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ORIGINAL ARTICLE

SEDENTARY LIFE IN THE CONTEXT OF EDUCATIONAL ATTAINMENT

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Abstract

The article deals with the issue of sitting and sedentary lifestyles as a social problem of the healthy adult population of the Czech Republic in relation to the education achieved. The research sample consisted of 1,122 respondents, 544 men (48.5%) and 578 women (51.5%). The data were collected using a standardized questionnaire, IPAQ, which mapped physical activity in the last week. More than 41.3% of the respondents sit for more than 6 hours in a work week. Similarly, on weekends 39.4% of the respondents sit for more than six hours. People with a basic education spend the most time sitting on weekdays. 78% of respondents with a basic education spend four hours or more sitting on weekdays. Surprisingly, those with a university education show the largest decline in the hours spent sitting at the weekends (compared to weekdays).

Prolonged sitting and sedentary lifestyle is a threat people should be warned about, because it is responsible for a series of pathologies of the human musculoskeletal system and predisposes excessive weight and obesity. The comparison of our results with similar studies points to a problem not only in the Czech Republic, but also in other economically developed societies.

It is necessary to apply the knowledge of a sedentary lifestyle in primary prevention and carry it consistently into practice.

Key words: *sedentary lifestyle; physical inactivity; time spent sitting; primary prevention; healthy adult population*

INTRODUCTION

Physical activity (hereinafter referred to as PA) is an integral part of human existence. Marcus and Forsyth (2010) prove the claim that a lack of exercise contributes to being overweight and also to obesity in both children and adults. It is deficient PA, together with a high energy intake that we associate with the accumulation of subcutaneous and visceral fat. This causes a massive occurrence of non-infectious diseases that reduce the quality of life and affect the entire bio-psycho-social status of an individual (Neuhaus et al. 2014). Ting et al. (2009) relate the increase in the incidence and prevalence of excessive weight and obesity to sedentary lifestyles, resulting in a diminishing need for natural movement, which is being replaced by technical means of transport (Kalman et al. 2009). Another factor influencing the lack of PA mentioned by Blair et al. (2002) is reduced physical exertion in earning one's living, i.e. the plants and animals are not necessary to grow and breed, they can be easily purchased without great physical demand. Cakirpaloglu (2012) adds that

the mass arrival of social networking means that the need for physical contact with peers and children and adolescents is decreasing, and the number of hours spent sitting at computers or televisions is increasing. In terms of kinesiology and ergonomics, sitting is an inappropriate type of body position (Chundela 2013). For a large part of the adult population sitting is required for the job – for example in administrative work, programming, etc., and without suitable compensatory PA it leads to other health complications. In the era of sedentary lifestyle and stereotypical uncoordinated movements at home and at work it is not uncommon that many people develop numerous functional, and in some cases even structural changes in the musculoskeletal system. Consequently, some specific muscle groups are overstrained and others are weakened (Čumpelík et al. 2006). Therefore, the notion of sedentary lifestyle has become a term that is being constantly debated. More than 10 years ago, Manson et al. (2004) found a correlation between a sedentary lifestyle and at least 300,000 premature deaths in the US alone. Moreover, they demonstrate a direct impact on the expenses associated with health care to the amount of $90 billion. However, Stejskal (2004) states that the low volume of PA and increased demands on mental performance of an individual can result in fatigue, due to long term sitting, to such an extent, that the exposed person is not able to perform any PA and only receives energy from food. Yet regular, albeit basal PA together with balanced energy intake is the best, cheapest and safest preventive and therapeutic agent for the maintenance of good health (Kahlmeier and Racioppi 2006). A considerable proportion of experts also highlight the fact that most tasks requiring movement in daily life make demands on a number of physical abilities at the same time. These motor skills also vary over time, which means that we constantly need to develop them. If we stop their development, they will return very quickly to their initial level, which is significantly contributed to prolonged sitting. A sedentary lifestyle may also be caused by a lack of space for an active lifestyle in cities, such as playgrounds, parks or forests. Certain associations between sedentary lifestyles and nature were demonstrated by Dadvand et al. (2014) who, based on research in children, confirmed the relationship between a shorter period of sitting and the presence of parks and forests around the place of residence. One objective of our research was to determine how much time the Czech population spend sitting at work and after work; and to compare the results with recommendations that indicate the time allotment for such sitting, which has no impact on public health.

MATERIALS AND METHODS

To collect data on PA in the last week of life we used a standardized short administrative version of the questionnaire IPAQ (International Physical Activity Questionnaire) by Fogelholm et al. (2006). The characteristics of the PA were divided into five groups, which reflected its intensity. They were:

1. Activities that involved movement during work or studies – lifting heavy loads, engraving, construction, climbing stairs, walking etc.
2. Moving – physical activity during transportation – walking, using bicycles and motor vehicles.
3. Housework, maintaining the house (flat) and caring for the family – chopping wood, shovelling snow, digging, sweeping, washing windows, raking the garden, walking etc.
4. Recreation, sport and leisure-time physical activity – aerobic, running, cycling, swimming, tennis, walking, etc.
5. Time spent sitting.

Those participating in the research had a subjectively problem-free health status. In order to ensure representativeness, we determined quotas that were filled with healthy adults through random selection. The data with regard to the age, gender and regional jurisdiction are representative in Czech population over 20 years of age. In terms of age, the respondents were divided into six age groups ranging from 20 to 70 years and over, in ten year periods. In terms of regions, there was a complete regional representation of the Czech Republic. 2,200 questionnaires were distributed. The return rate was 51%, which corresponds to 11,022 returned and validly completed questionnaires. In terms of

gender, the file comprised of 544 men (48.5%) and 578 women (51.5%), which corresponds to an analogous composition of the Czech population aged 20 years or over. Data collection took place in January to May 2013.

Statistics

Each completed questionnaire form underwent a logical and optical check. We checked the logical links, completeness and credibility of completion. 38 sheets were excluded due to non-functional logical links and incompletion (usually where the respondent refused to answer the questions and decided to terminate the interview in an untimely fashion, and a part of the interview sheets remained unfilled). Statistical data processing was performed using the programs SASDM 01.04.10, SPSS 16.0 and Excel 2010. Processed items were descriptive characteristics, 1st stage sorting and pivot tables of selected indicators of 2nd degree classification. The dependency rate of selected categorical characteristics, specifically education and time spent sitting were set on the basis of a chi-square test. To verify the normality of the data we used Shapiro-Wilk's test followed by nonparametric Mann-Whitney's U-test. The interpretation of data processed and the respective tables and charts are based on these analyzes. The significance level in all tests was set at $\alpha = 0.05$. On the basis of this analysis, we carried out an interpretation of the data processed and compiled the respective tables and charts.

RESULTS

The sample consisted of 544 men and 578 women. The age distribution of the sample is clearly shown in Table 1. After further filtering we assessed 1,084 valid respondents in terms of weekdays and 1,077 respondents regarding the age and the number of hours spent sitting on weekends.

Table 1 – Age distribution of the sample group

Age group	Number	% of the whole	*Deviation in percent
20–29 years	184	16.4	–0.2
30–39 years	235	20.9	–0.1
40–49 years	192	17.1	+0.1
50–59 years	185	16.5	0.0
60–69 years	179	16.0	+0.1
70 years and more	147	13.1	+0.1
TOTAL	1122	100.0	0.0

* Deviation expressed in percent. See the Age composition of the population of the Czech Republic in 2012. Balance at 31/12/2012 (Demographic Yearbook 2010–2013).

Table 2 shows the distribution of individual regions in relation to the sample group. It also contains a deviation from the actual situation related to the representativeness of the sample in relation to individual regions.

With regards to educational attainment we discussed four categories, namely primary education, secondary education (without GCSE's), secondary education with GCSE's, and finally university education. 8 respondents who didn't provide a valid reply to the question dealing with education were excluded from the total of 1,122. Therefore 1,114 respondents responded adequately. 129 of them achieved primary education, 262 respondents had an education without GCSE's, 482 with GCSE's and 241 respondents had a university education.

Table 2 – Individual regions of the Czech Republic in relation to the sample group

Region	Number	% of the whole	*Deviation
Prague	136	12.1	–0.1
Central Bohemia	135	12.0	0.0
South Bohemia	66	5.9	–0.1
Plzeň	64	5.7	+0.2
Karlovy Vary	31	2.8	–0.1
Ústí nad Labem	90	8.0	+0.2
Liberec	45	4.0	–0.1
Hradec Králové	62	5.5	+0.2
Pardubice	53	4.7	–0.2
Vysočina	55	4.9	+0.1
South Moravia	124	11.1	0.0
Olomouc	69	6.1	0.0
Zlín	62	5.5	–0.1
Moravia-Silesia	130	11.6	–0.1
TOTAL	1122	100.0	0.0

* Deviation expressed in percent. See the Age composition of the population of the Czech Republic in 2012. Balance at 31/12/2012 (Demographic Yearbook 2010–2013).

Fig. 1 shows the percentage of hours spent sitting on weekdays of respondents who answered validly. It is clear that only 393 respondents sit up to 4 hours a day, a period that does not represent a negative impact on the health of individuals. The smallest percentage visible was in the response "less than 1 hour", chosen by 13 respondents, while the largest representation was evident in those who responded with the last option, which was 6 hours or more per day. This was selected by 445 respondents of the research group. 43 respondents didn't respond to this question. Therefore we can say that 686 respondents out of the total of 1,079 respondents on average sit during weekdays for more than 4 hours ($p < 0.050$). Another disturbing finding was that the average number of hours spent sitting in healthy adults was 11.8 hours in a weekday.

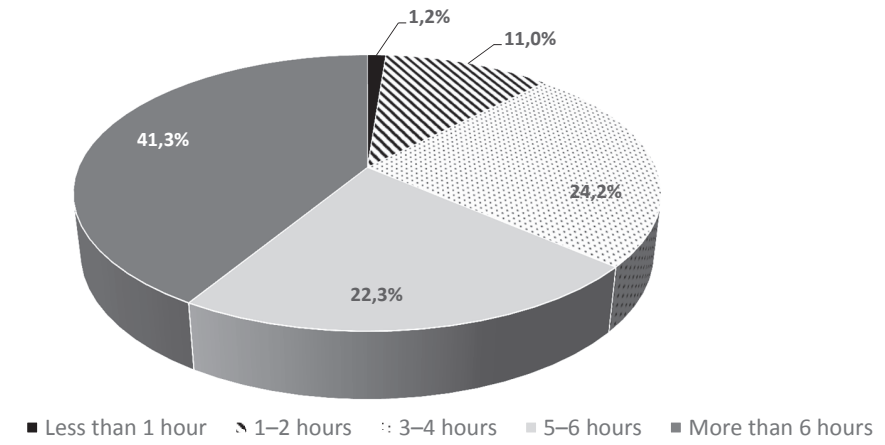

Fig. 1 – How much time did you usually spend sitting per day on weekdays during the last 7 days (average per day)? *N* = 1079

Fig. 2 shows the percentage of hours spent sitting on weekends. Another disturbing finding was that the highest proportion of respondents sit for 6 or more hours per day. This answer was given by 424 respondents. The second highest value was "three to four hours a day", and was given by 265 respondents. According to Beach et al. (2005) the time spent sitting that affects the health of an individual – up to 4 hours a day – is practiced by only 392 out of 1,077 respondents who gave valid answers, almost the same as on weekdays. The results show that 685 respondents sit for more than 4 hours a day on weekends, which is almost identical to the number recorded on weekdays. The average time spent sitting at the weekends is 11.52 hours a day ($p < 0.050$).

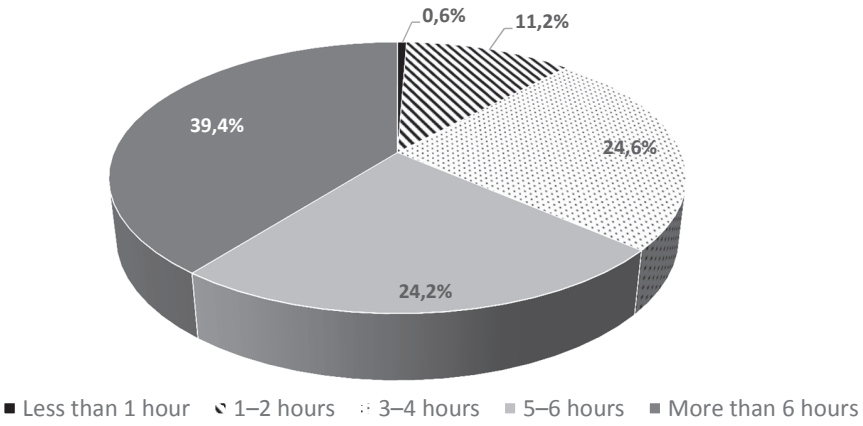

Fig. 2 – How much time did you usually spend sitting a day on weekends during the last 7 days (average per day)? *N* = 1077

An interesting finding was discovered by comparing the time spent sitting on weekdays and weekends with education. Tables 3 and 4 show the time dedicated to sitting with the percentage of individuals in relation to education. If we consider the time period of 4 hours spent sitting a day relatively non-harmful, it can be stated that only 18% of the respondents with primary education sit in this way. The rest, 82%, sit for a duration that is over this limit during the week. Surprisingly, individuals with primary education show the worst results and thus they take the leading position in hours spent sitting in a working week. In respondents who had a secondary education (without GCSE's) the values of up to 4 hour of sitting are attributed to 41.4% of the respondents. Secondary school graduates with GCSE's sit up to 4 hours in 38.3% of the cases. Finally, respondents with a university education sitting up to 4 hours in a working week are represented in 36.9% of the total. It is therefore evident that neither group meets the absolute majority of the optimal time for sitting in a working week.

Table 3 – Number of hours spent sitting on weekdays in relation to education. *N* = 1072

Education	Number of hours				
	0 hours	*1–2 hours*	*3–4 hours*	*5–6 hours*	*6 and more hours*
Primary	0.0%	7.7%	10.3%	26.5%	55.6%
Secondary without GCSE's	2.4%	13.5%	25.5%	17.5%	41.0%
Secondary with GCSE's	1.3%	11.9%	25.1%	22.3%	39.5%
University	0.4%	8.6%	27.9%	25.3%	37.8%

More important findings are presented in Table 4. The respondents with primary education show almost the same value in terms of the number of hours spent sitting in a working week. Only 17.6% sit up to 4 hours. The biggest decline in this case is represented by a group of respondents with a secondary education (without GCSE's). In this group 29.6% of the respondents sit for up to 4 hours per day. 37% of the respondents with a secondary education (with GCSE's) sit for up to 4 hours on weekends as well as on weekdays. However, a surprising finding is the final result. More than a half of the respondents with a university education, to be exact 51.6% of the respondents spend up to 4 hours of the total time sitting at the weekend. This result is supported statistically given that the significance level is less than 0.001. All other results show a statistical significance of $p = 0.05$.

Finally, an interesting finding is the relationship between time spent sitting and sex. From 1,077 respondents who answered validly, 551 women and 526 men, 41.9% of women and only 30% of men spend up to four hours per day sitting. The results at $p = 0.001$ show an apparent superiority of a sedentary lifestyle among the male population of the Czech Republic.

Table 4 – Number of hours spent sitting on weekends in relation to education. $N = 1070$

Education	Number of hours				
	0 hours	*1–2 hours*	*3–4 hours*	*5–6 hours*	*6 and more hours*
Primary	0.0%	6.7%	10.9%	16.8%	65.5%
Secondary without GCSE's	0.0%	8.8%	20.8%	22.4%	48.0%
Secondary with GCSE's	0.9%	10.7%	25.4%	26.5%	36.5%
University	0.9%	17.2%	33.5%	25.8%	22.7%

DISCUSSION

Sedentary life and physical inactivity are one of the major factors that contribute to low energy output and thus to excessive weight and obesity and other associated health complications (Blair et al. 2002). The issue of sedentary lifestyle is visible not only at work but also in the way the current population spends their leisure time. From a physiological perspective, the sitting position is one of the most inconvenient that the human body can adopt, because there is pressure on arteries and nerves. This can lead to the swelling of legs and insufficient blood supply. Changes of blood flow and pathological differences in blood gases are observed after just 3–4 hours of sitting per day (Beach et al. 2005). A fundamental problem of prolonged sitting occurs at the muscular level, resulting in the formation of muscle imbalance, which leads to frequent pains not only in the exposed parts of the body. Long periods of sitting are often accompanied by headaches, neck and back pain, or the already mentioned failure of blood supply to the lower limbs. According to Gilbertová and Matoušek (2002) long and inappropriate sitting is associated with cervicobrachial and cervicocranial syndrome, which leads to a faster onset of degenerative diseases, osteoporosis and susceptibility to musculoskeletal injuries. Vobr et al. (2012) assert that among the Czech population, sedentary work currently prevails over physically demanding work. 41% of men and 36% women have sedentary jobs, while only 14% of men and 9% of women perform physically demanding work. To minimize the risks that come with sedentary work there is the science of ergonomics. The subject of interest is the relationship between "man-work-machine". Despite some contribution of ergonomics to the improvement of physiologically acceptable sitting, what is not solved is the energy expenditure, which is under the average in a person sitting for an average time period at work (Chundela 2013). However, Healy et al. (2007) reported that to double the energy output it is sufficient if an individual takes a standing position during activities that don't require sitting during activities that don't require sitting

take a standing position. He also presents a view that is in slight contradiction with the organizations that promote physical activity (WHO 2013), in that a day spent sitting cannot be compensated for by only one-hour energy expenditure in the implementation of the PA, such as fitness or walking. Our results, which are not divided according to job performance, but according to weekdays and weekends, show that the adult population sits over the limit. On weekdays, on average the time spent sitting is 11.8 hours. If we consider sitting three to four hours a day as relatively non-harmful, the time spent sitting on weekdays is not exceed only by 12.2% of the respondents. Virtually identical results point to an unsatisfactory situation on weekends. The average daily time spent sitting at the weekends is 11.5 hours. Similarly, only 11.8% of the population sits for less than 3 hours a day on weekends. Similar negative results were seen in the UK. According to Kazi et al. (2014) during the day on average 56% of the time is spent sitting. Likewise Clemes et al. (2014) present similar findings when they point out that the measurement of time administrative staff spend sitting on weekends is 382 minutes. However, the problems of a sedentary lifestyle are rooted in childhood, when pupils are forced to undergo 9 years of compulsory schooling in classrooms. This problem does not improve by diminishing the quality and extent of physical education and lack of exercise in the free time of children (Hardman and Stensel 2009). A sedentary lifestyle usually culminates in adulthood with associated health complications. A sedentary lifestyle can correlate to some extent with the educational attainment of individuals (Vašíčková et al. 2012). Our results show the greatest number of hours spent sitting in people with primary education on weekdays, when nearly 56% of the respondents spend more than 6 hours per day sitting, but on weekends, almost 66% of the monitored population spend more than six hours sitting. This fact can be attributed to reduced socio-economic conditions due to the low average income of the population with basic education, which does not provide sufficient funds for performing leisure-time physical activity (Vobr et al. 2012). This fact is to a certain extent affected by the low level of education of this group, and lack of education directed at health promotion and education. This corresponds to the statement made by Sekota (2013), according to which the population with a basic education performs more hours of physically demanding work, but do not get enough compensation in the form of suitable PA. An interesting finding arises from the comparison of time devoted to sitting by a highly educated population and a population with a basic education on weekdays and weekends. While 63.1% of the respondents with a university education sit on working days for more than 4 hours, on weekends it is only 48.4%. The respondents with a primary education show a similar percentage of sitting for more than four hours on workdays and weekends, specifically 82.3% of the respondents sit for longer than 4 hours on weekdays and 82.1% on weekends. Due to this finding, it is necessary to try to bring more hours of physical education to basic education and thus reduce several hours of sitting in a physiologically unnatural position. It is also necessary to increase the efficiency of the education of health promotion, so that the problem of sedentary lifestyle is given to students prior to adolescence as a functional primary prevention. The compliance with movement regime has a significant impact on the quality of life, that's why movement becomes an active lifetime necessity. Within ergonomics it is important to educate about an optimal position in work or study and exercise in the free time (Kříž and Majerová 2010). If the population is excessively exposed to a sedentary lifestyle, which is evident from our research, it is important to apply the basics of secondary prevention. It is because the propagation primary prevention failed or was not supported at all. The most effective mechanism for the secondary prevention of health problems, which are also caused by long-term sitting, is to shorten considerably the time spent sitting and to develop more dynamic movement. While it is possible even for administrative tasks to adopt the standing position, socially this kind of compensation is hardly acceptable. Therefore, it is necessary to discuss other compensatory mechanisms, which means active sitting; Brügger's sitting position and its alternative variant (Chundela 2013). Another possibility is to use alternative sitting equipment, including kneeling chairs or a gym ball.

Civilization has undoubtedly brought much good, but even more bad for the body. The situation is very serious to alarming – the absence of meaningful physical education at all types of schools (mostly primary and secondary schools), the lack of leisure-time PA for children, the lack of basic educational principles in schools, education in families, the system of primary prevention and detection etc. (Zeman 2009). Today's people usually perform non-manual work, they spend most of their time in offices with poor lighting, poor ergonomic design of the workplace (chairs, tables, etc.), they travel by various means of transport and do not develop consistent PA (Ištoňová 2008). The last item in the preceding sentence is very important. It is clear that civilization, respectively its achievements and "rocket" development, will not be influenced by individuals. But what you can affect is your position in this civilization. People should become aware of what their body is designed for, and as it has to serve well, make an effort to make it serve as long and well as possible.

CONCLUSION

We can conclude that the time a healthy adult spends sitting is medically unacceptable, especially in terms of the negative health effects that sitting causes. Therefore, we consider our findings that are supported by similar research, alarming. We consider it urgent to solve and transmit the aspects of primary prevention from a methodological point of view into practice. It is necessary to make the whole of society familiar with the risks and effects of physical inactivity and a sedentary lifestyle, and finally to cooperate with all of the bodies involved with the issue of physical inactivity and to establish interagency cooperation to increase overall PA.

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose.

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