor the development of their children. Disadvantages are most often a sedentary lifestyle, habits that lead to asymmetric development of the spine and muscles.

In the Department of Physical and Rehabilitation Medicine, each specialist on the multidisciplinary team continually raises parent and child awareness, posture ethics, and preventive measures. Providing therapeutic and rehabilitative services for the preservation and prevention of musculoskeletal deformities in the pediatric population.

Conclusions

Physiologically correct posture is formed in parallel with the growth of the child and the development of all functions of the body. In violation of the posture, there are negative consequences: musculoskeletal system, muscular activity, the appearance of improper functioning of internal organs, and cardiovascular system, which causes the pathological process of curvature of the spine. It is necessary to maintain the motor stereotype of the correct posture because it can change both the positive and negative sides.

Periodic posture monitoring is an essential requirement for the timely detection of abnormalities. Early diagnosis of posture disorders and spinal deformities can be achieved through an effective screening system. Every parent should have the necessary knowledge to identify posture abnormalities and contact qualified professionals. It is the responsibility of

the Sviatoshynskiy District Consultative and Diagnostic Center, Branch 2, Kyiv, to provide appropriate forms and resources to raise public health awareness of this problem. The best treatment for posture disorders and spinal deformities is prevention. Children should be taught moderate physical activity and avoid bad habits that lead to bad posture.

Gratitude

To the director of the Communal non-profit enterprise "Consultative and Diagnostic Center" of Svyatoshinsky district of Kyiv, Polyakov Evgeniy Aleksandrovich, for the opportunity to perform professional duties.

Gratitude

To Nod Volodymyr Fedorovych for the opportunity to develop in the field of physical therapy.

Financing

This study did not receive external funding.

Conflict of interest

No potential conflict of interest in any form.

Consent for publication

The authors have received consent from parents and guardians of the pediatric population related to this manuscript, all of whom have consented to publication.

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Реабілітаційні заходи дитячого населення з порушенням постави

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Анотація: відповідно до всесвітньої організації охорони здоров'я, від 20 – 30% людей у світі мають захворювання та порушення опорно-рухового апарату, що супроводжують: скутістю, дискомфортом, обмеженням амплітуди руху та больовими відчуттями. З науковим прогресом з'являються нові перспективи, але існує інша сторона негативних факторів, пов'язаних з малорухливим способом життя та з недостатністю рухової активності. На протязі дня: сидючи за столом, перед комп'ютером, з телефоном в руках, порушуючи правило «положення школяра» перебуваючи у незручній позі більше 1 – 2 годин. Ці фактори сприяють гіпотонії м'язів та призводять до формування дисбалансу хребетної мускулатури, згодом розвивається дегенеративно-дистрофічні захворювання опорно-рухового апарату. Проаналізований скринінг ранньої діагностики змін та деформацій постави у підлітковому віці. Проблематика теми XXI століття, не нова. Аналізуючи наукові статті на тему порушень постави, слід звернути увагу на те, що основні зусилля спрямовані на зміцнення здоров'я та профілактику захворювань. Це забезпечить належний рівень здоров'я та зменшить захворюваність населення. *Опис мети.* Уданій публікації аналізуються результати профілактичних та діагностичних оглядів проведених пацієнтам підліткового віку з порушеннями постави у сагітальній та фронтальній площинах. *Матеріали і методи.* Проаналізовані результати профілактично-діагностичного огляду, в місті Києві, Комунальне некомерційне підприємство «Консультативно-діагностичний центр» Святошинського району, Філія 2, з травня по липень 2022 року. Прийняли участь 490 дітей підліткового віку, від 11 – 15 років, з порушенням постави у сагітальній та фронтальній площинах. За згодою батьків або осіб, які їх замінюють. Використовувались методи обстеження: візуальна діагностика, соматоскопія, мануально-м'язове тестування, функціональні проби для виявлення ступенів

порушення постави, рентген та магнітно-резонансна томографія. Для зручності сформована документація, розроблена картка для пацієнта. Більшість пацієнтів з порушенням постави у сагітальній та фронтальній площинах лікуються консервативними методами. Висновки. Основним завданням профілактично-діагностичного огляду, є виявлення на початковій стадії дисбалансу скелетно-м'язових порушень, підбір дієвих процедур, дотримання рекомендацій для позбавлення негативних звичок та положень тіла на протязі дня. Стан здоров'я дитини залежить від постійного спостереження батьків, консультування лікарів. Має бути співпраця лікарів, батьків та дітей, виконання простих правил та профілактичних заходів.

Ключові слова: розвиток, статистика, фізична терапія, техніки фізичної терапії, хребет.