SPORT - Science & Practice, Vol. 7, №1, 2017, pp. 39-54

Original scientific paper

PROPRIOCEPTION AND POSTURE

Snežana Milićev[4]
College of Sports and Health, Belgrade, Serbia

Kristina Vukušić
College of Sports and Health, Belgrade, Serbia

Abstract: From the aspect of model efficiency, taking up and maintaining a proper postural position implies the efficiency of the muscular work of antigravity muscles, with reduced load on the spinal column. It is necessary to know the complex impact of muscular activity on posture to correct improper and consolidate proper psychomotor scheme in a timely manner, and to maintain it stable in the variable conditions of gravity's effect. Maintaining proper posture is not only a mechanical phenomenon, which is observed from the aspects of weight and muscle contraction torques. It is important to raise awareness about the position of certain joints, as well as the feeling of the degree of muscle tension. Due to the weakness of selective muscles and adaptive shortening of certain muscles, unwanted compensatory movements and positions emerge, disturbing the psychomotor scheme of movement. Selective strengthening and stretching exercises are compulsory, but they are insufficient in the corrective exercise treatment. In order to achieve a stable and proper postural status, it is necessary to underline the impact of proprioception as a constituent in the consolidation of the bodily awareness of correct posture. By practising an "active" postural position on a stable base, first with open, and then with closed eyes, one acquires an adequate bodily awareness. Later on, it is improved by taking up and maintaining a postural position on an unstable base, as well as through the functional learning of movements. From the practical aspect of the implementation of therapeutic exercises, timely perception and correction of the scheme of movements and positions that emerge due to the impact of altered muscular activity, it is essential to have an individual approach to each patient.

Key words: *bodily awareness, compensatory movements, proprioception, postural position*

✉ [4] snezana.milicev@vss.edu.rs

INTRODUCTION

Observing the complex impact of muscular activity on body posture holds great importance for a timely correction of improper and consolidation of proper psychomotor scheme, as well as for maintaining it stable in the variable conditions of gravity's effect. It is necessary to automatize the proper body posture scheme from the very beginning of the therapeutic treatment, in order to avoid consolidating an improper body posture scheme in the variable conditions of gravity's effect and additional loads. It takes much more time to decompose it and then adopt a new, proper scheme. Of course, the stimulation of adequate biomechanicalinfluences on posture is important for forming spine's muscle "corset" and maintaining adequate flexibility (Anwer & al, 2015). Otherwise, what emerges is muscle weakness which then causes inadequate and uneven load of passive tensors, which suffer and lose their proper function and structure as a result.Thereby, bad body posture advances when it is more difficult to correct the changes, i.e. when severe adaptive shortenings and further structural changes occur. The impact of muscular activity is particularly notable in so-called critical periods of development, during which the organism is exposed to particular load, such as the first and the second year of life, the beginning of school and puberty. Kinesitherapeutic corrective treatment insists on achieving segmental stabilization (Cur & al, 2016). Numerous papers and practical work in hospitals point to the significance of selective strengthening and stretching exercises, which are inevitable. It is also noted that, when treating bad posture, trainers and physical education teachers implement proprioceptive exercise by using requisites of very demanding surfaces and in group training, when the stimulus dosing is questioned. What is notable in the corrective treatment implemented in kinesitherapy rooms in healthcare institutions is caution during proprioceptive training of bad posture, as well as insufficient representation of proprioceptive training when it comes to the treatment of bad posture.

From the aspect of kinesiology, different bodily loads are adequately overcome if body posture is proper. On the other hand, weakness of selective muscles and adaptive shortening of certain muscles, the question of when and how to influence on early correction unwanted compensatory movements and positions emerges, as they disturb the psychomotor scheme of movement, which is particularly noticeable during different bodily loads. Compensatory movements of adjacent segments are unwanted in posture. In patients with low posture and deformities they are enapropriate in various body burdens. The inspiration for this paper was to connect the kinesiological analysis of postural change through coordination tasks as "challenges" for postural muscular activity. In this text there is importance of stimulation postural muscle control by adequare dosis of stimulations in order to consolidate adequate sensomotor pattern. Postural position is achieved and maintained stable in different conditions of gravity's effectthrough an adequate sensorimotor pattern (Jevtić, 2006).

Proprioceptive training occupies an important position in medical rehabilitation. Nowadays, there are also other terms for this type of training. One

of them is PVV (Proprioceptive-Vestibular-Visual), which underlines the significance of the line composed of proprioceptors, the balance control center in inner ear, and sight. Then, there is also sensorimotor training, which aims at eliciting balance reactions by taking up positions that require maintaining balancing poses. Another frequently mentioned term is neuromuscular stabilization training. The sensorimotor aspect involves proprioception (the reception of an afferent signal), the perception of these signals (kinesthesia), efferent impulses that reach muscles, after which afferent impulses start again from the periphery, informing the CNS about the movement execution.Correction and stability are provided this way. Proprioception implies kinesthetic awareness, and involves two types of position awareness – static and dynamic. The static one enables conscious orientation between body parts, and the dynamic one provides neuromuscular system with movement speed and direction data. Proprioceptive sensibility is essential for the control of muscle contraction, the range of movement, and the coordination of the action, i.e. the accuracy of motor task performance. Mechanoreceptors in muscles, tendons, joints, skin, supply CNS with information, so the CNS is accurately informed from the periphery about a segment's position and position change during a contraction or passive mobilization. By comparing these ascending stimuli with the movement scheme (formed in higher centers), a reflex occurs along with the correction of an error caused by uncontrolled muscle contractions.

Superficial sensibility (touch, pressure) is also significant for regular informing of CNS regarding the stages of harmoniously conducted movement. At the same time, it provides information about obstacles, aberrations from the expected, which is learned through touch, via cutaneous exteroreceptors. This leads to an inflow of information about the stages of movement (the ending of one and the beginning of the next stage of a coordinated action).

The information about the control of position and movement also arrive from the vestibular system, the sense of sight. The actions of all these systems intertwine and amend each other. For example, the information from the inner ear labyrinth represent reactions to a change in head position, and since head follows trunk movement, those stimulations also represent information about the position of trunk and pelvis. This is extremely important for movement monitoring and timely reaction to the inaccuracies or errors that constantly happen.

Posture

The simplest way to describe posture is that it is a "model" bearing of the body related to the relative position and coherence of bodily segments during inactivity or activity.Proper posture denotes an optimal relationship between the reduction of the load on the spinal column and the reduction of muscular work from the aspect of model efficiency. Posture is analysed as a habit of natural upright position or walking position. Posture and the correctness of the standing position is observed from the aspect of the requirement of stability, the efficiency of muscle engagement and the position of spinal joints and lower extremities. Even though it is difficult to define rules, one can still refer to the "model" bearing

of the body. It can be said that proper posture is characterised by such an interrelation of bodily segments that the lines of the joint centre of a segment group always maintain within the "distance limits" toward the axis of the joints that carry the weight. (Zec, 1984).To maintain proper posture, this "distance limit" should be close to the joint axis of the even joints for movements in the sagittal plane. When posture is good, the trunk profile forms a natural physiological curve of the spinal column with an adequate neck lordosis, chest kyphosis and lumbar lordosis. The shape of the spinal column in the sagittal plane emerged thanks to the man's upright position and the head's need to occupy and maintain the most favourable position in the space. Sagittal physiological curves of the spinal column are tasked with embracing and distributing body weight into smaller components, i.e. to transfer it to a larger surface area. They emerge at an earliest period under the influence of righting reflex, adjustment reflex, sustentation reflex. Along with the functional stimuli that emerge when shifting from horizontal to sedentary and standing position, especially when lifting head, crawling, getting up and walking in the first and the following years of life, cervical spine moves forward, thoracic spine moves backward and lumbar spine moves forward, i.e. cervical, thoracic and lumbar curves emerge.

Postural problems involve different disorders of bodily segment positions. Depending on the projection of centre lines, there are: lordosis posture, kyphotic, "flatback" posture, "head forward" posture, "sway back" posture. The changement of physiological curves leads to pathological curves, such as: kyphotic, lordotic, kypho-lordotic and scoliotic curves.

Postural control development

Postural control is developed in segments and gradually, starting from establishing head control, then trunk control and finally achieving postural stability when standing or walking. The motor and sensory system responsible for postural stability matures at the age of 7-10. The development of posture in the sagittal plane between the ages of 4 and 12 is considered to be the consequence of normal musculoskeletal maturation, and it emerges through adaptation in the sense of maintaining balance in the sagittal plane.

The impact of muscular activity on posture

During childhood, muscles and tendons develop proportionally with the child's growth (dimensionalities). Posture has a tight connection with the length and balance of the muscles along the spinal column and pelvis. Maintaining proper posture is not only a mechanical phenomenon, observed only from the aspects of weight and muscle contraction torques. What is important for the maintenance of proper posture is adequate elasticity of the elements of joints that maintain flexibility, but do not allow hypermobility, so the action of the weight is balanced by the strength of stabilizer muscles without redundant and uneven load on the soft elements of joints. Apart from this, maintaining the stability of proper posture requires raised awareness of the position of certain joints, as well as of

the degree of muscle tension (Stevanović, 2002). Weak stabilisation muscles are usually considered the reason for the development of bad posture.In such cases, weight load leads to increased and uneven load on joints, overload on ligaments, and adaptive shortening of the connective tissue between muscles and joint elements, if the condition is prolonged. It has been noted that certain muscles are prone to faster weakening. Reduced physical activity and other causes result in the weakness of antigravity muscles, paravertebral muscles and abs, especially local stabilizers of the spine. On the other hand, reduced elasticity and muscle extensibility may occur as a reflection adaptive shortening of musculature. The muscles that stand out in that respect include m. iliopsoas, hamstrings, lumbar extensors, ventral chest muscles, and cervical spine extensors. It is important to be familiar with the given groups of muscles prone to weakness and shortening in order to conduct prevention, notice deviations on time and initiate adequate treatment.

The muscle groups that are prone to weakening include:

- Abdominal muscles (especially m. transversusabdominis)
- Paravertebral muscles (especially mm. transversospinales)
- Scapular fixators
- Flexors of the head (prevertebral muscles)
- Gluteal muscles

The muscle groups that are prone to shortening include:

- Hip flexor (especially m. iliopsoas, m. rectus femoris)
- Hamstrings
- M. triceps surae (m. gastrocnemius medialis et lateralis)
- Lumbar extensors
- Ventral chest muscles (especially m. pectoralismajor)
- Head and neck extensors.

Contemporary scientific achievements point to the existence of two forms of bad posture: neurological and kinesiological. Neurological bad posture is a consequence of delayed development of the central nervous system, it is characterized by muscle hypotonia, and it most commonly emerges by the age of 5, although some authors claim that it can appear by the age of 12. It involves elastic antigravity muscles. Kinesiological bad posture entails musculature shortening, especially in m. iliopsoas, hamstrings, lumbar extensors and ventral chest muscles. In this case, early diagnosis is crucial for timely corrective treatment.

Clinical examination of the patient

Bad posture and the deformities of body and feet are diagnosed based on anamnesis, clinical and neurological check-up and auxiliary analyses. It is very important to determine or eliminate other diseases which may include pathological *curves* of the spinal column. Radiographic examinations are done, and, if needed, neurophysiology examinations, computerized tomography, nuclear MRI and bone scintigraphy.

Clinical examination of the patient comprises general examination, neurological examination and examination of the spinal column. It should also be noted that the assessment of the body and feet status as a part of functional assessment plays a very important role. It must be comprehensive due to the fact that deviation from one segment may cause deviation from another one as well. Therefore, body is always analyzed as a whole and not only its specific parts. The examination starts with the inspection of a patient from the distance of 2-3m in order to acquire a general impression about the posture, constitution and relation between specific body parts. This observation is conducted from the side (in the sagittal plane) as well as from the back and front side (in the frontal plane). After obtaining a general picture of the body condition, the next step is to measure specific physiological curves. If observed from the side, the imaginary vertical line should go from the top of the head, across the ear shell and middle of the shoulder touching the hip and knee joints and descend 3-4cm before the cross-sectional base of the ankle joint. Shoulders are in the same level, the scapular angles as well, and scapulas must be at equal distance from the spinal column and stuck to the thorax. The Lorentz triangles (triangles of body shape) composed of arms placed next to the body downwards and the edge of the torso and part of the pelvic area are shaped as triangles and symmetrical. The examination of the knee position, Achilles' tendon and arch of the foot is inevitable. Measuring of seated height, measuring of limbs' length and assessment of the coxa obliqua are very important. Determination of hip flexion contracture and assessment of the muscle shortening by means of tests such as Thomas Test and modification, Ely, Ober's test, and examination of muscle shortening at the back thigh are of invaluable importance. It is essential to determine muscle shortening in pelvic ring, hip joint and spinal column, and especially lumbar part. Further on, tests implemented within functional assessment of the patient, in case of a bad posture, include Matthiass test, taking active postural position, Adams test and rigidity test in case of scoliosis, extension test in prone position for kyphosis. They also contribute to the assessment of the correctability of the condition and thus may point to the functional or structural stadium of deformity in body status.

If the condition is corrected by taking the postural position, it may suggest that the cause is bad posture. Further on, specific clinical tests are implemented for specific body deformities in terms of the progress in process when changes occur at ligamentous and skeletal system.

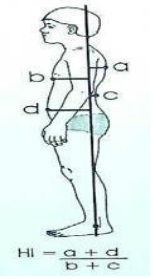
Altered posture of kypholordotic type is most often characterized by head protrusion, bent shoulders, winged scapula, frontal pelvic inclination, emphasized lumbar lordosis, thoracic kyphosis and abdomen protrusion.

Determining postural index per Fröhner

As per Jevtić, the fast method of posture observation is the calculation of postural index per Fröhner (Jevtić, 2006). The result value indicates normal posture or deviation in case of children and adolescents. As per Fröhner, four body segments are analyzed in the sagittal plane: sternum, thoracic kyphosis, lumbar lordosis and abdomen prominence.Their distance from the projection of the center of mass line in the sagittal plane is measured (it would be the best to place

anthropometer there) in order to obtain relevant line segments a, b, c and d expressed in centimeters (picture 1). Postural index is calculated as follows:
HI = a+d / b+c, where HI represents postural index,
a- thoracic curve, d- abdomen prominence, b- sternum, c- lumbar curve center
The result value may indicate the following conditions:
HI=1,0-1,2 Harmonic posture
HI= 0,9- 1,0or1,2-1,4 Weak posture
HI= below 0,9 or above 1,4 Bad posture

Picture 1. *Postural index per Fröhner (Jevtić, 2006)*



Stabilization musculature and posture

Loss of mobility, muscle weakness and proprioceptive changes affect sensory motorics and consequently impact the central presentation of segmental centre of gravity thus further causing deficit of balance dynamics and segmental coordination. Proprioceptive exercise agendas today increasingly focus on training programs for stabilization musculature, which is a precondition for joint stabilization. Unstable base is of key importance for the implementation of exercises. Stabilization musculature is located in close proximity to joints and it critically impacts their stability, while global muscles produce movement. Back muscles are divided by Bergmark (1989) into two groups – local and global muscle systems (Jevtić, 2006). The global system includes m. errector spinae, m. rectusabdominis, m. obliqus abdominis internus et externus. The local system consists of main stabilizing muscles. Lumbar spine includes m. transversus abdominis and m. multifidus. For cervical spine, main stabilizers are m.longuscolli,m.longus capitis, m.multifidus and m. semispinalis capitis et cervicis. In practice, it is useful to test primarily m. transversus abdominis by using the tool for pressure measuring in the air-filled cushion). It should be positioned under abdominal wall. Normal result should show reduction of pressure by 6-8 mmHg when a patient is asked to contract the muscle, i.e. pull the abdominal wall back from the cushion, reducing lumbar lordosis (Jevtić, 2006). Each activity lasts 10 seconds and should be repeated 10 times.

Segmental stabilization of lumbar spine by strengthening spine stabilizers through isometric muscle contractions is very important when it comes to muscle strengthening programs within corrective exercises for bad posture and bodily deformities treatment. This is important for maintaining good posture, correction of pelvis position by activating the corset muscle of spine.

Proprioceptive training in correction of bad posture

Based on the adequate sensory-motor patterns, the postural position is achieved and maintained stable in the variable conditions of gravity's effect. Exercises for insufficient muscles strengthening and exercises for relevant muscles stretching are compulsory and inevitable in the first stages of the treatment, but they are not enough to complete the comprehensive corrective treatment of bad posture.

In order to achieve a stable and good postural status, it is necessary to underline the impact of proprioception as a constituent in the consolidation of the bodily awareness of correct posture (Jevtić, 2006). By practising an "active" postural position on a stable base, first with open, and then with closed eyes, one acquires an adequate bodily awareness. Later on, it is improved by taking up and maintaining a postural position on an unstable base. This paper further focuses on importance of maintaining good posture in daily routine conditions and activities.

When selecting exercises, it is necessary to follow the principle of individual exercise doses, gradual approach, progressiveness and repetition. Exercises should be set up in following manner: from stable to unstable conditions, first with open and then closed eyes, from brief to prolonged maintaining of one position. Proprioceptive training is included in kinesitherapy program on individual basis when patient's general condition and postural status allows so in order not to overstimulate the system if unprepared for challenges. On the other hand, necessary stimulation of postural reflexes should not be delayed too long. For the above reason, this paper is highlighting the importance of individual approach to each patient, with kinesiological explanation of care that should be given to various challenges of different conditions of gravity's effect, change of tangent and angle of stimulus. The main principle of proprioceptive training lies in continuous causing of unexpected movements of small amplitudes in joints in order to keep the system constantly provoked and balance maintained. Proprioceptive training program must be carried out carefully and safely. The exercise equipment includes less demanding balance tools in the first stages, and then the more demanding ones: sponge pads, balance panels, foam pads, oscillatory wooden boards, balance boards (Tone-Boards), Pezziball (small and big ones) etc. Use of balancing equipment requires exercising based on using of lower extremities, pelvic area and lower back with a dominant set objective. Furthermore, destabilization may be achieved even without additional tools, i.e. by means of coordination exercises, as presented in the paper. In the course of exercising, the focus should be placed on keeping balance by insisting on stability, primarily by good position of pelvis based on the muscle contraction, so this

means excluding compensatory movements of other remote joints.

Correcting position in case of kypholordotic posture in front of a mirror

Correcting position in front of a mirror is carried out so that the patient can use the sight control and set up a model of bodily awareness both frontally and from the sides. The patient should face the mirror and take up the starting position. They should align the feet with the hips, bend them slightly so that the tension in the muscles above the knee is minimal. One arm should be placed on the abdomen, the other arm on the gluteal area. It is of key importance that the patient understands that they should contract abdominal and gluteal muscles, making the pelvic movement and reducing stressed pelvic inclination. Pelvic movements last until both spinae iliacae anterior superior are in the same frontal line with the front area of symphyisis pubica (to the extent possible). Each contraction should last 6 seconds in the beginning and then 10-15 seconds (picture 2).

When the patient masters the movement with their eyes open, they are instructed to do the same with their eyes closed. This way, the patient "becomes aware" of the movement of segmental stabilization of the lumbar spine by the pelvic movement. When they feel and recognize bodily awareness of the stabilization of pelvis, they are instructed to straighten up the thoracic spine and perform retropulsion of the shoulders. Since contracted abdominal muscles tend to increase back curve, a stronger contraction of deep extensor muscles of the thoracic spine, primarily m. transversospinales and m. intertransversarii is needed. The patient is then requested to carry out the axial extension (cervical retraction). The importance of becoming aware of the moments of axial extension includes the head flexion and extension of the lower cervical and thoracic spine leading to easy "straightening" of cervical lordosis (Kisner & Colby, 2012). It is important to separate the head flexion movement (10-15 degrees) from the neck flexion which is achieved by activating prevertebral muscles, m. rectus capitis anterior et lateralis, m. longus capitis (Hislop &Montgomery, 2013). The patient should maintain the final position for as long as possible.

It is necessary to gradually take up the position and become aware of the pelvic movement so as not to increase lumbar curve and thoracic curve. If curves are emphasized, the patient makes the movement within their limitations, slowly and appropriately, not emphasizing lumbar curve.

Picture 2. *Taking up "active" postural position*

Exercising "active" postural position on unstable base

Further improving of psychomotor scheme of good posture is achieved by practicing active postural position in more difficult conditions, with the challenges such as unstable base and movements on such base. Picture 3 shows activities of practicing "active" postural position by disturbing balance on unstable base with the open and then closed eyes.

Picture 3. *Practicing "active" postural position on unstable base*

The above mentioned is practiced gradually by keeping the proper pelvic position, not emphasizing the lumbar curve by contraction of the stabilizer of the lumbar curve. It is practiced gradually through repetitions of maintaining the "model" of good posture in more difficult conditions by means of efficient components of gravity's effects and thus aligning thecenter of mass with joints.

Practicing active postural position on unstable base and/or with additional coordination tasks

A bad posture causes compensatory segmental movements through

changes of body exertion. There occur unwanted movements and positions that affect psycho-motoric scheme and good posture in different conditions of gravity's effects, change of tangent and angle of stimulus.

Destabilization of position by leaning on heels

When leaning on heels, the one's torso, head and neck flexors and calf extensors oppose falling backwards. Therefore, the isometric contraction of lumbar spine stabilizers should be carried out first in order to prevent increase of lumbar curve due to maintaining balancing gravity by decrease of base surface (Picture 4).

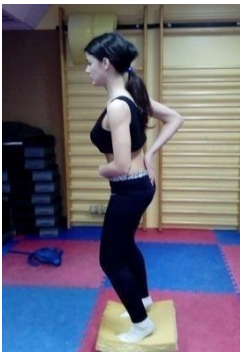
Picture 4. *Destabilization of position by leaning on heels*

Increased postural muscular activity by leaning torso sideways when the tangential force occurs that tends to bring down the body. The activity of lateroflexors, side torso stabilizers, is included. In terms of kypholordotic posture, it is necessary to insist on isometric contraction of abdominal and gluteal musculature, followed by leaning of torso in order to prevent lumbar curve (Picture 5).

Picture 5. *Improvement of bodily awareness by leaning body sideways on slightly unstable base*

Later on, improvement of postural activity is achieved by increasing torque that pushes body towards falling down frontally (light lifting of heels). A care is needed because lifting heels by more than 45 degrees causes compensatory segmental movements; this causes decrease of thoracic kyphosis and increase of cervical and lumbar lordosis (Stevanović, 2002). In order not to increase lordosis in already existing kypholordotic posture, stimulation of postural muscle activities is achieved by too high lifting of heels, first on stable and then on unstable base (Picture 6).

Picture 6. *Improvement of bodily awareness by lifting heels on slightly unstable base*



Functional learning of movements

The therapy treatment is based, as mentioned above, on improving neuromuscular control and coordination and not only increasing the muscular strength. It is very important to underline the significance of achieving segmental and global stabilization as mentioned by Kisner (Kisner & Colby, 2012). In the next stage, functional stabilization training is included through activities that imitate activities that are important in the daily life of the patient with the bad posture or bodily deformity.

The basis of functional learning of movements is re-learning of affected sensor-motoric patterns, i.e. coordination of muscles through neuromuscular control and not only the muscular strength (Jevtić, 2006). The key elements of the chain of local stabilizers of the lumbar spine that is activated by movements of limbs or torso prior to activating global muscles include: m. transversus abdominis, m. multifidus, diaphragm and pelvic bottom muscles. In this manner, they ensure stabilization of center of mass of the body (in this way stabilization of spinal columns), prior to activating "movers" of limbs and torso. This means that stability does not depend on strength of individual muscles, but on the number of included muscles in the chain. Thus, local stabilizers are protected from injuries. Healthy musculature of the local system causes optimal and equal pressure on spinal column which is overcome without effort. An example of the principle of functional learning of movements achieved by activation of spinal muscle is practicing, e.g. static contraction of local stabilizers is achieved by the elevation of arm in order not to emphasized lumbar lordosis. Later on, this is practiced on slightly unstable base. This is an example based on the imitation of sudden movements in the patient's activities of daily living (ADLs). In the condition of sudden movements of arms and legs, by imitating the ADL activities and thus creating a functional training, the automatism of the stabilization mechanism of the lumbar spine is practiced. This is very important, in order not

to worsen pathologic spinal curve in ADLs, e.g. when using public transportation and gripping the holder with the arm in elevation, the patient should preserve segmental stability and body posture in sudden unstable conditions.

CONCLUSION

The effect of muscle activities in comprehensive treatment of bad posture and recognizing progress of changes in more difficult stages of body deformities is complex. It is reflected in mutual dependence through simultaneous weakening of specific muscles, further progress of changes due to muscle shortening and inadequate psycho-motoric scheme for movement and body posture. Posture is closely linked with to the length and balance of muscles that are leaning of spinal column and pelvis. Moreover, good posture has an important role in proprioception and vice versa.

Taking into account the complex effect of muscle activities on body posture, the key conclusions are as follows:

1. Exercises for strengthening and stretching of the spine stabilizing muscles are a compulsory part of the treatment, but they are insufficient. In order to achieve a stable and proper postural status, it is important to practice an "active" postural position on a stable base, first with open, and then with closed eyes, one acquires an adequate bodily sensation. Later on, it is improved by taking up a postural position on an unstable base, as well as through additional coordination tasks, strictly dosed.
2. The paper underlines the importance of individual approach to each patient through mandatory coordination of unwanted movements and positions that occur as an effect of changes of muscular activities of patients having a bad posture. This is particularly important in condition of higher gravity torque in case of sudden movements of legs, arms, and torso. Therefore, functional learning of movements as functional stabilization training is a part of the bad posture treatment programs (creating exercises as an imitation of sudden movements in daily life activities and understanding the exertion in stabilization regime of lumbar spine).
3. Proprioceptive training is included in kinesitherapy program on individual basis when patient's general condition and postural status allows so in order not to overstimulate the system if unprepared for challenges. This paper is highlighting the importance of individual approach to each patient by the expert team, physiatrist and physiotherapist, with kinesiological explanation of care that should be given to various challenges of different conditions of gravity's effect, change of tangent and angle of gravity's effect.

REFERENCES:

1. Anwer, S., Alghadir, A., Sharhe, M. & Anwor, P. (2015). Effects of Exercises onSpinal Deformities and Quality of Life in Patients with Adolescent Idiopathic Scoliosis. Biomed Res Int.Review.

2. Cur, G., Aythan, C. &Yakut, Y. (2016). The effectiveness of core stabilization exercisesin adolescent idiopathic scoliosis. A randomized controlled trial.Prosthet Orthotint
3. Hislop, H.J. & Montgomery, J. (2013). Daniels and Worthinghams Muscle Testing: Techniques of Manual Examination, 9th. Philadelphia: W.B.Saunders.
4. Jevtić, R.M. (2006). Klinička kineziterapija. Kragujevac: Medicinski fakultet,Kragujevac
5. Kisner, C. & Colby, A.L. (2012). Therapeutic exercise, foundations and techniques,ed.6. Medical Publishers (P) Ltd.
6. Stevanović, S. (2002). Kineziologija i primenjena anatomija. Beograd: Zagorac
7. Zec, Ž. (1984). Osnovi kineziologije. Beograd: Viša medicinska škola, Beograd.

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