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Back Pain in Children and Adolescent

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ABSTRACT

Background: Regular physical activity promotes health and prevents development of many diseases. The prevalence of sedentary lifestyle related to physical inactivity in children and adolescents increases together with the decline of the needs and opportunities to be physically active.

Aim: The aim of this study was to determine whether the respondents suffer from back pain.

Methods: The total number of respondents was 5,433. The respondents' age ranged from 6 to 21 years. There were 49.7% girls and 50.3% boys. The research survey was of a quantitative nature. The data was collected using a non-standardized questionnaire focused on the healthy lifestyle of children and youth. The Statistica 10.0 programme (StatSoft, Tulsa, OK) was used for statistical processing. The Pearson's chi-quadrate test was used to analyse the collected data. Data was also evaluated using the adjusted residuals with 5% level of significance.

Results: The girls in the questionnaire survey (58.5%) reported back pain more often than boys (36.5%). Girls suffer from back pain 1.6x more often than boys. Almost half of the respondents suffers from back pain as 47% of all respondents said their back was aching. Both girls and boys are involved in some physical activity for 31–60 minutes a day. When performing intensive body activity (181+ minutes/day), the back pain affects girls (78.2%) more than boys (39.5%). Approximately the same percentage of girls (37.7%) and boys (40.7%) spend 241 and more minutes a day in physical passivity. There is a relation in the sense that the number of respondents who do not suffer from back pain decreases with their increasing physical passivity.

Conclusions: In general, we can say that both groups of girls and boys with a daily physical activity rate of up to 20% show increased back pain, but not statistically significant. There is a confirmed statistical dependence between the rate of daily physical activity and back pain across the research sample.

KEY WORDS

back, pain, survey, students, physical activity

INTRODUCTION

Back pain is a frequent health issue among children in school age. The prevalence of back pain increases with age, in particular in early adolescence. Recurring back pain in childhood may be a predecessor to back pain in adulthood (1). A higher sensitivity to back pain is common during a growth spurt. Studies indicate that in adolescence, girls suffer from back pain more often than boys (2, 3). Children in adulthood and towards the end of puberty in particular should not do sport activities involving lifting heavy weights. There are several factors which affect back pain, such as genetic, physiological, anthropometric, psycho-social characteristics, age, smoking, gender, the rate of physical activity, time spent in front of TV and with computers, weight and type of school bags, the duration and position while sitting, obesity, socioeconomic situation and several other factors (4). Other risk factors for developing back pain among adolescents are connected with sports activities involving hyperextension – such as gymnastics, the number of training hours, back injury and a rapid growth. Some sports activities are adjusted to the age of the athletes, e.g. activities on a football pitch, where the playing time is shorter for younger players. Other sports are not so easily adjustable to children's vulnerability, such as gymnastics, where hyperextension is very common. It is thus possible that some sports activities might damage the development of the spinal column, while other activities could be beneficial for children and adolescents (3). It is a para-

dox of the present day that a world-wide technological development, urbanisation, and car transport within and outside the city eliminate the needs and opportunities for a regular physical movement among children and adolescents. The needs and opportunities to be physically active are on the decline and a sedentary lifestyle with physical passivity prevails (5). Physical activity, health and quality of life closely interrelated. The human body is made for movement and for this reason, a regular physical activity is necessary for the optimum functioning of the body and prevention of diseases. It has been proved that a sedentary lifestyle is a risk factor for developing several chronic diseases, including back pain. Children and adolescent take part in various types of physical activities, such as playing games and doing different sports. However, with new patterns of spending free time (TV, internet, videogames), their everyday habits have changed. School children should do at least 60 minutes of a moderate to high physical activity daily in a form which takes into consideration their developmental stage, brings joy and includes various activities. A full dose of physical activity can comprise of several activities lasting at least 10 minutes. In groups of young children, the emphasis should lie of the development of motor skills (6). Problems with the locomotor system are the third most frequent cause for a long-term medical observation amongst children (after allergies and sensory defects). Adequate physical activity – best performed as an organised activity – has a positive effect on the locomotor system. It is important to have a suitable physical regimen in the school environment where children spend most of their time and where they are exposed to a long-term unilateral load (7).

AIM

The aim of the study was to ascertain whether the respondents suffer from back pain. The survey was carried out in the Olomouc region in 12 selected elementary and 3 secondary schools which agreed to take part in the research.

METHODOLOGY

The schools in the Olomouc region were selected randomly. Head teachers were addressed to agree or disagree with participation in the survey. Parents of children involved were asked to sign an informed consent prior to the survey. Schools and parents who did not give the permission were excluded. A piloting study was carried out prior to the survey in order to verify comprehensibility of each item in the questionnaire.

The research sample comprised of 5,027 pupils of elementary schools and 399 students of secondary schools in the Olomouc region, 5,426 in total. 7 respondents did not give their age. The total number of respondents was 5,433. The piloting was carried out on a random sample of respondents and verified the comprehensibility of the items. The age ranged from 6 to 21 years. There were 49.7% of girls and 50.3% of boys. The research was of quantitative design. Data was collected using a non-standardised questionnaire designed by the authors. The items in the questionnaire focused on back pain related to activity or passivity and were part a larger questionnaire on healthy lifestyle in a broader sense. The items were as follows:

1. Do you suffer from back pain? (choices: yes, no, sometimes).
2. How many minutes a day are you involved in the following activity? (choices: physical exercise, watching TV, sitting at a computer, reading books and listening to music).

Members of the research team helped respondents from lower elementary with completing the questionnaire. The survey was carried out anonymously and according to ethical norms for a research survey.

The statistical software Statistica 10.0 (StatSoft, Tulsa, OK) was used for data processing. To analyse the data, the Pearsons's chi-squared test was used. The value calculated with the chi-squared test was compared to the critical value corresponding to the selected significance level (usually 5%) with the given degree of freedom. In this statistical method, the critical significance level was set at 5% (each statistical significance level is available on demand with main author). The data was also evaluated using adjusted residuals.

For graphic representation of adjusted residuals, the following sign scheme was used:

- abs(z) >= 3.29 was replaced with +++ or – – –
- abs(z) >= 2.58 was replaced with ++ or – –
- abs(z) >= 1.96 was replaced with + or –
- for abs(z) < 1.96 we put 0

Which corresponds to categories:

0	= statistically insignificant
+, –	= a significant deviation on a 5% significance level
++, – –	= significance from 0.1% to 1%
+++, – – –	= probability of a random deviation lower than 0.1%

In the results section, physical activity is divided into six categories, which emerged from the answers. Physical passivity is divided into seven categories, which also emerged from the answers.

RESULTS

Back pain and daily physical activity of the sample

Table 1 shows the daily physical activity amongst girls and boys in relation to back pain. Physical activity is given in minutes and is divided into 6 categories (0 – no answer or no physical activity, 1–30 minutes, 31–60 minutes, 61–120 minutes, 121–180 minutes, 181and more minutes). The values were tested using the chi-squared test and a statistically significant relationship was discovered between physical activity and back pain. The significance level was set at $\alpha < 0.05$.

The daily rate of back pain was higher in girls than in boys. Back pain was reported by 58.5% of girls and 35.6% of boys. 47% of the respondents suffered from back pain. Girls spent most often 31–60 minutes doing a physical activity. (27.8%). 28.3% of girls spent 61+ minutes doing a physical activity. 17.8% of girls reported 0 minute. There were 3.9% of girls who reported daily physical activity exceeding 181 minutes and their back hurt in 78.2%.

Boys most often spent 31–60 minutes a day doing a physical activity, i.e. 30.7%. 36.2% of boys spent more than 61 minutes daily doing a physical activity. 15.1% of boys reported 0 minutes of physical activity. Only 3.3% of boys reported doing a physical activity for more than 181 minutes a day and their back hurt in 39.5%.

Daily passivity and back pain

Table 2 shows daily physical passivity amongst girls and boys in relationship to back pain. Physical passivity is given in minutes and is divided into 7 categories (0 – no physical passivity or not answered, 1–30 minutes, 31–60 minutes, 61–120 minutes, 121–180 minutes, 181–240 minutes and 241 and more minutes). The values were tested using the chi-squared test and a statistical significant relationship between physical passivity and back pain was discovered in both sexes. The significance level was set at $\alpha < 0.05$.

Girls most frequently spent 241 and more minutes of physical passivity a day (37.7%) and their back hurt in 69.3%. Physical passivity of 0 minutes was reported by 10.9% of girls.

Boys also spent more than 241 and more minutes of physical passivity a day (40.7%) and their back hurt in 45.8%. No daily physical passivity was reported by 11.3% of boys.

Back pain and daily rate of physical activity

Table 3 shows the daily rate of physical activity amongst girls and boys in relationship to back pain. The rate of daily physical activity is expressed as a rate between the time of a daily physical activity and passivity and is given in %. The range is 0–100%. All categories were tested using the qui-squared test. No statistically significant relationship between the rate of daily physical activity and back pain was discovered amongst girls, however, this relationship was discovered among boys. The significance level was set at $\alpha < 0.05$.

The highest daily rate of physical activity was in category 1–20% (39.1% of girls) and this category also shows back pain most frequently. With high daily rate of physical activity in category 81–100%, 51.8% of girls suffered from back pain, however, no statistical relationship was found. With boys, the highest daily rate of physical activity was in category 21–40% (37.2% of boys) and in this category, 35.5% of boys suffered from back pain. Within high daily rate of physical activity (81–100%), 16.9% of boys suffered from back pain.

Table 1 Daily physical activity and back pain amongst boys and girls

Daily physical activity (mins)	Girls			Boys			Boys and girls		
	Back pain		Total (n=2621)	Back pain		Total (n=2638)	Back pain		Total (n=5259)
	Yes (n=1532)	No (n=1089)		Yes (n=940)	No (n=1698)		Yes (n=2472)	No (n=2787)	
	n	n	N	n	n	n	n	n	n
0	291	172	463	145	253	398	436	425	861
1–30	353	334	687	143	333	476	496	667	1163
31–60	390	338	728	282	528	810	672	866	1538
61–120	326	169	495	254	415	669	580	584	1164
121–180	93	54	147	82	117	199	175	171	346
181+	79	22	101	34	52	86	113	74	187

Legend: n – number of respondents

Table 2 Daily physical passivity and back pain amongst girls and boys

Daily physical passivity (mins)	Girls			Boys			Girls and Boys		
	Back Pain		Total (n=2621)	Back Pain		Total (n=2638)	Back Pain		Total (n=5259)
	Yes (n=1532)	Ne (n=1089)		Yes (n=940)	No (n=1698)		Yes (n=2472)	No (n=2787)	
	n	n	N	n	n	n	n	n	n
0	169	117	286	76	221	297	245	338	583
1–30	13	23	36	15	44	59	28	67	95
31–60	47	62	109	22	90	112	69	152	221
61–120	191	256	447	76	257	333	267	513	780
121–180	237	194	431	131	297	428	368	491	859
181–240	191	134	325	128	207	335	319	341	660
241+	684	303	987	492	582	1074	1176	885	2061

Legend: n – number of respondents

Table 3 The rate of daily physical activity and back pain amongst girls and boys

Rate of daily physical activity (%)	Girls			Boys			Girls and Boys		
	Back pain		Total (n=2621)	Back Pain		Total (n=2638)	Back Pain		Total (n=5259)
	Yes (n=1532)	No (n=1089)		Yes (n=940)	No (n=1698)		Yes (n=2472)	No (n=2787)	
	n	n	N	n	n	n	n	n	n
0	291	172	463	145	253	398	436	425	861
1–20	590	436	1026	334	530	864	924	966	1890
21–40	481	351	832	348	633	981	829	984	1813
41–60	143	107	250	80	162	242	223	269	492
61–80	13	10	23	20	56	76	33	66	99
81–100	14	13	27	13	64	77	27	77	104

Legend: n – number of respondents

Table 4 The rate of daily physical activity and back pain amongst girls and boys expressed using adjusted residuals

Rate of daily physical activity (%)	Girls		Boys		Girls and Boys	
	Back Pain		Back Pain		Back Pain	
	Yes	No	Yes	No	Yes	No
	AR	AR	AR	AR	AR	AR
0	+	–	0	0	+	–
1–20	0	0	+	–	+	–
21–40	0	0	0	0	0	0
41–60	0	0	0	0	0	0
61–80	0	0	0	0	– –	+ +
81–100	0	0	– – –	+ + +	– – –	+ + +

Legend: AR – adjusted residuals, 0 = statistically insignificant, +, – = significant deviation on 5% significance level, ++, – – = significance from 0.1% to 1%, +++, – – – = probability of a random deviation less than 0.1%

The values of adjusted residuals were replaced with sign scheme (+++, ++, +, 0, -, --, ---). The adjusted residuals indicate that the group of girls who suffer from back pain with zero daily rate of physical activity is slightly overrated (AR value +). Among boys, the group who suffer from back pain with the daily rate of physical activity 1–20% is slightly overrated. There is a highly overrated group (AR value +++) of boys who do not suffer from back pain with the daily rate of physical activity 81–100%. These are boys whose daily physical exercise was above the, i.e. significantly more than given by the WHO.

DISCUSSION

Physical activity is one the basic human activities and it is a prerequisite for physical as well as psychological wellbeing. It is the essence of a healthy life. The WHO recommends children and adolescents take at least 60 minutes of physical exercise a day with moderate intensity. A higher rate of physical activity might bring health benefits for children and adolescents. The growing rate of physical passivity is alarming. Only 34% of European adolescents aged 13–15 are physically active in the required amount. Physical passivity contributes to the increasing numbers of obesity amongst children in Europe, in particular amongst children from poorer socio-economic background. In most European countries, the rate of physical activity amongst young people aged 11–15 is dropping significantly, especially among girls of this age group. Children and adolescents spend more time at school than ever before, the school demands are higher and can shorten the time available for physical activity and doing sports (8). In our study, girls and boys took most frequently 31–60 minutes of physical exercise a day. Only 28.3% of girls and 36.2% of boys met the norm for daily physical activity recommended by the WHO, which suggests 60 minutes a day.

Authors Kratěnová and Žejglicová (7) studied the occurrence of headaches, neck and low back pain. Back pain (regardless of the affected area) was more often reported by girls and children with a bad posture. Amongst children with a bad posture, headaches were significantly linked with neck pain.

When comparing the occurrence of pain among children who do some sport (organised or not) with children who do not do any sport, no differences were found. When a specific sport was taken into consideration, there was a higher occurrence of pain in the low back area. This was the case of basketball of volleyball, dance/ballet/aerobic for girls and children doing Asian sports. Children spent on average 4 hours a day doing a physical activity and spent on average 14 hours a week watching TV, playing video and PC games. The respondents in our survey were asked to specify the area of back pain. When answered, the lumbar region was the most frequent place. Yet 3,065 respondents (56.4%) did not answer this item in the questionnaire. We can only speculate about the reasons: the question was not clear, the respondents are not familiar with spinal regions…

The first international cross/sectional study "Health Behaviour in School-Aged Children" (hereafter as HBSC) was carried out in 2013/2014 and included 219,460 school-aged children from the Czech Republic, Slovakia, Hungary, Poland and Ukraine. In terms of regular physical exercise, the Ukrainian and Slovak pupils and more active than the average of the HBSC and rank among the first ten countries with the highest percent of active school children. With Czech, Hungarian and Polish pupils, their daily physical activity is comparable to the HBCS average. Children from Slovakia watch TV for two and more hours a day more often in comparison to other countries involved in the HBSC across all age categories. Slovakia also ranks among the first ten countries with the highest percent of school-aged children watching TV for two and more hours on work days. By contrast, Hungarian children are below the average in the time spent daily watching TV and ranked among the first ten countries with the lowest occurrence of children watching TV for two and more hours a day (9).

A study focused on back pain among 15 and 16-year-old children was conducted in the northern part of Finland. Physical activity was examined using a questionnaire among 4891 boys and 4587 girls. Back pain was reported by 32% of boys and 45% of girls. Boys were more physically active than girls at the age of 15–16. Boys also spent more time at a computer than girls, while girls spent more time reading than boys. In general, boys spent more time being physical passive than girls. Passivity in terms of sitting for more than 4 or more hours a day was linked to back pain among girls, but not among boys. Various types of passivity, such as watching TV, reading books and magazines, working with a computer, or other types of these activities were not significantly linked to back pain. Physical activity was linked to back pain among very active respondents who spent 6 and more hours doing a physical activity, both among girls and boys (10).

In our survey, girls reported back pain more often than boys. Girls suffered form back pain 1.6x more often than boys. About the same percentage of girls and boys in our study spent 241 and more minutes daily being physically passive. There is a relationship

between increasing physical passivity and fewer respondents with no back pain. With high physical activity (181+ minutes a day) girls suffered from back pain more often than boys.

Another survey was carried out in south Portugal. The sample comprised of 966 adolescents aged 10 to 16. Back pain was studies using a questionnaire. In the last year of the period in question, 456 (47.2%) respondents suffered from back pain and 600 (62.1%) respondents reported life-long experience with back pain. Girls reported back pain twice as often compared to boys (11).

Physical activity has been vanishing for the past 25 years from the lifestyle of children and adults in the Czech Republic. Current monitoring of physical activity clearly shows that the majority of children in the Czech Republic do not reach the recommended 60 minutes of physical activity a day. Only about 25% of boys and 20% of girls meet the international recommendations, statistically significant differences are speak against girls. When observing the rate of sedentary behaviour and passive ways of spending free time amongst children, we come to the opposite conclusions, i.e. the overall rate of sedentary lifestyle has been increasing over the past decade, in particular the time spent with a computer or a tablet. The amount of time spent watching TV has not significantly changed over the past 10 years (12).

Another survey focused on back pain and physical activity was carried out in Denmark with a sample comprised of 9,433 adolescents (3,956 boys and 5,457 girls). In this study, 43% of girls and 37% of boys reported back pain. More girls reported back pain within the past month and it was also discovered that taller respondents reported back pain more often than others. The authors also state that complaints about back pain may not indicate a disease of a severe problem in this area. 40% of respondents aged 17 reported back pain. More than 40% of respondents saw a doctor due to back pain (13).

Another study by Hasler (14) claim that 5–6% of children in Germany (400,000 out of 7.2 million aged 8–16) suffer from severe back pain with serious or grave limitations in their daily life. In Switzerland, 27,500 out of 500,000 children are affected. Chronic back pain does not focus only on pain as a symptom, but also on the consequences. Pain might have a considerable impact of daily activities, may prevent a child from doing sports or may lead to school absence. Insufficient physical fitness or top-level sports might be risk factors for developing common functional back pain, especially during pubertal growth.

LIMITATIONS

There are several limitations to this survey. A non-standardized questionnaire which had not been tested for validity or reliability was used as a research tool. The number of respondents from secondary schools involved in the survey was low 399 (7.3%) compared to 5,027 respondents from elementary schools (92.5%). The results cannot be applied to the entire child population, but are rather locally limited. Respondents from lower elementary schools may have not answered the item no. 3 in the questionnaire correctly. In item no. 1, the two categories *sometimes* and *yes* were merged. The sample was not divided into age categories. A potential benefit of the survey might be in the large sample involved.

CONCLUSION

The authors suggest a follow-up survey investigating the causes of back pain amongst children and adolescents and to analyse why girls suffer more from back pain and at what age the back hurts the most. Healthcare professionals should then focus on these individuals in their preventive care and thus prevent the increasing number of back pain sufferers amongst adult population. A follow-up survey could also be added with scales evaluating possible symptoms of depression and stress in connection with back pain amongst these individuals. Another factor, which might be investigated, is the socio-demographic effect on back pain – a nuclear family, adoptive parents, ethnicity, etc. At present, there are very few studies dealing with the correlation between smoking and back pain amongst children. Smoking may also be indirectly linked to psychic or social problems, which are the most common cause of developing back pain in children and adolescents.

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