

The significance of postural re-education in scoliosis

Oana Suciu^{1,2}, Dan Ioan Aurelian Nemeș^{1,2,3}, Dan V. Poenaru^{1,4}, Andreea Niță^{1,3}, Roxana Ramona Onofrei^{1,2}, Elena Constanța Amăricăi^{1,2}, Daniel Popa^{1,2}, Răzvan Drăgoi^{1,2}, Liliana Cațan^{1,2}, Diana Andrei^{1,2}, Dan Surducă^{1,2}

Abstract

Objectives: To study modalities of postural therapy in scoliosis. *Method:* We have studied 20 patients for 8 months (aged between 13 and 20), the clinical assessment being made monthly. The evaluation was made with digital pictures made in similar condition every time, then processed on the computer. The treatment consisted in classic treatment of rehabilitation and postural treatment (maintain fixed postures for conscious them, active exercise for postural correction followed than by home postural training). *Results:* Therapy had good results in time both for the evolution of the disease and attitude of the patient up to the disease. The results were better with growing age of the patients, the therapy act being based on the active participation of the patient. The set rights positions were better during the exercise based on proprioception than those guided by view, the evolution in time being better for the first. The treatment had very good results for mild scoliosis and good for medium scoliosis witch proves the efficiency of the treatment. *Conclusions:* After the treatment the scoliotic patient is improved but not treated. The effects of the postural therapy were for the entire body not only on the disease. The postural therapy can not be applied at any age because the patient must be able to understand advices. This kind of therapy is proper for people older than 13 years because the mental representation of our body and the operative thoughts appear after this age. The therapy can be performed if the participation is active.

Key words: scoliosis, posture, proprioception

Rezumat

Obiectivul lucrării: studierea modalităților de terapie posturală în scolioză. *Metodă:* Am studiat 20 de pacienți, timp de 8 luni, cu vârste cuprinse între 13 și 20 de ani. Evaluarea clinică a pacienților s-a făcut lunar. S-a realizat o evaluare paraclinică cu ajutorul unor fotografii digitale realizate în condiții similare, apoi procesate cu ajutorul computerului. Tratamentul a constat într-o parte clasică de recuperare și tratament postural (menținerea unor posturi fixe pentru conștientizarea lor, exerciții active pentru corectare posturală, urmate de antrenament postural la domiciliu).

¹Timișoara University of Medicine and Pharmacology, e-mail: oanabereteu78@yahoo.com

²Timișoara City Emergency and University Hospital - Rehabilitation and rheumatology department.

³Excentric Company Ltd, Timișoara, Medical Rehabilitation Centre

⁴Timiș County University and Emergency Hospital - Orthopaedic and traumatology department

Rezultate: Tratamentul a înregistrat rezultate bune atât în ceea ce privește evoluția bolii cât și în privința atitudinii pacienților față de boală. Rezultatele au fost mult mai bune la pacienții cu vârste mai înaintate deoarece tratamentul presupune participarea activă a pacienților. Redresarea posturii s-a realizat mai bine în timpul exercițiilor bazate pe propriocepție decât cele ghidate de vedere, evoluția în timp fiind mai bună pentru primele. Tratamentul a avut foarte bune rezultate pentru scoliozele ușoare și bune pentru cele medii ceea ce dovedește eficiența tratamentului. **Concluzii:** După tratament pacientul sciotic suferă o îmbunătățire dar nu vindecare. Efectele terapiei posturale s-au observat la nivelul întregului corp, nu numai asupra sciozei. Tratamentul postural nu poate fi aplicat la orice vârstă deoarece pacienții trebuie să înțeleagă sfaturile acordate. Această terapie este adecvată copiilor peste 13 ani deoarece reprezentarea mentală a corpului și gândirea operativă apar după această vârstă. Tratamentul poate fi efectuat numai prin participare activă.

Cuvinte cheie: scolioza, postură, propriocepție

Introduction

Scoliosis is a progressive disease characterized by one or more lateral curvatures of the vertebral column visible in the frontal plane, together with a vertebral rotation and with a possibility to a superior and inferior compensation of the vertebral curvatures but without a complete reduction of it by suspension or lying position. The most common method of diagnosing scoliosis today is to measure the, so called, Cobb angle. The Cobb angle is defined as the angle between the end plates of the two end vertebrae of the scoliosis curve. A spine with a Cobb angle greater than 10 degrees is considered scoliosis. Cobb classified the scoliosis according to its gravity, assessed by the value of Cobb angle: mild if Cobb angle $<20-30^\circ$, medium if Cobb angle $=25-50^\circ$ and severe if Cobb angle $>50^\circ$ (1).

According to its aetiology, scoliosis is classified in two main groups:

- functional scoliosis: sciotic attitude, professional scoliosis, scoliosis out coming of visual and hearing deficits, static scoliosis and antalgic scoliosis
- structural or bone scoliosis:
 - Idiopathic scoliosis (primitive, essential): infantile scoliosis, age under 4 years, juvenile scoliosis, age 4-10 years and teenagers' scoliosis after 11-12 years;

- Secondary scoliosis and others.

The diagnostic can be determined on clinical and paraclinical examination. The clinical examination consists in static clinical examination: the assessment of the orthostatic posture and dynamic clinical examination: muscular and joints functional assessment, bending and also gait evaluation. Paraclinical examination is based on X-ray, magnetic resonance imaging, computer tomography, Moiré topography, computer raster stereography, Zebris system (ultrasound) and Cyberware system (laser). For human species orthostatic posture and walking are essential. At birth, the human species have an immature posture system. The posture matures because of external influences and under brain and limbic system coordination. Posture system remains one of the last acquisitions of the human species, less mature as the vital function because of lack of a specific organ and being a complex interrelation of various systems. This is why any kind of disturbances, scoliosis being one of them, has to be therapeutically approached in any stage of detection (2-5).

Posturology is defined as the study of geometrical and biomechanical organization of different segments of the body and the process of their regulation. It can also be defined as the neurological

mechanisms which permits the stabilization of these elements in space during orthostatic position and gait [2, 3].

Objectives

The paper's aim was to study modalities of postural therapy in scoliosis, the consequence on disease and on its evolution. Posture disturbances are strongly correlated with scoliosis signs, interfering in their appearance and persistence. The goals of the paper were to demonstrate the relationship between scoliosis signs and posture disturbances and to demonstrate that acting on posture in scoliosis we will obtain benefits on the signs and evolution of the disease.

Methods

During 8 months, we studied 20 patients, aged between 13 and 20, with various types and forms, different shapes and degrees of scoliosis.

The patients were selected as follows:

- 3 patients with idiopathic infantile scoliosis, "C" shaped, with right dorsal convexity, 2 mild forms and 1 medium form;
- 3 patients - idiopathic infantile scoliosis, "C" shaped, with left dorsal convexity, 2 mild forms and 1 medium form;
- 2 patients - idiopathic infantile scoliosis, "S" shaped, with right dorsal convexity and left lumbar convexity, 1 mild form and 1 medium form;
- 5 patients - idiopathic juvenile scoliosis, "S" shaped, with right dorsal convexity and left lumbar convexity, 2 mild forms, 2 medium forms and 1 severe form;
- 4 patients - idiopathic juvenile scoliosis, "S" shaped, with left dorsal convexity and right lumbar

convexity, 1 mild form, 2 medium forms and 1 severe form;

- 3 patients - idiopathic teenagers' scoliosis, "S" shaped, with left lumbar convexity and right dorsal convexity, 1 mild form, 1 medium form and 1 severe form.

The treatment consisted on classic rehabilitation programme (electric stimulation, stimulative massage, kinetotherapy) [1,6,7,8] and postural treatment. The postural treatment consisted in fixed maintained postures for their consciousness, active exercises for postural correction followed then by home postural training [9, 10].

The classic rehabilitation programme included massage in order to relax the muscles from the concavity and strengthen the muscles from the convexity (Figure 1).

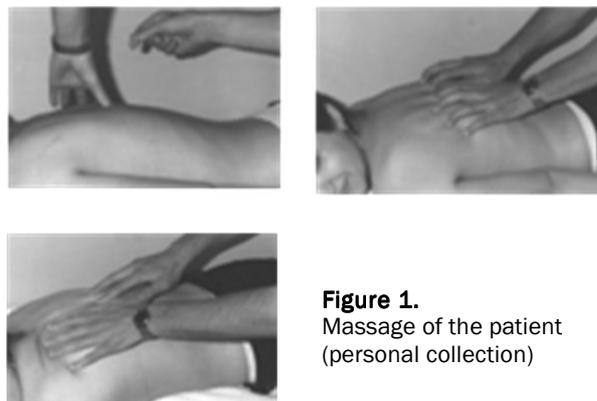


Figure 1.
Massage of the patient
(personal collection)

The classic kinetic programme consisted in Klapp and Cotrel methods, Schrot method for trunk mobilization, respiratory exercises, effort training [11,12] (Figure 2).



Figure 2. The classic kinetic treatment of scoliotic patient (personal collection)

The postural treatment applied included fixed maintained postures for their consciousness, active exercises for postural correction and a programme for postural training at home.

Fixed maintained postures were indicated for the patient to become conscious of them. In order to apply postural treatment there are some important principles to take into consideration:

- A patient can not follow postural therapy without being aware of it. Patient must be brought in situations to understand the movement and postural development. The patient must be confronted with sensations, positions, new motor strategies and he must be conscious of what is happening in the new postural situation through which the new body scheme is elaborated.
- It's not possible to change the posture by an external therapeutically act without an active participation of the subject and without his awareness of the changes from this new act.
- Postural changes must be visualized and not followed by the subject.

The technique adopted consisted in three postures:

- Normal relaxed posture
- Controlled posture guided by view in the mirror
- Controlled posture guided by proprioception (with eyes closed).

Active exercises for postural correction use the positions of the trunk and limbs in order to correct the spine deviations, exercises made in front of the mirror in order to better control the position (Figure 3).

There were also used isometric exercises and passive and active range of motion exercises and proprioception neuromuscular facilitation exercises. The postural home training consisted in an international exercise programme, explained and given to the patient, 15 minutes daily. The patient was also advised to supervise his correct attitude in orthostatic position and in walk.

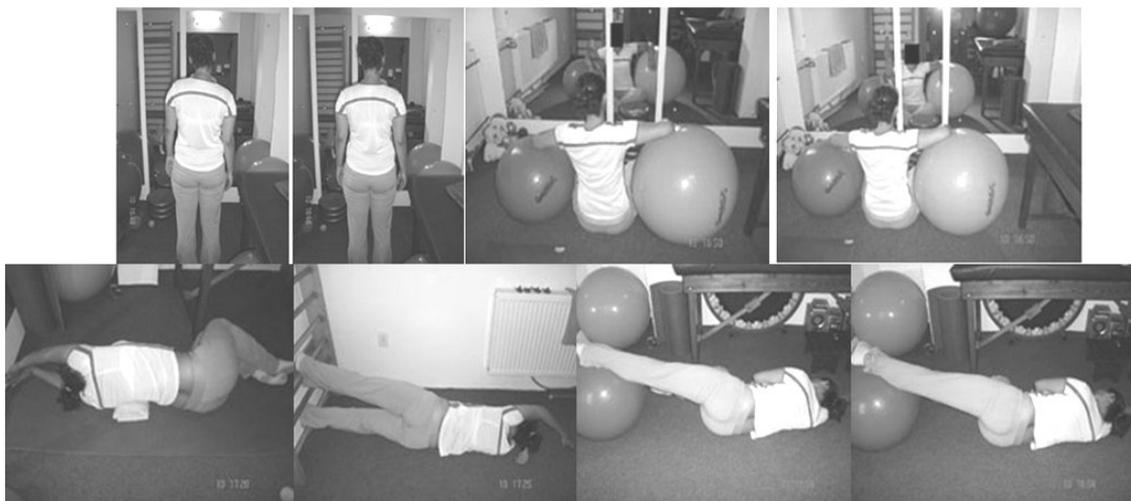


Figure 3. Active exercises for postural correction (personal collection)

They must focus on maintaining the head lifted with their look ahead and shoulders retraction. The patient must keep his back straight even when bending to pick up an object. On the chair the patient should keep its straight position, avoid seating in armchairs and the chair must have a rigid seat [1, 8]. The clinical assessments were made monthly, the photographic evaluation was made at the beginning, after four months of therapy and then after eight months. The photographic evaluation consisted in digital pictures made in similar conditions, then processed on computer (13). The photo camera was positioned at 1,5 m distance from patient and 1 m high. At each assessment there were made 3 digital shots of 1 Mega pixel:

- first shot was made in normal relaxed orthostatic position;
- the second shot was made in a controlled posture guided by view in the mirror;
- The third shot was made in a controlled posture guided by proprioception (with eyes closed).

On each photo there were marked 4 mobile evaluation points on scapulae (right and left superior and inferior angle) and 1 fixed evaluation point on

vertebrae process of L5 vertebrae. The rectangular system of coordinates was established among the point of L5 vertebrae and the other 4 points (left superior angle=LSA, right superior angle=RSA, left inferior angle=LIA, right inferior angle=RIA). The photos were processed on the computer in CorelDraw 12 programme. The evaluation was made according to the average of processed data for each patient: initial, at 4 months and at 8 months.

As an example, at initial assessment, the rectangular system of coordinates in normal relaxed position had the following results: LSA (left superior angle): 68/340, RSA (right superior angle): 98/354, LIA (left inferior angle): 45/217, RIA (right inferior angle): 129/243. In controlled posture guided by view in the mirror the results were: LSA: 50/334, RSA: 65/361, LIA: 49/233, RIA: 101/251. In controlled posture guided by proprioception (eyes closed), the results were: LSA: 66/349, RSA: 70/355, LIA: 55/240, RIA: 98/252 (figure 4).

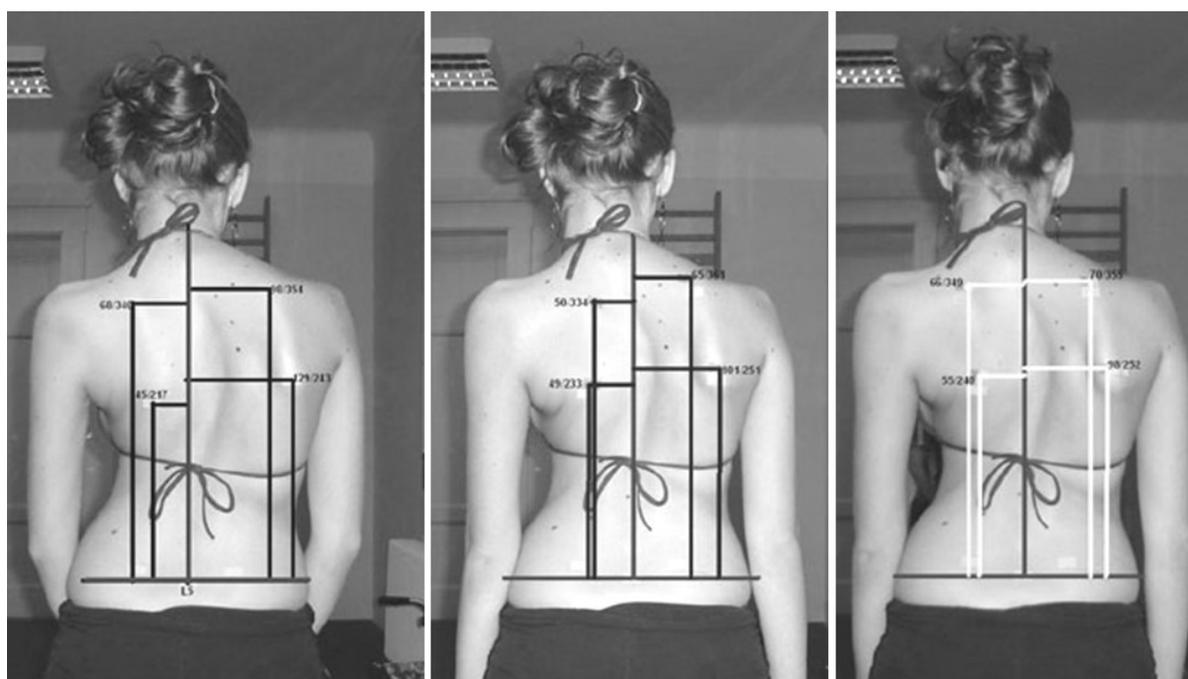


Figure 4. Initial assessment: a patient in normal posture (left), controlled posture guided by view in the mirror (middle), controlled posture guided by proprioception (right)

The assessment made after 4 months had the following results:

- In normal relaxed posture: LSA: 80/366, RSA: 78/364, LIA: 53/237, RIA: 114/259;
- In controlled posture guided by view in the mirror: LSA: 79/361, RSA: 71/369, LIA: 61/237, RIA: 88/255;
- In controlled posture guided by proprioception (eyes closed): LSA: 77/363, RSA: 73/371, LIA: 60/243, RIA: 88/255 (Figure 5).

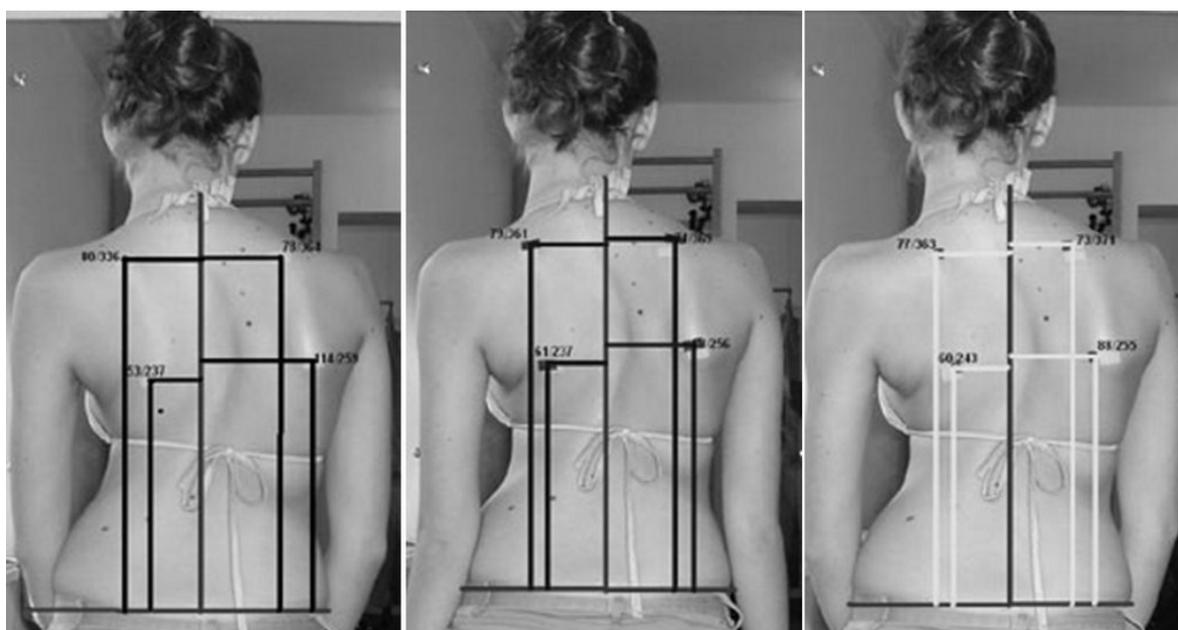


Figure 5. Assessment at 4 months: a patient in normal posture (left), controlled posture guided by view in the mirror (middle), controlled posture guided by proprioception (right)

The final assessment made after 8 months had the following results:

- In normal relaxed posture: LSA: 93/388, RSA: 88/396, LIA: 61/268, RIA: 108/283;
- In controlled posture guided by view in the mirror: LSA: 101/389, RSA: 70/380, LIA: 65/271, RIA: 83/272
- In controlled posture guided by proprioception (eyes closed): LSA: 89/385, RSA: 73/373, LIA: 62/264, RIA: 101/263 (Figure 6).

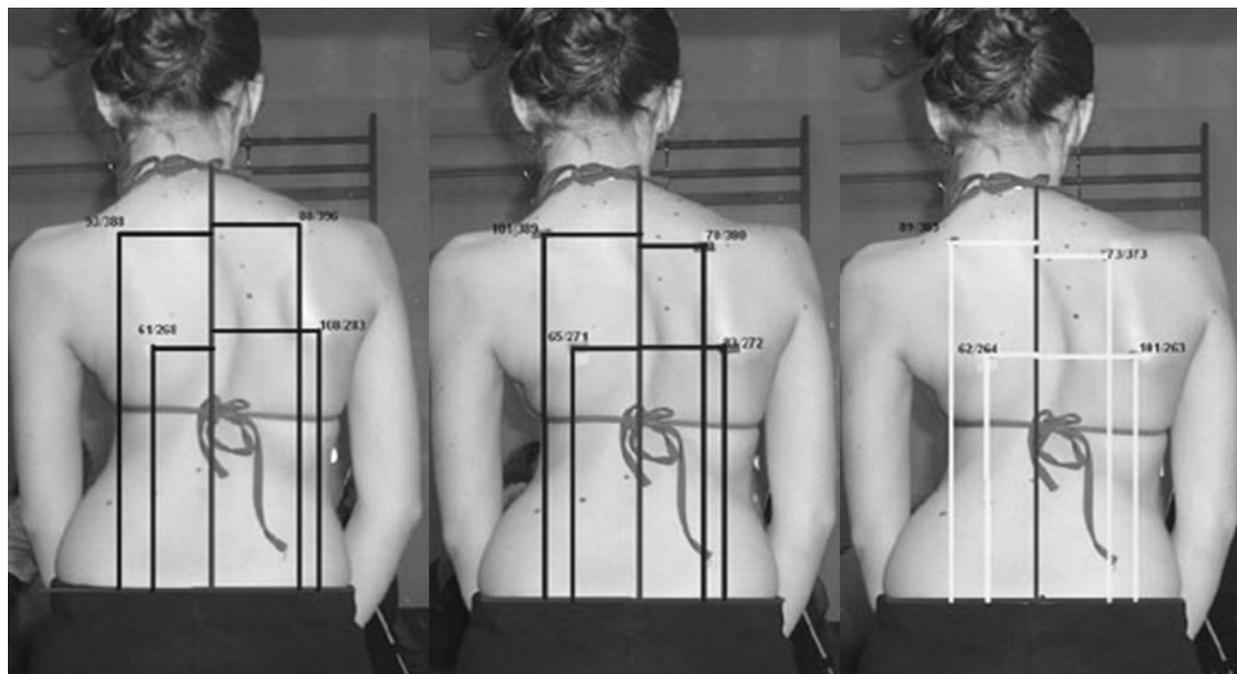


Figure 6. Assessment at 8 months: a patient in normal posture (left), controlled posture guided by view in the mirror (middle), controlled posture guided by proprioception (right)

Results

The patients were selected according to literature: female patients' rate was higher than male's. Our lot was made by 17 females and 3 males.

Therapy had good results in time, both for the evolution of the disease and the patient's attitude up to the disease (table I).

Table I. The average of correction distance during the study period

Study period	After 1 month	After 4 months
Average of correction distance (pixels) during the study period	12	30.2

The results were better in older patients, the therapy act being based on the active participation of the patient and seeing and feeling the difference between the postures, as seen in the literature.

The set rights positions were better during the exercises based on proprioception than those guided by view, the evolution in time being better for the first because "Body scheme is a gnostic custom, constantly present and allows us to be aware of our body as a static and dynamic unit" (table II)[7].

In time, both categories of patients treated with posturology had good results, better on those treated with proprioception exercises (table III).

The treatment had results in every form of scoliosis, but very good results for mild scoliosis and good for

medium scoliosis, which proves the efficiency of treatment (table IV).

Table II. Number of patients who rectified their position based on view or proprioception

Rectification	Eyes open	Eyes closed
Cases	5	15

Table III. The evolution in time of patients who reacted better with eyes opened compared with those with eyes closed

Assessment period	Average distance (pixels) of correction for each type of rectification	
	Eyes open	Eyes closed
1 month	6	11
4 months	7	16
8 months	9	19

Table IV. The representation of treatment efficiency according to scoliosis severity

Scoliosis type	Assessment period	Average distance (pixels) of correction in time for each form of scoliosis		
		Mild form of scoliosis	Medium form of scoliosis	Severe form of scoliosis
1 month	14.4	13.2	12.6	
4 months	15.3	14.5	13.8	
8 months	16.7	15.4	14.1	

Conclusions

After the treatment the scoliotic patient is improved but not treated. The effects of the postural therapy were for the entire body, not only on the disease. The postural therapy induced a better locomotor's function. Its best results are on dorsal idiopathic juvenile scoliosis and had results in every form of scoliosis, but very good results for the mild scoliosis and good for medium scoliosis. The postural therapy can not be applied at any age because the patient must be able to understand advices. This kind of therapy is proper for people older than 13 years because the mental representation of our body and

the operative thoughts appears after this age. The therapy can be performed if the participation is active and if it is an operative act.

References

1. Nemeș I.D.A, Drăgoi M., Totorean A., et al.(2003) *Kinetoterapia-lucrări practice*, Ed.Orizonturi Universitare, Timișoara
2. Gagey P.M., Baron J.B., Ushio N. (1974) *Activité tonique posturale et activité gestuelle. Le test de la clé*, *Agressologie*, 15: 353-358;
3. Martins da Cunha H. (1986) *Le Syndrome de Déficience Posturale. Son intérêt en Ophtalmologie*, *J.Fr.Ophtalmol.*; 9: 747-755;
4. Scoppa F. (2002) *Posturologia e schema corporeo. Attualita in Terapia Manuale & Riabilitazione*;3(4): 5-16;
5. Sahlstrand T., Ortengren R., Nachems A. (1978) *Postural equilibrium in adolescent idiopathic scoliosis*, *Acta Orthop. Scand.* 1 49: 354-365;
6. Nemeș I.D.A, Drăgoi M., Totorean A., Ghiță A. (2003) *Electroterapie - Lucrări practice*, Ed. Orizonturi Universitare, Timișoara;
7. Nemeș I.D.A, Gogulescu A., Jurca M. (1999) *Masoterapie (masaj și tehnici complementare)*, Ed. Orizonturi Universitare, Timișoara;
8. Sbenghe T. (1987) *Kinetoterapia profilactică, terapeutică și de recuperare*, Ed. Medicală, București;
9. Den Boer WA, Anderson PG, V Limbeek J, Kooijman MA, (1999) *Treatment of idiopathic scoliosis with side-shift therapy: an initial comparison with a brace treatment historical cohort*, *Eur Spine J.*;8(5):406-410;
10. Negrini S., Fusco C., Minozzi S., et al. (2008) *Exercise Exercises reduce the progression rate of adolescent idiopathic scoliosis: Results of a comprehensive systematic review of the literature*, *Disability and Rehabilitation*, 30(10): 772 – 785;
11. Kiss I. (2004) *Fiziokinetoterapia și recuperarea medicală în afecțiunile aparatului locomotor*, Ed. Medicală, București, p. 94-100;
12. Dumitru D. (1984) *Reeducarea funcțională în afecțiunile coloanei vertebrale*, Ed. Sport-Turism, București;
13. Dunk N. M., Lalonde J., Callaghan J.P.(2005) *Implications for the Use of Postural Analysis as a Clinical Diagnostic Tool: Reliability of Quantifying Upright Standing Spinal Postures From Photographic Images*, *Journal of manipulative and physiological therapeutics*, 28(6): 386-392.