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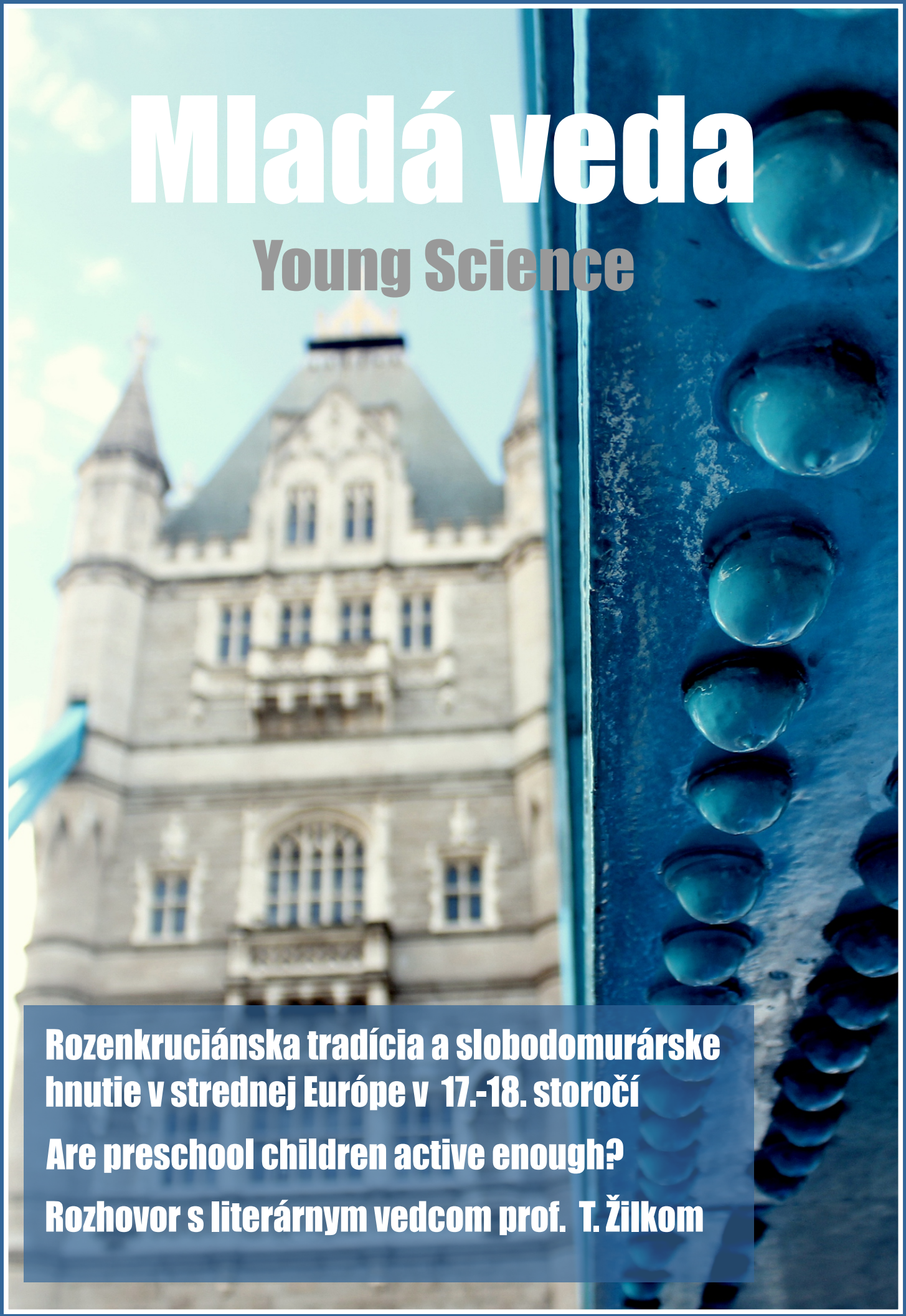

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Are preschool children active enough?

Rozhovor s literárnym vedcom prof. T. Žilkom

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ARE PRESCHOOL CHILDREN ACTIVE ENOUGH?

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Abstract

An increasing number of investigations have asked how active preschool children are. Because various studies have used different methods of analysis, it remains difficult to answer this question adequately. Nevertheless, one consistent theme seems to be the nature of PA among preschool children. When preschool children are active, they tend to engage in very short intervals of movement, spending very little time at the level of intensity which could be considered vigorous. On the basis of both the analysis of present knowledge and our proper research work, the aim of the paper was to enrich knowledge of the minimum need for physical activity of preschool children. Present research analysis results were compared with the recommendations of NASPE. By means of children monitoring we investigated the volume and intensity of children's physical activity. Results from our analysis were also compared with results of Slovak as well as foreign authors. The standard for moderate-to-vigorous physical activity was met in 11 papers. 52% of analyzed papers state that children were within the required level of intensity for less than an hour per day. Comparing present research studies with our results we found out that only in two cases the volume of MVPA (moderate-to-vigor physical activity) was lower than that of ours. Our research study also points out the alarming situation regarding the insufficient physical load and the low volume of physical activity.

Key words: moderate-to-vigor physical activity, monitoring, NASPE, Polar Team 2

Introduction

Knowledge about lifestyle of our ancestors confirms the fact that during the whole period of phylogenesis physical activity (further referred to as „PA") has a prominent role in developing and shaping the human's body. The important place and meaning of PA in the life of man used to be considered a natural part of one's ontogenesis in consequence of which the human being became the object of investigation within several upcoming science branches, not excluding medicine (Junger, 2000). As early as ancient medicine pointed out that movement was necessary and irreplaceable for people.

Nevertheless, what was valid for the whole history of mankind has not been valid in last decades. It was at the end of 2nd millennium, when for the first time in the history of

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mankind it was not possible to fully compensate and eliminate the drop-out of physical activity caused by changes in production technologies and lifestyle (Junger, 2009).

There are many development stages within the ontogenesis of man, during which he is subject to sensitive periods. These critical sensitive periods are phases in one's life during which the organism reacts increasingly to exogenous stimulus necessary for development of a particular skill. If the organism does not receive such stimulus during the period it may be difficult, less successful or even impossible to develop some of functions later in life. During the preschool age developmental changes are the weightiest throughout entire ontogenesis. (Junger, 2000). Documents from the World Health Organization in the Association for all emphasize the fact that preschool age is the most important period for creating life-long habits, value orientations as well as basic abilities (Dvořáková, 1998).

Though, the growing number of obese children is bewildering. According to Canning, Courage, & Frizzell (2004) and WHO (2008) as many as 22 million children under the age of 5 suffer from obesity.

An increasing number of investigations have asked how active preschool children are. Because the various studies have used different methods of analysis, it remains difficult to answer this question adequately. Nevertheless, one consistent theme seems to be the nature of PA among preschool children. When preschool children are active, they tend to engage in very short intervals of movement, spending very little time at an intensity that could be considered vigorous.

The minimum need for physical activity of man is defined by so called threshold limit value. It is the necessary amount of physical activity of man needed for healthy the development of the organism. Current analyses in the field of physical activity of preschool children recommend to abide the minimum level of physical activity in the following volume: 60 minutes of structured and 60 minutes of spontaneous physical activity per day, while preschool children should spend at least 1 hour at the moderate-to-vigorous intensity of PA (from 140 heartbeats/minute or more precisely ≥ 3 Mets). These standards were elaborated by the *National Association for Sport and Physical Education (NASPE).* The guideline was created by the Active Start committee, consisting of motor development experts, movement specialists, exercise physiologists, and medical professionals. This physical activity recommendation is the best currently available guideline against which to compare preschoolers' physical activity levels. In 2009, the Australian Government's Department of Health and Aging released the recommendation that preschool-aged children should engage in a minimum of 3 hours of PA every day (Department of Health and Aging (DOHA, 2009). However, is it enough? It was only a few years ago, according to Kučera (1985), when children were physically active for as much as 60% of their vigil, which is approximately 6 hours per day; out of these they spent at least 2,5 – 3 hours in the average zone of the circulatory system stimulation, which represents 150% of the quiescent pulse rate.

Long-time scientific experience based on weekly preschool children observation records show that during the stay in kindergarten, the allowed time for the particular types of physical activities is a little more than 3 hours (Junger, 2000). At the same time, most of these activities were done at the low level of intensity. Miškovová's research studies (1992) state the volume of physical activity, in the duration of 2 hours and 8 minutes. However, other

research conclusions by Erik and Dagmara Sigmund (2011) prove that all preschool children meet health-oriented recommendations for physical activity (stated therein before according to NASPE). Observing 244 children in Czech kindergartens it was found that everyday PA in kindergartens ranges in the volume of 2x20 minutes of exercise on a carpet, 50-70 minute-long walk outside and then setting sufficient time for other spontaneous PA at the school yard.

On the other side are research studies of world authors who talk about the deficit of physical activity in preschool children. According to Tucker (2008), only 54% research studies from the area proved meeting minimum amount of children's physical activity elaborated by NASPE.

In 2007, Timmons et all dealt with an extensive research study in which he summarized recommendations as well as real amount of preschool children's physical activity written by American authors who addressed themselves to the issue. In this research study he investigated how does regular physical activity of various intensity and duration affect one's health. According to authors (in the table), aerobic PA exercised 3 times per week for approximately 35 minutes has a minimum or no health benefit for preschoolers. He concluded that the amount and nature of PA required for optimizing healthy growth and development during the preschool years is as yet unknown.

Given this much variability of studies, an important consideration then becomes how much PA is required for optimizing healthy growth and development?

The aim of the research was to enrich knowledge of the minimum need for physical activity of preschool children, by means of both the analysis of present knowledge and our own research work.

Methods

The first part of our research was the analysis of papers written by Slovak and foreign authors who conducted similar measurement of volume and intensity of preschool children's physical activity. Papers were obtained from the following databases: Medline, PsychInfo, the Physical Activity Index, Web of Knowledge, Child Development and Adolescent Studies, Pubmed Scholar google, Proquest, Web of Science, Science direct, and Scopus. Key words were preschool children, physical activity, monitoring, amount and intensity, obesity. Totally, we analyzed 23 papers. Analyzing these papers we were interested in the volume, intensity and recommended minimum amount of daily physical activity. Analysis results were compared with the recommendations of NASPE. Subsequently, results from our own research were also compared with results of Slovak and foreign authors.

Then, using the method of random sampling, we chose 5 from among all kindergartens in Košice, Prešov and Veľký Šariš. From the group of preschoolers in each kindergarten we chose 10 children, of it there were 5 boys and 5 girls. Research sample consisted of 50 children who were monitored using Polar Team 2 and 90 children who were monitored using the method of observation. The average age of children was 5,4 while none of monitored children was less than 5 or more than 6 years old. Each child was physically developed, without any health problems. Parents of monitored children were let know in advance and signing a written document they agreed with conducting research. At the beginning we performed a basic anthropometric examination, marked their quiescent pulse rate and set

aerobic zones according to Karvonen. These data were necessary for personal characterization of each child in the Polar Team 2 software (hereinafter PT2). Research was conducted in the seasons of autumn, winter and spring, under the standards weather conditions characteristic for each season. Altogether, we have already monitored 35 days. We were interested in the functional reaction of child's organism during a whole stay in kindergarten. Using the method of observation we investigated the volume of physical activity and using time records, which were filled in by children's parents, we investigated the amount of physical activity during the leisure time of monitored children.

For the sake of intensity evaluation, we set the limit of 140 heartbeats per minute (approximately 60% of maximum heart rate of children, which represents the transition level from the low PA to MVPA. Each PA performed above this limit was considered developing, bringing health benefit for preschool children.

Observation took place during the whole day, regardless of the environment of children's stay. Statistic processing of data was realized using the STATISTICA 10 PC software (Stat Soft, 2012).

Results and discussion

According to our further analysis, almost all foreign authors followed standards by *National Association for Sport and Physical Education.* Out of 23 analyzed papers, 12 were American, 4 were British, 3 were Slovak ones, 2 were Chilean, 1 was Estonian and 1 paper was Australian. Two authors gathered data by measuring pulse rate of children. In 6 papers data were gathered based on observation method and 15 authors investigated the volume and intensity of PA by means of accelerometer. In 11 papers the standard for moderate-to-vigor *PA was met.* 52% of the analyzed papers state that children were physically active at the desired intensity for less than an hour a day (Table 1). Authors using the method of observation showed higher volume of physical activity than authors using accelerometer. It may have connection with the season in which research was conducted. Characteristic of research in 1985-1989 is the higher volume of physical activity; however, analyzed papers show significant measurement deviation which were caused neither by the method nor by the year of the research realization. Analyzing it more deeply we did not find a reason or a common denominator, which could cause such a significant variation in results.

On the basis of monitoring children we found out that the average volume of daily PA during the stay in kindergarten was 52 minutes. Similarly we measured the volume and intensity of children's PA out of their stay in kindergartens. During work days the volume was approximately 34 minutes a day per child. Therefore, the average volume of daily PA during the monitored days was 86 minutes. Children thus exercised for the average of 34 minutes a day less than says the standard for minimum physical activity of preschool-aged children by NASPE. Total duration of stimulating physical load during the monitored period was only 21 minutes (daily average of child), which represents only 24% efficiency of physical activity performed (Graph 1).

The difference in the physical load during the monitored days was not statistically proved. Using the Wilcoxon paired test it was confirmed that among the individual monitored days the difference was not statistically significant (at the level of 0,05). Wilcoxon paired test

also confirmed the fact that the difference in physical load in children during various seasons was not statistically significant. Based on all these results and using the Mann-Whitney U-test we found out that the difference between genders (at the level of 0,05) was not statistically significant.

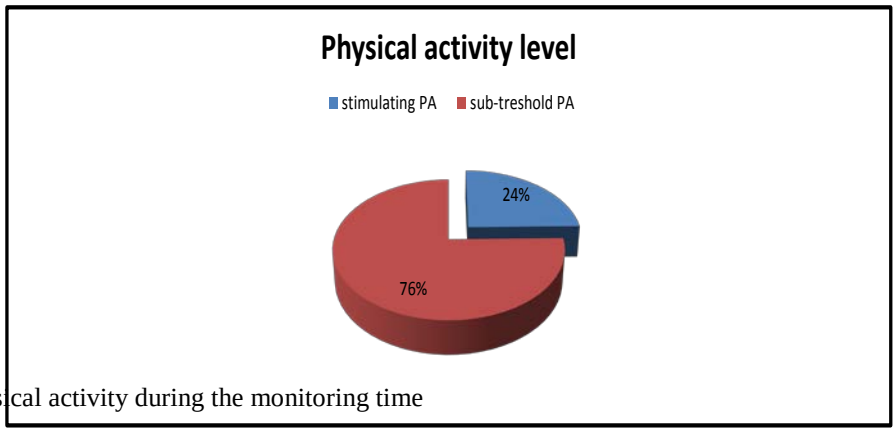
Comparing paper analyses with our results we found out that only in two cases the volume of MVPA was lower than that in our research (Table 1). Klesger, 1986 presents as many as 447 minutes higher MVPA; however, he gathered data using the method of observation. Benham-Deal (2005) and Jago at al. (2005) used method which is, by the nature and by the subject of observation, the best comparable with the method of using Polar Team 2. Their results are also inadequately differing and from 2,4 to 5,7 times higher than our results.

Though, this data lacks the analysis of children's lifestyles. Research studies of foreign authors do not say anything about the environment in which children moved, or whether they attended a private or state kindergarten. Next, a country with its own conditions and criteria in the field of Movement and Health may also greatly influence the variability of results. We do not know at what level governments influence the life of kindergartens as well as children in these countries. In Slovakia, all state as well as private kindergartens have to follow the National Educational Program ISCED 0, which is the basic curricular document in the field of education of preschool-aged children. It influences the volume of performed PA in a large scale although the real realization of PA depends on teachers. Nevertheless, this fact was not a subject of our analysis although we must agree that it may considerably influence results.

Conclusion

Results from our research study point out the alarming situation regarding the insufficient physical load and the low volume of physical activity, which can be the cause of consequential health problems of children in preschool age.

Child's organism does not get proper motor and functional development, as necessary. Children do not perform physical activity in the volume recommended neither by DOHA nor by NASPE. However, are those threshold levels of PA sufficient? They are confronted by the facts of increasing obesity and lowering amount of children's physical activity. During the last 20 years we are observing a high increase also in this age group. The number of obese children is increasing, the standards for PA are low and so decreases the real amount of children's PA. Many research studies from both Slovakia and foreign countries suggest this phenomenon. Are problematic the standards, which were investigated and which most of children don't meet anyway? If the minimum need for children's physical activity was set correctly, probably we wouldn't have to categorize as obese more and more children each year. Following research is needed to find out what volume of physical activity is necessary for proper motor and functional development of a child and what volume of PA would stop increasing obesity.



Graph 1 Effectivity of physical activity during the monitoring time
Source: self-processing

Author	Methods	Time spent in MVPA in minutes	Comparing to daily minimum of physical activity (NASPE)	Comparing to our research
Kučera, 1985	telemetry, observation	180	+	+
Klesger, 1986	observation	468	+	+
Sallis et al., 1988	observation	372	+	+
Poest et al., 1989	observation	216	+	+
Miškovová, 1992	observation, time records	51	-	+
Kain & Andreade, 1999	accelerometer	22	-	+
Junger, 2000	observation, time records	90	+	+
Finn et al., 2002	accelerometer	7	-	-
Janz et al., 2002	accelerometer	28	-	+
Oja et al., 2002	accelerometer	92	+	+
Burdette et al., 2004	accelerometer	146	+	+
Reilly et al., 2004	accelerometer	30	-	+
Pate et all, 2004	accelerometer	92	+	+
Telford et al., 2005	accelerometer	120	+	+
Fisher et al., 2005	accelerometer	25	-	+
Jago et al., 2005	heart rate monitoring	51	-	+
Benham-Deal, 2005	polar team	120	+	+
Reilly et al., 2006	accelerometer	20-25	-	=
Vasquez et al., 2006	accelerometer	22	-	+
Kelly et al. 2006	accelerometer	19-25	-	+
Mettalinos-Katsaras, 2007	accelerometer	272	+	+
Cardon, 2008	accelerometer	34	-	+
Van Cauwenberghe, 2012	accelerometer	12	-	-

Table 1- Analysis of papers
Source: self-processing

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