

SCHOOLTIME PHYSICAL ACTIVITY IN LOWER PRIMARY SCHOOL PUPILS

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Abstract: *The paper presents recent findings on children's physical activity during the time they spent at school. The research was carried out in 2009. The research method involved a detailed school-day time snapshot, among others showing the volume of physical activity, the intensity of physical strain, and the range of school physical activities. 138 children aged 7–11 attending various Czech primary schools participated in the survey. The results suggest that most Czech schools do not take advantage of available opportunities supporting health and physical activity in children sufficiently. The findings can contribute to improving pupils' school regimen and designing programmes promoting their healthy lifestyle.*

Key words: *physical activity, school physical activity, lower primary school children, day time snapshot*

Introduction

A lack of physical activity (PA) has negative consequences for population health. Regular physical activity adequate to age and physical and psychic predispositions can influence individuals' health, especially their fitness.

The recommended limits for volume, intensity and range of physical activity are based on specific differences among children. The National Association for Sport and Physical Education states recommendations for physical activity from early preschool age. As for lower primary school children, longer physical activity of mild or moderate intensity lasting at least one hour a day is recommended. Activities of greater intensity are recommended to last from 5 to 15 minutes and they should be interrupted by rest periods. Continual physical activity of high intensity is not considered appropriate (Corbin, Pangrazi, Le Mesurier, 2002; Corbin, Pangrazi, 2003).

Varied spontaneous, organised and motivating activities should be natural part of children's week routine. These activities also include physical activities pursued at school.

Methodology starting points

Data obtained by direct observation represent a traditional method deployed when monitoring PA (Brown et al., 2006). Its main advantage is that observed children are not limited in movement by devices, whereas incomplete records of the observed data and a risk of subsequent misinterpretation are substantial shortcomings.

Questionnaires are also very common. The main advantage of this method is smooth realization of the research, while the shortcomings consist especially in low validity, reliability and objectivity of respondent's statements (Shephard, 2003).

Other techniques include e.g. individual records, time snapshots, physical activity dairies, and individual or group interviews (Henry, Webster-Gandy, Elia, 1999).

Accelerometers recording the acceleration of a body or the movement of its parts are also often used for monitoring PA. These devices can be deployed when locomotion activities (walking, running, jumping etc.) are expected to prevail in the physical regimen of the researched subjects. On the contrary, they are not appropriate when measuring cycling, skating/roller-balding, swimming etc. Some children may develop aversion to measuring due to devices being attached to them (Trost, McIver, Pate, 2005). Therefore, strong motivation is needed, and negative reaction on the side of children needs to be considered.

Finally, pedometers recording vertical acceleration of the body when walking, running, jumping etc. are appropriate tools for monitoring physical activity too. The standard measuring unit is a number of steps per a certain period. Placing a pedometer on a body is similar to that of an accelerometer (Sigmund, Frömel, Neuls, 2005). Measured data are presented in an easy and straightforward way, which can contribute to individuals' motivation (Miklánková, 2009).

Many researchers study the influence of school physical regimen on the overall quality of daily physical activity (Cox et al., 2006); however, the main focus has been placed on older children. The longitudinal research pursued by Sigmund and his team (2007) concluded that a daily number of steps significantly decreases just two months after starting compulsory school attendance. The importance of walking in daily routine is stressed also by the WHO.

The opportunities of pupils' school physical activity (SPA) are not restricted just to physical education classes. In the Czech Republic, lower primary school instruction involves the following forms of SPA: exercises before the start of the classes (Mužík, Krejčí, 1997), "PE moments" in lessons (Hnízdilová, 2006), activating teaching method "learning in motion" (Jonášková, 2009), and movement-relaxation breaks (Mužík, Krejčí, 1997). Another important SPA is walking, especially transfers between classrooms, and then biological and geographical excursions, school trips etc. Combining the above mentioned activities can provide 60 minutes of SPA a day, not including physical education. The question is to what extent the above forms of SPA are exercised in schools.

Research problem

The empiric research described in this paper focuses on physical activity in lower primary school children. The key research question is stated as follows: *What are the*

volume, intensity and range of school physical activity in lower primary school pupils?
 The key question implies several partial research questions:

1. What are the common characteristics of SPA in lower primary school?
2. Is there a difference in the volume and intensity of SPA between girls and boys?
3. Is there a difference in the volume and intensity of SPA among individual years?
4. What are the relations among the observed variables of pupils' SPA?
5. How do pupils assess their own (individual) physical activity?
6. How do pupils assess their class teacher's concern over their physical activity?
7. What recommendations can the findings lead to?

Research methodology

The research method involved a questionnaire for children aged 7–11 designed and verified by the researchers. The questionnaire survey was used to obtain data from a large number of Czech primary schools.

The questionnaire contained closed questions concerning respondents' personal data (age, gender), and then closed questions focusing on respondents' views of sufficiency of individual physical activity, and teachers' concern/unconcern over the physical activity of their pupils. The closed questions offered four answer options: definitely yes (1), rather yes (2), rather not (3), and definitely not (4). These questions were completed by an open question investigating reasons for sufficiency/insufficiency of respondents' physical activity.

The core of the questionnaire was a *day time snapshot*, recording all physical activity during a school day. Respondents were asked to mark the duration of physical activities by means of five-minute intervals, the intensity of physical activities by means of a three-degree colour scale (intensity 1 to 3), and the range of physical activities by means of a commentary.

The research was conducted at the end of 2008/2009 school year. The research population involved 138 children aged 7–11 (68 boys and 70 girls) from all years of lower primary school (see Table 1).

Table 1 Research population: Number of respondents in individual years

Year	1	2	3	4	5	Total
Number of respondents	18	21	27	31	41	138

The questionnaires were distributed by students of the Faculty of Education at Masaryk University who addressed respondents in their home towns and home villages, meeting the condition that two respondents could not attend the same primary school. Thus, a varied sample of children attending 138 lower primary schools was obtained. Students distributing the questionnaires also assisted respondents with filling in the day time snapshots.

The completed questionnaires were processed in 2009/2010 school year. The

frequency of answers was expressed by means of basic statistical characteristics: arithmetic mean, minimum, maximum, median, mode and standard deviation. The differences in frequency of answers among particular age groups of respondents and relations among selected variables were verified by means of the following statistical methods: Student's t test, variance analysis, chi square test and correlation. Statistical computing was done with the help of Statistica CZ 9 software.

Results

The introductory parts of the paper discuss basic forms and time possibilities for school physical activity of lower primary school pupils. This section presents the results of research into SPA based on a questionnaire survey and day time snapshots.

Basic characteristics of pupils' physical activity during their stay at school

The total volume of school physical activity differs especially according to presence or absence of physical education lessons in pupils' timetable. As shown in Table 2, the average volume of SPA with a PE lesson is nearly 40 minutes, while on days without a PE lesson it is just 19.2 minutes. In 45 cases (i.e. 32.8 % of results) researched pupils pursued no other SPA than PE instruction (see "result frequency" column in Table 2). Furthermore, mode equal to zero for results of SPA without physical education indicates that the average volume of SPA is very low.

Table 2 Total volume of SPA (n = 138, age 7–11)

Statistical characteristics	SPA with PE (in minutes)	Result frequency	SPA without PE (in minutes)	Result frequency
Arithmetic mean	39,9		19,2	
Minimum	0	17 (12.4 %)	0	45 (32.8 %)
Maximum	120		115	
Median	40		15	
Mode	45		0	
Standard deviation (SD)	28,9		20,3	

If we compare the volume of SPA with a theoretical possibility of SPA (60 minutes per day), and with the average length of pupils' stay at school, there are notable differences (Fig. 1).

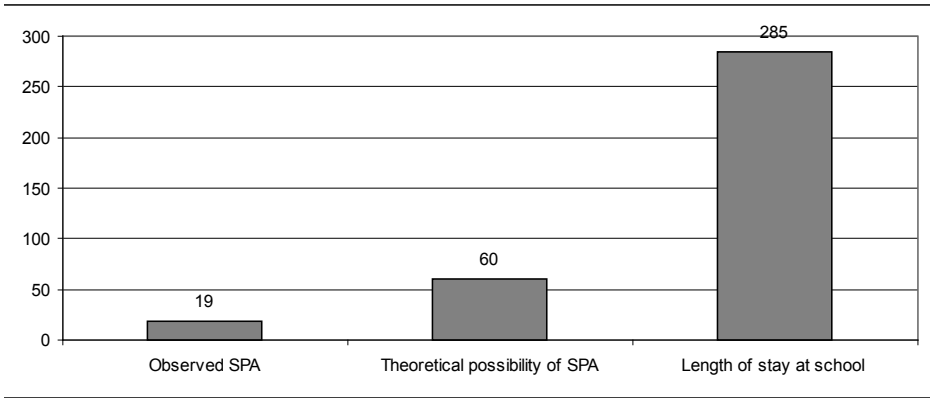


Fig. 1 Comparison of SPA results with a theoretical possibility of SPA and the length of stay at school (in minutes)

The share of particular forms of SPA on the total SPA volume is illustrated in Fig. 2. With the exception of movement-relaxation break, the occurrence of other individual forms of SPA is practically insignificant. Exercising before classes was not stated by any respondent. PE moments occupy on average only 0.11 minute a day, with the frequency of occurrence equal to 2. Slightly more common seems to be “learning in motion” (on average 0.4 minutes a day), but with the same frequency of 2. Transfers between classrooms, school buildings, classroom and sports ground etc. last on average 2.92 minutes a day, and going for a walk takes 1.17 minutes a day (frequency equal to 3, lasting from 25 to 45 minutes).

As clear from Fig. 2, movement-relaxation breaks account for most SPA volume. During these breaks, pupils move on average 15 minutes a day. Walking or games in school corridors seem to be dominant activities, movement games in school sports grounds and school grounds or other school premises are also common. Next, throwing a ball with a classmate, rope skipping, gum skipping, kids chase are popular too. According to pupils, the intensity of these activities is usually moderate.

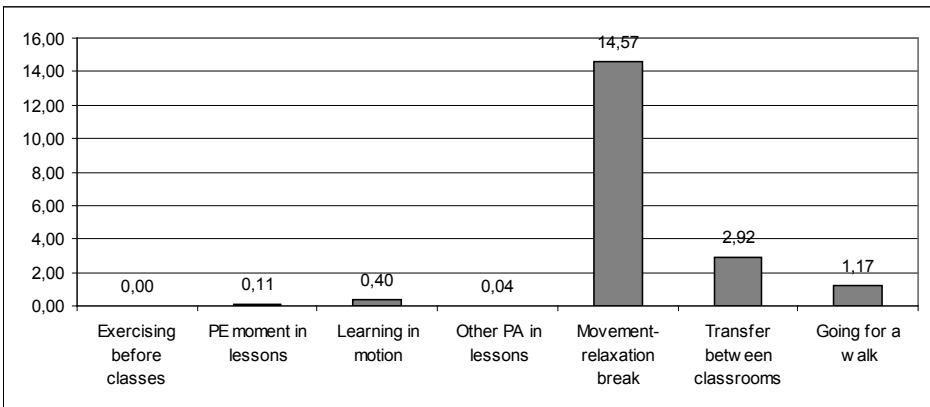


Fig. 2 Average volume of observed SPA (in minutes) in particular forms of SPA

Table 3 reveals that even movement-relaxation breaks are not common for all pupils. Surprisingly, 62 pupils reported no activity of this type, so 45 % of respondents did not have any movement-relaxation break on the observed day (see Table 3, result frequency).

Table 3 Statistical characteristics of the volume of movement-relaxation breaks

Statistical characteristics	Volume of movement-relaxation breaks in minutes	Result frequency
Mean	14.57	
Minimum	0	62 (45.3 %)
Maximum	75	1
Median	10	16
Mode	0	62
SD	17.81	

Comparison of pupils’ school physical activity according to gender

Comparing the volume of total SPA with individual SPA for boys and girls (individual SPA is optional, especially in breaks) reveals only slight differences. For both boys and girls the difference between total SPA and individual SPA is only 3 to 4 minutes a day (see Fig. 3).

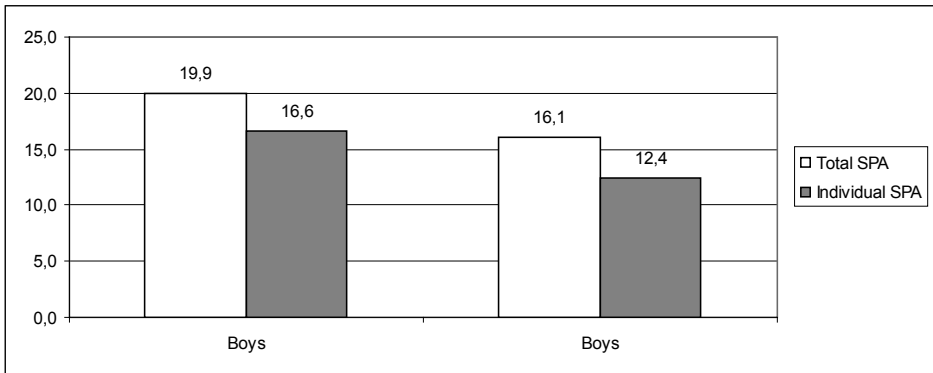


Fig. 3 Difference between total SPA and individual SPA for boys and girls

T test carried out at 0.05 level of significance did not prove statistically significant differences in SPA volumes between boys and girls, not even when the classification according to the intensity of physical activity or the comparison of total and individual SPA were applied (see Table 4, column p). Though, a certain difference is apparent (Fig. 4), suggesting that boys are more active than girls in terms of physical activity at school.

Table 4 Differences in the volume of SPA between boys and girls according to the intensity of physical strain and forms of SPA (t test)

Variables	boys (minutes)	girls (minutes)	boys (SD)	girls (SD)	t	p
Intensity 1	5.07	6.50	11.43	12.32	0.70	0.48
Intensity 2	11.72	9.07	14.10	16.62	1.00	0.32
Intensity 3	3.13	0.50	12.43	2.97	1.72	0.09
Total SPA	19.93	16.07	19.28	20.57	1.13	0.26
Individual SPA	16.57	12.43	17.02	17.25	1.41	0.16

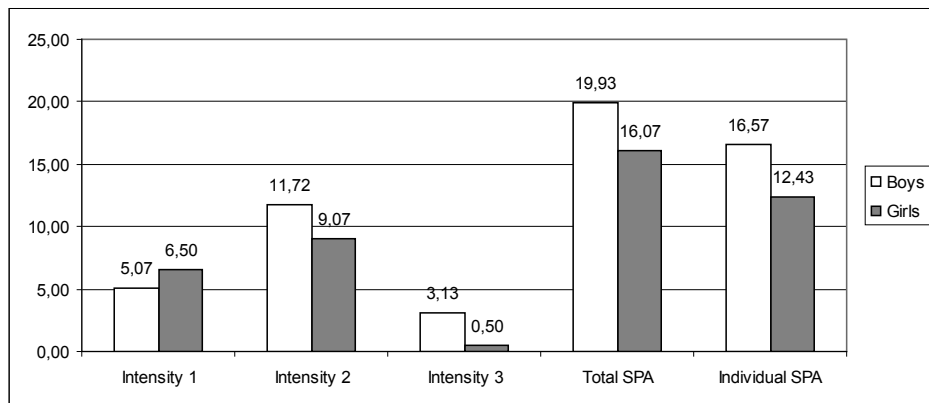


Fig. 4 Differences in the intensity and volume of SPA between boys and girls (in minutes)

The higher volume of SPA in boys corresponds with pupils' self-reflection of the question *I think I have enough physical activity in my daily regimen, i.e. at school as well as outside school*. As illustrated in Fig. 5, positive answers (definitely yes, rather yes) are predominant. Boys' self-reflection is closer to answer "definitely yes" than that of girls' (the average value for boys being 1.57 and girls 1.61. For details see Table 5. Nevertheless, the difference between boys' and girls' self-reflection is not statistically significant.

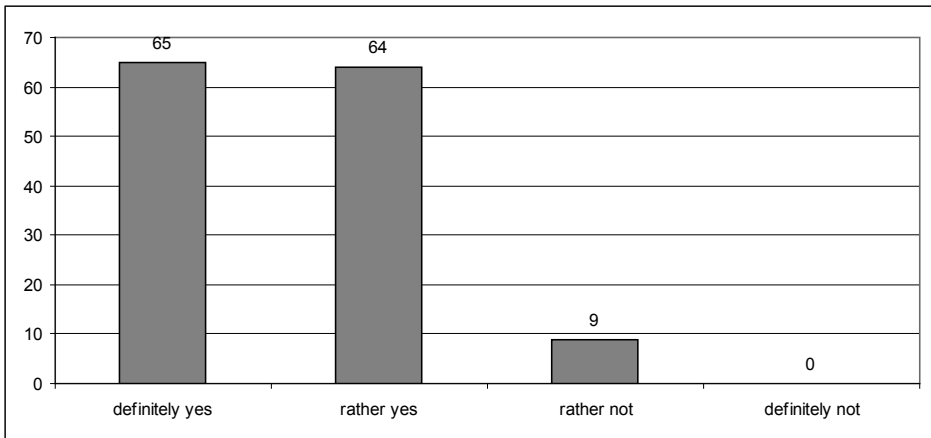


Fig. 5 Frequency of pupils' answers to the question whether they have enough physical activity (n = 138)

Table 5 Differences in pupils' self-reflection according to gender (average value of answers on a 1–4 scale)

	Boys	Girls
Pupils' self-reflection of PA	1,57	1,61

Comparison of pupils' school physical activity according to lower primary school years

The differences in the volume of SPA among pupils of individual years are shown in Fig. 6. The variance analysis proved statistically significant differences in the volume of SPA only in SPA of moderate physical strain (intensity 2) – see Table 6, in bold. The follow-up Fisher's LSD post-hoc test for intensity 2 revealed that statistically significant differences in the volume of SPA with moderate intensity of physical strain were in individual years more frequent. See Table 7, figures in bold.

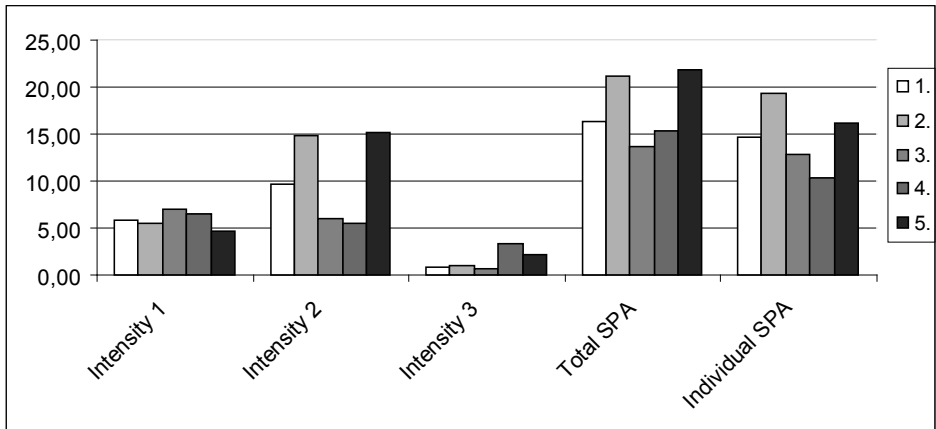


Fig. 6 Differences in the intensity and volume of SPA among individual lower primary school years

Table 6 Differences in the intensity and volume of SPA (in minutes) among individual lower primary school years (variance analysis)

Year	1	2	3	4	5	1 (SD)	2 (SD)	3 (SD)	4 (SD)	5 (SD)	F	p
Intensity 1	5.83	5.48	7.04	6.45	4.63	2.83	2.62	2.31	2.16	1.90	0.19	0.94
Intensity 2	9.72	14.76	5.93	5.48	15.13	3.54	3.28	2.89	2.70	2.38	2.86	0.03
Intensity 3	0.83	0.95	0.74	3.39	2.13	2.14	1.98	1.75	1.63	1.44	0.44	0.78
Total SPA	16.39	21.19	13.70	15.32	21.88	4.71	4.36	3.84	3.59	3.16	0.99	0.41
Individual SPA	14.72	19.29	12.78	10.32	16.13	4.05	3.75	3.31	3.09	2.72	1.02	0.40

Table 7 Fisher's LSD post-hoc test for intensity 2

Year	2	3	4	5
1	0.298622	0.408176	0.343217	0.207729
2		0.045431	0.030778	0.928730
3			0.911241	0.015333
4				0.008307

The observed differences are important because the volume of physical activity with moderate intensity of physical strain positively affects pupils' health and fitness. While the average length of 5 to 6 minutes for SPA with moderate intensity of physical strain in year 3 and 4 is nearly insufficient, a 15-minute period (in year 2 and 5) may be regarded as satisfactory.

The comparison of individual years does not reveal any statistically significant differences in pupils' self-reflection of whether they have enough physical activity, as shown in Table 8. Surprisingly, pupils with the highest average volume of individual SPA (year 2) express on average the lowest satisfaction with individual PA (1.81 on

a four-grade scale), whereas pupils of year 5 are the most satisfied ones. Their average value of answer 1.45 is close to “definitely yes”.

Table 8 Differences in pupils’ self-reflection according to individual lower primary school years (variance analysis)

Year	1	2	3	4	5	1 (SD)	2 (SD)	3 (SD)	4 (SD)	5 (SD)	F	p
Self-reflection	1.56	1.81	1.63	1.61	1.45	0.14	0.13	0.12	0.11	0.10	1.26	0.29

Relations between the observed variables

The analysis of the obtained results involved also the examination of relations between the observed variables. Correlation analysis was used to determine the relations between the SPA volume of different intensity of physical strain, the total volume of SPA, and the volume of individual SPA. The results are presented in Table 9. The statistically significant relations are marked in bold.

Table 9 Correlation coefficients between the observed variables ($p > 0.05$ in bold)

Variables	Intensity 2	Intensity 3	Total SPA	Individual SPA
Intensity 1	-0.05	-0.08	0.52	0.53
Intensity 2		-0.09	0.70	0.57
Intensity 3			0.34	0.03
Total SPA				0.77

As already mentioned, school physical activity with moderate intensity of physical strain is important part of physical activity. This finding is further confirmed by a relatively strong correlation between SPA with intensity 2 and the total pupils’ SPA (correlation coefficient 0.70). The highest correlation was observed between the total SPA and the individual SPA (0.77).

Assessing teachers’ concern over physical activity of their pupils

Teacher training for lower primary school teachers as well as educational programmes for basic education encourage teachers to support physical activities of their pupils. This is undoubtedly one of the main educational aims in the educational field of physical education. Therefore, the following item: “My teacher shows his/her concern whether I have enough physical activity in my daily regimen, i.e. at school as well as outside school” was included in the questionnaire. The survey results are as follows:

Boys and girls from the research population hold nearly the same views; the difference examined by chi square test is not statistically significant. The average answer to this question on a four-degree scale rests between the answer “definitely yes” (value 2) and “rather not” (value 3) – see Table 10. The frequency distribution of the answers is shown in Fig. 7.

Table 10 Assessing teachers' concern over PA of their pupils (average value of answers on a 1–4 scale)

	Boys	Girls
Teachers' concern over PA of their pupils	2.42	2.43

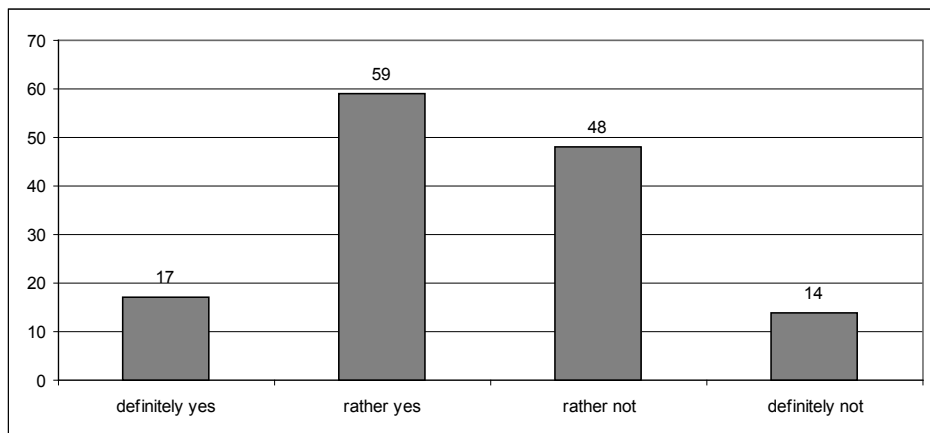


Fig. 7 Frequency of pupils' answers to the question whether they think that their teacher is concerned over their total PA

The differences in the average value of answers of pupils of individual lower primary school years are not statistically significant and on a four-degree scale fluctuate between 2.29 (year 4) and 2.78 (year 1), as clear from Table 11.

We consider this finding based on views of 138 pupils of 138 schools very important since it indicates that a substantial part of lower primary teachers (45 %) rather or definitely fails in meeting one of their educational aims in physical education.

Table 11 Differences in assessing teachers' concern over PA of their pupils in individual lower primary school years (variance analysis)

Year	1	2	3	4	5	1 (SD)	2 (SD)	3 (SD)	4 (SD)	5 (SD)	F	p
Teachers concern	2.78	2.38	2.48	2.29	2.35	0.20	0.18	0.16	0.15	0.13	1.13	0.35

Discussion

The research findings correspond with Sigmund's team (2007) observation that children's total PA substantially decreases after they start their compulsory school attendance. The low volume of SPA and prevailing non-physical activities in children's daily regimen lead to the development of muscle imbalances manifested by poor posture. The number of children with poor posture in Czech lower primary schools currently exceeds 50 % (Vrbas, 2010). As proved by Zachrla (1999), there is a marked increase in the prevalence of poor posture in children even during the first year of primary school.

Drawing upon the results obtained by Kuchařová (2010) who analysed physical activity outside school in the same population of respondents, we can put together the average structure of daily activities of lower primary school children (Fig. 8). This structure confirms that non-physical activities absolutely prevail in children's weekday regimen and school regimen significantly contributes to this. Nevertheless, it should be noted that research by Kuchařová did not prove insufficient volume of outside school PA in Czech children when compared to the required minimum of one hour a day by the NASPE (2001).

Physical education significantly contributes to SPA, but it usually occupies only two lessons in a week timetable. Therefore, it is necessary to pay increased attention to other possibilities as well.

We acknowledge that the research population is not representative of the age group of lower primary school children. Although the findings cannot be generalised, the insight into the school regimen of 138 Czech schools enables us to draw conclusions and hypotheses for follow-up research or proposed measures.

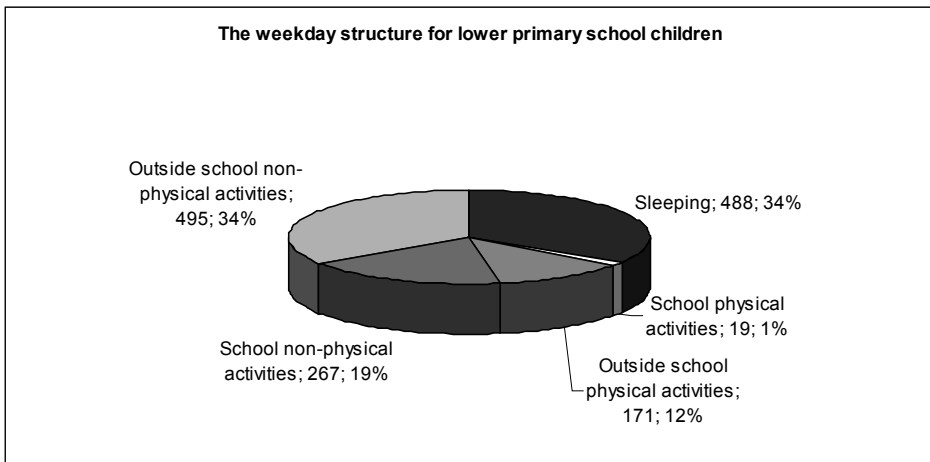


Fig. 8 The weekday structure for lower primary school children in minutes and percents per day

Conclusion

The research findings can lead to the following **conclusions**:

- The average volume of SPA in lower primary school children is very low and without compulsory physical education on average equals to less than 20 minutes a day. Movement-relaxation breaks account for nearly 15 minutes of this period; however, only 55 % of respondents really pursue physical activities. The volume of other forms of SPA is negligible and amounts to 3 minutes a day.

- No statistically significant difference in the volume and intensity of SPA between boys and girls has been observed, even though boys' SPA seems to be slightly higher. It can be hypothesised that there is no difference in the volume and intensity of SPA between boys and girls at lower primary school.

– A statistically significant difference in the volume and intensity of SPA has been revealed among the individual years of lower primary school. Although these differences are not large, and cannot be generalized, it can be hypothesised that there is a difference in the volume and intensity of SPA among pupils of individual years at primary school.

– Statistically significant relations have been proven between the observed variables of pupils' SPA. The correlation between the total SPA and SPA with moderate intensity of physical strain (0.70) which is crucial for pupils' health and fitness is especially important.

– The questionnaire survey has revealed that a vast majority of lower primary school children perceive their total physical activity during a day/week as sufficient. However, 45 % of respondents assume that their class teacher is definitely or rather not concerned over the physical activity of the pupils. We believe this finding is important for both, school practice as well as teacher training.

Even though the obtained results cannot be generalized, and the hypotheses stated should be verified on a representative population of respondents, it is possible to make these **suggestions for the educational practice**:

– All pupils need to be provided with a movement-relaxation break lasting at least 15 minutes at least once a day.

– It is necessary to include PE moments with compensatory or relaxation exercises (see e.g. Hnízdilová, 2006) into classes to a greater extent.

– The “learning in motion” teaching method (e.g. Jonášová, Michálková, Mužík, 2006, Jonášová, 2009) can be recommended to a much greater extent.

– Depending on possibilities, we recommend doing exercises before lessons (e.g. stretching such as Sun Salutation) especially in the first years of primary school.

– It is necessary to stress the educational obligation of lower primary school teachers in educational practice and teacher training: in physical education show interest and lead children to physical activities both at school as well as outside school.

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SONDA DO ŠKOLNÍ POHYBOVÉ AKTIVITY DĚTÍ MLADŠÍHO ŠKOLNÍHO VĚKU

Abstrakt: Příspěvek přináší aktuální poznatky o pohybové aktivitě dětí při pobytu ve škole. Výzkum byl proveden v roce 2009. Výzkumnou metodou byl podrobný časový snímek všedního dne, zachycující mimo jiné objem pohybu, intenzitu fyzického zatížení a obsah školních pohybových aktivit. Výzkumným souborem bylo 135 dětí ve věku 7 až 11 let z různých základních škol České republiky. Na základě získaných výsledků lze usuzovat, že většina českých škol v dostatečné míře nevyužívá možnosti pro zdraví podporující pohybovou aktivitu dětí. Prezentované poznatky mo-

hou být využity ke zlepšení školního režimu žáků a při tvorbě programů podporujících zdravý životní styl dětí.

Klíčová slova: pohybová aktivita, školní pohybová aktivita, děti mladšího školního věku, časový snímek dne