



Postural defects and the efficacy of prevention programs in schools

Received:

05-04-2020

Accepted:

25-04-2020

Published:

04-05-2020

Damian M. Kania¹, Patrycja M. Romaniszyn², Andrzej W. Mitas²

¹ *Institute of Physiotherapy and Health Sciences, The Jerzy Kukuczka Academy of Physical Education in Katowice*

² *Department of Informatics and Medical Devices, Faculty of Medical Engineering, Silesian University of Technology in Gliwice*

Abstract:

The body posture is the person's individual feature that varies daily and throughout his or her life. Postural defects are one of the most frequently diagnosed diseases of affluence in the world. The problems are usually caused by bad postural habits, excess body weight (which can permanently impair the locomotor system), and decreasing physical activity. It is commonly believed that the greatest risks occur during the period of the fastest growth of a child, i.e. between the age of 6 and 7 years, and during puberty. Diversified and multi-directional measures should be taken to effectively counteract the dangerous and deepening phenomenon of the prevalence of postural defects in children. The effectiveness of preventive measures aimed at limiting postural defects is determined by the need for cooperation of all entities closely related to teaching, education, and care of the physical and mental health of the child. A very important stimulus that improves the willingness and involvement of the child (patient) in the therapy may be the use of interactive games, which force the correction of specific forms of movement, and the use of attractive means of activating mobility, such as sensorimotor disks etc.

Keywords:

body posture, faulty posture prevention, physical activity

Corresponding author:

Patrycja Romaniszyn,
Department of Informatics and Medical Devices,
Faculty of Medical Engineering,
Silesian University of Technology, Roosevelta 40, Zabrze.
patrycja.romaniszyn@polsl.pl

How to cite the paper

Kania DM, Romaniszyn PM, Mitas AW. Postural defects and the efficacy of prevention programs in schools. *Physiother Health Act* 2020; 28:9-14. DOI: 10.32087/pha-2020-0002

Introduction

Mens sana in corpore sano (a healthy spirit resides in a healthy body), said the Ancients, and, being right in what they said, they implemented health guidelines into the educational process. Nowadays, physical education lessons sometimes have a "sitting" course. The effect of body posture on comfort is obvious, perhaps not at early school age, but certainly at "second youth" age. Education is a form of investment with the return taking place mostly in a mature age, substantially affecting the late stages of life. The doubtful "achievements" in developing faulty posture have their effects at the age when immanent pain often disturbs everyday function. The illusory indoctrination of the efficacy of pharmacological pain management is undoubtedly effective but there are significant side effects, which makes pain relief difficult. The advances in surgical technologies inspire positive thinking about the possibilities of replacing body parts for artificial implants.

One can use old folk wisdom in the modern version as it is worth remembering the proverb "As you make your bed so you must lie on it". It is worth remembering this when a person focuses his or her eyes on the smartphone screen: they lower the head, which leads to the application of such a force to the cervical spine as if their head weighed about 20 kg. The head is a heavy part of the body, and its deviation from the natural position (determined by human development in evolution and ontogenesis) causes very large moments of force. The ability to sit or stand correctly can be improved, but it requires not only physical work (contrary to the lazy nature of man), but above all, the knowledge of how to perform such work at minimum energy consumption.

This study aimed to present the problem of postural defects in terms of

prevention and the need to implement physical activity at all ages.

Material and Methods

Google Scholar was used to identify literature sources for the analysis. The papers were searched for using the following keywords: faulty posture, faulty posture prevention, physical activity in faulty posture, both in Polish and English. The problems contained in the review were divided into 3 main categories, according to the keywords. The following chapter presents a general approach to the problems discussed in the study, shows the statistics on the prevalence of faulty posture in children and adolescents, information on the recommendations related to postural defects, and attempts to bring closer the stimulants of physical activity used in the above-mentioned diseases.

Results

Faulty posture in children

The body posture is the person's individual feature that varies daily and throughout his or her life. It is defined as an individual shape of the body and the arrangement of individual sections of the upper body and lower limbs in the standing position [1].

Postural defects are one of the most frequently diagnosed diseases of affluence in the world [2]. According to statistical data from the Polish Registry of Congenital Developmental Defects (ZPRWWR), the percentage of children with developmental defects in the skeletal system has significantly increased in the last several years [3]. Epidemiological data reveal that 416,381 children aged 0-18 years were diagnosed with postural problems in Poland in 2007, which accounts for 5.19% of the child population [4]. The problems are mostly caused by bad habits, excess body weight-height ratio

(which can permanently impair the locomotor system), and decreasing physical activity [5]. It is commonly believed that the greatest risk occurs during the period between the age of 6 and 7 years and during puberty [6].

It was found based on the above-mentioned studies that the group most susceptible to numerous skeletal system pathologies is children in early school age. Body posture plays an essential role here and depends on many factors, such as sex, age, type of somatic structure of the skeletal-articular-muscular system, mental status, and lifestyle [7]. In addition to these factors, stimuli that directly affect the incorrect alignment of the body posture in the group of children have a significant effect on the development of pathology. These include, first of all, improperly designed student's workplace (desks and chairs not adjusted to body height), improper positions taken during work (learning) and relax, and very often overloaded school backpacks and their improper carrying [8]. Postural defects caused by these factors can be corrected with relatively little effort but in their initial phase. If, however, the problem is ignored and no preventive action is taken, the defect will become worse as the child develops. Over time, muscle contractions may occur (generally, they are more difficult to compensate), and, consequently, the skeletal system may be deformed.

Numerous studies have shown the effect of physiological mechanisms on the protection of body posture. The stabilization of the standing position is ensured by the muscles of legs, pelvis, and upper body, whereas the improvement in muscle sensation is closely related to the quality of body posture [9]. Proprioception (also termed deep sensation) also plays a key role in the process of signaling the states of individual links of the motion apparatus [10]. On the other hand, the

mechanisms responsible for the development of scoliosis include biomechanical processes that last many years and start at the moment when the child begins to take the first steps [11].

Faulty posture prevention

Caring for an increasing number of children of different ages who have been diagnosed with postural problems is a large and complex social problem. To effectively counteract the dangerously deepening defects in the youngest children, all educational measures should be taken not only to popularise knowledge but also to allow for the prudent application of diversified preventive measures. Pathologies of the musculoskeletal system require specialist treatment, which is not the responsibility of the teaching and educational environment. Since these risks occur at every stage of development, preventive measures should be implemented from an early age. Therefore, it is necessary for children, parents and teachers to know about health promotion activities, the role of correct body posture and methods to improve it, and adequate motivation for actual prevention activities [2].

With the steadily increasing number of children with postural defects, the Ministry of Health and the Ministry of Education in 2009, based on the support of a team of experts, published a recommendation concerning the prevention of postural defects in children and adolescents in the area of teaching and education [8]. Schools were identified as important environments of first aid, whose task should be to eliminate factors contributing to the development of these defects, and thus to create the correct body position. However, apart from the prevention programs implemented during physical education classes, often the only way to influence a student with faulty

posture is corrective and compensatory gymnastics classes.

Despite the implemented prevention measures, due to the developing pathologies of the musculoskeletal system, it happens that secondary prevention is necessary. It includes regular screening of students, their observation, and further corrective therapy, which is aimed at reshaping their body alignment habits, termed postural reeducation. An important role at this stage is played by physical education teachers, who are often the first to observe abnormal body posture of their students [12]. There are recommendations in the literature for the prevention of postural defects among children and young people. This prevention is reflected in maintaining the correct body system, elimination of the factors threatening with the occurrence of the above-mentioned defects, ensuring the adequate amount of physical exercise, and regular assessment of the health status [13]. Based on the above considerations, it should be noted that the measures taken to prevent faulty posture determine the need for cooperation between all actors closely related to the teaching, education and care of the physical and mental health of the child.

Stimulants of physical activity

Despite the continuously implemented health promotion programs and numerous prevention initiatives, the number of children with postural defects continues to be alarmingly high [14]. The prevalence of defects of habitual origin inspires the application of new methods to correct abnormal body position in children through using new technologies (including biofeedback). A very important stimulus that improves the willingness and involvement of the child (patient) in the therapy may be the use of interactive games, which forces the correction of specific forms of movement and the posture itself. The most popular are generally available console games

controlled by body movement or virtual reality headsets that allow you to plan and stimulate specific movement tasks.

Another solution is MoCap system based on the method of motion analysis with six cameras. The person undergoing corrective exercises moves in the area of a specific scene, and each movement is transferred to the computer for further animation [15]. Another system supporting the rehabilitation process of children with postural defects is the modular system of inertial sensors proposed by Schepers, Roetenberg and Veltink [16]. It allows for transforming real images of the character into a game plot, which makes it an interesting alternative involving a small patient in gymnastics. The approach, oriented especially towards improving the function of postural muscles, is based on the use of the platform for balance exercises [17]. In addition to the description of the device, the authors of the publication included a report on a significant increase in motivation of people exercising with the use of the platform compared to those who undergo traditional forms of exercise.

New technologies have been widely used in the prevention of postural defects in children. Nevertheless, elementary solutions such as unstable surfaces (sensorimotor disks) are very often used as seat pads during classroom activities. In a way, they represent an alternative to conventional corrective gymnastics classes. Literature sources have demonstrated that the use of such simple tools yields satisfactory results in the prevention of postural defects and their further development [18,19].

Discussion

The interdisciplinary knowledge represents an educational difficulty. Its popularization depends on the level of public awareness. The question of "how to walk, sit and stand correctly" is topical,

and the importance of the problem is growing because the level of a comfortable life is constantly being raised by inventions which differ in terms of the kind (from *door-to-door* communication to meals prepared in industrial conditions). In any case, the market acceptance criterion is to minimize the workload of the user. Under these conditions, it is difficult to initiate the development of anthropologically significant features, characteristic for the careful performance of once everyday activities such as walking or standing. The development of the muscular system is limited to its larger parts, while the greatest effect on the faulty posture with long-term negative consequences is from short muscles located deep, hidden, and invisible, and they often determine the quality of work of the skeletal system.

Postural defects determine the effectiveness of the teaching process. A dramatic situation occurs especially when a student contacts computer terminals. The inclination of the upper body, lowered head, eyesight directed at an object (a screen or a book that is in close proximity) without rest (e.g. looking away) are just a few examples of external manifestations of destruction, which, without a properly instilled awareness, will only deepen. Unfortunately, this will also happen when those affected by the illness, decide to reduce the deficits by themselves and immediately.

In the case of postural reeducation, the opportunities are significantly limited

by abnormal habits and the skeletal and articular stability. This is the essence of the educational problem in the field of postural control. Supervision of a teacher or carer in a school environment must be reduced to a minimum due to the technical conditions of enforcement of such recommendations in a multi-person classroom environment. A good solution (which however requires the mental acceptance of the carers)³ is to use "simple machines" that support mobility. An unstable seating base, a movable chair, or an adjustable screen or a desktop are just some examples of the equipment. Furthermore, this technology, supported by appropriate knowledge, allows for reshaping correct habits that, if established, may lead to the involuntary application of healthy principles.

In conclusion, special attention should be paid to the scale of diseases such as postural defects, especially in children. Nowadays, this problem is unfortunately very often underestimated, and correct habits are introduced too late. Therefore, solutions should be sought not only to encourage children to be physically active but also to contribute to early prevention of a wide range of postural defects.

References

- [1] Kasperczyk T. Wady postawy ciała: diagnostyka i leczenie. Kraków, Firma Usługowo-Handlowa „Kasper”; 1994.
- [2] Latalski M, Bylina J, Fatyga M, et al. Risk factors of postural defects in children at school age. *AAEM* 2013;20(3):583–87.
- [3] Latos-Bieleńska A, Materna-Kiryłuk A, Mejnartowicz JP. Wrodzone wady rozwojowe w Polsce w latach 2000–2002. Dane z Polskiego Rejestru Wrodzonych Wad Rozwojowych. Poznań, Ośrodek Wydawnictw Naukowych; 2006.
- [4] Pilarska AA. Spatial diversification of musculoskeletal and connective tissue incidence of polish population. *J Educ Health Sport* 2018;8(12):375–83.

- [5] Maciałyzyk-Paprocka K, Krzyżaniak A, Kotwicki T, Kałużny Ł, Przybylski J. Postawa ciała dzieci w wieku przedszkolnym. *Probl Hig Epidemiol* 2011;92(2):286–90.
- [6] Krawińska A. Ontogenetyczne procesy formowania się postawy ciała człowieka. Poznań, Wyd. WSSE; 1990.
- [7] Maciałyzyk-Paprocka K, Dudzińska J, Stawińska-Witoszyńska B, Krzyżaniak A. Incidence of scoliotic posture in school screening of urban children and adolescents: the case of Poznań, Poland. *Anthropologic AI Review* 2018;81(4):341–50.
- [8] Górecki A, Kiwerski J, Kowalik IM et al. Profilaktyka wad postawy u dzieci i młodzieży w środowisku nauczania i wychowania – rekomendacje ekspertów. *Praca pogładowa. Pol Ann Med* 2009;16(1):168–77.
- [9] Nowak S. Sterowanie pozycją stojącą w procesie wychowania fizycznego. Radom, Wyd. PR; 2005.
- [10] Nowotny J. Czucie ułożenia, a postawy ciała dzieci i młodzieży. Katowice, Wyd. AWF Katowice; 1986.
- [11] Karski T. Biomechanical aetiology of the so-called adolescent idiopathic scoliosis (AIS). Lublin Classification (1995–2007). Causative influences connected with “gait” and “standing ‘at ease’ on the right leg”. *Jour Orthop Res* 2018;1:102:1-10.
- [12] Nowotny-Czupryna O. Profilaktyczne aspekty diagnostyki i terapii wad postawy ciała. W: *Wady postawy ciała u dzieci i młodzieży. Profilaktyka – diagnostyka – terapia.* Bielsko-Biała, wyd. WSA; 2009,7.
- [13] Nowotny J, Nowotny-Czupryna O, Czupryna K. Reedukacja posturalna w systemie stacyjnym. Bielsko - Biała, Wyd. WSA; 2008.
- [14] Janiszewska R, Tuzinek S, Nowak S, Ratyńska A, Biniaszewski T. Nieprawidłowości postawy ciała u dzieci 6–12-letnich uczniów szkół podstawowych z Radomia – badania pilotażowe. *Probl Hig Epidemiol* 2009;90(3):342–46.
- [15] Moiz F, Leon-Salas WD, Lee Y. Motion tracking for smart home care. Abstracts. Missouri Regional Life Sciences Summit 2010.
- [16] Schepers HM, Roetenberg D, Veltink PH. Ambulatory human motion tracking by fusion of inertial and magnetic sensing with adaptive actuation. *Med Biol Eng& Comp* 2010;48(1):27–37.
- [17] Fitzgerald D, Trakarnratanakul N, Smyth B, Caulfield B. Effects of a Wobble board-based therapeutic exergaming system for balance training on dynamic postural stability and intrinsic motivation levels. *J Orthop Sport Phys* 2010;40(1):11–9.
- [18] Jankowicz-Szymańska A, Mikołajczyk E. Zastosowanie powierzchni niestabilnych w profilaktyce wad postawy u dzieci. *Hygeia* 2015;50(1):31–6.
- [19] Linek P, Wolny T, Sikora D, Klepek A. Supersonic shear imaging for quantification of lateral abdominal muscle shear modulus in pediatric population with scoliosis: a reliability and agreement study. *Ultrasound Med Biol* 2019;45(7):1551-61.