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Review article

# PHYSIOTHERAPY ASPECT OF DIAGNOSIS AND TREATMENT OF POSTURAL DISORDERS

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## Abstract

Postural disorders are common among preschool and school-age children. In regard to gender and age distribution, children are characterized by different indicators of body posture. Posture for different professionals has different importance, and from a standpoint of one physiatrist it represents a measure of the efficiency of muscular balance and neuromuscular coordination. Bad posture represents a functional deviation from normal posture status without structural changes to the spine or lower extremities. Evaluation and treatment of postural disorders requires knowledge of basic principles related to the conduct of individual body segments, joints and muscles. The combined physical training programmes that include strength and muscle stretching exercises, particularly with regard to the postural antigravity muscles, should help in the prevention of health problems that could occur later in life. Future research on the impact of early school-based back posture promotion in relation to the integration of back posture principles according to biomechanical favourable lifestyle and back pain prevalence later in life is essential.

**Keywords**: posture, assessment, exercise, scoliosis

## Introduction

Holding body is biological characteristics of human beings created through evolution. Posture includes static and dynamic behavior of the body in space relative to each other and the environment.

It is difficult to define the legality and models "proper posture" of the body, because it is very individual and specific. Proper posture depends on the structure of the skeleton, on correct arrangement of muscles, muscle strength as well as the symmetry of the paired parts. Holding body depends on the current emotional state of the personality as well as from a variety of influences. Posture for different professionals has different importance, and from a standpoint of one physiatrist it represents a measure of the efficiency of muscular balance and neuromuscular coordination

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(Zec, 1984). Each individual will engage in many different postures every day. A good posture is a posture that is stable, and produces minimal stress and strain on the spinal structures, such as muscles, ligaments, intervertebral discs and nerves (Scannell & McGill, 2003; Callaghan & McGill, 2001).

To put it simply, the posture of the body involves proper alignment of the body segments and their balance, which is achieved by providing a minimal input of power with maximum mechanical efficiency (Garrison & Read, 1999; Zec, 1994). The malalignment of one body segments will cause change to occur in adjacent segments, as well changes in other segments, as the body seeks to adjust or compensate for the malalignment (closed-chain response to keep the head over the sacrum) (Gelb et al., 1995).

Bad posture represents a functional deviation from normal posture status without structural changes to the spine or lower extremities.

A bad posture is likely to subject the spine to abnormal and high levels of stress and strain (Bullock-Saxton. 1993). Postures that represent an attempt to either improve function or normal appearance are called compensatory postures ( Riegger-Krugh & Keysor, 1996). Bad posture has also been linked to poor balance, as well as to decreases in gait and functional performance. In fact, research shows that poor posture is even associated with increased mortality rates in older adults (Page, 2005).

Current trends among domestic and foreign authors inidcate that poor posture among children occurs in two forms: a neurological and kinesiology. Neurological is characterized by muscular hypotonia, which is a consequence of immaturity of the central nervous system and usually disappears by the age of five. In Kinesiology bad posture is described as an evident shortening of the muscles, which needs to be timely noticed and treated. (Savic, 1994). “Typically, muscles overused in a certain direction will become tighter and shorter—an effect known as adaptive shortening. Opposing muscles to repetitive movements sustain stretches during prolonged postures. As a result, these muscles tend to become longer and weaker—an effect known as stretch weakness” (Kendall et. al., 2005).

The seated posture is a flexor-dominated posture that further shortens and tightens the musculature on the ventral side of the body and lengthens while weakening the musculature on the dorsal side of the body. “As a result of the muscle imbalances that develop in our musculoskeletal system, postural distortions occur that tend to correspond with the muscular findings” (Hammer, 2007).

Monitoring of the growth and development of preschool and school-age children includes continuous checking of their posture, especially during critical periods of growth and development. There are periods during the growth of a child which are particularly important for the appearance of bad posture (Milosevic & Obradovic, 2008; Sabo, 2006). Therefore, it is highly important to detect the postural problems at an early stage and keep them under the strict kinesiological control (Auxter et al., 1989). The first critical period - 1-2 years of life which is a marked as a period of increasing in body weight and the development of locomotor function. Posture which is accomplished in the first year of life is a complex function which is preceded by a series of changes in the active and passive part of the locomotor apparatus, in particular musscle localized along the spinal column. Of great importance is the state of mineral metabolism which is intensified in this period often leads to various changes in the skeleton.

Second critical period - 6-7 years of life when the child moves from preschool to school age with a new physical load: more seating, as well as sitting in inadequate classrooms, writing often in incorrect position, carrying heavy school bags and so on. In the age between 5 and 10, when the growth becomes slower, the postural problems show somewhat lower rate of incidence, whereas with the onset of puberty, an increased emergence of postur-

al abruptly deteriorating conditions and the detection of new cases can be widely anticipated. The third critical period – from the age of 11 to the age of 14 is the period when it comes to of work intensive sex glands, weight gain and increased physical activity, and thus to an increased load of the skeleton. Bad posture can occur in adolescence when mainly conditioned by external factors (bad seater, bad beds, inadequate clothing, professionally burden - particularly heavy period of study crafts during the maturation of the skeleton, which is unable to resist the permanent load, insufficient engagement sports activities). Some of these factors have an influence on the formation of bad posture in the previous stages of the developmental period of the child. Due to the long-term negative impact of gravity and retention of irregular posture while sitting, standing, aided by wearing (too) heavy school bag in one hand or on one shoulder posture over time takes on the curve in the sagittal or frontal plane and thus incorrectly scoliotic posture (Kosinac 2006). A prolonged flexed posture may also cause deconditioning of the spinal muscles thus inducing higher risk of injury (O 'Sullivan et al., 2006).

## Diagnosis of postural disorders

Postural status of children in preschool and school conditions is estimated by observation or measurement. Visual methods are subjective, and measurement methods give somewhat more accurate picture of body posture. The observation was performed in the sagittal plane from the side, in the frontal plane with the front and rear. Analysis of each subject at a distance of 2 m with the measures and evaluate individual body segments in the following order (Protic-Gava & Scepanovic, 2012).

1. Holding head and neck - holding your head includes raised brow parallel to the frontal plane, and the direction of view is parallel with the horizontal plane. The shape of the neck is cylindrical in posture lordosis formed with the distance from the vertical 3.5 cm. Head and neck posture describes when the patients sitting and standing and any differences should be notied. Janda describes "upper crossed syndrome" to show the effect "poking chin" on the neck muscles, with the weak neck deep flexors, as are rhomboids and serratus anterior (Page, 2005) .

2. Shoulders position: shoulders are normally placed in the frontal plane. Deviations may be in the form of the curvature of the shoulders forward or asymmetry of the left and right shoulder. Inequality at shoulder height is usually associated with the dominant hand, raised his shoulder tension of the upper trapezoid and levator scapula.

3. Appeatance of the chest - and the shape of the thorax, adjustedness front wall, the presence of deformities, half symmetry, regularity rebarnih arches, respiratory mobility of the ribs during normal and deep inspiratory and muscle relief. Particular attention should be paid to the configuration of the ribs of the posterior wall of the thorax, especially in front of the slope, which we can indicate the presence of structural deformities of the spine.

4. Position the hull - look at whether the hull is set in the center line or dezaksiran.

5. Appearance of the abdomen - the anterior wall of the abdomen should be in the line of the anterior chest wall or something behind.

6. Appearance Lorentz triangles stature - the space between the hull and the inner side of limbs. We see their symmetry or asymmetry.

7. Pelvic position:- physiological pelvic tilt relative to the transverse plane is about 60 degrees.

8. The appearance and position of scapula - are normally placed in the region of 4 -7 ribs. Observe the asymmetry, distance and lift the inside edges relative to the spinal column. The asymmetry of the position of the scapula (or attracting too much lapse of one or both scapulas or curved fins) consequence is the weakening of serratus anterior muscle of the dominant hand (her shoulder is lower), the rhomboid muscle tension and lattisimus dorsi muscle. Drawn scapulas: shortened rhomboid muscles, elongated pectoralis major and pectoralis minor muscle, spaced scapula: serratus anterior muscle tension, prolonged rhomboid and middle trapezoid muscle; curved fins: the anterior serratus muscle weakness (Kosinac & Banovic, 2008).

9. Appearance of the spine - look at the position of the spine as a whole following the thorny extensions, variations in the sagittal and frontal planes, the size of the physiological curve. Excessive lumbar lordosis usually cause streching of anterior longitudinal ligament and shortening dorsal back extensors, posterior ligaments and scapular muscles as a result of excessive dorsal kyphosis (Adams & Hutton, 1985).

10. Appearance of the lower ekstremiteta- should pay attention to the direction of the longitudinal axis of the lower extremities, the presence of deformities ("x" or "o" leg), the length of the limbs. Measuring with centimeter tape, starting from the anterior superior iliac spine to the internal malleolus or from the navel to the internal malleolus.Some extent of genu varum is normal at birth and during infancy up to 3 or 4 years of age (Edgar, 2002).

11. The position and appearance of the feet - identification of the constitution of the foot, an overview on all sides including plantar and spotting deformities. When one malleolus appears more prominent or lower than the other and calcanear eversion is present, it is possible that the a common foot problem known as pes planus, or flat foot, may be present.Calcaneal eversion of 5 to 10 is normal in toddlers, but by 7 years of age, no calcaneal eversion should be presents (Valmassy, 1996).

## Measurement methods

Assessment of posture is performed by measuring the physiological curvature of the spine using the surplus with thinner ribbon, ruler. These methods give results, but not completely reliable. No matter what you have already overcome, this method is still applicable for pre-schools and schools that are not able to purchase modern diagnostic equipment.

The most frequently used method of measurement is a method for assessing from Napeleon Wolanski with measure 8 segments of body posture (pose, shoulders, keeping shoulder blades, chest, thorax in the frontal plane, keeping the anterior abdominal wall, the shape of the leg and instep) (Protic-Gava , Scepanovic, 2012). By Wolanski there are three ratings: 0, 1 and 2 (Table 1). The rating is 0 when all parameters are normal relations - normal status. Grade 1 represents some deviation from the normal status posture. It is a functional deformity - give the active part of the locomotor apparatus. Grade 2 is characterized by significant deviations from normal state, and corresponds to the structural changes of the locomotor apparatus. By calculating the score for each segment, we get the total score based on which the posture estimates from very poor to excellent (Table 1).

Table 1. Grades by Wolanski

| POSTURE | SCORE |
|---|---|
| EXCELLENT | 0 |
| VERY GOOD | 1-4 |
| GOOD | 5-8 |
| BAD | 9-12 |
| VERY POOR | 13-16 |

Somathoscopic method according Radisavljević includes evaluation of the following segmentSomathoscopic method according Radisavljević includes evaluation of the following segments body posture in the frontal plane, the back side: head, shoulders, shoulder blades, triangles stature (Lorentz triangles), pelvis, knee, Achilles tendon. Observation in the sagittal plane (with sides), includes posture: the neck (cervical), the chest (thoracic) and lumbar (lumbar) curve, the position of the knees and feet. From the front, in the frontal plane, watching the thorax (Radisavljević, 2001).

The mobility of the spine determine active and passive range of motion measurements of flexion, extension, laterofleksije and rotation of the spine (Jandrić, 2009). Other tests that should be part of the postural examination are measuring the length of the leg and straight-leg raising test (Laseque test), as well as reviews of specific joints, length and muscle strength (Kendal et al., 1993). The location of the joints indicates that the muscles in elongated or not (Magee, 1992). Neurophysiological review covers motor skills, sensitivity and sensory function.There are many methods and a range of equipment available for spinal posture and motion measurement. These different measurement methods vary in size, cost, accuracy, dimensions of measurements, ease of use and invasiveness, and each has its advantages and disadvantages. From the range of equipment available, biplanar radiography, opto-electronic systems, electromagnetic tracking systems, and inertial measurement systems are all capable of both 3 dimensional spinal posture and motion measurements. Biplanar radiography, opto-electronic systems and electromagnetic tracking systems are the more established and common methods employed. Radiography or X-ray is one of the popular methods used in posture and motion measurement, especially in spinal mobility measurement; intersegmental vertebra kinematic analysis and postural tracking (Harrison et al., 2005).

It is necessary for lateral radiography of the whole spine in an upright position with scoliosis. The radiographic result is used for the determination of side (left or right, depending on the convexity) and the degree of curvature (Cobb angles), the rotation of vertebral bodies and to determine the bone maturity to of the patient. To measure the angle of curvature by Cobb there is need to choose the vertebrae above and below the apex of the curve, which are most inclined. Cobb angle is the angle between the lines that intersect and are placed on top top and bottom of the lowest vertebra.

## Treatment of postural disorders

Individual approach to patients with postural disorders in the context of the history and clinical evaluation is essential, and requires education of doctors and physiotherapists in specially designed methods, focused on specific spinal deformity. Evaluation and treatment of postural disorders requires knowledge of basic principles related to the conduct of individual body segments,

joints and muscles. Improper handling resulting in uneven loads and stresses the bone, articular, ligaments and muscles (Magee, 1992; Michele, & Moore, 2004). By understanding muscle imbalances associated with functional impingement, specialist for physical medicine and rehabilitation can prescribe appropriate exercises for both treatment and prevention.

Kinesiology treatment of scoliosis posture directed toward a specific type of problem caused by poor posture is carried out in several stages (Tribastone, 1994). Cooperation with the doctor and therapist is very important at the beginning of treatment, with the establishment of psychophysical harmony with relaxation and acceptance exercises to develop awareness of poor posture. The most important phase of Kinesiology treatment is correction of posture. Stretching with exercises in different positions and in motion, support the correction of the spine. In most cases, it is necessary to complete the correction of posture breathing exercises, muscle relaxation, to eliminate certain muscular tension and strengthening muscles to the functional findings, especially abdominal, in order to give adequate support to the spine and to prepare for any sporting activities . They are extremely important posture correction exercises with the mirror. Are the most effective exercises in the compensation conditions, for example Klapp exercises creep. The ultimate goal of Kinesiology treatment is the integration of postural adjustments that can be achieved in posture in everyday movements, which allows a person with a scoliotic posture ability to resist negative impacts on standing or when carrying schoolbags, improper seating, sports with monotonous motion (Tribastone, 1994) . A very interesting approach to postural disorders represent Bowen therapy that includes a complete relaxation of the body which activates the internal capabilities of the body and mind, returning to balance and harmony.Bowen terapija dovodi do bolje usklađenosti tela, bez manipulacije na zglobovima. Bowen moves stimulate several types of intrafascial mechanoreceptors that affect muscle tonus and increase vagal tone. The type of move used in Bowen also assists the hydration of fascia, which in turn encourages better vascular and nerve supply (Wilks, 2013).

Therapeutic exercise, alone or in combination with other forms of treatment, are a logical way to maintain and improve flexibility in patients with functional and structural changes in the spinal cord, the risk for pain, pulmonary dysfunction, and progression (Jandrić, 2012). Literature data shows that exercises with the addition of (active release technique ) ART® will more effectively correct postural distortion (Tacker et al., 2011). The combined physical training programmes that include strength and muscle stretching exercises, particularly with regard to the postural antigravity muscles, should help in the prevention of health problems that could occur later in life, since incorrect or improper posture constitutes the basis for further deterioration of health. The combined program of corrective gymnastics with games and exercises in water had significant eff ects on improving the muscle tone in the respondents, which in turn had a direct impact on improving their body posture, both in terms of all of the individually surveyed body parts and in overall terms (Torlakovic et al., 2013). The more interventions studied are needed to allow the formulation of evidence based guidelines for the prevention of back pain in schoolchildren (Cardon et al., 2007). The intensive effective back posture education through elementary school curriculum is effective til adolescence.

Therapeutic exercise can improve the angle of the curve Cobb angles in patients with idiopathic scoliosis, strength, mobility and balance, vital capacity (Fusco et al., 2011). International Association of Society on Scoliosis Orthopaedic and Rehabilitation Treatment (SOSORT) in 2006 provided guidelines for conservative treatment of scoliosis (Weiss et al., 2006). The first of the three methods of conservative treatment of spinal deformity are based on kinesiotherapeutic methods including Schroth, Lyonaiseovu, Side-Shiftovu and Dobosiewiczevui method, and other methods kinesiotherapeutical (Negrini et al., 2003). Scoliosis Intensive Rehabilitation (SIR), leads to a subjective improvement and reduction of progression of the curve (Weiss et al., 2003). Treatment of spinal orthosis has been shown effective in preventing the progression of curvature at the IS

(Maruyama et al., 2011). It has been shown that treatment of spinal orthoses can reduce the prevalence of surgery, then restored sagittal profile and influence the rotation of the spine.

Future research on the impact of early school-based back posture promotion in relation to the integration of back posture principles according to biomechanical favorable lifestyle and back pain prevalence later in life is essential (Geldhof et al.,2007).

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