PILOT STUDY ON THE APPLICATION OF THE NQLS QUESTIONNAIRE IN A STUDY OF PHYSICAL ACTIVITY IN INHABITANTS OF VILLAGES AND TOWNS

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BACKGROUND: The environment of a neighborhood (the availability of sports facilities, services, and transportation) can influence physical activity (henceforth PA), however the influence of different environments on PA have not been clearly described in the Czech Republic yet.

OBJECTIVE: The aim of the study is to identify the relationships between obesity and PA in Olomouc and the surrounding countryside depending on differences in the neighborhood environment. A further aim of the study is to form recommendations concerning physical activity enhancement and lifestyle.

METHODS: PA was quantified on the basis of the NQLS (Neighborhood Quality of Life Study) questionnaire, which includes the internationally standardized IPAQ long questionnaire in its second part. The study involved 241 valid questionnaires from the respondents from Olomouc (capital of Olomouc region, 100,000 inhabitants) and Prakšice (village close to Olomouc, less than 1,000 inhabitants) aged 15–60 (102 men and 139 women). The data adjustment was done in compliance with the international guidelines of the "IPAQ Research Committee" (www.ipaq.ki.se).

RESULTS: Based on individual values, 6% of the inhabitants of Olomouc and 2% of inhabitants of Prakšice show very low physical activity, 23% of the inhabitants of Olomouc and 11% of inhabitants of Prakšice meet minimal PA requirements, and 66% of the inhabitants of Olomouc and 87% of inhabitants of Prakšice show higher levels of physical activity. Both the inhabitants of the town and the village confirm the good availability of services such as grocery stores, elementary schools and post offices. In both the town and the village, the inhabitants also claim that there is good availability of pedestrian and cycling paths. The inhabitants of the village show higher physical activity than the inhabitants of the town.

CONCLUSIONS: The young and middle aged inhabitants of the village show significantly higher PA than the inhabitants of the town. The majority of the inhabitants of both Olomouc and Prakšice are physically active enough. In overweight or obese women, we recommend including vigorous PA which does not overstress the muscular skeletal system or to increase the overall PA to the required level by increasing the volume of walking and moderate PA. We also advocate for a change of the entire lifestyle.

Keywords: MET-minutes/week, IPAQ, physical activity, obesity, neighborhood.

INTRODUCTION

An optimal level of physical activity (hence PA) is generally considered to be an important part of a healthy and physically active lifestyle. However, the conditions for promoting and carrying out physical activity are not the same in all places. Different environments of neighborhoods (the availability of sport facilities, services, and transportation) can influence PA. However, the relationships between the environment and PA have not been thoroughly studied in the Czech Republic, yet. Studies on the relationships between PA and the environment have been in the forefront internationally (Saelens, Sallis, Black, & Chen, 2003). Moreover, since the individual approach to PA has not been efficient enough, public health experts require PA to be studied in the context of the environment where it is taking place (Badland & Schofield, 2006). Walking as the most frequent type of PA in adults is essential in meeting health recommendations (Cerin, Leslie, Toit, Owen, & Frank, 2007) and is to a great extent influenced by the aesthetics of the surrounding environment, by the conditions and accessibility of places suited for walking, the traffic density, and by the combination of environmental attributes (Owen, Humpel, Leslie, Bauman, & Sallis, 2004).

Similarly to walking, also other types of PA are influenced by the environment (De Bourdeaudhuij, Sallis, & Saelens, 2003; Saelens, Sallis, Black, & Chen, 2003). Based on the studies carried out in cities in the Czech Republic, a positive influence of a physical activity friendly environment on PA has been confirmed. Moreover, the environment influences PA more significantly than biosocial variables (Sigmund, Mitáš, Sigmundová et al., 2008; Sigmund, Mitáš, Vašíčková et al., 2008). Further, it has been confirmed that males and females

were more likely to be active in towns with less than 100,000 residents (Frömel, Mitáš, & Kerr, 2009). Living in villages with less than 1,000 inhabitants is essentially different to living in a town with a hundred thousand inhabitants, therefore different physical activity behavior and different related attributes are expected. The aim of the study is to identify the relationship between obesity and PA in the town of Olomouc and in the countryside according to the differing environment of the places. A further goal is to create recommendations enhancing a physically active lifestyle.

METHODS

The survey was carried out as a part of nationwide research on PA, which is involved in the international research Physical Activity Questionnaire Prevalence Study (Bauman et al., 2009; Guthold, Ono, Strong, Chatterji, & Morabia, 2008). PA was estimated using the NQLS (Neighborhood Quality of Life Study) questionnaire, which in its second part includes the internationally standardized IPAQ long questionnaire (Craig et al., 2003; Frömel et al., 2004). The NQLS questionnaire asks about the neighborhood of a respondent (types of residence, streets, places suited for walking and cycling, environment, availability of services and facilities, neighborhood safety). The IPAQ questionnaire asks about physical activity and inactivity carried out in the last 7 days. The IPAQ questionnaire allows comparison of PA of vigorous and moderate PA, walking and sitting in the context with other personal, demographical and environmental variables. Data were collected in 2005. In Prakšice, the questionnaires were distributed randomly. In Olomouc, which is the closest city with one hundred thousand inhabitants, the sample was obtained by random selection on the basis of age and address. In total, 241 valid questionnaires were obtained from the respondents in Olomouc and Prakšice aged 15–60 (102 men and 139 women). The adjustment of data was carried out in compliance with the international guidelines for data processing of the "IPAQ Research Committee" (www.ipaq.ki.se/ipaq.htm). The analyses of PA were carried out in 136 respondents aged of 24–35, 36–48, and 49–60. Respondents younger than 24 years were not included because data on university students could have been included into these analyses which could lead to a risk of biased data. In the case of neighborhood characteristics, the entire sample, i.e. including respondents aged 15–23, was considered.

The assessment of PA in MET values was divided into 6 METs for vigorous PA, 4 METs for moderate PA and 3.3 METs for walking. The total average PA expressed in MET-min/week was calculated using average minute values for adequate PA (vigorous PA, moderate PA, walking) multiplied by the responding energy equivalent in METs for the given PA intensity (www.ipaq.ki.se/scoring.htm).

The groups were divided according to Body Mass Index in compliance with the categories by Placheta et al. (1999), which consider gender. To assess the significant differences, the variance analysis, nonparametric Kruskall-Wallis test, and the relevant η^2 coefficient (from the effect size coefficients) were used, where $\eta^2 = 0.01$ low effect, $\eta^2 = 0.06$ medium effect and $\eta^2 = 0.14$ large effect (Morse, 1999).

RESULTS

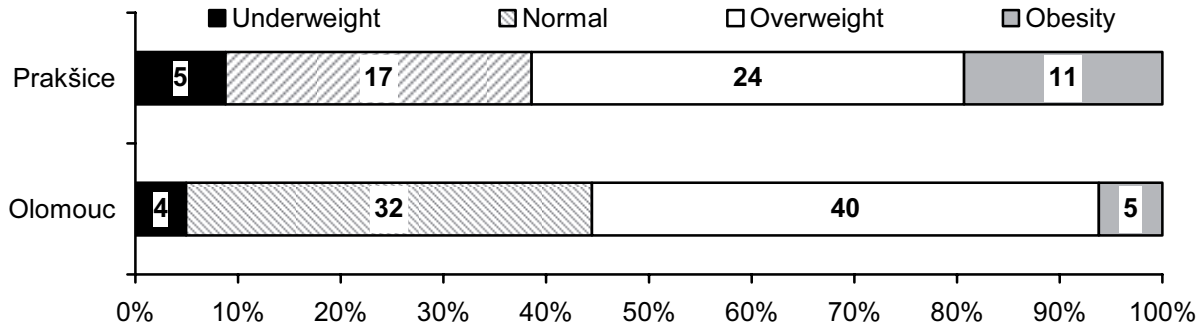
According to the Kruskal-Wallis test, we have not found any differences between PA in men and women in all age categories (TABLE 1).

TABLE 1
The comparison of total weekly PA (MET-min/week) between men and women in different age categories

Age category		*n*	*Mdn*	*IQR*	*H*	*p*	η^2
24–35 years	**men**	13	6,067	8,847	0.08	0.770	0.002
	women	25	5,424	4,424			
36–48 years	**men**	23	5,723	6,381	0.54	0.461	0.009
	women	37	5,047	6,354			
49–60 years	**men**	18	6,140	9,003	0.17	0.536	0.005
	women	20	5,368	6,434			

Legend:
Mdn – median
IQR – inter-quartile range
n – scope of sub-sample
p – level of statistical significance
H – testing criterion of Kruskal-Wallis test
η^2 – effect size coefficient

Fig. 1
The sample of inhabitants of the village of Prakšice (n = 55) and the town of Olomouc (n = 81) according to BMI (kg/m^2)



Based on the individual values, 6% of the inhabitants of Olomouc and 2% of inhabitants of Prakšice show very low physical activity, 23% of the inhabitants of Olomouc and 11% of inhabitants of Prakšice meet minimal PA requirements, and 66% of the inhabitants of Olomouc and 87% of inhabitants of Prakšice show higher levels of physical activity.

Out of the total sample, 64% inhabitants of Prakšice and 55% inhabitants of Olomouc are overweight or obese (Fig. 1). It is difficult to assess the association between PA and BMI coefficient. A significant correlation was found between BMI and moderate PA r = 0.29. In walking and vigorous PA a negative correlation in relations to BMI (r = –0.11; r = –0.05) was found.

In men, no differences in relation to BMI were identified, whereas in women, we identified both statistically and logically significant differences in moderate PA (H(3, 82) = 8.11; p = 0.044; η^2 = 0.1). Obese and overweight women have more moderate PA than women with normal weight and underweight (TABLE 2).

It seems that type of residence (in this case the town of Olomouc and the village of Prakšice), can play a significant role in PA performance, especially in young people (aged 24–35) and the middle aged generation

TABLE 2
The assessment of PA of different intensity according to BMI – Women 24–60 years old (MET-min/week)

Activity	Weight (according to BMI)	*n*	*Mdn*	*IQR*	*H*	*p*	η^2
Vigorous PA	underweight	7	360	1,080	3.15	0.369	0.04
	normal	36	630	1,440			
	overweight	29	0	2,160			
	obesity	10	0	2,880			
Moderate PA	underweight	7	270	1,680	**8.11**	**0.044**	**0.10**
	normal	36	1,920	2,940			
	overweight	29	3,255	2,700			
	obesity	10	2,020	2,827			
Walking	underweight	7	1,881	2,789	0.29	0.96	0.003
	normal	36	2,492	2,921			
	overweight	29	1,848	2,508			
	obesity	10	1,931	3,366			

Legend:
Mdn – median
IQR – inter-quartile range
n – scope of sub sample
p – level of statistical significance
H – testing criterion of Kruskal-Wallis test
η^2 –effect size coefficient

TABLE 3
The assessment of PA according to the size of location and age categories (MET-min/week)

Age category	Number of inhabitants	*n*	*Mdn*	*IQR*	*H*	*p*	η^2
24–35 years	> 100,000	17	3,846	4,884	**4.04**	**0.044**	**0.11**
	< 1,000	21	6,067	6,300			
36–48 years	> 100,000	40	4,831	5,804	**4.61**	**0.031**	**0.08**
	< 1,000	20	6,039	8,426			
49–60 years	> 100,000	24	3,933	6,257	2.38	0.123	**0.06**
	< 1,000	14	7,377	4,373			

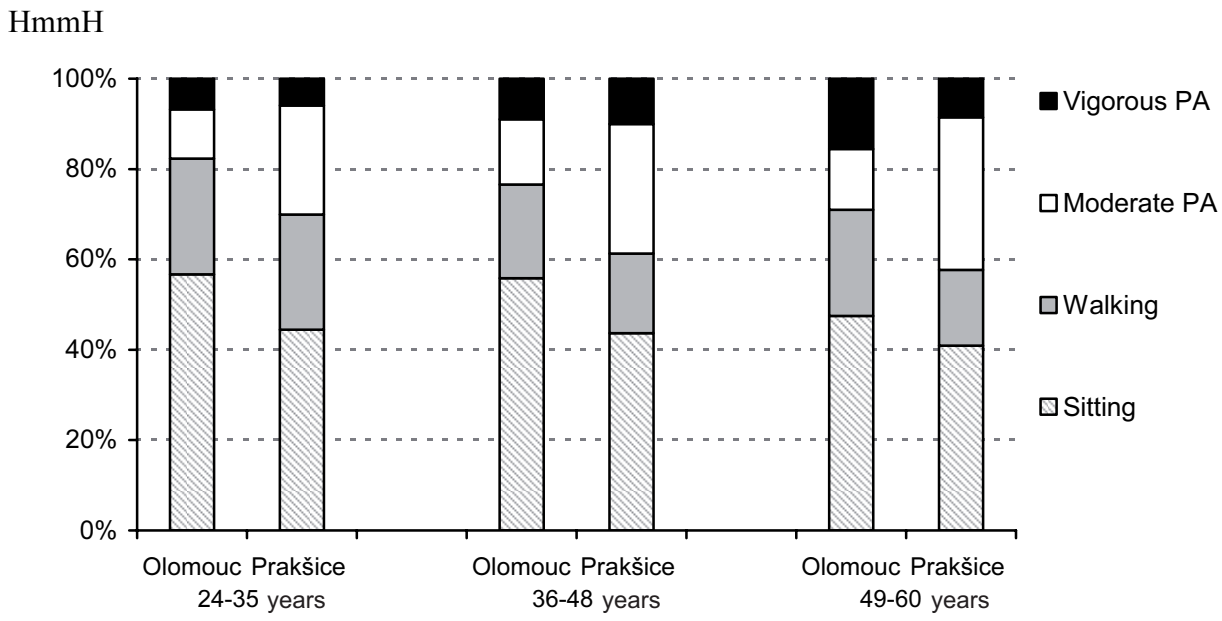
Legend:
Mdn – median
IQR – inter-quartile range
n – scope of sub-sample
p – level of statistical significance
H – testing criterion of Kruskal-Wallis test
η^2 – effect size coefficient

(36–48 years). These age groups in the village show higher PA than the inhabitants of the town. In the age category of 49–60 years, we have not found any differences between Olomouc and Prakšice (TABLE 3).

Next to the PA analysis regarding intensity, an analysis regarding the type of PA, e.g. job related, transportation, leisure time and housework PA, was also carried out. On the basis of the variance analysis, we have found significant differences in job related PA between both men and women ($F = 9.95$; $p = 0.002$) and between the inhabitants of Prakšice and Olomouc ($F = 7.83$; $p = 0.006$), their interaction factor was also statistically significant $p = 0.03$. On the basis of the post hoc Fischer LSD test, occupational PA in Olomouc men is significantly lower than in men from Prakšice ($p = 0.002$). Moreover, men in Prakšice show higher PA than women in Prakšice ($p < 0.001$). In transportation PA, no significant differences in relation to gender and the size of the given locations have been found.

The analysis of PA while working in the house and around the house has shown significant differences between the inhabitants of Prakšice and Olomouc ($F = 19.27$; $p < 0.001$), when according to the post hoc Fischer LSD test, men ($p < 0.001$) and women

Fig. 2
Ratio of physical activities and inactivities per day according to age categories and size of location



($p = 0.009$) from Prakšice show significantly higher PA related to housework. In case of leisure time PA, we have found significant differences between inhabitants from Prakšice and Olomouc ($F = 8.22$; $p = 0.005$), when according to the post hoc Fischer LSD test, women ($p = 0.01$) from the village of Prakšice show a lower level of leisure time PA than women from Olomouc.

In the comparison of the physical environment of the studied locations concerning the accessibility of shops, facilities and different services, the respondents from both the locations assessed the accessibility according to minutes spent walking to the destinations. In both locations, very good accessibility (up to a 10 minute walk) was found in the case of a grocery store (> 83%), an elementary school (> 73%), a bus or a train stop (> 87%), but also in the case of walking to the post office. Both the locations are also similar in the ratio of inhabitants who have to walk to their school or work for more than 30 minutes from their home (32–34%). The inhabitants of the village of Prakšice have worse access to supermarkets, to different stores, restaurants, coffeeshops, etc. However, regarding the accessibility of facilities for PA such as fitness/wellness studios, gyms and similar ones, the situation is almost equal, as 53% of Olomouc inhabitants and 41% of Prakšice inhabitants confirm accessibility within less than a 10 minute walk.

Both the locations can be considered as highly walkable locations which was also confirmed by 85% of the respondents who completely or somewhat agreed that there are sidewalks in their neighborhoods. More than half of the respondents from both the locations agreed with the statement that there are easily accessible pedestrian and cycling paths in their neighborhoods and their surroundings.

The fact that walking accounts for an extensive part of daily PA, is shown in Fig. 2. The proportion of sitting to other daily physical activities is rather unsatisfactory. In some categories, it reaches over 57% of all daily activities and inactivities.

DISCUSSION

The aim of the study is to examine the relationship between obesity and PA in Olomouc and in the countryside in relation to the environment of locations. Results from foreign studies predominantly show that men are more active than women. So our results have not confirmed the expectation (Ammouri, Neuberger, Nashwan, & Al-Haj, 2007; Caspersen, Pereira, & Curran, 2000; Googin & Morrow, 2001; Hagströmer, Oja, & Sjöström, 2007; Troiano, Berrigan, Dodd, Masse, Tillert, & McDowell, 2008). That men are more physically active than women. Physical inactivity is crucial to obesity development in developed countries (Batch & Baur, 2005). In our study, 56% of village inhabitants are overweight or obese in comparison to 29% of town inhabitants. Significant differences between the village and town inhabitants were found only in the relationship of moderate PA to BMI. However, with an increasing BMI coefficient, vigorous PA decreases or vanishes completely. The high percentage of overweight or obese people in the Czech population was also stated in the International Association for the Study of Obesity (2007a), in which it was shown that 73.2% of Czech men (thereby taking second place within the studied European countries), and 57.6% of Czech women, 57.6%, therefore taking third place within the studied European countries) exhibit overweight and obesity. In Czech children aged 5–17 years old, overweight was found in 14.7% of boys and 13.4% of girls (International Association for the Study of Obesity, 2007b).

According to the individual data, most of the inhabitants of both the town and the village are sufficiently active, however the criteria seem to be very low. In comparison a study, e.g. by Muntner, Gu, Wildman, Chen, et al. (2005), argues that only 66.3% of the respondents in the Chinese population are physically active. The levels for sufficient and high PA are based on general PA recommendations. The recommendations of the "IPAQ Executive Committee 2003" are based on the short version of the IPAQ questionnaire (www.ipaq.ki.se/scoring.htm). The authors regard a respondent to be sufficiently physically active if he/she performs vigorous PA at least 3 times week for at least 20 minutes a day, or moderate PA or walking for at least 5 times a week and for at least 30 minutes a day, or any combination of moderate or vigorous PA reaching the minimal level of 600 $MET\text{-}min^{-1}\cdot week^{-1}$ (Abu-Omar, Rütten, & Robine, 2004).

The inhabitants of the village show higher PA than the inhabitants of the town in age categories 24–35 and 36–48 years old. We have also found differences in the case of PA in the house and around the house, which is higher in the village inhabitants. On the other hand, the town inhabitants show higher leisure time PA. These results are in compliance with the study on the leisure time PA of women aged 40–49 (Wilcox, Castro, King, Housemann, & Brownson, 2000), when women from villages showed more sedentary behavior and more barriers to PA than women from towns. Similarly, results are found in the study by Cole, Leslie, Bauman, Donald and Owen (2006) which examined walking. Men from towns showed significantly higher levels of walking in leisure time or in exercises. In women, more walking was found in women who were younger, had higher education and BMI below 25 kg/m^2. Moreover, in 14% of respondents, walking reached health recommendations.

It is a positive finding of this study that both the locations are of high walkability, which has been also

confirmed by the respondents' answers in which 85% of the inhabitants agreed completely or somewhat agreed that there are sidewalks in their neighborhoods and similarly more than half of the respondents answered that there are easily accessible pedestrian and cycling paths. Similarly, in a study by Rütten and Abu-Omar (2004), 71.8% of the respondents agreed that there are enough opportunities to carry out PA in their neighborhoods, moreover respondents living in the countryside or smaller towns were more satisfied with their opportunities than those living in larger towns. Of the countries observed, the Germans and the Dutch assessed the opportunities for PA as being the best, as opposed to the Italians and the Portuguese, who assessed their opportunities as being the worst. In a study of 20 countries (Bauman et al., 2009), the Czech Republic is among those countries that show that walking forms an essential part of high levels of PA amounting to more than 30% of PA. The authors argue that even countries having an infrastructure that supports walking can reach high levels of PA without having high levels of vigorous PA: Describing the environmental attributes that influence PA can provide resources applicable in regional policies regarding public health and other matters. It is moreover important to identify types of environment that enhance changes in physical activity behavior (Leslie, Saelens, Frank, Owen, Bauman, Coffee, & Hugo, 2005).

The use of subjective techniques of PA estimation is a limit of the study since the differences found could be due to different PA estimations by the respondents. A small number of participants and the statistical comparison of obviously different groups could affect the results of this study.

CONCLUSIONS

- The village inhabitants of younger and middle age showed significantly higher PA than other respondents.
- The majority of the inhabitants of Olomouc and Prakšice meet the IPAQ recommendations for PA.
- The inhabitants of the village show higher PA in the house and around the house than the inhabitants of the town.
- Women from the town show higher leisure time PA and men from the town show higher PA related to their job than people from the village.
- The inhabitants of Prakšice show a higher percentage of moderate PA in the total amount of daily physical activities and inactivities.
- The inhabitants of Olomouc show a higher percentage of walking and vigorous PA as part of the total daily amount of physical activities and inactivities.
- A higher percentage of overweight and obese people are found in the village.
- A lower percentage of sitting in the overall amount of daily activities and inactivities was found in the village people.
- Both the inhabitants in Prakšice and Olomouc claim good accessibility of groceries, elementary schools, and post offices.
- There was worse access to supermarkets, restaurants, coffeeshops, and specialized stores identified in the village.
- Both in the village and town, gyms and fitness clubs are easily accessible.
- Both the locations have highly walkable environments with pedestrian and cycling paths.
- PA in men and women was equal, no significant differences were found.
- To overweight and obese women, we recommend including some vigorous PA which is not harmful to the muscular-skeletal system. Or to increase their total PA by increasing the amount of walking and moderate PA. More attention should be paid to an overall change in lifestyle.
- To improve the physical environment, we recommend conducting a further analysis using Geographical Information Systems.

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www.ipaq.ki.se/ipaq.htm – International Physical Activity Questionnaire website.
www.ipaq.ki.se/scoring.htm – Scoring protocol of International Physical Activity Questionnaire.

PILOTNÍ STUDIE VYUŽITÍ DOTAZNÍKU NQLS V KONTEXTU S POHYBOVÝM CHOVÁNÍM OBYVATEL VESNICE A MĚSTA

(Souhrn anglického textu)

VÝCHODISKA: Odlišné prostředí místa bydliště (dostupnost sportovišť, služeb, dobrá dopravní obslužnost...) může ovlivňovat pohybovou aktivitu (dále PA), avšak tento vliv ani rozdíly v prostředí nebyly v České republice dosud detailně zdokumentovány.

CÍLE: Cílem této studie je poukázat na vztah obezity a PA v Olomouci a na venkově v závislosti na odlišném prostředí místa bydliště. Dílčím cílem je snaha o formulaci doporučení podporující pohybově aktivní životní styl.

METODIKA: PA byla kvantifikována na základě dotazníku NQLS (Neighborhood Quality of Life Study), který ve své druhé části obsahuje mezinárodně standardizovaný dotazník IPAQ long, dlouhou administrativní verzi. Do studie bylo zahrnuto 241 validních dotazníků od respondentů z Olomouce a Prakšic ve věku 15–60 let (102 mužů a 139 žen). Úpravy získaných dat byly provedeny v souladu s mezinárodně stanovenou metodikou vyhodnocování „IPAQ Research Committee" (www.ipaq.ki.se).

VÝSLEDKY: Dle individuálních hodnot je 6 % obyvatel Olomouce a 2 % obyvatel Prakšic velmi málo aktivních, 23 % obyvatel v Olomouci a 11 % obyvatel v Prakšicích splňuje minimální požadavky na PA a 66 % v Olomouci a 87 % v Prakšicích vykazuje vyšší úroveň pohybové aktivity. Obyvatelé města i vesnice uvádějí dobrou dostupnost služeb typu malý obchod s potravinami, základní škola a pošta. Stejně pozitivně je ve městě i na vesnici hodnoceno chodecké prostředí se stezkami pro chodce a pro cyklisty. Obyvatelé vesnice vykazují vyšší pohybovou aktivitu, než obyvatelé města.

ZÁVĚRY: Obyvatelé vesnice mladšího a středního věku vykazovali signifikantně více PA než obyvatelé města. Většina obyvatel Olomouce i Prakšic je dostatečně pohybově aktivních. U žen s nadváhou a obezitou doporučujeme vyšší zařazení absentující PA intenzivnějšího charakteru, které nadměrně nezatěžuje pohybový aparát, nebo zvýšit celkovou PA na přijatelnou úroveň vyšším objemem chůze a PA střední intenzity. Pozornost by měla být zaměřena na celkovou změnu životního stylu.

Klíčová slova: MET-minuty/týden, IPAQ, pohybová aktivita, obezita, prostředí bydliště.

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First-line publications

Sigmundová, D., Sigmund, E., Mitáš, J., & Frömel, K. (2009). The relation between the environment and daily steps of the residents in Czech regional towns. *European Journal of Public Health, 19 (Supplement 1),* 207.
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