

## Risk Factors of Poor Posture in Children and Its Prevalence

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### Abstract

Postural deviations are a common problem among children caused by long-term effects of poor posture induced by different factors of modern lifestyle. Television, video entertainment, motorized transportation, fast food and lack of regular physical activity and weight gained are the most common risk factors of postural deviation in children. In this review article we investigated and analyzed recent data about the prevalence of postural deviation among children and the risk factors that influence the occurrence of these deviations among children. To gather as much as possible scientific data we used "Jab Ref" as a research-sector focusing more in navigating on Medline, Google Scholar and Inspire options that this program contain. As selection-criteria of scientific articles we collected were these key words such as: poor posture, risk factors, postural deviation and children. This review article shows that the prevalence of poor posture in children caused by inactive lifestyle has increased this last decade. There are scientific data even why "obesity" is not considered "as the primary factor" that affects the occurrence of postural deviations in children but as a risk factor that increase the probability of its occurrence. It is very important to emphasize that the existence of poor posture in children is necessary to be diagnosed earlier than growth process finishes in order to prevent its aggravation.

**Keywords:** Poor posture, risk factors, postural deviation, children.

### 1. Introduction

Modern life has negatively affected most of the human motor behavior increasing tendency of a sedentary life style. (Bogdanovic. Z & Markovic. Z, 2009; Brianezi.L et al., 2011, Mino.D et al., 2013). Television, video games, motorized transportation, fast food and lack of regular physical activity contribute to the poor physical condition of children leading to an anatomical or biomechanical modification of the spinal cord. (Kratenova. J et al., 2007; Latalski. M et al., 2013)

According to Lafond. D et al 2007 these modifications in most of them are associated with postural deviations. Through his study he underlined the need of the training physical education staff in terms of diagnosing the presence of postural deviations in children and the importance of including specific training programs in Physical Education program. Suggestions presented by him help us to understand that the posture deviations should not only be at the focus of the medicine or science but also in the context of Education sector due to prevention and improvement of the children's quality of life.

First of all, it is very important to clarify what "Posture" means. This term is defined differently by different scientists. According to Latalski.M et al 2013 "Posture" is a motor habit shaped on a specified morphological and functional background. Based on this point of view posture is an indicator of the mechanical efficacy of the kinetic sense, as well as muscular balance and neural muscular coordination. (Latalski.M et al 2013) Throughout the entire life, human body posture changes continuously, but the biggest challenges are most clearly seen during the period of dynamic development because of rapid and progressive developments. To restore a new balance according to these changes, human body performs several compensatory actions which often become the reason for the emergence of postural deviations. (Latalski.M et al 2013). Ningthoujam. R., 2014, considers "posture" as a product of human behavior, emphasizing that factors affecting a wrong posture are features of daily behavior. According to him "posture" reflects the well-being of the individual, reflects its activity and somehow relevant personality.

*The aim of this review article was to investigate about the stream of the poor posture's latest trends in children observing its prevalence and risk factors that may increase these incidences.*

## 1.1 Research Methods

The research method that we used was JabRef 2.10. It is an open source bibliography reference manager by which everyone can provide data in an easy-way from online scientific databases. Because of this we decided to use this methodology to gather as much as possible scientific information which was directly related to the goal of this review.

Literature was obtained by means of the Medline, Google Scholar and Inspire search engine and was prompted by the following key words: postural deviation, posture, children, BMI, obesity. Altering these key words we analyzed evidences into two groups: articles that indicate the prevalence and the factors that influence the appearance of postural deviation in children and the second group analyzed all the evidences that show the correlation between obesity – posture deviation or postural control. Despite the fact that Jab Ref “reference manager” showed about 100 articles, we selected only 15 of them because they were directly related to our study aim.

### 1.1.1 Analysis Result

#### 1.1.1.1 Prevalence of postural deviation in children and risk factors

Recently poor posture in children has been one of many important concerns of different scientist. Kratenova.J et al 2007 is one of those who investigated the prevalence of postural deviation among children (7, 11, 15 years old). From 3520 subjects included in this study resulted that because of lack of physical activity (measured by PAQ-c) 50 % of children were detected with protruding scapulae, 32 % with lumbar and 31 % with round back. The preferred leisure-time form used from children was TV and playing video games spending 14 hour weekly. Children reported that they spent only 4 hours per week to participate in different sports activities. In this study it is underlined that 20% of those who reported no participation in sports activities were more risked by poor posture than children who regularly attend sports activities.

With the same diagnostic methodology (questionnaire and medical data on postural problems) 14, 7 % of 380 subjects (14 years old) were detected with a postural deviation while 30% of those didn't were aware about the state of their posture alignment. (Latalski.M et al 2013) Low level of physical activity was the most common risk factor that influenced their posture conditions. The economic standard of the families has significantly affected the lack awareness about their body posture. The long- term effect of being on seated position by watching or playing video-games has been detected as a significant risk factor of altered posture alignment. (Kratenova.J et al., 2007; Latalski.M et al 2013).

Staying for hours in a given position (e.g. sitting in front of computer) where the basic purpose is not maintaining the correct postures, because of weakening of agonist (shortening) and antagonist (extension) muscles, posture appeared ramp. Specifically, because of agonist-antagonist relationship, sitting for a long time, makes abdominal and pelvic (flexor) muscles staying for long time at their short position associated with lengthening of the back and gluteus muscles. Because of these imbalances occurs the appearance of thoracic kyphosis which is often associated with head extraction. According to Krugh.Ch & Keysor. J.J., 2014 this is because of the compensatory actions of kinematic chains in order to create a new redistribution of body weight in accordance with new human body position. Mino.D et al 2013 observed that different posture deviations on 400 female subjects (9-18 years old) from Golestan province resulted to be affected by several risk factors. There is a meaningful relationship between body weight and lordosis (31 girls/ 50-60 kg), kyphosis and the way of doing assignments (16.7%) , scoliosis and how to sit (sitting with lean back - 95.9%), shoulders drop and carrying bag and books (105 female using 1 hand/ 208 female using 2 hands). These significant relationships between postural problems and factors presented above are needed to be well known by Physical Educators in order to pay the necessary attention to this concern focusing on better posture education informing children about the importance of good posture and how to prevent this phenomenon.

Bueno.R.C & Rech.R.R., 2013 in their cross sectional study among 864 children (8-15 years old) from Southern Brazil presented that 16.6% were detected with dorsal kyphosis, 27.9% with lumbar hyper-lordosis and 33.2% with scoliosis. They studied these posture deviations taking in consideration the influence of backpack weight and how they carried it. These evidences were further enriched by the study of Ningthoujam.R., 2014 *who investigated how flat sole shoes may affects posture alignment of 749 children (396 boys and 353 girls; aged between 9-13 years. hey Because of inappropriate shoes 5.3 % of children suffered by deviations as flat foot, bow legs and knock knees emphasizing that the degree of deviation was slight deformities. “Obesity” was other risk factor which has been continuously studied to determine its influence on children’s posture alignment. Kussuki.M.O.M et al., 2007 investigated how obesity may influence the posture, comparing normal-weight, overweight and obese children from 7 to 10 years old. (Table no.1)*

**Table no. 1.** Summary of results detected by Kussuki.M.O.M et al 2007.

Body weight category	Significant difference between groups		Not so significant difference between groups		
	Hyperlordosis (Lumbar)	Head protraction	Hyperkyphosis (Thoracic)	Scoliosis	
Obese	66, 67%	54, 17%	54, 17%	33, 33%	
Overweight	53, 85%	41, 67%	41, 67%	31, 81%	
Normal weight	35%	12, 5%	32, 5%	34, 28%	

They concluded that the excess of body weight **is a significant factor** for the risk of postural alterations because of its biomechanical constraints which often are associated with compensatory body actions to replace the center of gravity within area of support. These compensatory actions are usually associated by the appearance of posture deviation. Central Nervous System through specialized sectors of weight distribution control, reorganize the muscular tension commands system in accordance with the information received by peripheral sectors namely the imbalance created by the excessive weight in different sectors of the body (obesity), by incorrect posture obtained for a long time during homework or studying, by carrying the school-bag only on one side thus bending the spine in that side, or shoes that do not fit with the form of the anatomical plantar foot. (Krugh.Ch.R & Keysor J.J., 1996; Penha.P.J et al., 2005).

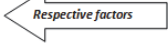
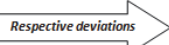
Our opinion about the discrepancy of the authors in this parameter is the inadequacy of the BMI test to find out its correlation with posture. We think that obesity negatively affects indirectly the posture. According to Krugh Ch.R & Keysor J.J., 1996 and Penha P.J et al., 2005, CNS is the one that commands muscular tension, while BMI has a negative effect on the calculation of "weight distributions" that makes the CNS, and deviations can occur after a relatively long time as a result of bad muscular tensions adopted by all kinetic chain due to reorganization of this excessive body weight. In this review article it is also included a detailed study of biomechanical responses of obese subjects (10-15 years old) conducted by Rosell A.A et al., 2010.

They highlighted that 30.17% of the subjects who resulted with forward gravity center projection were also identified with posture problems such as calcaneus valgus, hyper-extension and knee valgus, pelvic anterior-version and head protraction. They concluded that the displacement of the gravity center because of excessive body weight could lead to compensatory posture position to redistribute the body weight. These can be the causes of posture deviation. As fast as possible individuals will prevent long term effects of obesity, this can reduce risk of posture deviations appearance as result of increased BMI. Silva L.R et al., 2011 after investigating postural changes in obese and non-obese children and adolescents, showed no significant differences between obese and normal weight girls due to the presence of postural deviations. But the results indicated a higher prevalence of muscle pain on obese girls muscle compared to normal weight girls. Obesity is a factor that affects the appearance of postural deviations, but is not the main factor. Also, in this study, was quoted that "obesity increases the probability for the appearance of posture deviations. (Silva L.R et al., 2011)

While Nieto M.L et al 2010 analyzed the differences in the footprint and balance performance in school-aged children, being them in normal weight and overweight. The methodology he used was a photograph developer, fixer, and photo paper and a force platform. Participants of this study were twenty six school aged children (age = 11.6±0.5 years), 15 girls and 11 boys. Results showed significant differences between the two groups (with and without overweight) due to dynamic balance and static balance (with one leg). Based on the above study we cannot say that body weight affects negatively all types of balance. If the static balance test is realized in limited circumstances (stand on one foot), obese children exhibit a limited balance mainly in the case of static balance (standing on one foot) and the dynamic because they except the main task for establishing and maintaining the center of gravity inside surface of the support they also need to better manage their excess body weight. The review article realized by Purenovic .T et al., 2007 due to determination of the tendency of international studies (from 2000-2007) related to posture deviations among children and adolescents he underlined the existence of high prevalence of posture deviation among children of school age warning many of international scientists. He concluded that because of different methods used, the results obtained from 50 studies (25 national and 25 international) in this field have been different but not significant.

Although the results were different the main contexts were the same because all the studies indicate the negative impact of obesity on posture deviation in children, despite the fact that it is not the most important and the primary risk factor. A summary of the prevalence of poor posture and risk factors is well described at the table no.2 presenting what was discovered through this study related to this new generation problem.

**Table no.2.** Prevalence and risk factors of poor posture in children.

Author.	Examined subjects	Prevalence of poor posture (%)	Risk factors
<b>Kraténová .J et al 2007</b>	3520 children aged 7, 11, and 15 years from Czech Republic	Protruding scapulae 50% Lumbar lordosis 32% Round back 31%	Low level of physical activity
<b>Latalski .M et al 2013</b>	380 children aged 14, 175 girls and 205 boys from schools in eastern Poland and the Czech Republic.	1. A defect was detected in 14.7% of children 2. 30% were not aware if their body posture was normal or not	1. Low physical activity level 2. Economic standard of the family 
<b>Minoo et al 2013</b>	9-18 years old school female in Golestan province.	1. Lordosis 2. Kyphosis (16.7%)  3. Scoliosis (95.9%) 4. shoulders drop - one hand (105 subjects) - two hands (208 subjects) 5. hallux valgus	1. body weight 2. how they do the homework 3. how to sit 4. the way of carrying the bag and books 5. wearing inappropriate shoes
<b>Bueno R.C &amp; Rech R.R 2013</b>	864 children aged 8-15 years old from Southern Brazil	Dorsal kyphosis 16.6% for, Lumbar hyperlordosis 27.9% Scoliosis 33.2%	Backpack weight
<b>Ningthoujam. R 2014</b>	749 children (396 boys & 353 girls) aged between 9-13 years.	Flat Foot Deformities Genu Valgum Knock Knees Deformities Genu Varum Bow Legs Deformities } 40 (5.3%) from 794.	Inappropriate shoes.
<b>Rosell.A.A et al 2010</b>	35 overweight children aged between 10-15 years.	30.17% forwarded gravity center (Associated by postural alterations such calcaneus valgus, hyper-extension and knee valgus, pelvic anterior-version and head protraction.)	Body weight
<b>Silva.L.R et al 2011</b>	41 children aged 9-17 years (obese group (n = 33) & non-obese group (n = 18).	Obese boys showed greater alterations at knee's region. Obese girls reported to feel more pain than what non-obese girls has reported.	Body weight
<b>Nieto M.L 2010</b>	26 children aged 11.6±0.5 years ( 15 girls & 11 boys)	Greater Arch Index & Footprint areas Lower balance performance	Body weight

## 2. Results and Conclusions

At the end of this review article it is evident that children are facing more and more with poor posture incidences. These challenges have become a daily problem because of their behavioral changes caused by the modernization process. This process influences several life habits such as:

- Reduced level of physical activity.
- Increased probability of obesity appearance.
- Increased time spent watching TV or playing video games.
- Using automobilist transportation a lot.
- Bad nutrition (Fast-Food)

Moreover, these studies demonstrate that there are many other factors which negatively influence the normal curvature of "Posture" in children such as:

- How to do homework
- How to sit on the bench
- The way they carry their heavy school bag.
- Wearing uncomfortable shoes

Knowing these factors and their influences on children's "posture" is very important in order to prevent not only the appearance of postural deviation in children but also to reduce the possibility to face the consequences that these deviations cause in children's daily life. Postural deviations are a common problem among children caused by long-term effects of poor posture induced by modern lifestyle. For this reason, we conclude that "the diagnosis of postural problems

in children" should be performed as soon as possible in order to have time and more opportunities to improve the quality of our children's life. Based on the research articles included in this literature review, the most frequent deviations in children are: (Kratenova.J et al., 2007; Latalski.M et al., 2013; Minoo D et al., 2013).

- ✓ *Scoliosis (often caused by the way we sit, the weight of the bag),*
- ✓ *Kyphosis (how homework is done)*
- ✓ *Lordosis (weight).*

The literature review on the impact of BMI on the emergence of postural deviations in children even though "obesity" is not considered as the primary factor that negatively affects normal curvature of children's posture; it is shown that it increases the probability of the emergence of postural deviations in children. International studies have concluded that **there is a significant correlation between "obesity and the occurrence of postural deviations in children"** because of continued compensating actions of the posture to replace the center of gravity within the support area, we conclude **that early diagnosis and early treatment of obesity reduces the danger of the emergence of poor posture.** Through this review article we highlight that **"Poor posture" isn't only an "aesthetic problem"** any more but more than that. Children with postural deviation as a result of obesity showed a **low level of balance by conditioning motor performance** by hardening many of children's daily life activities.

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