

Active Lifestyle and Health State Determinants in Czech Children

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Abstract

To gather information about active lifestyle and its impact on current population of children, a research of a representative sample of children aged 6-14 was conducted between 1997 and 2007. Within the research project, 17,978 healthy children (51% boys and 49% girls) and 1,382 child patients (52% boys and 48% girls) aged 6-14 were examined (in laboratory conditions/outside laboratory). Information about physical activities performed during the week (their amount and form) was obtained through questionnaires and was verified in a representative sample of the target population via Sporttester. Apart from information about their current physical regime we asked children about the current and past physical regime of their parents (approx. 40% of observed children's parents were thus investigated). Health status was evaluated by methods recommended by the Czech Medical Association.

The amount of weekly realized physical activities significantly decrease with age increase in both boys and girls. Children leading active lifestyle, i.e. performing suitable physical activities for at least 5 hours a week, are more physically fit, have substantially less health problems (e.g. lower number of subjects with overweight and obesity, lower prevalence of higher BP, etc.) and lifestyle diseases associated with hypokinesia in general.

Exercise intervention programmes of about 3-5 hours a week that can be run at schools will bring about positive changes in children's health status and will not have negative impact on their study results.

Keywords: Active lifestyle; Movement activities; Children; Health state; Overweight; Obesity

Introduction

Recent times have seen a continuous decrease in the performance of physical activities, both spontaneous and organized [1-3]. Research has shown that the amount of physical activities performed by children and adolescents has decreased by approximately 30% in the last two decades [1-4]. Lifestyle is undergoing substantial changes. A term frequently mentioned in connection with this issue is "active lifestyle". Active lifestyle (ALS) is a form of lifestyle (LS) characterized by interaction between an individual and his/her environment. From a general point of view, such interaction has two dimensions: biological and social [5]. Lifestyle changes both in the course of an individual's life and within various social groups. It has an influence on an individual's physical, mental and social behaviour and activity, shaping his/her personality and abilities, performance and identity. It is conditioned by external factors (e.g. age, sex, health status) as well as by the internal environment that reflects cultural traditions, social, economic and political situation in the society etc [6].

Active lifestyle is seen as a lifestyle where adequate regular physical activity plays a significant role [1]. Physical activity, however, is not only seen from the biological point of view; it involves bio-psycho-social dimensions of living and functioning of the human body. Movement is a basic human need [7]. Its lack may pose a severe threat to an individual's life. Lack of movement – hypokinesia – is one of the typical features of modern lifestyle. Health status is influenced, apart from the effect of chronic diseases, by an individual's behaviour and

activity. Active lifestyle has been seen as one of the key factors determining an individual's health status [7,8].

At present, the amount of performed physical activities in the population of children and adolescents is below the level that is seen as a biological need. Based on our investigation, the level was reached approximately in 1996 [1]. Hypokinesia has an important influence on both physical fitness and physical performance and on an individual's working efficiency and health status [1,3]. The objective of this study was to gain information on active lifestyle in the population of children and its influence on their current health status with the aim of obtaining data on their health status, physical fitness and physical regime.

Subjects and Methodology

To gather information about active lifestyle and its impact on current population of children, a research of a representative sample of children aged 6-14 was conducted between 1997 and 2007. All children were without regularly physical training in sports clubs. They have 2 hours weekly the physical education in the school. Within the research project, 17,978 healthy children (51% boys and 49% girls) and 1,382 child patients (52% boys and 48% girls) aged 6-14 were examined (in laboratory conditions/outside laboratory). Blood pressure was measured at least twice in a seated position before other examinations to "minimize" the white coat effect. Posture was evaluated by means of a modified Janda test.

Appropriate or inappropriate body weight is determined by the percentage of body fat while the Body Mass Index (BMI) is an auxiliary parameter to specify the body composition. The body

composition was assessed by whole-body bio-impedance impedance method using prediction equations for child population [1,9].

The measurement of body fat content was performed using the multi-frequency BIA analyzer BIA 2000 M, in a tetrapolar configuration of electrodes on the right side of the body in a lying position. The arrangement of the electrodes followed the manufacturer's recommendations. The apparatus measures total impedance, i.e. allows determining its capacity and resistance components. In The hydration state was controlled 8 hours before the laboratory evaluation in all subjects. Weekly movement regimen was monitored by pedometers Omron HJ-720IT-E2 and form of movement using questionnaires.

Means and standard deviations were calculated according to standard methods. The Pearson correlation was used for assessment of dependence in followed variables. The paired t-test was used to evaluate differences between means where appropriate. The level of significance was set at $p < 0.05$. The calculation was realized with help of SPSS.19 packet. The parents of all participating minors a written informed consent at the first examination. Institutional ethics approval was obtained from the Faculty of Physical Education and Sports Charles University Ethics Committee.

Classification	BMI	%BF
	(kg.m-2)	(%)
Underweight	<15.5	<16.0
Standard	15.5-21.9	16.1-23.0
Overweight	22.0-26.9	23.1-28.0
Obesity	27 or more	28.1 or more

Table 1: Standards for child overweight and obesity based on BMI and %BF applicable to children aged from 6 to 14 years.

Results and Discussion

The results of the study can be summarized as follows:

More than 85 % of weekly movement activities in both groups were realized by walking. Rest of were home gymnastics, cycling, swimming, etc. The form of realized physical activities partly depends on the season. All measurements were realized on spring. The weekly physical activity was significantly higher in boys ($p < 0.05$) independently on BM. The mean weekly number of steps decreased in girls from 10473 ± 284 steps/week in age of 6 years to 6763 ± 265 steps/week in age of 14 years, and in boys ranged from 10986 ± 362 to 8083 ± 311 steps/week.

The total amount of time when physical activities were performed during the week ranged between 120 and 250 minutes in the population of non-active children and between 480 and 1200 minutes in the group of active children. Differences between boys and girls were significant ($p < 0.05$).

The amount of physical activities performed during the week (PA) substantially decreases in dependence on the increasing age. The decrease is similar in boys and girls.

We have not found any substantial differences in the amount of physical activities performed by children in cities and children in the country. The research has shown that children under 10 perform physical activities 7.3 ± 2.3 hours on average while children aged 14 are

physically active only 2.1 ± 0.4 hours per week. These decrease of movement activities amount is confirmed by the data of other European studies [4]. The decrease in the performed weekly physical activities is basically linear and can be expressed by the following equation for boys:

$$PA (\text{hour.week-1}) = -0.917^* \text{age (years)} + 15.044$$

$$r = 0.876, p < 0.0001$$

Similar dependence in girls can be described as follows:

$$PA (\text{hour.week-1}) = -0.876^* \text{age (years)} + 14.412$$

$$r = 0.834, p < 0.0001.$$

Individuals with poor physical skills that represent approx. 6-10% of the population of school children are characterized by notable failure to comply with the standards for physical education at school. In most cases they are able to overcome this problem.

Only a small part of children, approx. 10% or less, suffers from morphological defects or health problems.

The average daily amount of energy expended on physical activities including classes of physical education at school ranges between 60-70% of the recommended volume in both younger and older children, i.e. the amount of performed physical activities constitutes 60-70% of the necessary volume of exercise. This is reflected in the increasing prevalence of overweight and obesity in most developed countries [2,4,6].

Considering the possibility of influencing physical regime in the population of children we must not forget that in most cases children spend substantially more time at school (where influence is exercised) than at home.

The critical age for forming "positive" attitude to physical activities, i.e. a lasting attitude that would be retained when growing up, is the age of 1-3 years and the early school age, 6-7 years. It is clear that in the first group it is the responsibility of the family to create such attitude while the responsibility of school increases in the older stage.

The research has further shown a substantial degree of genetic conditioning with regard to the performance of physical activities in children [7].

There is a 75% probability that a child will lead an active lifestyle if both his/her parents are physically active [1,7].

If only one parent is active, the probability is around 50%.

Our study has proven that children tend to prefer extra-school physical education and sport to other leisure activities provided that there are suitable conditions and that they are appropriately informed and motivated.

There is clear evidence of an increase of physical activities performed outside "official" playgrounds and also of the fact that physical education at schools offers an outdated and unsuitable model for the performance of physical activities.

No child was found within the study that would not at least partially deviate from the correct body posture. No significant differences were found between girls and boys.

The research has revealed a considerable number of muscle shortenings, mainly in the upper part of the body. These deviations, frequently observable at a glance, were usually not paid attention to.

The results of body composition evaluation (mean values of body fat percentage - %BF) and the percentage of overweight or obese children (assessed in compliance with Table 1) are summed up in Table 2 for boys and Table 3 for girls.

These results are substantially better than for example in the USA, where some states report up to 40 or more per cent of obese children. Higher percentage of overweight or obese children has been also observed in developing countries [4,7,10].

An important fact that has its roots in contemporary lifestyle is that the number of overweight or obese children is on the increase both in Czech Republic and other developed countries.

It has been found that the occurrence of hypertension in children and adolescents is approximately double the present standard (around 8%). Differences between the sexes were insignificant.

The incidence of higher blood pressure in physically active children was substantially lower than in non-active children. It could be ascribed either to the active way of life or to the fact that a significant number of active children comes from active-parent families where the parents usually don't suffer from hypertension.

	NBoys		Boys	
Age		%BF	Obesity	Overweight
(years)		(%)	(%)	(%)
6	190	22.4 ± 4.1	8.0 ± 1.0	15.0 ± 3.1
7	188	21.4 ± 3.8	8.3 ± 1.1	15.6 ± 2.4
8	192	20.4 ± 4.4	8.6 ± 1.2	16.2 ± 2.6
9	186	20.1 ± 3.6	9.4 ± 1.0	16.8 ± 3.1
10	196	19.9 ± 3.2	9.8 ± 0.9	17.0 ± 2.6
11	198	19.5 ± 3.0	10.2 ± 1.3	17.4 ± 2.4
12	196	18.2 ± 3.1	10.6 ± 1.6	17.9 ± 2.6
13	199	17.9 ± 2.9	10.8 ± 1.8	18.3 ± 2.7
14	187	18.0 ± 2.8	11.0 ± 2.0	19.0 ± 3.0

Table 2: Mean ± SD body fat percentage (%BF) and obesity and overweight percentage in boys.

s	N _{Girl}		Girls	
Age		%BF	Obesity	Overweight
(years)		(%)	(%)	(%)
6	175	24.5 ± 4.0	8.0 ± 1.5	16.0 ± 2.1
7	174	23.1 ± 3.8	8.3 ± 1.4	16.4 ± 2.1
8	181	22.8 ± 3.9	8.7 ± 1.6	16.8 ± 2.2
9	184	22.3 ± 3.6	9.6 ± 2.0	17.0 ± 2.4
10	180	21.9 ± 3.3	10.0 ± 2.1	17.3 ± 2.1
11	182	21.3 ± 3.1	10.4 ± 2.0	17.7 ± 1.8
12	176	20.3 ± 3.0	10.9 ± 2.3	18.2 ± 1.9

13	194	20.9 ± 2.6	11.4 ± 1.9	19.0 ± 2.1
14	187	21.4 ± 3.0	12.0 ± 1.7	19.5 ± 2.0

Table 3: Mean ± SD body fat percentage (%BF) and obesity and overweight percentage in girls

A 6-month intervention programme had been tried out in young hypertonic patients (suffering from borderline hypertension), which lead not only to an improved physical performance and weight regulation but also to a 4-6 mm Hg decrease in systolic blood pressure.

It has been found that approximately 28% of children suffer from a certain type of allergy. Differences in the occurrence of allergy in active and non-active children were not substantial. Likewise, no difference between boys and girls was found. The incidence of allergy in children increases insignificantly with age. The essential problem underlying the performance of physical activities by children is the offer that is presented to them and the possibility to acquire "positive" experience when performing suitable physical activities. That is why all programmes focused on achieving this objective are welcome.

The energy expended on the performance of physical activities is directly proportional to their volume both in boys and girls. Exercise intervention programmes of at least 3 hours a week for both healthy and physically challenged children can be run at schools and will produce measurable changes in children's fitness (both aerobic and physical). Intervention programmes are efficient if the intensity of exercise exceeds 85% of maximum heart rate in most included physical activities. At basic schools, intervention programmes of 5 hours of physical education a week can be run without negative impact on study results. Demonstrable results have been obtained even from short-term intervention programmes both in healthy children and in selected groups of patients, in whom the exercise might significantly influence their social integration, mainly in school environment. Body composition does not only reflect the physical regime followed by an individual but it is also one of the decisive motivation factors for the performance of physical activities. Changes in the degree of fitness due to "natural" development of a child's body are very similar in children who exercise and children without regular physical training. The system of targeted physical training in children and adolescents in sport classes and the related Youth Sport Centres is currently not able to ensure efficient and long-term development of the abilities of selected individuals.

Long-term efficiency of physical or sport training in children and adolescents can be achieved if: It does not, in any case, pose a risk to the health status and development;

An individual's close social environment is at least willing to accept the exercise intervention programme; Apart from the exercise intervention itself, information about healthy lifestyle is available as "part" of the programme; Suitable individuals are "subjected" to sport training; Training intervention takes place in suitable environment – this does not apply only to the training ground but to the training process itself. Possible causes of insufficient physical regime in children [1,7,11,12].

Neither children nor their parents or teachers are sufficiently informed about active lifestyle. Importance of regular physical activities in children is often underestimated.

It is important to bear in mind that physical education at school has two dimensions – realization and education. Schools are often

equipped with unsuitable furniture – it must be remembered that sitting is a dynamic activity. Insufficient daily physical regime – movement is not seen as an indispensable part of a child's daily regime and is not used as a compensation element. A substantial part of the contemporary population of children has inadequate muscle strength. Parents and teachers do not pay enough attention to the impact of hypokinesia on a child's body. The possibility of doing compensation exercise "at school desk" is often forgotten and the free time of children at school is seldom used for performing appropriate physical activities.

Conclusion

Children leading active lifestyle, i.e. performing suitable physical activities for at least 5 hours a week, are more physically fit, have substantially less health problems and lifestyle diseases associated with hypokinesia in general. Exercise intervention programmes of about 3-5 hours a week that can be run at schools will bring about positive changes in children's health status and will not have negative impact on their study results. Responsibility for the current state of the population of children rests with the family and school. Major part of the population of children fails to be appropriately informed about healthy lifestyle either in a family or at school. The study has been conducted with the support of the Ministry of Education, Youth and Sports of the Czech Republic, Research project.

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