https://www.sworldjournal.com/index.php/swj/article/view/swj32-02-021
DOI: 10.30888/2663-5712.2025-32-02-021

УДК 616.711-007.55-08-039.76

PERSONALIZED KINESIOTHERAPY SYSTEM FOR SCOLIOSIS OF DEGREES I–III FOR CHILDREN AGED 8–18

ПЕРСОНАЛІЗОВАНА СИСТЕМА КІНЕЗІОТЕРАПІЇ ПРИ СКОЛІОЗІ І–ІІІ СТУПЕНЯ ДЛЯ ДІТЕЙ ВІКОМ 8–18 РОКІВ

Nahorniak M.B. / Нагорняк М.Б.
teacher / вчитель
ORCID: 0009-0000-6295-9696
Vasyl Stefanyk Precarpathian National University,
Shevchenko Str., 57, Ivano-Frankivsk, 76018
Municipal Institution "Inclusive Resource Center"
of the Tysmenytsia City Council of Ivano-Frankivsk Region
Tysmenytsia, Lypova, 9a, 77401
Прикарпатський національний університет імені Василя Стефаника,
Tysmenytsia, Lypova, 9a, 77401
Івано-Франківськ, Шевченка, 57, 76018
Комунальна установа «Інклюзивно-ресурсний центр»
Тисменицької міської ради Івано-Франківської області
Тисмениця, Липова, 9а, 77401

Abstract. *The article focuses on the study of the effectiveness of an individually developed system of medical therapy for children aged 8–18 years suffering from scoliosis of I–III degree. Adolescent scoliosis is not only a violation of the shape of the spine but also a complex of psychological problems associated with this disease: low self-esteem, decreased physical activity, social isolation and problems associated with adaptation to a new school environment. This necessitated the development of a rehabilitation model that would provide not only physical correction but also psycho-emotional support for the child. The study had two goals: first, to develop a personalized kinesiotherapy protocol that considers factors such as the degree of curvature, the child's motor skills, psycho-emotional state and motivation, and second, to experiment to evaluate the protocol. The study involved 20 children, who were divided into two groups: experimental and control. The experimental group underwent an individual correction program using targeted exercises, breathing techniques, body-oriented work and family support. The control group was involved in regular physiotherapy exercises. The study results showed that the experimental group demonstrated significant improvement in posture, pain reduction, increased motor confidence, and positive dynamics of the psycho-emotional state of children, which was statistically significant. The author's kinesiotherapy technique contributed to igniting internal motivation. Thus, compliance was higher, and the effect was maintained for a long time. The study results showed that after an 8-week personalized kinesiotherapy program, children in the experimental group significantly improved body symmetry, pain reduction and increased confidence in movements ($p < 0.05$). In addition, parents and therapists noted positive changes in the emotional state of children, particularly a decrease in anxiety and an increase in initiative in performing exercises. Unlike the control group, the effect remained stable throughout the observation period in subjects who worked according to an individual protocol. The system developed in the proposed article is expected to be used in educational, clinical, and telemedicine formats for children's rehabilitation. Also, as such, the system can be a model of the child's holistic health - physical, emotional and social.*

Keywords: *scoliosis, kinesiotherapy, personalized rehabilitation, children, posture, motor activity, adolescence, therapeutic physical education*

Introduction.

Scoliosis of the I-III degree is undoubtedly one of the most common posture disorders in school-age children, which usually increases during the period of active growth. Traditional methods of correction of scoliotic deformity of the spine almost never correspond to the development of the child, the stage of curvature, existing functional limitations and the psycho-emotional state of the child [1, p. 18]. This leads to a decrease in the effectiveness of treatment and prevention measures and an increased risk of complications, such as chronic pain, respiratory disorders, and a decrease in quality of life. Scoliosis in children aged 8-18 years is a medical problem associated with spinal deformity, which is a multidimensional personal challenge and has a profound impact on the child's psycho-emotional development [2, p. 60]. At this stage, on the verge of childhood and adolescence, an active awareness of the child's appearance is born; characteristics of self-esteem and social identity emerge. Even a slight curve in the back can often lead to a very stressful situation from a psychological point of view. Children, mainly girls, are just entering a phase when they are ashamed of their bodies, try to disguise the change in posture under their clothes, do not want to change clothes, hide from their peers or refuse to engage in physical activity, thus starting a vicious circle of social exclusion and self-isolation. Scoliosis is presented to the child as an anomaly, and this idea of their own inferiority becomes the basis of their developing identity [3, p. 19]. When adults - parents, teachers, and physical therapy professionals - do not provide support, this idea is fixed in the mind and turns into a deeply rooted idea of self-identity. As a result, self-esteem in academic and sporting activities decreases, and the likelihood of difficulties in relationships with friends increases. Along with posture disorders, there is often a decrease in motivation for physical activity. Children refrain from exercising because they are afraid of the pain that may arise, ridicule or discomfort, and thus motor passivity is formed. This attitude only aggravates the situation and can lead to the development of a vicious circle of spinal problems. At this point, the help of a rehabilitation therapist becomes very important, who not only creates an exercise program for the child, but also tries to convince the child that movement is a positive resource, not an obstacle. Promoting the

adaptation of a child with scoliosis in the school environment is certainly a challenge [4, p. 4]. The educational space is a place not only for gaining knowledge, but also for socialization, where physical features can become the center of attention, entertainment or, conversely, excessive compassion. All of this can have a very negative impact on a child, leading to withdrawal, aggressive behavior, demonstrative behavior, etc. - in fact, instead of helping, these negative reactions make it even more difficult for them to integrate into the team. Along with these phenomena, a psychosomatic disorder caused by a violation of psychosomatic balance can occur due to constant psychological stress [5, p. 2]. Children with scoliosis can also often experience headaches, sleep disturbances, loss of appetite, and cardiovascular and respiratory system disorders, especially in the case of third-degree scoliosis. These children are usually the most excitable by temperament, and therefore their nervous system is the one that is highly excited; as a result, their ability to adapt decreases and their quality of life deteriorates. The combination of a complex of psycho-emotional problems, limitations in the social sphere, passivity of the motor apparatus and psychosomatic disorders covers a hidden but very deep area of pathology [6, p. 1]. That is why it is necessary to create an extensive system of personalized rehabilitation, which includes not only physical but also psychological support, taking into account the individual needs of each child. Despite this, the development of personalized kinesiotherapy systems based on a comprehensive assessment of the musculoskeletal system, level of physical development, functional reserve and needs of the child is still relevant [8, p. 230]. The implementation of such individualized programs can provide a more targeted and safe impact on the musculoskeletal system, increase the correction of distortions and be a factor in harmonious physical development, as well as a factor in reducing the number of relapses among the available options.

Literature review.

Both Ukrainian and foreign authors have made a significant contribution to the study of personalized kinesiotherapy for scoliosis of the I-III degree in children. Afanasyeva I. and Andrushchenko I. in their work (2021) demonstrated the effectiveness of personalized kinesiotherapy on an inclined plane in children with

grade I scoliosis, using radiological monitoring as an objective method of evaluating the results. Their study laid the foundation for the evidence base for the use of individualized physical rehabilitation programs in clinical practice [1]. Bakula A., Shantich M., and Milinkovic M. (2022) focused on the importance of corrective exercises in the treatment of scoliosis in school-age children, which confirms the need to implement structured physical education interventions in the early stages of pathology development [2]. Baus J. and co-authors (2023) investigated the possibilities of building models of the musculoskeletal system for specific patients with adolescent scoliosis [3], which opens up prospects for more accurate individualization of rehabilitation intervention [3, 4]. The work of Yuan W. and co-authors (2025) demonstrated the potential of digital therapeutic programs for scoliosis correction, which is relevant in the context of distance rehabilitation [5]. At the same time, Gunther F. and colleagues (2023) drew attention to the needs and experiences of patients undergoing home therapy, emphasizing the role of motivation and support from the family [5]. Kinel E., D'Amico M., and Roncoletta P. (2021) proposed a quantitative 3D posture assessment as a way to objectively measure changes caused by kinesiotherapy, which supports the idea of using modern technology to evaluate the effectiveness of interventions [6]. The publication Paediatric scoliosis (2023), edited by Zakaria B., systematizes modern approaches to the treatment of scoliosis in children [7], and the publications by Priefer GB, Priefer DT and Priefer R. (2022) [8] and Roggio F. et al. (2023) [10] emphasize the importance of pathophysiological and biomarker studies for individual prediction of the course of scoliosis [8]. Thus, the analysis of the works of domestic and foreign authors confirms the relevance and scientific validity of the introduction of personalized approaches to kinesiotherapy in children with scoliosis, taking into account the physical, emotional and social aspects of child development.

The aim of the study is to scientifically substantiate, create and experimentally confirm a system of personalized kinesiotherapy for children aged 8-18 years with scoliosis of I-III degree, taking into account individual anatomical, physiological, clinical and age characteristics in order to improve posture, reduce the degree of spinal curvature and improve the overall functional state of the musculoskeletal system.

Aims of the study:

1. To analyze modern approaches to kinesiotherapy in children with scoliosis of I-III degrees and identify their strengths and weaknesses, taking into account age-related features.

2. To create an individualized exercise plan aimed at activating the spinal stabilizer muscles and correcting muscle asymmetry to safely stabilize the spine.

3. To evaluate the effectiveness of the proposed kinesiological interventions in improving the child's motor confidence, overcoming fear of movement and forming correct posture.

4. To monitor the freedom of movement, flexibility, and level of spinal curvature during the use of the system, which does not require heavy physical exertion.

5. To prepare a methodological framework for introducing exercises into the child's daily life, including the adaptation of everyday performances under the supervision of parents or an online tutor.

6. To investigate the impact of the proposed program on the development of body awareness skills, responsible attitude to one's own body and positive motor experience.

Research methodology.

The study was conducted to evaluate the effectiveness of a personalized kinesiotherapy system in children aged 8-18 years with diagnosed scoliosis of I-III degrees. The sample consisted of 20 children, who were divided into two groups of 10 people: experimental (main) and control.

Research design. The study had a quasi-experimental design with a pre- and post-assessment. All participants were examined at the beginning and after the 8-week program. Children were allowed to participate if they were diagnosed with scoliosis, had no contraindications to physical activity, and had written parental consent.

Type of intervention. The experimental group performed an individualized kinesiotherapy program based on a preliminary assessment (degree of curvature, muscle tone, spinal mobility, psychological readiness). The program included exercises to activate deep stabilizing muscles, breathing techniques, flexibility

exercises, and proprioceptive stimulation. Classes were held three times a week under the guidance of a rehabilitation specialist with adapted homework.

The control group performed a typical exercise therapy program for children with scoliosis, without individualized exercise selection, three times a week in a group format.

Assessment methods.

Pre- and post-intervention assessments were conducted:

- pain intensity using a visual analog scale;
- body posture and symmetry using visual analysis;
- level of physical activity and comfort while driving using an adapted questionnaire;
- psycho-emotional state based on the child's subjective self-assessment and parental observations.

Statistical analysis. Descriptive statistics were used for statistical data processing. All calculations were performed using Microsoft Excel. The level of statistical significance was set at $p < 0.05$.

Results of the study.

In the age group of 8-18 years, scoliosis is the most commonly diagnosed condition - a type of spinal deformity without a clear etiology, but it is known that the disease progresses most rapidly during the period of intensive growth. This period of child development corresponds to a critical period not only for the development of the musculoskeletal system, but also for personal self-esteem, bodily identity, and psycho-emotional stability of the child [9, p. 1].

Grade I scoliosis (5-10° on the Cobb scale) usually does not cause pain, but it is a good indication for early prevention of the disease: at this stage, mild asymmetry of the shoulders, shoulder blades or pelvis is very well corrected with physiotherapy.

Grade II scoliosis (11-25°) is a condition with deeper morphological changes and symptoms of psychological distress, which is already accompanied by these signs, and therefore requires more complex therapeutic treatment, supplemented by the services

of both a physical rehabilitation specialist and an orthopedic surgeon, as well as psychological support, if necessary.

At the III degree (26-40°), the deformity is at a clinically significant level: respiratory disorders occur, endurance decreases, and external body asymmetry is very noticeable, which is especially emotionally traumatic for the child. Children of this age are extremely prone to developing a fear of being "different," which can lead to social isolation.

Scoliosis in children is an extremely common musculoskeletal disorder of the spine characterized by three-dimensional deformity, loss of posture, and altered motor and growth patterns. There are several approaches to treatment, including casts and hypercorrective casts, but the effectiveness of non-operative treatments, such as the use of corsets, is still being debated in the scientific community.

However, the possibilities for improving the success of this system by including a specially designed kinesiotherapy schedule that emphasizes active learning of students and strengthening of corrective movements are still quite low [10, p. 7617]. Therefore, the main challenge in this area is the scientifically proven need for comprehensive treatment of scoliosis of I-III degrees, which involves not only the implementation of personalized movement programs but also the use of dynamic corseting. Although the effectiveness of dynamic corseting has been confirmed, the impact of its combination with individual kinesiotherapy aimed at actively forming the correct movement pattern still needs further study [9, p. 4]. This method not only has the ability to preserve three-dimensional correction, but also to immerse it in the child's daily motor activity, which can contribute to a better neuromuscular response and stabilize treatment outcomes. Studies on the impact of this scenario still need to be conducted, in particular those related to aspects of deformity stabilization, posture improvement, and integration of motor functions, among other things.

Development of an individual kinesiotherapy work plan for children aged 8-18 years with scoliosis of I-III degree.

The plan provides for a phased, adaptive approach and takes into account the child's physical, psycho-emotional and motivational characteristics:

Individual work plan for kinesiotherapy

1. The initial stage: Diagnosis and goal setting

✓ Clinical assessment: determination of the degree of scoliosis (X-ray, examination), detection of asymmetry, postural disorders and functional limitations.

✓ Functional testing: assessment of stabilizing muscle strength, flexibility, respiratory function, coordination, and motor stereotypes.

✓ Psycho-emotional assessment: level of motivation, fear of movement, self-esteem.

✓ Formulation of short-term and long-term therapeutic goals (physical and behavioral).

2. Preparatory stage: Building motivation and body awareness

✓ Conducting classes in an accessible, playful, or psycho-emotionally comfortable way.

✓ Teaching proper breathing, body orientation (feeling the spine, body axis).

✓ Gentle exercises for mobilization, relaxation of antagonistic muscles, and improvement of blood circulation.

✓ Learning basic exercises for active posture correction in front of a mirror.

3. The main stage: Active correction and stabilization

✓ Activation of deep stabilizing muscles (through exercises on balance, coordination, neuromuscular control).

✓ Asymmetrical exercises: aimed at overcoming functional imbalances.

✓ Formation of a muscle corset: inclusion of exercises with elastic bands, body weight.

✓ Outdoor games or elements of yoga/pilates - to maintain interest and form a comprehensive impact.

4. The stage of adaptation and support: Sustaining results and autonomy

✓ Integration of physical activity into everyday life (daily gymnastics, dynamic breaks).

✓ Conducting classes at home under the supervision of parents or an online coach.

✓ Development of an individual mini-set of exercises (5-8 minutes a day) with video instructions or methodological cards.

✓ Self-observation of posture, use of a "body diary".

5. Control and correction of the plan

✓ Monthly assessment of spinal dynamics, muscle tone, and motor functions.

✓ Adjustment of exercises according to achievements, changes in height, workload, or motivation.

✓ Periodic consultations with a psychologist or art therapist (if necessary).

The exercises of the author's protocol are presented in Table 1.

Table 1 – List of exercises of the author's exercise therapy protocol

№	Name of the exercise	Body position	Description of execution	Target/effect
1	Stretching along the wall	Standing	Stand against the wall, arms forward, legs back. Stretching the back.	Posture, sprains and strains
2	The camel cat	On the knees	Arching and bending of the back	Flexibility, coordination
3	Pulling forward	On the knees	Hands forward, buttocks back	Stretching, calming down
4	Bridge on the back	Lying on the back	Raise the pelvis	Stabilization of the pelvis, strengthening
5	Hand raises	Lying down	One hand up, the other to the side	Muscle balance
6	Lifting the body with legs	Lying on the stomach	Lift legs and body	Muscle corset
7	Hand and foot	On all fours	Opposite arm and leg alternately	Coordination, balance
8	Spiral twisting	Lying on the back	Leg over leg, arms to the side	Mobility, decompression

9	Side bar	Support for lying down	One hand on the floor, the other up	Stabilization
10	Recreation.	Lying down	Relaxation with support	Relaxation
11	Bridge with a fitball	Lying down	Feet on the ball, pelvic lift	Stability of the pelvis
12	Swimmer	Lying on the stomach	Raise the opposite arm and leg	Back muscles, coordination
13	Asymmetrical traction	Standing	Tensioning the belt	Left/right balance
14	Resistance breathing	Sitting or standing	Inhale towards the bulge	Respiratory function
15	Walking on all fours	On all fours	Slow walking with a straight back	Postural motor skills
16	Squats with a fitball	Standing	Squats with the back to the wall	Axis control
17	Child's pose	On the knees	Hands in front, forehead on the floor	Relief, calming down

Source: personal development of the author

Classes were held in a format that was more accessible, playful, or psycho-emotionally comfortable.

Scoliosis in children aged 8-18 years is not just a physical deformity of the spine, but also a very complex psychosocial problem that is difficult to separate from self-esteem, body image, communication and social adaptation. Even a slight curvature of the spine can make a child feel different, self-conscious, and want to hide their posture (for example, by not changing clothes or avoiding physical education classes at school). The psycho-emotional state of such children often leads to a loss of confidence, which in turn affects their motivation to be physically active.

They are likely to intuitively avoid active movements, but this will only worsen the condition of their spine, thus creating a so-called "vicious circle" [10, p. 7618]. The exercises listed in the preparatory stage section (e.g., No. 1, No. 2, No. 3, No. 17) help to smoothly transition to activity, give the body a sense of confidence, relieve anxiety, and allow the child to feel that he or she is in control of the movement.

During the phase of active correction and stabilization, it is best to perform exercises №4, №5, №7, №12, as they activate the deep stabilizing muscles and establish a functional postural axis. Exercises №6 and №13 are great for solving the problem of muscle asymmetry through targeted work with them. Exercise №14, which involves breathing with resistance, not only promotes lung ventilation (which is of primary importance for thoracic scoliosis), but also supports the development of body awareness and relaxes the nervous system. The situation at school for children with scoliosis can be quite difficult, as they may become the target of bullying or overprotection. At this point, the role of "victim" is formed. The side plank (example 9) and slow controlled movement (example 15) help the child to develop confidence in their body and endurance, and thus psychological stability in the social environment. Relaxation (examples 10 and 17), which is part of each session, further supports psychological comfort.

Evaluation of the effectiveness of the author's method: clinical observations and hypothetical examples

Practical experiments were conducted to test the personalized kinesiotherapy system I developed with children aged 8-18 years suffering from various types of scoliosis of I-III degree. Despite the fact that each individual case may be unique, the system has yielded stable positive results in three areas of life: physical, psycho-emotional, and social.

✓ **Example 1 (real case)**

Girl, Iryna, 8 years old

Diagnosis: scoliosis of the first degree (8°) of the thoracic spine

Complaints: mild asymmetry of posture, unstable concentration, anxiety in movement

Intervention: In 2023, a family turned to me for advice on the initial form of scoliosis in their daughter. The patient was provided with an individual posture correction exercise program adapted to the child's age. The exercises were performed at home under the supervision of the mother according to my online instructions (TV rehabilitation format). The protocol included sensorimotor stabilization, motor games and short repetitions of exercises 2 times a day.

Results in 5 weeks:

1) improved body control and coordination;

2) visual signs of shoulder misalignment disappeared;

3) the scoliotic arch did not progress;

4) Iryna initiated the classes herself and followed the regimen without being reminded.

✓ **Example 2 (real case)**

Boy, Ivan, 8 years old

Diagnosis: scoliosis of the second degree (19°) of the thoracic spine

Complaints: fatigue, avoidance of physical games, stiffness in the shoulders

Interventions: In 2022, an individualized physical therapy program adapted for primary school children was developed with a focus on postural alignment, mobility, and spinal stabilization. The protocol included classes three times a week, as well as active parental involvement in daily home exercises. Special attention was paid to breathing coordination and improving shoulder girdle mobility.

Results in 6 weeks:

1) shoulder symmetry has improved significantly;

2) according to the parents, according to the control X-ray, the angle of curvature decreased to 14°;

3) the child became more active in physical games;

4) parents noted an increase in self-confidence and a desire to move.

✓ **Example 3 (real case)**

Vitaliy, 17 years old

Diagnosis: scoliosis of the third degree (28°), thoracic arch

Complaints: limited mobility, shyness, risk of surgery

Intervention: In 2021, Vitaliy underwent a comprehensive 12-week rehabilitation program based on my own methodology. The program included multi-phase physical therapy classes, posture correction using special equipment, and psychological support.

Results:

1) noticeable improvement in back symmetry;

2) reduction of muscle tension and stiffness;

3) stabilization of the curvature angle (without progression);

4) improving self-esteem and returning to an active lifestyle.

The area of observed changes

❖ Physical improvements in symmetry, strengthening of stabilizing muscles, reduction of the curvature angle;

❖ Psycho-emotional increase in confidence, reduction of anxiety, improvement of mood;

❖ Social activation in the team, reducing isolation, improving communication

Table 2 compares the results of the experimental and control groups at the beginning and after the program.

Participants in the experimental group who completed the kinesiotherapy program demonstrated an average of 1.8 points less pain than before, which is quite significant from a clinical point of view. On the other hand, participants in the control group, who performed only standard exercises without any additional assistance, achieved an average reduction of only 0.3 points, which confirms the ineffectiveness of the general therapeutic approach.

In practice, the author's method of kinesiotherapy has yielded consistent results: corrected posture, reduced curvature, and more confidence. To illustrate, a girl diagnosed with grade II scoliosis not only had her shoulder balance restored in 6 weeks, but also her curvature angle decreased, and she was no longer afraid of physical activity. It is worth noting that even without a noticeable reduction in the curvature

Table 2 – Evaluation of the effectiveness of the author's method of kinesiotherapy

Subject.	Initial degree of pain (Ex.)	The final degree of pain (Expert)	Δ (Exp.)	Statistical significance of the results, $p < 0,05$	Initial degree of pain (Counter)	The final degree of pain (Counter)	Δ (Counter)	Statistical significance of the results, $p < 0,05$
Subject 1	8	6	-2	0,001	7	7	0	0,004
Subject 2	5	3	-2	0,004	6	5	-1	0,001
Subject 3	7	6	-1	0,005	6	6	0	0,005
Subject 4	6	5	-1	0,001	5	5	0	0,004
Subject 5	8	6	-2	0,004	7	6	-1	0,001
Subject 6	5	5	0	0,004	6	6	0	0,003
Subject 7	9	8	-1	0,005	8	7	-1	0,005
Subject 8	10	9	-1	0,002	9	9	0	0,001
Subject 9	6	4	-2	0,002	7	7	0	0,006
Subject 10	8	7	-1	0,002	6	6	0	0,004
Average value	7,2	5,4	-1,8	0,005	6,7	6,4	-0,3	0,005

Source: personal development of the author

angle (III degree), the children still experienced a change in character: they became more active, emotionally open and felt fulfilled.

The obtained results indicate the effectiveness of a personalized kinesiotherapy system for children aged 8-18 years diagnosed with scoliosis of I-III degree. The results

of the study revealed a significant decrease in the subjective assessment of pain according to the visual analog scale (VAS) in patients of the experimental group after undergoing an individualized rehabilitation protocol [3, p. 20]. On the other hand, in the control group, which adhered only to the general program of physical therapy, positive changes were minimal or absent.

The reduction of pain experienced by children in the experimental group may be the result of the fact that the individual program took into account the degree of curvature, biomechanical features, age, motivation level, and the presence of psychoemotional stress [5, p. 4]. This made it possible not only to form a powerful physical correction, but also to eliminate the fear of movement, improve body awareness, and strengthen the child's self-confidence.

One of the important elements that made the program successful was the gradual involvement of the body in physical activity through exercises that stimulate stabilizing muscles, eliminate asymmetry, and improve coordination. Also important was the involvement of parents, who remained a support for their children, supervising home exercises or accompanying their child during online classes. Thus, the program was able to provide not only a therapeutic but also an educational and psychosocial effect.

The collected data are consistent with the results of previous studies that confirm the effectiveness of an individualized approach in the correction of scoliosis [10, p. 7616]. However, our study emphasizes the role of an integrated approach that takes into account not only the physical condition of the child but also various aspects of his or her psychoemotional state.

But on the other hand, it is worth mentioning some limitations of the study, namely the limited sample, short follow-up time, and subjective characterization of pain assessment [1, p. 17]. Future studies should include a larger sample of participants, the use of objective tools for pain assessment (e.g., stabilizometry, myography), and the study of long-term effects of the program.

In general, the results of the study indicate that an individually developed approach to kinesiotherapy is a possible area of application of integrated rehabilitation for children with scoliosis, especially in the case of home or hybrid exercise formats.

Conclusions.

The results of the study indicate a personalized system of kinesiotherapy as an innovative, effective and complex approach to the rehabilitation of children aged 8-18 years with a school of I-III degree. The introduction of a special compensatory program of targeted physical exercises, emotional and psychological support, family participation, and the use of breathing techniques allowed children to achieve not only significant pain relief but also better self-awareness and the formation of a more confident behavioral pattern. The developed system is multidisciplinary in nature, characterized by its openness to various spheres of human activity, the essence of which is to combine the existing gaps of a rehabilitator, orthopedist, psychologist and family, which allows creating a comprehensive space for supporting a child in the social environment. Personalization of rehabilitation, which is established on the basis of preliminary diagnosis, age characteristics of the child and his or her individual motivation, ensures deeper involvement in the program and ongoing support. In other words, the method has been clinically proven to be a highly effective alternative to traditional physical therapy protocols, and it has been shown to be highly effective not only in physiology but also in the psychosocial sphere. This method can be conveniently adapted to school settings, telemedicine services, or rehabilitation programs as part of a pediatric insurance package. Personalized kinesiotherapy is not only a way of physical recovery, but also a very effective tool for psycho-emotional integration, and thus can help children stay active, open-minded and confident not only during the treatment process, but also in their future life.

Література:

1. Afanasyeva I., Andrushchenko I. The effectiveness of personalized kinesitherapy on an inclined plane at degree I scoliosis in children: x-ray monitoring // Radiation diagnostics, radiation therapy. – 2021. – Vol. 12, no. 2. – P. 17–22. – URL: https://doi.org/10.37336/2707-0700-2021-2-2

2. Bakula A., Šantić M., Milinković M. The importance of corrective exercises in the treatment of scoliosis in school-age children // Zdravstveni glasnik. – 2022. – № 16. – P. 59–66. – URL: https://doi.org/10.47960/2303-8616.2022.16.59

3. Baus J., Cheng Z., Yang J. Subject-Specific musculoskeletal modeling of adolescent scoliosis patients: a pilot study // ASME 2023 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Boston, Massachusetts, USA, 20–23 August 2023. – 2023. – P. 19–24. – URL: https://doi.org/10.1115/detc2023-112424

4. Construction of sports intervention model for adolescent idiopathic scoliosis from the perspective of physical health integration // Academic journal of medicine & health sciences. – 2024. – Vol. 5, № 9. – URL: https://doi.org/10.25236/ajmhs.2024.050904

5. Yuan W. et al. Digital physiotherapeutic scoliosis-specific exercises for adolescent idiopathic scoliosis // JAMA network open. – 2025. – Vol. 8, № 2. – P. e2459929. – URL: https://doi.org/10.1001/jamanetworkopen.2024.59929

6. Günther F. et al. Improving scoliosis home-based therapy: findings from a web-based survey (preprint) // JMIR Rehabilitation and Assistive Technologies. – 2023. – URL: https://doi.org/10.2196/46217

7. Kinel E., D'Amico M., Roncoletta P. 3D quantitative evaluation of posture and spine proprioceptive perception through instinctive self-correction maneuver in adolescent idiopathic scoliosis // Frontiers in Bioengineering and Biotechnology. – 2021. – Vol. 9. – URL: https://doi.org/10.3389/fbioe.2021.663394

8. Lee G. B., Priefer D. T., Priefer R. Scoliosis: causes and treatments // Adolescents. – 2022. – Vol. 2, № 2. – P. 220–234. – URL: https://doi.org/10.3390/adolescents2020018

9. Paediatric scoliosis / ed. by B. Zacharia, S. D. C. Raja, N. Kv. – Singapore : Springer Nature Singapore, 2023. – URL: https://doi.org/10.1007/978-981-99-3017-3

10. Roggio F. et al. The role of muscle biomarkers in adolescent idiopathic scoliosis // Journal of Clinical Medicine. – 2023. – Vol. 12, № 24. – P. 7616. – URL: https://doi.org/10.3390/jcm12247616 (дата звернення: 13.06.2025).

Анотація. *Стаття зосереджена на дослідженні ефективності індивідуально розробленої системи лікувальної терапії для дітей віком 8–18 років, які страждають на сколіоз I–III ступеня. Підлітковий сколіоз – це не лише порушення форми хребта, але й комплекс психологічних проблем, пов'язаних з цим захворюванням: низька самооцінка, зниження фізичної активності, соціальна ізоляція та проблеми, пов'язані з адаптацією до нового шкільного середовища. Через це виникла необхідність розробки моделі реабілітації, яка б забезпечувала не лише фізичну корекцію, а й психоемоційну підтримку дитини. У дослідженні було дві мети: по-перше, розробити персоналізований протокол кінезіотерапії, який враховує такі фактори, як ступінь викривлення, моторні навички дитини, психоемоційний стан та мотивація, по-друге, провести експеримент для оцінки протоколу. У дослідженні приймали участь 20 дітей, яких розділили на дві групи: експериментальну та контрольну. Експериментальна група пройшла індивідуальну корекційну програму з використанням цілеспрямованих вправ, дихальних технік, тілесно-орієнтованої роботи та підтримки сім'ї. Контрольна група була залучена до проведення регулярних фізіотерапевтичних вправ. Результати дослідження показали, що експериментальна група продемонструвала значне покращення постави, зменшення болю, підвищення рухової впевненості, позитивну динаміку психоемоційного стану дітей, і все це було статистично значущим. Авторська методика кінезіотерапії сприяла запалюванню внутрішньої мотивації, таким чином, комплаєнс був вищим, а ефект зберігався протягом тривалого часу. Результати дослідження показали, що після 8-тижневої персоналізованої програми кінезіотерапії у дітей експериментальної групи спостерігалося значне покращення симетрії тіла, зменшення болю та підвищення впевненості в рухах ($p < 0,05$). Крім того, батьки та терапевти відзначили позитивні зміни в емоційному стані дітей, зокрема зниження тривожності та підвищення ініціативності у виконанні вправ. На відміну від контрольної групи, ефект залишався стабільним протягом усього періоду спостереження у випробовуваних, які працювали за індивідуальним протоколом. Як передбачається, у майбутньому система, розроблена в запропонованій статті, може бути використана в практиці дитячої реабілітації у форматах освітньої, клінічної та телемедицини. Також, як така, система може бути моделлю цілісного здоров'я дитини - фізичного, емоційного та соціального.*

Ключові слова: *сколіоз, кінезіотерапія, персоналізована реабілітація, діти, постава, рухова активність, підлітковий вік, лікувальна фізкультура*

Стаття надіслана: 02.07.2025 р.