EXERCISE AND QUALITY OF LIFE

Volume 7, Issue 1, June 2015

UDC 796.012.1-057.87:613.12

POSTURAL AND NUTRITIONAL STATUS OF STUDENTS FROM URBAN AND SUBURBAN ENVIRONMENT

Ksenija Radaković, Branka Protić-Gava, Tijana Šćepanović, Mića Radaković, Maja Batez and Milan Kojić

Faculty of Sport and Physical Education, University of Novi Sad, Serbia

Abstract

Monitoring postural and nutritional status is very useful for sheding light on problems in the process of growth and development of children. The aim of this study was to determine the difference in postural status of younger-aged school children of urban and suburban environment according to their nutrition.

Research sample included 497 male and female pupils from Novi Sad (251) and suburban environment (246), aged 11 and 12. Postural status was assessed using the method of somatoscopy and nutrition level with BMI calculator. The relation between the category of nutrition and the incidence of postural disorders was tested using a chi-square test at the significance level of $p \leq 0.05$.

The results show a statisticaly significant difference in pupils in terms of sagittal spine plane, chest and feet according to their nutritional status. Lordotic bad posture ($p=0.008$), right lumbar scoliosis ($p=0.007$), high arch foot ($p=0.043$) and flat feet ($p=0.007$) were the most frequent postural disorders in the normal weight pupils. The incidence of kypholordotic posture ($p=0.005$) and flat-chest ($p=0.002$) was significantly higher among pupils from suburban environment. The incidence of kypholordotic posture ($p=0.012$) was significantly higher in over-nourished pupils from the suburban environment.

Postural disorders and nutritional abnormalities significantly increase in children of the urban and suburban environment. Therefore, it is necessary to provide adequate conditions and include them in an organized physical exercise in order to prevent the occurrence of postural disorders and disorders of the nutritional status.

Key words: postural disorders, nutritional status, elementary school, urban and suburban environment.

Introduction

Monitoring nutritional status represents a manifold useful activity because it indicates the adequacy of the process of growth and development of children, helps in understanding the current, and may serve as a prognostic factor for their future health. Nutritional status of children can be evaluated based on clinical examination, laboratory procedures and anthropometric measurements (Zdravkovic, 2001). Disorders of nutritional

status go in two directions: on one side is malnutrition, which represents a personal, individual and general social problem of economically underdeveloped world countries, and on the other is obesity, which is becoming a growing social-health problem of the modern world (Markovic et al., 2008).

Unhealthy diet and lack of physical activity represent one of the main causes of certain diseases and postural disorders (World Health Organization, 2002). Based on this report for 2001, the World Health Organization adopted the act on the Global strategy on healthy diet, physical activity and health (World Health Organization, 2004), which emphasizes the importance of adopting the habit of regular physical activity as early as the childhood age. Unfortunately, the adoption of bad habits is already evident in children of school age. Hypokinesia first leads to the weakening of the energy exchange, then the basic physiological system and locomotor apparatus of a growing organism. The consequence of the aforementioned causes is the occurence of bad posture, which, not timely corrected, becomes a deformity. Postural disorders of the locomotor system can occur at any age, although there are certain periods in which the organism is more susceptible. These are the periods in which children are especially vulnerable, such as the period of starting school, so one should be extremely cautious when participating in their upbringing (Protic-Gava & Romanov, 2008).

The prevalence of obesity over the past two decades has been growing, both in the smaller and industrially developed countries (Centers for Disease Control and Prevention, 2012). Namely, the number of obese children and adolescents has tripled in the last three decades. Health problems caused by obesity during childhood can cause social and psychological problems that can worsen during adulthood (Dean & Flett, 2002). Therefore, the primary task is to discover bad posture and deformity in the early stages, and do everything to prevent its further development (Gojkovic, 2011).

The aim of this study was to analyze the frequency of postural disorders among primary school pupils in Novi Sad and the suburban areas according to the category of their nutritional status.

Methods

The sample of respondents included 251 pupils from primary schools in Novi Sad (PS "First Vojvodina Brigade", PS "Zarko Zrenjanin" and PS "Petefi Sandor") and 246 pupils from suburban primary schools (PS "Miroslav Antic" Futog, PS "Sveti Sava" Rumenka, and PS "Djura Jaksic" Kac), aged 11 and 12. The pupils were divided into subsamples - urban and suburban areas, and by gender - male respondents (270) and female respondents (227).

To determine the postural status we used the modified method of Napoleon Wolanski according to Radisavljevic, which means observing the body segments in the sagittal and frontal plane (Protic-Gava & Scepanovic, 2012).

Posture of the individual body segments was evaluated by the following assessments: zero (0) - normal physiological status, one (1) - less deviation from normal physiological status, two (2) - larger deviation from the normal physiological status (Radosavljevic, 2001).

While monitoring the posture of the body segments in order to determine the postural status, the respondents took a natural upright position, with the view directed forward, with arms relaxed beside the body. The respondents were minimally dressed and barefoot. The observation was carried out from a distance of 2-3 meters from the lateral, rear and front side (Sabo, 2006).

The nutrition status of the respondents was identified by the body mass index (BMI), for which it was necessary to measure the body height in centimeters (converted to meters) and body weight in kilograms. Body mass index was calculated as the ratio of body weight in kg square body height in meters - BMI = BW/BH2 - kg/m2 (Medved, 1987), using the criteria proposed by the World Health Organization (Ogden et al., 2002). Values below 5 percentile suggested malnutrition, values between 5 and 85 percentiles - normal nutrition, values above 95 percentiles - overweight.

The obtained results were processed in SPSS version 20. For determining the differences in postural status of pupils according to the category of nutrition, we used the nonparametric method of chi-square test.

Results

Tables 1 and 2 show the numerical and percentage distribution of postural disorders of the spine, chest and lower extremities in the total sample of respondents.

Table 1. Numerical and percentage distribution of postural spinal disorders in the total sample of respondents

Postural diorders	**Assessments of postural disorders**							
	Good posture (0)		Bad posture (1)		Extremely bad posture (2)		Total	
	Number	%	Number	%	Number	%	Number	%
Kyphosis	401	80.7%	90	18.1%	6	1.2%	497	100%
Lordosis	378	76.1%	101	20.3%	18	3.6%	497	100%
Kypho-lordosis	426	85.7%	60	12.1%	11	2.2%	497	100%
Flat back	447	89.9%	46	9.3%	4	0.8%	497	100%
Winged scapulae	165	33.2%	263	52.9%	69	13.9%	497	100%
Left chest scoliosis	438	88.1%	57	11.5%	2	0.4%	497	100%
Right chest scoliosis	443	89.1%	51	10.3%	3	0.6%	497	100%
Left lumbar scoliosis	485	97.6%	12	2.4%	0	0.0%	497	100%
Right lumbar scoliosis	486	97.8%	11	2.2%	0	0.0%	497	100%
Left chest-lumbar scoliosis	493	99.2%	4	0.8%	0	0.0%	497	100%
Right chest-lumbar scoliosis	484	97.4%	13	2.6%	0	0.0%	497	100%
Compensatory scoliosis L/R	489	98.4%	8	1.6%	0	0.0%	497	100%
Compensatory scoliosis L/R	486	97.8%	10	2.0%	1	0.2%	497	100%

Tabela 2. Numerical and percentage prevalence of postural disorders of chest and lower extremities in the total sample of respondents

Postural disorders	**Assessments of postural disorders**							
	Good posture (0)		Bad posture (1)		Extremely bad posture (2)		Total	
	Number	%	Number	%	Number	%	Number	%
Concave chest	429	86.3 %	63	12.7 %	5	1.0%	497	100 %
Protruding chest	463	93.2 %	31	6.2%	3	0.6%	497	100 %
Flat chest	463	93.2 %	26	5.2%	8	1.6%	497	100 %
„X“ legs	272	54.7 %	188	37.8 %	37	7.4%	497	100 %
„O“ legs	457	92.0 %	36	7.2%	4	0.8%	497	100 %
Leg hyperexstension	485	97.6 %	12	2.4%	0	0.0%	497	100 %
Flat foot	136	27.4 %	264	53.1 %	97	19.5 %	497	100 %
Concave foot	490	98.6 %	3	0.6%	4	0.8%	497	100 %

Chart 1 shows the percentage prevalence of nutritional status of the total sample of respondents.

Chart 1. The percentage prevalence of nutrition categories of the total number of respondents

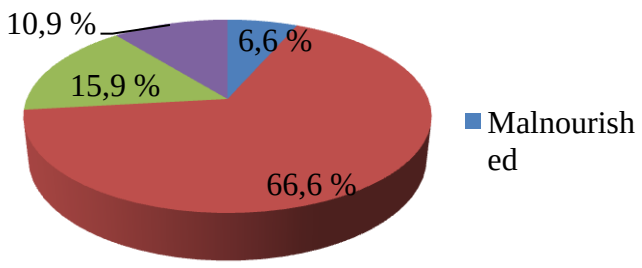

Table 4. Numerical and percentage prevalence of nutrition categories of the respondents in urban and suburban areas

Nutrition status	**Area**								
	Urban			Suburban			Total		
	N	% by ITM	% u by area	N	% by ITM	% by area	N	% by ITM	% by area
Malnuurishment	16	48.5%	6.4%	17	51.5%	6.9%	33	100%	6.6%
Normal nourishment	176	53.2%	70.1%	155	46.8%	63%	331	100%	66.6%
Over-nourishment	42	55.7%	16.7%	37	46.8%	15%	79	100%	15.9%
Obesity	17	31.5%	6.8%	37	68.5%	15%	54	100%	10.9%
Total	251	50.5%	100%	246	49.5%	100%	497	100%	100%

χ^2=9.037 df=3 p=0.029

The research results show statistically significant differences in postural status between urban and suburban respondents only in the categories of normal and over-nourished respondents. In normal weight respondents (Table 4), statistically significant differences were present in the sagittal plane (lordosis, kypho-lordosis and flat chest), frontal plane (right lumbar scoliosis), and feet (flat and concave foot). In over-nourished respondents the differences are manifested only in kypho-lordosis (Table 5).

Table 5. Numerical and percentage prevalence and difference in postural status of the respondents in urban and suburban areas according to normal nourishment

Postural disorders	**Normal nourishment**							
	Urban area			**Suburban area**			χ^2	p
	Good posture number (%)	Bad posture number (%)	Extremely bad posture number (%)	Good posture number (%)	Bad posture number (%)	Extremely bad posture number (%)		
Lordosis	134 (76.1%)	41 (23.3%)	1 (0.6%)	135 (87.1%)	17 (11%)	3 (1.9%)	χ^2=9.641	p=0.008
Kypho - lordosis	164 (93.2%)	11 (6.2%)	1 (0.6%)	126 (81.3%)	27 (17.4%)	2 (1.3%)	χ^2=10.760	p=0.005
Right lumbar scoliosis	168 (95.5%)	8 (4.5%)	0 (0.0%)	155 (100%)	0 (0.0%)	0 (0.0%)	χ^2=7.220	p=0.007
Flat chest	170 (96.6%)	6 (3.4)	0 (0.0%)	134 (86.5%)	16 (10.3%)	5 (3.2%)	χ^2=12.527	p=0.002
Flat foot	40 (22.7%)	101 (57.4%)	35 (19.9%)	59 (38.1%)	76 (49%)	20 (12.9%)	χ^2=9.976	p=0.007
Concave foot	169 (96.7%)	3 (1.7%)	4 (2.3%)	155 (100%)	0 (0.0%)	0 (0.0%)	χ^2=6.298	p=0.043

Table 6. Numerical and percentage prevalence and difference in postural status of the respondents in urban and suburban areas according to over-nourishment

Postural disorders	**Over-nourishment**							
	Urban area			**Suburban area**				
	Good posture number (%)	Bad posture number (%)	Extremely bad posture number (%)	Good posture number (%)	Bad posture number (%)	Extremely bad posture number (%)	χ^2	**p**
Kypho – lordosis	39 (92.9%)	3 (7.1%)	0 (0.0%)	25 (67.6%)	9 (24.3%)	3 (8.1%)	χ^2=8.781	0.012

Disscusion

The study was conducted in order to analyze the frequency of postural disorders among primary school pupils of Novi Sad and suburbs according to the category of their nutritional status.

Number of school-aged children with postural and nutritional disorders is increasing, which can result in serious problems if not removed in time. The nutritional status of children and young people is the subject of interest of many researchers (Freedman et al., 2007). Postural and nutritional disorders of children carry a risk of various health problems (Stanisic et al., 2005). A large percentage of children with postural and nutritional disorders is confirmed by the results of this study, where over 30% of respondents have a nutritional disorder, and over 50% of children have some of the postural disorders.

Relations between anthropological characteristics and postural status suggest that obese children have more postural disorders, especially of the feet, overweight and obese children have in time lower motor development, and have shown that 12-year old children, with a pronounced longitudinal dimensionality, are more susceptible to the spinal deformities, and with more subcutaneous fat tissue and circular dimensionality is more susceptible to foot deformity - flat foot (Djokic & Stojanovic, 2010).

Compared with children from urban areas, it is assumed that children from suburban and rural areas are deprived of many types of entertainment, and that their daily motor activity is significantly more intensive and more efficient. Daily chores of rural school children should require physical activity throughout the day, so their physical status, as a rule, has less deviations from normal. Research conducted on a sample of children from urban and rural schools point to dramatically lower percentage of postural disorders in children from rural areas, and flat foot is a postural disorder rarely seen in children from rural areas (Zivkovic & Karaleic, 1996).

Based on these results it can be concluded that the results of our study do not match the aforementioned study because the results show that children from suburban area have equal percentage of postural disorders compared to their peers in urban areas, and in some

segments even higher percentage of postural disorders, such as kypho-lordosis, flat chest and "X" leg, whereas the respondents from urban areas have better posture of these segments.

Research and evaluation of nutrition and posture status of respondents aged 11 to 12, shows a statistically significant difference in the aggregate assessment of posture in the respondents according to the BMI. Excellent (14.4%), very good (23.2%) and good posture (60%) of the body was found in the respondents in the category of normal nutritional status (Protic-Gava, Scepanovic, & Batez, 2015).

Children need to actively engage in physical activity, as early as possible in order to work on the prevention and elimination of obesity, malnutrition and postural disorders (Demesi & Mikov, 2012). Research shows that children with better motor skills have less or no postural disorders (Madic, 2006).

The American Heart Association and the American College of Sports Medicine recommend that children and young people should participate in 60-minute physical activity of moderate intensity on a daily basis in order to achieve positive health effects (Siljak, 2008).

This study, which was conducted in order to analyze the postural status of urban and suburban pupils, and detect differences according to their nutritional status, was based on the assumption that the respondents from suburban areas would have less postural and nutritional disorders (Protic-Gava & Krneta, 2010). However, the respondents from urban and suburban areas had the same percentage of postural disorders in certain segments, spine, while in some segments the respondents from suburban areas had poorer nutritional status (more obese respondents).

Based on the obtained results it can be concluded that statistically significant differences between the respondents from urban and suburban areas exist only in certain segments of the spine and feet in the category of normal and over-nourished pupils. There were no statistically significant differences in postural status in malnourished and obese respondents. The category of normal nourished respondents revealed statistically significant differences in lordotic poor posture and flat feet in favor of the respondents from suburban areas. Postural disorders of kypho-lordosis and a flat chest were found in more respondents from suburban areas. In the category of over-nourished respondents, a statistically significant difference between urban and suburban respondents was found only in the postural disorder of kypho-lordosis in favor of the respondents from urban areas.

According to these results it can be concluded that more attention should be paid to children from suburban and rural areas and provide them with equal conditions for physical activity and sport as children from urban areas have. This would avoid increasing postural nutritional disorders in children from less urban areas.

References

Centers for Disease Control and Prevention. (2012). Trends in the Prevalence of Extreme Obesity Among US Preschool-Aged Children Living in Low-Income Families, 1998-2010. *JAMA*, *308*(24), 2563-2565.

Dean, H., & Flett, B. (2002). Natural history of type 2 diabetes diagnosed in childhood: Long term follow-up in young adult years. *Diabetes*, 51, A24-A25.

Demesi, D., & Mikov, A. (2012). Postural status of preschool and early school age children. In M. Lazovic (Eds.), Anthology *"Congress of physiatrists of Serbia with international participation"* (pp. 65-69). Vrnjacka Banja: Physiatric association of Serbia.

Djokic, Z., & Stojanovic, M. (2010). The morphological characteristics and postural status of children aged 9 to 12 in Sremska Mitrovica. *General medicine, 16*(1-2). 41-49.

Freedman, D. S., Mei, Z., Srinivasan, S. R., Berenson, G. S., & Dietz, W. H. (2007). Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa heart Study. *J Pediatr. 150(1), 12-17, e2.* Taken from: Protic–Gava, Scepanovic and Batez (2015).

Gojkovic, D. (2011). Prevention of postural disorders of the spine in IV-grade children. Anthology of scientific and professional studied *"SPORT AND HEALTH"* Tuzla.

Madic, D. (2006). Relations between motor and postural status of preschool children in Vojvodina. In G. Bala (Eds.), Anthology *"Anthropological status and physical activity of children and youth"* (pp. 185-191). Novi Sad: Faculty of Sport and Physical Education.

Markovic, S., Igrutinovic, Z., Kostic, G., & Vuletic, B. (2008). Nutritional status and possible factors of etiopathogenesis of obesity in school children. *Medical Journal*, 1, 07-14.

Medved, R. (1987). *Sports medicine.* Zagreb: Yugoslav Medical Edition/JUMENA.

Ogden, C. L., Flegal, K. M., Carroll, M. D., & Johnson, C. L. (2000). Prevalence and Trends in Overweight Among US Children and Adolescents, 1999-2000. *Journal of the American Medical Association, 2*(288), 1728-1732.

Protic-Gava, B. (2008). The incidence of a particular posture type in relation to the BMI category in older school children. *Physical education (Skopje), 36*(2), 241-244.

Protic-Gava, B., & Krneta, Z. (2010). Postural status of early-school-age children in four districts of Vojvodina. *Gazette of the Anthropological Society of Serbia*, *45,* 375-383.

Protic-Gava, B., & Scepanovic, T. (2012). *Basics of kynesiotherapy and applied corrective gymnastics.* Novi Sad: Faculty of Sport and Physical Education.

Protic-Gava, B., Scepanovic, T., & Batez, M. (2015). The incidence of postural disorders according to the BMI of adolescents. *Montenegro Sports Academy, "Sport Mont", 43,44,45,* 233-238.

Radisavljevic, M. (2001). Corrective gymnastics with the basics of kynesiotherapy. Belgrade: Faculty of Sport and Physical Education.

Sabo, E. (2006). Postural status of preschool children in the territory of AP Vojvodina. In G. Bala (Eds.), Anthology *"Anthropological status and physical activity of children and youth"* (pp. 97-98). Novi Sad: Faculty of Sport and Physical Education.

Siljak, E. (2008). *Recreation research trend at the 10th ECSS Congress*. Graduate thesis. Belgrade: Faculty of Sport and Physical Education. Specified by: Mitic, D. (2011). The importance of physical activity in the prevention and treatment of obesity in childhood and adolescence. *Medical Journal, 16*(39), 107-112.

Stanisic, S., Djukic, V., Cantric, G., & Cimbaljevic, T. (2005). *The nutritional status of children before enrollment and prevalence of obesity (research report).* Berane: Children's medical center - Health center "Dr Nika Labovic".

World Health Organization (2002). *Diet, physical activity and health, Resolution WHA55.23.* Available at: *http://apps.who.int/gb/archive/pdf_files/WHA55/ewha5523.pdf*

World Health Organization (2004). *Global Strategy on Diet, Physical Activity and Health. Resolution* WHA57.1. Available at: *http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf*

Zdravkovic, D. (2001). Obesity in childhood and adolescence. *Clinical pediatric endocrinology*, 349-72.

Zivkovic, D., & Karaleic, S. (1996). *Relations of lordotic bad posture and morphological characteristics of children in prepuberty.* FIS Communications, Fifth International Symposium, Nis.