

IMPACT OF THE SCHOOL BAG ON THE POSTURE OF PRIMARY SCHOOL CHILDREN

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ABSTRACT: An indispensable part of equipment of any pupil is a school bag. Many consider that school bags are too heavy and they contribute to bad posture, that is increasingly common problem in younger children. The most timely health problem correlated with the adverse impact of school bags is lower back pain. The question is how much school bag affects imbalanced spine function and occurrence of improper body posture in children of developmental age. In order to find satisfying answer extensive research was conducted to determine correlation between improper carrying of heavy bag and paramorphic changes in posture, address preventive measures and procedures to combat this mass phenomenon in young people, as well as to examine type of posture in children from the first to ninth grade. The research was conducted on 358 pupils of primary school and based on the obtained result we can conclude that as many as 43,3% of pupils from the first to the ninth grade have some kind of posture deformity. Results of the research show that there is statistically significant difference between all grades in the weight of the school bag ($F=38,65$; $p=0,00$). By analysing HI-square test, it was determined the occurrence of statistically significant ($p<0,05$) difference by type of posture except in the first, second and ninth grade where results showed no statistically significant differences by type of posture ($p>0,05$).

Keywords: posture, posture disturbances, heavy bag, growth and development

INTRODUCCION

An indispensable part of pupil's equipment is a school bag. Many, especially parents consider school bags too heavy, but still we have no answers regarding dangers of school bags for child's health. The problem of school bag becomes even more problem of family, school and society. This problem has to be solved as systematic, preventive and protective measures that obliged the joint activities of parents, educators and teachers in the school. Poor posture is increasing problem in young children. Collecting data on children's growth and development and on impact of different endogenous and exogenous factors on their body at different ages is very important to understand growth and development and especially for proper and timely selection of preventive measures in order to ensure proper child's growth and development.

The most timely health problem correlated with adverse affect of school bags is lower back pain. Pain can occur throughout musculoskeletal system. Furthermore, poor posture, fatigue, exhaustion and consequently poorer concentration in school and poorer school achievement. Most of the available literature recommends weights of school bags up to 15% of child's weight because this weight is not related with health problems in children. School bag is often considered as a big culprit responsible for imbalanced spine function and occurrence of improper body posture in children of developmental age.

It is worrying that when enrolling in the first grade around 20% of children already have poor posture problems and this percentage is increasing so after completing the primary school it is 40%.

To find satisfying answer and scientifically based explanation, extensive research was conducted to determine correlation between improper carrying of (too) heavy bag and paramorphic changes of posture. Also, the aim of this work is to address preventive measures and procedures in order to combat this mass phenomenon in young people. Also, we wanted to examine how many children from the first to the ninth grade have a postural deformity i.e. their type of posture.

METHODS

The research was conducted on the sample of 358 pupils of the primary school Osnovna škola Bijakovići, Međugorje.

The research included pupils from the first to the ninth grade. Testing was approved by parents, principle of the school and ministry of education, culture and sport via written confirmation.

Pupils were tested by the clinical Adam's forward bend test, and in addition to physical examination and evaluation instruments for measurements are used as scoliometer, scale and central tape.

During the research we used anthropological measurement methods and all obtained results were processed in Statistica programme and by calculating:

- Descriptive statistics: mean, minimal score, maximal score
- Parametric methods: ANOVA
- Non-parametric methods: HI-square test

RESULTS

Table 1. Number and percentage of respondents with the bag 15% heavier than body weight

PUPILS WITH THE BAG 15% HEAVIER		
GRADE	F	%
FIRST	3	3,4
SECOND	2	2,2
THIRD	10	11,2
FOURTH	17	19,1
FIFTH	14	15,7
SIXTH	16	18,0
SEVENTH	16	18,0
EIGHTH	11	12,4
NINTH	0	0,00
NOTE: F – number of respondents ; % - percentage		

Table 2. Difference between grades in bag weight

BAG WEIGHT					
GRADE	F	MEAN	MIN	MAX	ANOVA
1	49	2,9	2,5	4	F=38,65 p=0,00
2	39	2,8	2	3,5	
3	44	3,9	3,5	4,5	
4	37	5,0	4,0	7,0	
5	44	5,4	4,0	6,0	
6	34	6,7	5,0	8,0	
7	42	6,9	5,0	8,0	
8	36	6,8	5,0	7,5	
9	33	6,6	4,0	8,0	
NOTE: F – number of respondents ; MEAN – average value ; MIN – minimal score ; MAX – maximal score; ANOVA – analysis of variance ; F – value of ANOVA test; p – level of significance of error					

Table shows results of descriptive statistics and difference between grades in bag weight from the first to the ninth grade tested by the parametric

independent ANOVA test. Results show that there is statistically significant difference between all grades in school bag weight ($F=38,65$; $p=0,00$).

Table 3. Difference of respondents by type of posture

GRADE	NORMAL POSTURE	POSTURAL DEFORMITY	SCOLIOSIS	KYPHOSIS	FLAT BACK	COMBINATION KYPHOSIS/S COLIOSIS	χ^2 (p)
FIRST	1	2	0	0	2	0	5,82 (0,32)
SECOND	2	0	0	0	0	0	8,08 (0,15)
THIRD	4	6	4	2	0	0	11,29 (0,04)
FOURTH	4	13	6	2	5	0	20,00 (0,00)
FIFTH	9	5	1	1	1	1	18,67 (0,00)
SIXTH	9	7	5	0	2	0	18,64 (0,00)
SEVENTH	10	6	4	2	0	0	20,93 (0,00)
EIGHTH	8	3	1	2	0	0	19,71 (0,00)
NINTH	0	0	0	0	0	0	
NOTE: χ^2 - HI-square test; p – level of significance of error							

The difference of respondents by type of body posture for each grade is calculated by HI-square test. Calculated χ^2 value and corresponding minimal error of statistical conclusion indicates that in each grade there are statistically significant ($p < 0,05$) differences by type of posture except in the first, second and ninth grade where results show no statistically significant differences by type of posture ($p > 0,05$).

DISCUSSION

The research conducted on 358 pupils of primary school from the first to the ninth grade indicates that each group of pupils i.e. each grade has pupils with improper posture (poor posture). Based on the research it can be concluded that as many as 43,3% of pupils from the first to the ninth grade has some form of posture deformity (kyphosis, scoliosis, lordosis, normal, chest deformity, flat back, flat back, chest deformity, normal, funnel-shaped chest, kyphosis etc).

Namely, according to the Croatian Health Statistics Yearbook for 2010, at the physical check-up for pupils for the year 2009/10, improper body posture was recorded in 20% of pupils of primary and 27% of pupils

of secondary school. More serious health problems and deformities as brachial plexus damage with clenched arm and breathing problems also can occur but still rarely. There is no scientific evidence on correlation between structural spine curvatures (scoliosis, kyphosis) with school bags.

But a recent study of American and New Zealand authors (Kistner and et.; Mackie HW and Legg) showed that bag weight should be limited to as much as 10% of child's weight because a weight of 15% or 20% compared to 10% increases chances of tilting head forward, subjective health disturbances of a child like fatigue, exhaustion and back pain and difficulties in walking and balance.

In some European countries, the law stipulates that weight of school bag must not exceed 10% of child's body weight (Fošnarič, 2007; Gent et al., 2006). Many researchers conducted worldwide indicate that school bag weights exceed allowed value and range from 10 to 14% (Whittfiel, 2001; Fošnarič, 2007). A recent studies in some Dalmatian primary schools in pupils of all grades showed that the average school bag weight

in relation to pupils' weight range from 12,5% to 13,8% (Paušić i Kujundžić, 2008).

According to children body weight curves in Croatia, children weight aged 6,5 years is on average 24 kilograms or 95% of pupils start the first grade of primary school with the body weight of 18 to 37 kilograms. If we take recommendation of 15% of a child's body weight than school bag of the pupil in the first grade on average should not be heavier than 3,6 kilograms (for 95% of pupils between 2,7 to 5,6 kilograms). More strict criteria (10%) that limits an average bag weight to 2,4 kilograms (for 95% of pupils between 1,8 and 3,7 kilograms). Question is whether is this criteria feasible since school bags are much heavier in reality (according to some measurements over 7 kilograms). Problem of heavy bags is noticed not just in our countries but also in other 115 countries. Interestingly, in Italy an average weight of school bags is measured at 8 kilograms a maximum of even more than 12 kilograms (Šimetin, I.P., 2012)

Problem of heavy bags is global problem recognised in many European and world countries. This is evidenced in many scientific researches conducted and published in this area. Furthermore, many countries have taken concrete actions within national strategic documents, for example: Ministry of Education of Malta adopted in 2000 document of strategic importance on fight against heavy school bags (Handling of Heavy school bags Report 2000) where they recommend the weight of school bag to be up to 10% of pupils' body weight and not more than 20% and they give recommendation to achieve this goal. In Hong Kong national guidelines are given to reduce school bags weight. The Central Bureau of Education in India adopted guidelines to reduce school bag weight. Although these countries are culturally and geographically very different, it is surprising how much problems are similar and some solutions and recommendations have universal value. Kosinac many times has examined school bag weights of the pupils in primary school in Split (1976,1989,1996). In 1976 author has determined on the sample of 24 pupils of the first, second, third and fourth grade of the primary schools in Split the following: an average school bag weight in the first grade was 2,4 kg, in the second grade 2,8kg, in the third grade 3,5kg and in the fourth grade 3,9kg. Ten years after (in 1986) an average school bag weight increased for the first grade to 2,7kg, for the second grade to 3,2kg, for the third grade to 4,1kg and for the fourth grade to 4,9 kg. Comparative analysis of the school bag content and official weekly schedule on the date of inspection the author has determined: pupils of the first grade had in the bag 32% of didactic material (textbooks, notebooks, maps, drawing supplies etc) that were not predicted by the schedule for that day. In the second grade there were 37% of unnecessary didactic material, 39% in the third and 35% in the fourth grade.

The obtained indicators in this preliminary research were a justified determinant for one comprehensive research conducted in 1996 in Split in the primary school Dobri (Kosinac, 2004).

Researches on human posture has led us to conclusion that there is no universal model of good posture. However, we can make effort to give the best definition of good posture where the good posture is the one where the body makes least effort to maintain stable balance. In younger children poor posture is becoming more pronounced. Collecting data on children growth and development and on impacts of different endogenous and exogenous factors on their body at different ages is important to understand growth and development and especially for proper and timely selection of preventive measures to ensure proper growth and development of a child.

In this research it was found that an average school bag weight in pupils of primary school from the first to the ninth grade is 12,3% of the average pupil's body weight.

To find satisfying answer and scientifically based explanation of the problem, we conducted extensive research to determine correlation between improper carrying of (too) heavy school bag and paramorphic posture changes. The most of available literature recommends school bag weight up to 10%-15% of a child's body weight because this weight is not related to health disturbances in child.

Problem of heavy school bags is a global problem recognized in many European and world countries. This is evidenced by large number of scientific researches conducted and published in this area. Heavy school bag creates health problems in proper development (mostly posture problems that lead to spinal deformities). Throughout this research it can be concluded that as many as 43,3% of pupils from the first to the ninth grade have some kind of posture deformities, and school bag weight in primary school pupils from the first to the ninth grade is 12,3% of the average pupils' body weight.

With special proposals and measures school can contribute to reducing pupils' bags in terms of adjusting schedules, setting up lockers for unnecessary things etc. In addition to this, additional education of teachers, pupils and parents about harmfulness of school bag to health is necessary. Producers of school bags should take care of this and contribute to the solution through propaganda and educational activities. Short instructions and demos on proper carrying of the school bag would be useful for children, parents and teachers and very concrete and instructive contribution in protection of child's spine.

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